December 19, 2017
Kleinfelder Project No.: 20182162

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

SUBJECT: Antero Midstream LLC – Middlebourne V Compressor Station
West Virginia Department of Environmental Protection, Division of Air Quality, 45CSR13 Air Permit Application

On behalf of Antero Midstream LLC, please find attached the 45CSR13 Air Permit Application for the proposed Middlebourne V Compressor Station (the Facility) located in Tyler County, West Virginia. The Middlebourne V Compressor Station will be a new source. Based on the calculated potential emissions for the full buildout of the Facility, the Middlebourne V Compressor Station will be a major source under the Title V program for nitrogen oxides (NOx) and volatile organic compounds (VOCs). Therefore, within 12 months of the Title V threshold being met or exceeded, a 45CSR30 application (Title V operating permit application) will be submitted to WVDEP. Middlebourne V Compressor Station is not subject to the requirements of 45CSR14 since the facility is not a PSD source nor the requirements of 45CSR19 since the facility will not be located in a nonattainment county.

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

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

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

Sincerely,

KLEINFELDER

Kaitlin Meszaros
Air Quality Professional

Enclosure: Middlebourne V Compressor Station Air Permit Application

KLEINFELDER 1801 California Street, Suite 1100, Denver, CO 80202 p | 303.237.6601 f | 303.237.6602

Antero Midstream LLC

Middlebourne V Compressor Station

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

Tyler County, West Virginia

December 2017

Prepared by:

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

DEN17O67029

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WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION

DIVISION OF AIR QUALITY

601 57th Street, SE
Charleston, WV 25304
(304) 926-0475
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):*
Middlebourne V Compressor Station

4. The applicant is the:
☐ **OWNER** ☐ **OPERATOR** ☒ **BOTH**

5A. Applicant's mailing address:
1615 Wynkoop Street
Denver, CO 80202

5B. Facility's present physical address:
Elk Fork Road
Middlebourne, WV 26149

6. **West Virginia Business Registration.** Is the applicant a resident of the State of West Virginia? ☐ **YES** ☒ **NO**

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

11B. List all current 45CSR13 and 45CSR30 (Title V) permit numbers associated with this process (for existing facilities only):

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 Middlebourne, WV, drive northeast on WV-18N/ Main St. toward Court St / Dodd St. Drive 3.8 miles and turn right toward Elk Fork. Continue onto Elk Fork for 0.4 miles. Turn right only Elk Fork Rd and drive for 1.6 miles. The facility will be on the left.

12.B. New site address (if applicable):	12C. Nearest city or town:	12D. County:
Elk Fork Road Middlebourne, WV 26149	Middlebourne	Tyler
12.E. UTM Northing (KM): 4376.21	12F. UTM Easting (KM): 511.880	12G. UTM Zone: 17

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

14A. Provide the date of anticipated installation or change: October 2018 – 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: May 2019

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), 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:

☒ Bulk Liquid Transfer Operations	☒ Haul Road Emissions	☐ Quarry
☒ Chemical Processes	☐ Hot Mix Asphalt Plant	☐ Solid Materials Sizing, Handling and Storage Facilities
☐ Concrete Batch Plant	☐ Incinerator	☒ Storage Tanks
☐ Grey Iron and Steel Foundry	☐ Indirect Heat Exchanger	

☒ General Emission Unit, specify: Engines, Dehydrators, Generator, Fuel Conditioning Heater, Venting Emissions

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

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

☐ Absorption Systems	☐ Baghouse	☒ Flare
☐ Adsorption Systems	☐ Condenser	☐ Mechanical Collector
☐ Afterburner	☐ Electrostatic Precipitator	☐ Wet Collecting System

☒ Other Collectors, specify : Oxidation catalysts, VRUs, Thermal oxidizer

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:

☒ Authority of Corporation or Other Business Entity	☐ Authority of Partnership
☐ Authority of Governmental Agency	☐ 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 _____ DATE: 12/14/2017

(Please use blue ink) *(Please use blue ink)*

35B. Printed name of signee: Ward McNeilly		35C. Title: Vice President, Reserves Planning and Midstream
35D. E-mail: wmcneilly@anteroresources.com	36E. Phone: (303) 357-6822	36F. FAX: (303)357-7315
36A. Printed name of contact person (if different from above): Barry Schatz		36B. Title: Senior Environmental and Regulatory Manager
36C. E-mail: bschatz@anteroresources.com	36D. Phone: (303) 357-7276	36E. FAX: (303)357-7315

PLEASE CHECK ALL APPLICABLE ATTACHMENTS INCLUDED WITH THIS PERMIT APPLICATION:

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

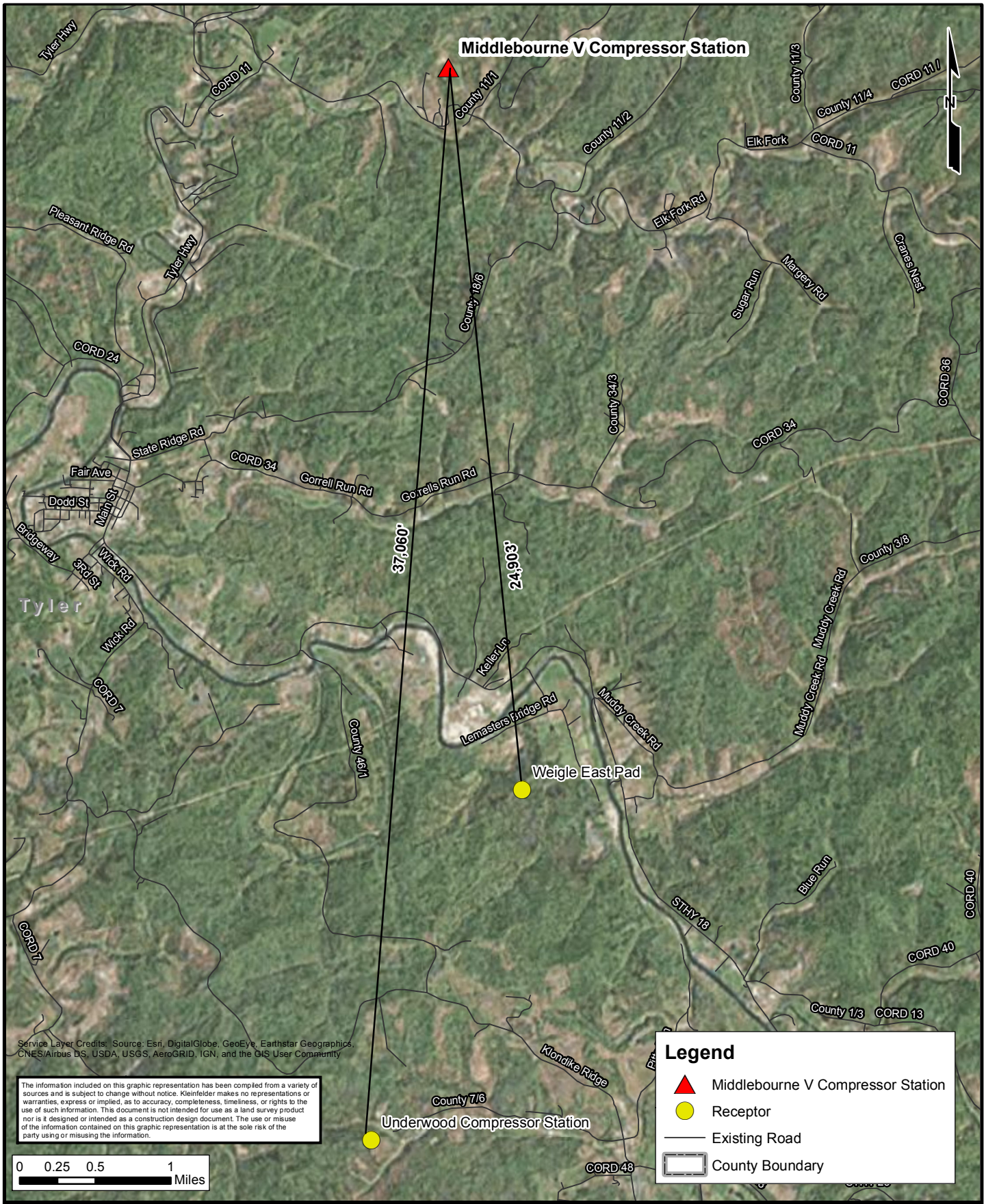
Discussion of Nearby Facilities

Middlebourne V Compressor Station – Closest Antero Facilities

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

2. SIC Code: The Middlebourne V Compressor Station will operate under SIC code 4923 (natural gas distribution). The closest facility owned by Antero Midstream LLC with this SIC code is the Underwood Compressor Station which is 7.02 miles south south-west of the Facility. All Antero Resources Corporation production facilities operate under the SIC code of 1311 (crude petroleum and natural gas extraction). The closest facility operated by Antero Resources Corporation with the SIC code of 1311 is the Weigle East Pad 4.72 miles to the south south-east.

3. Contiguous or Adjacent: The land between the Middlebourne V Compressor Station and its nearest facility operating under SIC code 4923 is not owned or managed by Antero Midstream LLC or Antero Resources Corporation. Therefore, the two facilities are not contiguous or adjacent. Secondly, land between the Middlebourne V Compressor Station and its nearest facility operating under SIC code 1311 is not owned or managed by Antero Midstream LLC or Antero Resources Corporation. Therefore, the two facilities are not contiguous or adjacent.



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PROJECT NO.	20182162
DRAWN:	10/13/2017
DRAWN BY:	B. McDavid
CHECKED BY:	K. Meszaros
FILE NAME:	MiddlebourneV_ClosestReceptor.mxd

Antero Midstream LLC

Middlebourne V Compressor Station
Tyler County, West Virginia

FIGURE

Attachment A.
Business Certificate

State of West Virginia

Certificate

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

ANTERO 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 Barker, Manager
Corporations Division
Tel: (304)558-8000
Fax: (304)558-8381
Website: www.wvsos.com
E-mail: business@wvsos.com

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

Control # A45E1

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

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: [The **name must contain one of the required terms** such as limited liability company" or abbreviations such as "LLC" or "PLLC". See instructions for complete list of acceptable terms and requirements for use of trade name.]
   ☒ **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

214913 3/2/2014 8:35:00

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:
   - [X] an **at-will** company, for an indefinite period
   - [ ] a **term** company, for the term of _____ years, which will expire on _____.

10. The company is:
   - [X] **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.
   - [X] **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.].
   - [X] **No** [Proceed to question 14.]

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

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

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.

Jeffrey W. Bullock, Secretary of State

5466900 8300

140532521

AUTHENTICATION: 1328067

DATE: 04-29-14

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

Attachment B.
Area Map

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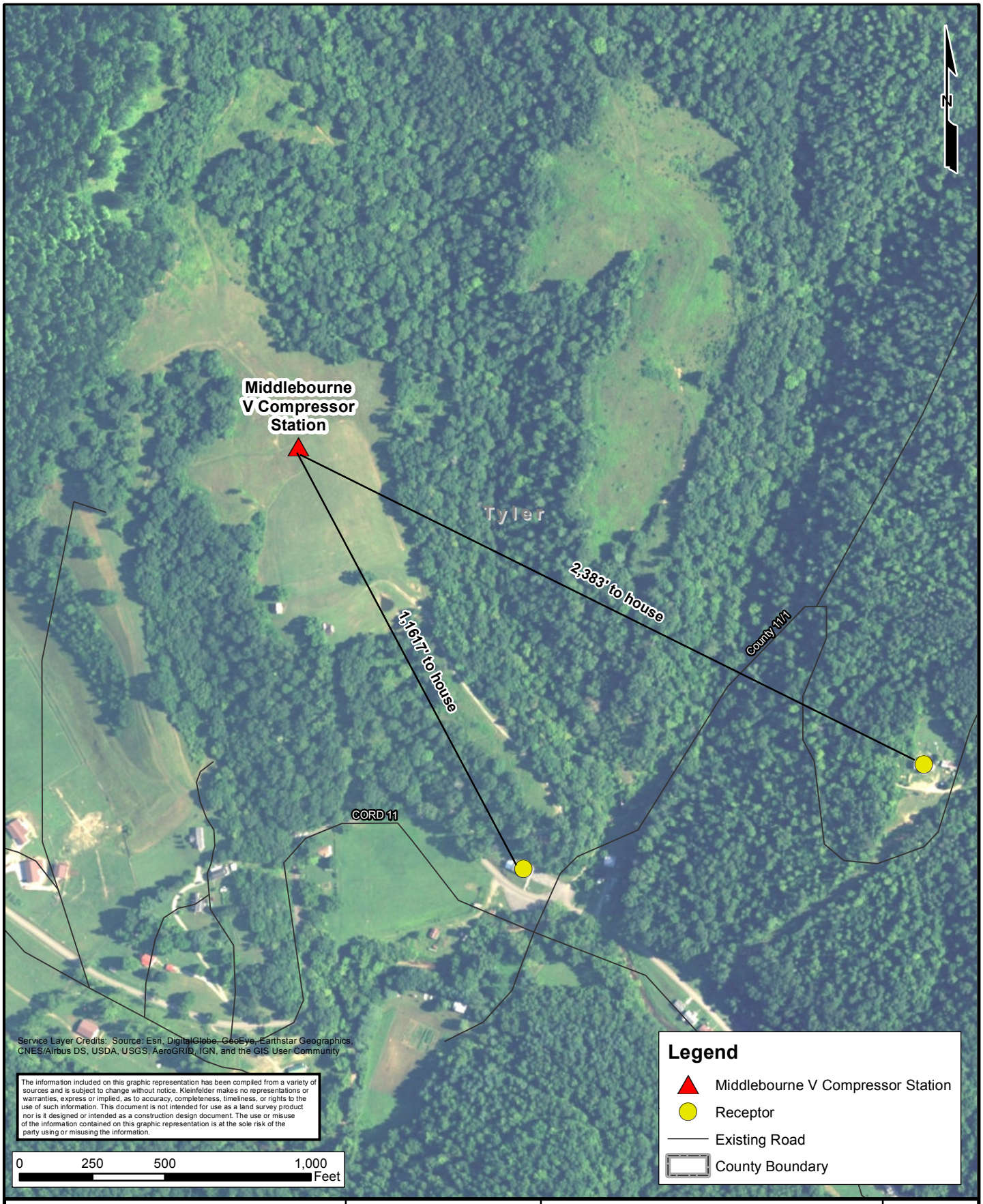
PROJECT NO.	20182162
DRAWN:	10/13/2017
DRAWN BY:	B. McDavid
CHECKED BY:	K. Meszaros
FILE NAME:	MiddlebourneV_Topo.mxd

Antero Midstream LLC

Middlebourne V Compressor Station
Tyler County, West Virginia

FIGURE



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

PROJECT NO.	20182162
DRAWN:	10/13/2017
DRAWN BY:	B. McDavid
CHECKED BY:	K. Meszaros
FILE NAME:	MiddlebourneVCS_Aerial.mxd

Antero Midstream LLC

Middlebourne V Compressor Station
Tyler County, West Virginia

FIGURE

Attachment C.
Installation and Startup Schedule

Middlebourne V Compressor Station – Installation and Startup Schedule

The Middlebourne V Compressor Station will be a new facility located in Tyler County, WV, approximately 3.75 miles northeast of Middlebourne, West Virginia. Ground clearing and other site preparation activities are anticipated to occur starting in July 2018. Installation of equipment is anticipated to begin in October 2018. Facility operations are scheduled to begin on or around May 2019.

Attachment D.
Regulatory Discussion

Middlebourne V 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^3 (§60.110b(a)). However, Subpart Kb does not apply to storage vessels with a design capacity less than or equal to 1,589.874 m^3 that are used for petroleum or condensate storage prior to custody transfer. The storage tanks at the Middlebourne V Compressor Station will be less than 1,589.874 m^3 and will be used for storage prior to custody transfer. Therefore, Subpart Kb does not apply to the Middlebourne V Compressor Station.

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

Applicability: Subpart GG applies to all stationary gas turbines with a heat input at peak load equal to or greater than 10 million Btu per hour (§60.330(a)). Since the microturbine generator at the Middlebourne V Compressor Station has 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. Subpart KKK will not apply as the Middlebourne V Compressor Station is not yet built.

IV. *Subpart LLL - Standards of Performance for SO_2 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. Subpart LLL will not apply as the Middlebourne V Compressor Station is not yet built.

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

Applicability: Subpart JJJJ applies to 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 Middlebourne V Compressor Station as the compressor engines will be ordered after June 12, 2006 and manufactured after July 1, 2007. Also, Subpart JJJJ applies to the PSI generator engine

as it will be order after June 12, 2006 and manufactured after July 1, 2007. This unit is certified to the emission limits of Subpart JJJJ.

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 (§60.4305(a)). Since the microturbine generator at the Middlebourne V Compressor Station will 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 facilities that were constructed, modified, or reconstructed after August 23, 2011 and on or before September 18, 2015 (§60.5365). Therefore, Subpart OOOO does not apply as the Middlebourne V Compressor Station is not yet constructed.

VIII. *Subpart OOOOa – Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification, or Reconstruction Commenced after September 18, 2015*

Applicability: Subpart OOOOa applies to reciprocating compressor facilities that were constructed, modified, or reconstructed after September 18, 2015 (§60.5365a(c)). Also, Subpart OOOOa applies to storage vessel affected facilities with individual tank emissions greater than 6 tons per year (§60.5365a(e)). Lastly, the collection of fugitive emissions components at a compressor station is an affected facility under this Subpart (§60.5365a(j)). Since the Middlebourne V Compressor Station will be built after September 18, 2015 and will be a compressor station with reciprocating compressors, Subpart OOOOa does apply. The pneumatic devices that will be installed at Middlebourne V Compressor Station will be air-actuated or electric and therefore exempt from the requirements of this Subpart. The storage tank affected facility applicability for the onsite storage tanks will be determined within the first 30 days of production, per Subpart OOOOa.

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 Middlebourne V Compressor Station because none of the components will 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 Middlebourne V Compressor Station, and because it is an area source of HAP emissions, the two (2) TEG dehydrators are applicable sources under Subpart HH (§63.760(b)(2)). However, actual benzene emissions from each of the dehydrators at the Middlebourne V Compressor Station are estimated to be less than 1 ton per year, so the 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 Middlebourne V 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 Middlebourne V 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 Middlebourne V 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 Middlebourne V Compressor Station as the compressor engines and PSI generator engine will be new RICE. The engines will

meet Subpart ZZZZ by meeting 40 CFR Part 60, Subpart JJJJ as the Middlebourne V 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 Middlebourne V Compressor Station as it is not a major source of HAP emissions.

Prevention of Significant deterioration and Title V Greenhouse Gas Tailoring Rule

Applicability: The Tailoring Rule was published into the Federal Register starting in 2010 in three steps. Step 1 of the Tailoring Rule stated that Title V or PSD requirements would apply to greenhouse gas (GHG) sources only if the sources were subject to Title V or PSD because of other regulated pollutants. Due to court proceedings in 2014, the facility is required to follow Step 1 of the Tailoring Rule. The potential CO_2e emissions from the Middlebourne V Compressor Station are greater than 100,000 tons per year. Because the Middlebourne V Compressor Station is also a major source under the Title V program due to NOx and VOC emissions, GHG emissions may also be subject to Title V, but not PSD, requirements.

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 Middlebourne V Compressor Station:

I. *45CSR2 – To Prevent and Control Particulate Air Pollution from Combustion of Fuel in Indirect Heat Exchangers*

II. *45CSR4 – To Prevent and Control the Discharge of Air Pollutants into the Open Air Which Causes or Contributes to an Objectionable Odor or Odors*

III. *45CSR6 – Control of Air Pollution from Combustion of Refuse*

IV. *45CSR8 – Ambient Air Quality Standards*

V. *45CSR11 – Prevention of Air Pollution Emergency Episodes*

VI. *45CSR13 – Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants, Notification Requirements, Administrative Updates, Temporary Permits, General Permits, Permission to Commence Construction, and Procedures for Evaluation*

VII. *45CSR14 – Permits for Construction and Major Modification of Major Stationary Sources for the Prevention of Significant Deterioration of Air Quality*

45CSR14 establishes a preconstruction permit program for the Prevention of Significant Deterioration (PSD) Program under the Clean Air Act. According to Section 2.43 of this rule, a Major Stationary Source is defined as any of the twenty six named sources listed in 2.43a which emits or has the potential to emit 100 tons per year or more of any regulated pollutant. Although the Middlebourne V Compressor Station will have the potential to emit over 100 tons per year of NOx and VOCs, it is not one of the twenty six named stationary sources and thus not defined a Major Stationary Source under the PSD Program by Section 2.43a. Additionally, Section 2.43b of this rule defines a Major Stationary Source as any stationary source which emits or has the potential to emit, 250 tons per year or more of any regulated pollutant. The Middlebourne V Compressor Station does not have the potential to emit 250 tons per year or more of any regulated pollutant, thus is not a Major Stationary Source under then PSD Program and 45CSR14 does not apply.

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*

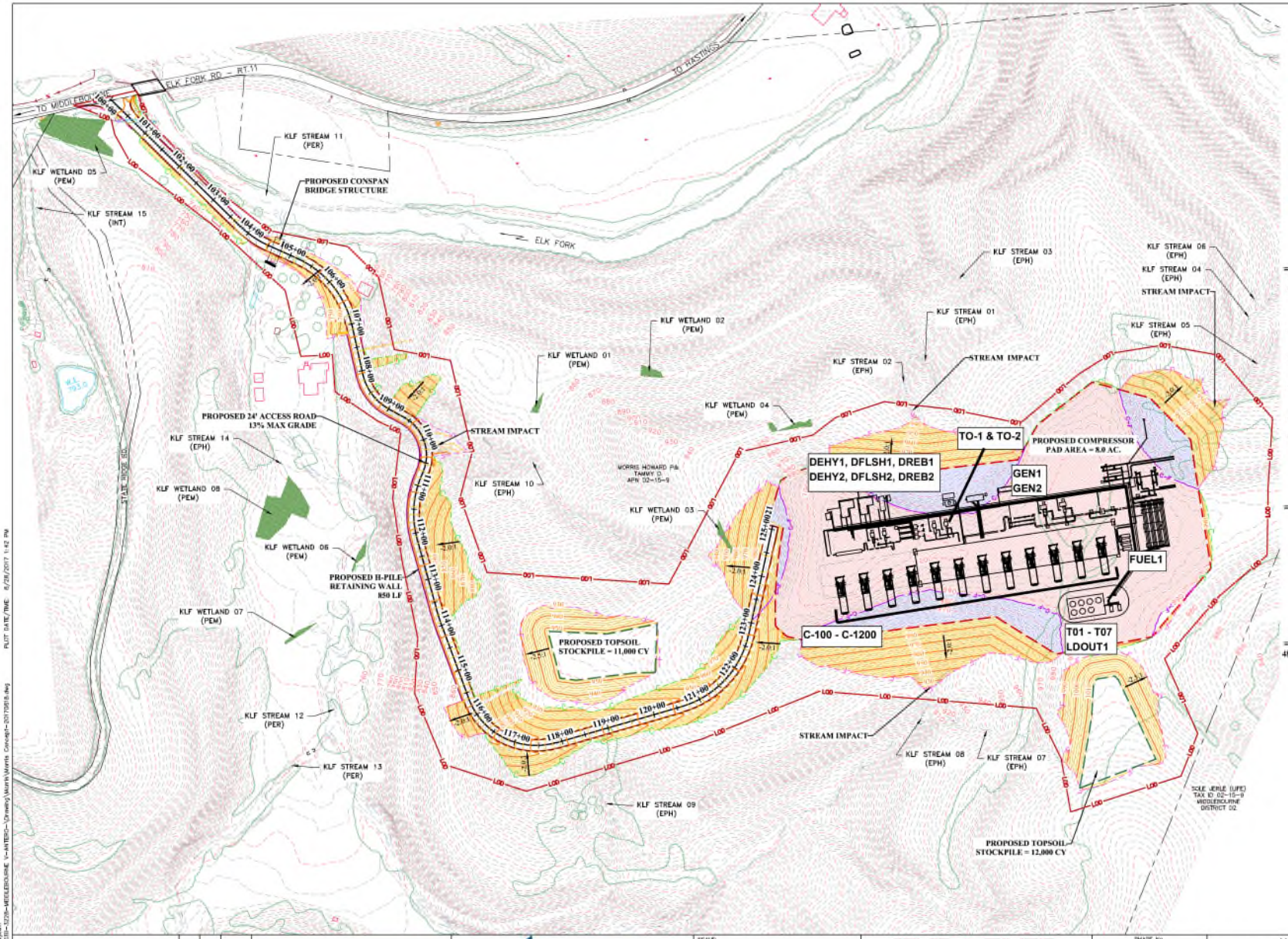
XII. *45CSR30 – Requirements for Operating Permits*

This rule establishes an air permitting program that is consistent with Title V of the Clean Air Act. According to Section 3.1.a.1, any major source as defined by the rule, shall not operate except in compliance with a permit issued under this rule on or after the effective date of the operating permit program. Section 2.26.b defines a major source as any stationary source that directly emits or has the potential to emit 100 tons per year or more of any pollutant subject to regulation. However, because a compressor station is not one of the 44 named sources under 2.26.b, fugitives do not need to be included when determining the 100 ton per year threshold. Potential emissions of NOx and VOCs from the Middlebourne V Compressor Station will be over 100 tons per year not including fugitive emissions, so the Middlebourne V Compressor Station is a major source as defined by this rule and applicable to 45CSR30. The Middlebourne V Compressor Station will need to apply for a permit under this rule within 12 months of the effective date of the operating permit program per Section 4.1.a.1.F of the rule.

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*

Attachment E.
Plot Plan



PLAN LEGEND

- EXISTING CONTOURS
- EXISTING ROAD EDGE
- EXISTING BUILDING
- EXISTING TREE LINE
- O/U EXISTING OVERHEAD POWERLINE
- EXISTING UTILITY POLE
- EXISTING FENCE
- EXISTING RIGHT OF WAY
- POTENTIAL EXISTING STREAM
- WETLAND
- LOD LIMIT OF DISTURBANCE
- PROPOSED CONTOURS
- C PROPOSED CUT LIMIT
- F PROPOSED FILL LIMIT
- PROPOSED EDGE OF ACCESS ROAD
- PROPOSED EDGE OF PAD
- PROPOSED EDGE OF TOPSOIL STOCKPILE
- PROPERTY LINE
- CUT AREA
- FILL AREA

NOTES

1. BASE MAPPING WAS PROVIDED BY BLUE MOUNTAIN.
2. ALL CONSTRUCTED SLOPES ARE 2.0H:1V. SLOPES MAY BE REVISED BASED ON GEOTECHNICAL ENGINEER'S INVESTIGATION AND RECOMMENDATIONS.
3. EROSION AND SEDIMENT CONTROLS WILL BE DESIGNED UPON ACCEPTANCE OF CONCEPTUAL GRADING PLAN.
4. PROPERTY LINES SHOWN ARE BASED UPON DIGITAL TAX MAPS. LINES ARE IN APPROXIMATE LOCATIONS.
5. ALL COORDINATES ARE IN NAD-83 WEST VIRGINIA STATE PLANE NORTH, FEET, DATUM, UNLESS OTHERWISE NOTED.
6. STREAMS AND WETLANDS SHOWN ARE BASED ON DELINEATIONS DONE BY KLEINFELDER AUG. 2017.
7. A PORTION OF THIS PROJECT IS WITHIN THE 100 YR FLOODPLAIN, MAPPED ZONE A, IN ELK FORK, A TRIBUTARY OF THE LITTLE MUSRINGUM / MIDDLE ISLAND WATERSHED, FEMA FLOOD MAP 54095C0075C

EARTHWORK SUMMARY

CUT (SWELL) FACTOR	110%
FILL (SHRINK) FACTOR	100%
TOTAL CUT	141,000 CY
TOTAL FILL	95,000 CY
NET CUT/TOPSOIL	46,000 CY
ASSUMED TOPSOIL THICKNESS	12-IN

LOD BY LANDOWNER

48-2-15-09 MORRIS HOWARD P. & TAMMY D. 27.00 AC

NOT FOR CONSTRUCTION
2017-08-22

NO.	BY	DATE	DESCRIPTION

Antero Midstream Partners LP

SCALE:	
DRAWN:	DATE:
CHECKED:	DATE:
APPROVED:	DATE:
SURVEY DATE:	
SURVEY BY:	
FIELD BOOK No.:	

THRASHER
THE THRASHER GROUP, INC.
CIVIL • ENVIRONMENTAL • CONSULTING • FIELD SERVICES
620 WHITE OAKS BOULEVARD, BRIDGEPORT, WV 26330
PHONE (304) 624-4108 • FAX (304) 624-7831

PHASE No.
CONTRACT No.
PROJECT No. 030-3228

ANTERO MIDSTREAM
CONCEPTUAL PLAN FOR THE MB 5 COMPRESSOR STATION AND ACCESS ROAD
TYLER COUNTY, WEST VIRGINIA
CONCEPTUAL PLAN

SHEET No. 1

LAYOUT TAB: Layout1
CAD FILE: V:\030-3228-MIDDLEBOURNE V-ANTERO-\Drawing\Work\Work Concept-20170918.dwg
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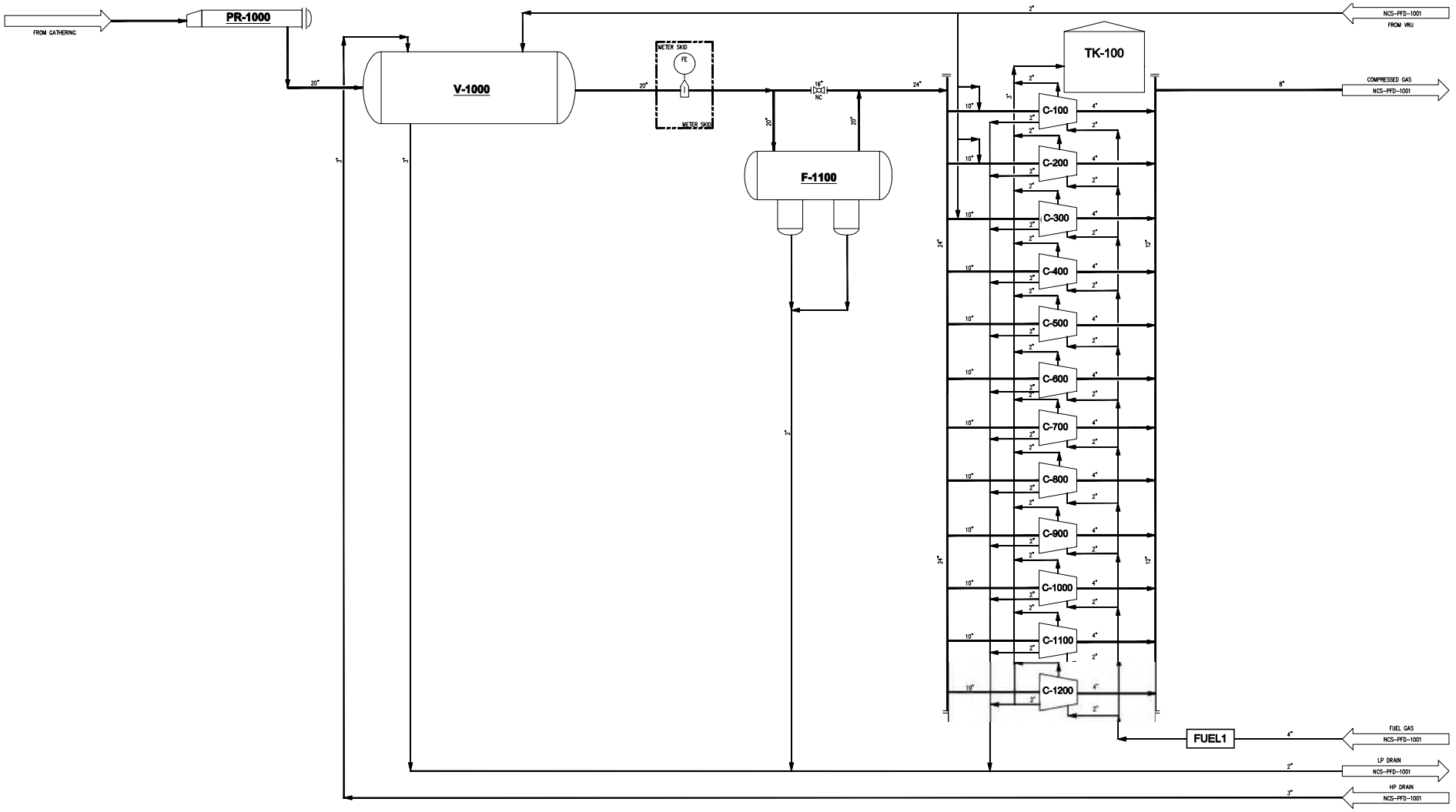
Attachment F.
Process Flow Diagram



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PLOT TIME/DATE: June 19, 2014

LAST SAVED: 06/18/14 BY: Alyx Cooley

FILE LOCATION: \PROJECTS\ANTERO APPALACHIAN RESOURCES\4083.0164.00 - NICHOLS CS\1000-PFD-PID\NCS-PFD-1000.DWG

NOTES:

REFERENCE DRAWINGS	
DWG. NO.	TITLE

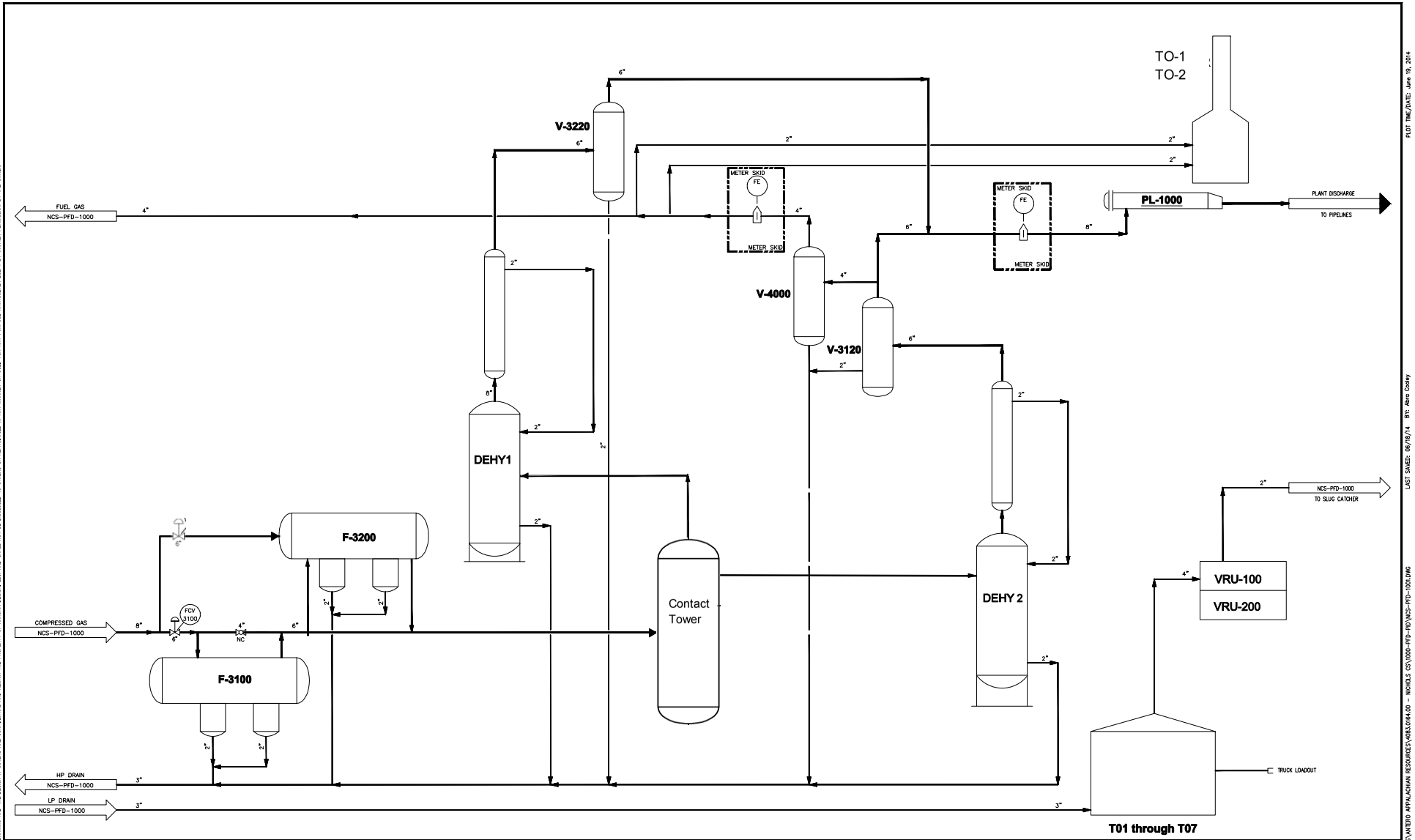
REVISIONS						
NO.	DESCRIPTION	BY	DATE	CHK.	DATE	APPR.	DATE
B	ISSUED FOR AIR PERMIT	AC	06/19/14	LW	06/19/14	PS	06/19/14
A	ISSUED FOR REVIEW	AC	05/06/14	JW	05/06/14	PS	05/06/14

Antero Resources

KAHUNA VENTURES LLC
WESTMINSTER, CO 80021
303-451-7574
BY: KAHUNA DESIGN LLC.

PROCESS FLOW DIAGRAM

DRAWN BY: A. COOLEY	CHECKED: J. WARMAN	APPROVED: P. STOCKEBRAND
CREATION DATE: 05/05/14	CHECK DATE: 05/05/14	APPR. DATE: 05/05/14
Proj. No.: 4083.0164.00	DWG. No.: TCS-PFD-1000	SHEET No.: 1 OF 2
SCALE: NONE		B



NOTES:

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

Antero Resources

KANUMA VENTURES LLC
WESTMINSTER, CO 80021
303-451-7374
BY: KANUMA DESIGN LLC.

PROCESS FLOW DIAGRAM

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

PLOT TIME/DATE: June 19, 2014

LAST SAVED: 06/18/14 BY: Alora Cooley

FILE LOCATION: N:\PROJECTS\ANTERO APPALACHIAN RESOURCES\4083.0164.00 - NICHOLS CS\1000-PFD-PID\NCS-PFD-1001.DWG

Attachment G.
Process Description

Middlebourne V Compressor Station – Process Description

The Middlebourne V Compressor Station will be located in Tyler County, West Virginia. The process description below is based on the full buildout of the facility.

Gas from surrounding pipelines enters the facility through receivers 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 500 barrel settling tank (T04). Gas from the filter separator is sent to one (1) of twelve (12) 2,500 horsepower (hp) Caterpillar G3608 lean burn compressor engines (C-100 through C-1200). The twelve (12) compressor engines are controlled with oxidation catalysts (1C through 12C). Fuel gas for the compressor engines will be treated prior to the engines by a fuel conditioning skid with a 0.5 MMBtu/hr heater (FUEL1) to allow more complete combustion. Produced fluids are routed to the settling tank and gas goes to the TEG dehydrators contact tower.

The dehydration system for this facility will consist of one contact tower that operates with two regenerator and flash tank systems. The TEG dehydrator regenerator and flash tank (DEHY1 and DEHY2) contains a 225 million standard cubic feet per day (MMscf/day) regenerator, 225 MMscf/day flash gas tank, and 1.5 MMBtu/hr reboiler. Primarily, vent gas from the flash gas tank will be routed to the unit's reboiler (DREB1 and DREB2) and used as fuel. In the case where the flash tank gas cannot be used by the reboiler due to excess gas or the reboiler being offline, the gas will be routed to the dedicated thermal oxidizer (TO-1 and TO-2). The vent gas off of the regenerator will be routed to the dedicated thermal oxidizer (TO-1 and TO-2). The thermal oxidizers each have a control efficiency of 98%. Emissions from the reboilers will be routed to the atmosphere.

Produced fluids from the dehydrators (DEHY1 and DEHY2) are routed to the settling tank (T04). 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) 500 barrel settling tank (T04) where the fluids settle out as either condensate or produced water. The produced water goes to three (3) 400 barrel produced water tanks (T05 through T07) and the condensate goes to three (3) 400 barrel condensate tanks (T01 through T03). Flashing only occurs at the settling tank as the fluids stabilize in the settling tank before going to the other storage tanks. All seven (7) 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. A second vapor recovery unit (VRU-200) is also connected to the tanks as a backup unit. The produced fluids are trucked out via tanker trucks as needed (LDOUT1). The anticipated production is 300 barrels per day of condensate and 90 barrels per day of produced water.

One (1) 800 kWe microturbine generator (GEN1) and one (1) PSI Industrial 21.9L 649 horsepower certified natural gas generator engine will be used at the facility for support power generation. The Capstone C800 unit is comprised of four (4) 200 kWe units that can be operated individually. Likely, all generators will not be operating 8,760 hours per year; however, emissions were calculated as such for maximum flexibility.

Fugitive emissions from component leaks and emissions from pigging venting or blowdown events (VENT1) also occur.

There will also be small storage tanks (1,000 to 4,000 gallons) located at the facility. Their ID number, description, and exact size are listed in the table below.

Tag Number	Description	Gallons
TK-100	Compressor Skid Oily Water Tank	2,000
TK-101	Used Oil Tank	4,000
TK-102	TEG Make-Up Tank	1,000
TK-103	Compressor Coolant Tank	2,000
TK-104	Engine Lube Oil Tank	2,000
TK-105	Compressor Lube Oil Tank	2,000

Attachment H.
Material Safety Data Sheets

SAFETY DATA SHEET

Material Name: Produced Water **US GHS**

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

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

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

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

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

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

* * * Section 2 – HAZARDS IDENTIFICATION * * *

GHS Classification:

Eye Irritant – Category 2A.

GHS LABEL ELEMENTS
Symbol(s)

Signal Word

Warning

Hazard Statements

Causes serious eye irritation

Precautionary Statements

Prevention

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

Response

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

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

If EYE irritation persists, get medical advice / attention.

Storage
Store in a secure area.

Disposal
Dispose of contents/containers in accordance with regulations.

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

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

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

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

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

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

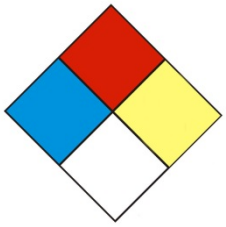
First Aid: Ingestion (Swallowing)
First aid is not required, normally. If spontaneous vomiting occurs, lean the victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. If symptoms develop, seek medical attention.

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

Most important symptoms and effects

None known or anticipated.

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



NFPA 704 Hazard Class

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

General Fire Hazards

No fire hazards are expected.

General Fire Hazards

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

Extinguishing Media

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

Unsuitable Extinguishing Media

None

Fire Fighting Equipment / Instructions

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

Hazardous Combustion Products

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

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

Recovery and Neutralization

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

Materials and Methods for Clean-Up

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

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

Emergency Measures

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

Personal Precautions and Protective Equipment

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

Environmental Precautions

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

Prevention of Secondary Hazards

None

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

Handling Procedures

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

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

Storage Procedures

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

Incompatibilities

Keep away from excessive heat to prevent rupture of container.

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

Component Exposure Limits

Water (7732-18-5)

ACGIH: Not listed

Sodium Chloride (7647-14-5)

ACGIH: Not listed

Engineering Measures

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

Personal Protective Equipment: Respiratory

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

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

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

Personal Protective Equipment: Skin and Hands

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

Personal Protective Equipment: Eyes

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

Hygiene Measures

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

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

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

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

Chemical Stability

This is a stable material.

Hazardous Reaction Potential

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

Conditions to Avoid

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

Hazardous Decomposition Products

Not anticipated under normal conditions of use.

Hazardous Polymerization

Not known to occur.

* * * Section 11 – TOXICOLOGICAL INFORMATION * * *

Acute Toxicity

A: General Product Information

Unlikely to be harmful.

B. Component Analysis – D50/LC50

Water (7732-18-5)

Oral LD50 Rat 90 g/kg

Sodium Chloride (7647-14-5)

Oral LD50 Rat 3 g/kg

Potential Health Effects: Skin Corrosion Property / Stimulativeness

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

Potential Health Effects: Eye Critical Damage / Stimulativeness

Contact with eyes may cause moderate irritation.

Potential Health Effects: Ingestion

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

Potential Health Effects: Inhalation

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

Generative Cell Mutagenicity

Not expected to cause genetic effects.

Carcinogenicity

General Product Information

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

Reproductive Toxicity

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

Specified Target Organ General Toxicity: Single Exposure

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

Specified Target Organ General Toxicity: Repeated Exposure

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

Aspiration Respiratory Organs Hazard

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

* * * Section 12 – ECOLOGICAL INFORMATION * * *

Ecotoxicity

A: General Product Information

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

Persistence / Degradability

No information available

Bioaccumulation

No information available

Mobility in Soil

No information available

* * * Section 13 – DISPOSAL CONSIDERATIONS * * *

Waste Disposal Instructions

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

Disposal of Contaminated Containers or Packaging

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

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

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

* * * Section 14 – TRANSPORTATION INFORMATION * * *

DOT Information

Shipping Description: Not Regulated

UN #: Not Regulated

* * * Section 15 – REGULATORY INFORMATION * * *

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

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

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

State Regulations

Component Analysis

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

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

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

U.S. Export control classification Number: EAR99.

* * * Section 16 – OTHER INFORMATION * * *

NFPA® Hazard Rating

Health	1
Fire	0
Reactivity	0

HMIS® Hazard Rating

Health	1	Slight
Fire	0	Minimal
Physical	0	Minimal

Key/Legend

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

Literature References

None

Other Information

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

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

Date of Preparation: January 28, 2014

Date of Last Revision: March 4, 2014

End of Sheet

SAFETY DATA SHEET

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

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

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

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

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

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

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

* * * Section 2 – HAZARDS IDENTIFICATION * * *

GHS Classification:

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

GHS LABEL ELEMENTS

Symbol(s)

Signal Word

Danger

Hazard Statements

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

Precautionary Statements

Prevention

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

Response

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

Storage

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

Disposal

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

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

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

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

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

First Aid: Eyes

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

First Aid: Skin

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

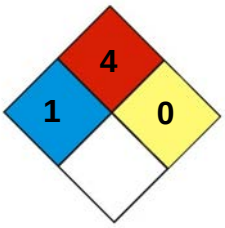
First Aid: Ingestion (swallowing)

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

First Aid: Inhalation (breathing)

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

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



NFPA 704 Hazard Class

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

General Fire Hazards

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

Hazardous Combustion Products

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

Extinguishing Media

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

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

Unsuitable Extinguishing Media

None

Fire Fighting Equipment / Instructions

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

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

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

Recovery and Neutralization

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

Materials and Methods for Clean-Up

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

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

Emergency Measures

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

Personal Precautions and Protective Equipment

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

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

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

Environmental Precautions

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

Prevention of Secondary Hazards

None

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

Handling Procedures

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

Storage Procedures

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

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

Incompatibilities

Keep away from strong oxidizers, ignition sources and heat.

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

Component Exposure Limits

Octanes (111-65-9)

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

Heptanes (142-82-5)

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

n-Hexane (110-54-3)

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

n-Pentane (109-66-0)

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

n-Butane (106-97-8)

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

Propane (74-98-6)

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

Ethane (74-84-0)

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

Benzene (71-43-2)

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

Toluene (108-88-3)

ACGIH: 20 ppm TWA (listed under Toluene)

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

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

Engineering Measures

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

Personal Protective Equipment: Respiratory

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

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

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

Personal Protective Equipment: Hands

Gloves constructed of nitrile or neoprene are recommended.

Personal Protective Equipment: Eyes

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

Personal Protective Equipment: Skin and Body

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

Hygiene Measures

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

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

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

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

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

Chemical Stability

This is a stable material.

Hazardous Reaction Potential

Will not occur.

Conditions to Avoid

Keep away from ignition sources and high temperatures.

Hazardous Decomposition Products

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

* * * Section 11 – TOXICOLOGICAL INFORMATION * * *

Acute Toxicity

A: General Product Information

Harmful if swallowed.

B. Component Analysis – LD50/LC50

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

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

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

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

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

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

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

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

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

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

Potential Health Effects: Skin Corrosion Property / Stimulativeness

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

Potential Health Effects: Eye Critical Damage / Stimulativeness

Contact with eyes may cause moderate irritation.

Potential Health Effects: Ingestion (swallowing)

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

Potential Health Effects: Inhalation (breathing)

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

Respiratory Organs Sensitization / Skin Sensitization

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

Generative Cell Mutagenicity

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

Carcinogenicity

A: General Product Information

May cause cancer.

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

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

B: Component Carcinogenicity

Benzene (71-43-2)

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

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

Reproductive Toxicity

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

Specified Target Organ General Toxicity: Single Exposure

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

Specified Target Organ General Toxicity: Repeated Exposure

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

Aspiration Respiratory Organs Hazard

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

* * * Section 12 – ECOLOGICAL INFORMATION * * *

Ecotoxicity

A: General Product Information

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

B: Component Analysis – Ecotoxicity – Aquatic Toxicity

Benzene (71-43-2)

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

Natural Gas condensates (68919-39-1)

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

Persistence / Degradability

No information available

Bioaccumulation

No information available

Mobility in Soil

No information available

* * * Section 13 – DISPOSAL CONSIDERATIONS * * *

Waste Disposal Instructions

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

Disposal of Contaminated Containers or Packaging

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

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

* * * Section 14 – TRANSPORTATION INFORMATION * * *

DOT Information

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

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

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

Placard:

* * * Section 15 – REGULATORY INFORMATION * * *

Regulatory Information

Component Analysis

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

Benzene (71-43-2)

SARA 313: 0.1% de minimis concentration

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

SARA Section 311/312 – Hazard Classes

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

SARA SECTION 313 – SUPPLIER NOTIFICATION

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

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

Canadian Regulatory Information

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

European Union Regulatory Information

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

State Regulations

Component Analysis – State

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

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

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

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

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

Component Analysis – WHMIS IDL

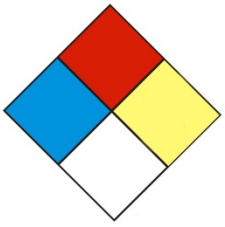
The following components are identified under the Canadian Hazardous Products Act Ingredient Disclosure List:

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

* * * Section 16 – OTHER INFORMATION * * *

NFPA® Hazard Rating

Health	1
Fire	4
Reactivity	0



HMIS® Hazard Rating

Health	1	Slight
Fire	4	Severe
Physical	0	Minimal
		* Chronic

Key/Legend

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

Literature References

None

Other Information

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

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

Date of Preparation: January 29, 2014

Date of Last Revision: March 4, 2014

End of Sheet

SAFETY DATA SHEET

Material Name: Wet Field Natural Gas

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

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

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

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

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

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

* * * Section 2 – HAZARDS IDENTIFICATION * * *

GHS Classification:

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

GHS LABEL ELEMENTS

Symbol(s)

Signal Word

Danger

Hazard Statements

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

Precautionary Statements

Prevention

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

Response

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

Storage

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

Disposal

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

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

CAS #	Component	Percent
74-82-8	Methane	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.

Material Name: Wet Field Natural Gas

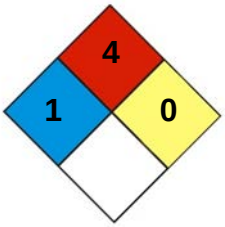
First Aid: Ingestion

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, CO2, and other gaseous agents. However, fire should not be extinguished unless flow of gas can be immediately stopped.

Unsuitable Extinguishing Media

None.

Fire Fighting Equipment / Instructions

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

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

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

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

Recovery and Neutralization

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

Materials and Methods for Clean-Up

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

Emergency Measures

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

Personal Precautions and Protective Equipment

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

Environmental Precautions

Do not flush gas vapors toward sewer or drainage systems.

Prevention of Secondary Hazards

None.

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

Handling Procedures

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

Storage Procedures

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

Incompatibilities

Keep away from strong oxidizers, ignition sources and heat.

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

Component Exposure Limits

Methane (74-82-8)

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

Ethane (74-84-0)

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

Propane (74-98-6)

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

Butane (106-97-8)

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

Pentanes (109-66-0)

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

Hexanes (110-54-3)

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

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 * * *

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

Material Name: Wet Field Natural Gas

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

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

Chemical Stability

This is a stable material.

Hazardous Reaction Potential

Will not occur.

Conditions to Avoid

Keep away from strong oxidizers, ignition sources and heat.

Hazardous Decomposition Products

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

* * * Section 11 – TOXICOLOGICAL INFORMATION * * *

Acute Toxicity

A: General Product Information

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

B. Component Analysis – LD50/LC50

Methane (74-82-8)

Inhalation LC50 Mouse 326 g/m3 2h

Ethane (74-84-0)

Inhalation LC50 Rat 658 mg/l 4h

Propane (74-98-6)

Inhalation LC50 Rat 658 mg/l 4h

Material Name: Wet Field Natural Gas

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

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

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

Nitrogen (7727-37-9)
Simple Asphyxiant

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

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

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

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

Carcinogenicity

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

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

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

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

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

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

* * * Section 12 – ECOLOGICAL INFORMATION * * *

Ecotoxicity

A: General Product Information

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

B: Component Analysis – Ecotoxicity – Aquatic Toxicity

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

Persistance / Degradability

No information available.

Bioaccumulation

No information available.

Mobility in Soil

No information available.

* * * Section 13 – DISPOSAL CONSIDERATIONS * * *

Waste Disposal Instructions

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

Disposal of Contaminated Containers or Packaging

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

* * * Section 14 – TRANSPORTATION INFORMATION * * *

DOT Information

Shipping Name: Natural Gas, Compressed

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

Placard:

* * * Section 15 – REGULATORY INFORMATION * * *

Regulatory Information

Component Analysis

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

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

SARA Section 311/312 – Hazard Classes

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

SARA Section 313 – Supplier Notification

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

State Regulations

Component Analysis – State

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

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

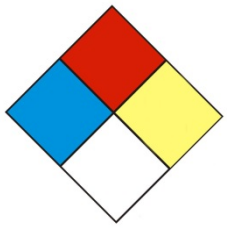
SAFETY DATA SHEET

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

SAFETY DATA SHEET

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

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

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

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

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

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

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

* * * Section 2 – HAZARDS IDENTIFICATION * * *

GHS Classification:

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

GHS LABEL ELEMENTS

Symbol(s)

Signal Word

Danger

Hazard Statements

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

Precautionary Statements

Prevention

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

Response

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

Storage

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

Disposal

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

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

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

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

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

First Aid: Eyes

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

First Aid: Skin

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

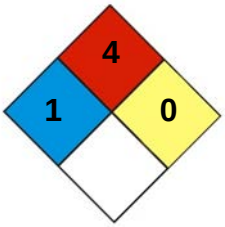
First Aid: Ingestion

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

First Aid: Inhalation

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

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



NFPA 704 Hazard Class

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

General Fire Hazards

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

Hazardous Combustion Products

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

Extinguishing Media

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

Unsuitable Extinguishing Media

None.

Fire Fighting Equipment / Instructions

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

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

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

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

Recovery and Neutralization

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

Materials and Methods for Clean-Up

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

Emergency Measures

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

Personal Precautions and Protective Equipment

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

Environmental Precautions

Do not flush gas vapors toward sewer or drainage systems.

Prevention of Secondary Hazards

None.

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

Handling Procedures

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

Storage Procedures

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

Incompatibilities

Keep away from strong oxidizers, ignition sources and heat.

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

Component Exposure Limits

Methane (74-82-8)

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

Ethane (74-84-0)

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

Propane (74-98-6)

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

Butane (106-97-8)

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

Pentanes (109-66-0)

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

Hexanes (110-54-3)

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

Nitrogen (7727-37-9)

Simple Asphyxiant

Carbon Dioxide (124-38-9)

ACGIH: 5000 ppm TWA (listed under Carbon Dioxide)

Oxygen (7782-44-7)

N/A – Necessary for life

Engineering Measures

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

Personal Protective Equipment: Respiratory

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

Personal Protective Equipment: Hands

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

Personal Protective Equipment: Eyes

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

Personal Protective Equipment: Skin and Body

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

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

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

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

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

Chemical Stability

This is a stable material.

Hazardous Reaction Potential

Will not occur.

Conditions to Avoid

Keep away from strong oxidizers, ignition sources and heat.

Hazardous Decomposition Products

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

* * * Section 11 – TOXICOLOGICAL INFORMATION * * *

Acute Toxicity

A: General Product Information

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

B. Component Analysis – LD50/LC50

Methane (74-82-8)

Inhalation LC50 Mouse 326 g/m3 2h

Ethane (74-84-0)

Inhalation LC50 Rat 658 mg/l 4h

Propane (74-98-6)

Inhalation LC50 Rat 658 mg/l 4h

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

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

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

Nitrogen (7727-37-9)
Simple Asphyxiant

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

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

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

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

Carcinogenicity

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

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

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

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

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

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

* * * Section 12 – ECOLOGICAL INFORMATION * * *

Ecotoxicity

A: General Product Information

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

B: Component Analysis – Ecotoxicity – Aquatic Toxicity

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

Persistance / Degradability

No information available.

Bioaccumulation

No information available.

Mobility in Soil

No information available.

* * * Section 13 – DISPOSAL CONSIDERATIONS * * *

Waste Disposal Instructions

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

Disposal of Contaminated Containers or Packaging

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

* * * Section 14 – TRANSPORTATION INFORMATION * * *

DOT Information

Shipping Name: Natural Gas, Compressed

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

Placard:

* * * Section 15 – REGULATORY INFORMATION * * *

Regulatory Information

Component Analysis

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

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

SARA Section 311/312 – Hazard Classes

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

SARA Section 313 – Supplier Notification

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

State Regulations

Component Analysis – State

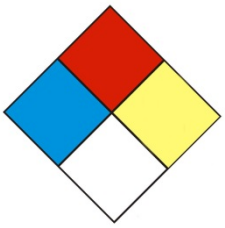
The following components appear on one or more of the following state hazardous substances lists:

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

* * * Section 16 – OTHER INFORMATION * * *

NFPA® Hazard Rating

Health	1
Fire	4
Reactivity	0



HMIS® Hazard Rating

Health	1	Moderate
Fire	4	Severe
Physical	0	Minimal
		* Chronic

Key/Legend

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

Literature References

None

Other Information

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

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

Date of Preparation: January 30, 2014

Date of Last Revision: March 4, 2014

End of Sheet

Material Safety Data Sheet
(TRIETHYLENE GLYCOL (TEG))

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

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

EMERGENCY NUMBER: 800-255-3924

SECTION 1 – IDENTIFICATION OF CHEMICAL PRODUCT

PRODUCT NAME:..... TRIETHYLENE GLYCOL (TEG)
EFFECTIVE DATE:..... October 1, 2007
CHEMICAL FAMILY:..... Glycol
FORMULA: $C_6H_{14}O_4$
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

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_2).

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

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

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 agentsand 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

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)

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:
Although the information and recommendations set forth herein (hereinafter "Information") are presented in good faith and believed to be correct as of the date hereof, the Company makes no representations as to the completeness or accuracy thereof. Information is supplied upon the condition that the persons receiving this MSDS will make their own determination as to its suitability for their intended purposes prior to use. Since the product is within the exclusive control of the user, it is the user's obligation to determine the conditions of safe use of this product. Such conditions should comply with all Federal Regulations concerning the Product. It must be recognized that the physical and chemical properties of any product may not be fully understood and that new, possibly hazardous products may arise from reactions between chemicals. The information given in this data sheet is based on our present knowledge and shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship. NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OF ANY OTHER NATURE ARE MADE HEREUNDER WITH RESPECT TO INFORMATION OR THE PRODUCT TO WHICH INFORMATION REFERS.

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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[1]	Emission Point ID[2]	Emission Unit Description	Year Installed/ Modified	Design Capacity	Type[3] and Date of Change	Control Device [4]
C-100	1E	Compressor Engine #1	2018	2,500 hp	New	OxCat (1C)
C-200	2E	Compressor Engine #2	2018	2,500 hp	New	OxCat (2C)
C-300	3E	Compressor Engine #3	2018	2,500 hp	New	OxCat (3C)
C-400	4E	Compressor Engine #4	2018	2,500 hp	New	OxCat (4C)
C-500	5E	Compressor Engine #5	2018	2,500 hp	New	OxCat (5C)
C-600	6E	Compressor Engine #6	2018	2,500 hp	New	OxCat (6C)
C-700	7E	Compressor Engine #7	2018	2,500 hp	New	OxCat (7C)
C-800	8E	Compressor Engine #8	2018	2,500 hp	New	OxCat (8C)
C-900	9E	Compressor Engine #9	2018	2,500 hp	New	OxCat (9C)
C-1000	10E	Compressor Engine #10	2018	2,500 hp	New	OxCat (10C)
C-1100	11E	Compressor Engine #11	2018	2,500 hp	New	OxCat (11C)
C-1200	12E	Compressor Engine #12	2018	2,500 hp	New	OxCat (12C)
GEN1	13E	Capstone Microturbine Generator	2018	800 kW	New	None
DEHY1	14E	Dehydrator Still Vent #1	2018	225 MMscfd	New	TO-1 (15C)
DFLSH1	15E	Dehydrator Flash Tank #1	2018	225 MMscfd	New	DREB1 (16E) or TO-1 (15C)
DREB1	16E	Dehydrator Reboiler #1	2018	1.5 mmbtu/hr	New	None
DEHY2	17E	Dehydrator Still Vent #2	2018	225 MMscfd	New	TO-2 (16C)
DFLSH2	18E	Dehydrator Flash Tank #2	2018	225 MMscfd	New	DREB2 (19E) or TO-2 (16C)
DREB2	19E	Dehydrator Reboiler #2	2018	1.5 mmbtu/hr	New	None

T01	20E	Condensate Tank #1	2018	400 barrel	New	VRU-100 & VRU-200 (13C & 14C)
T02	21E	Condensate Tank #2	2018	400 barrel	New	VRU-100 & VRU-200 (13C & 14C)
T03	22E	Condensate Tank #3	2018	400 barrel	New	VRU-100 & VRU-200 (13C & 14C)
T04	23E	Settling Tank	2018	500 barrel	New	VRU-100 & VRU-200 (13C & 14C)
T05	24E	Produced Water Tank #1	2018	400 barrel	New	VRU-100 & VRU-200 (13C & 14C)
T06	25E	Produced Water Tank #2	2018	400 barrel	New	VRU-100 & VRU-200 (13C & 14C)
T07	26E	Produced Water Tank #3	2018	400 barrel	New	VRU-100 & VRU-200 (13C & 14C)
FUEL1	27E	Fuel Conditioning Heater	2018	0.5 MMBtu/hr	New	None
----	----	Oxidation Catalyst - Compressor #1	2018	----	New	1C
----	----	Oxidation Catalyst - Compressor #2	2018	----	New	2C
----	----	Oxidation Catalyst - Compressor #3	2018	----	New	3C
----	----	Oxidation Catalyst - Compressor #4	2018	----	New	4C
----	----	Oxidation Catalyst - Compressor #5	2018	----	New	5C
----	----	Oxidation Catalyst - Compressor #6	2018	----	New	6C
----	----	Oxidation Catalyst - Compressor #7	2018	----	New	7C
----	----	Oxidation Catalyst - Compressor #8	2018	----	New	8C
----	----	Oxidation Catalyst - Compressor #9	2018	----	New	9C
----	----	Oxidation Catalyst - Compressor #10	2018	----	New	10C
----	----	Oxidation Catalyst - Compressor #11	2018	----	New	11C
----	----	Oxidation Catalyst - Compressor #12	2018	----	New	12C

VRU-100	----	Vapor Recovery Unit #1	2018	TBD	New	13C
VRU-200	----	Vapor Recovery Unit #2	2018	TBD	New	14C
TO-1	28E	Thermal Oxidizer #1	2018	6.0 MMBtu/hr	New	15C
TO-2	29E	Thermal Oxidizer #2	2018	6.0 MMBtu/hr	New	16C
LDOUT1	30E	Production Liquids Truck Loadout	2018	390 bbl/day	New	None
VENT1	31E	Venting Episodes	2018	Variable	New	None
GEN2	32E	PSI Natural Gas Generator	2018	649 bhp	New	None

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

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[1]	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[3] *(Speciate VOCs & HAPS)*	Maximum Potential Uncontrolled Emissions [4]		Maximum Potential Controlled Emissions [5]		Emission Form or Phase *(At exit conditions, Solid, Liquid or Gas/Vapor)*	Est. Method Used [6]	Emission Concentration [7] (ppmv or mg/m^4)
		ID No.	Source	ID No.	Device Type	Short Term[2]	Max (hr/yr)		lb/hr	ton/yr	lb/hr	ton/yr			
1E	Upward Vertical Stack	C-100	Compressor Engine #1	1C	Oxidation Catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	1.65 14.44 3.14 0.17 0.010 1.21 0.88 2811	7.24 63.25 13.76 0.75 0.044 5.32 3.86 12311	1.65 0.88 1.60 0.17 0.010 0.28 0.11 2811	7.24 3.86 7.00 0.75 0.044 1.24 0.48 12311	Gas/Vapor	EE	
2E	Upward Vertical Stack	C-200	Compressor Engine #2	2C	Oxidation catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	1.65 14.44 3.14 0.17 0.010 1.21 0.88 2811	7.24 63.25 13.76 0.75 0.044 5.32 3.86 12311	1.65 0.88 1.60 0.17 0.010 0.28 0.11 2811	7.24 3.86 7.00 0.75 0.044 1.24 0.48 12311	Gas/Vapor	EE	
3E	Upward Vertical Stack	C-300	Compressor Engine #3	3C	Oxidation catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	1.65 14.44 3.14 0.17 0.010 1.21 0.88 2811	7.24 63.25 13.76 0.75 0.044 5.32 3.86 12311	1.65 0.88 1.60 0.17 0.010 0.28 0.11 2811	7.24 3.86 7.00 0.75 0.044 1.24 0.48 12311	Gas/Vapor	EE	

4E	Upward Vertical Stack	C-400	Compressor Engine #4	4C	Oxidation catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	1.65 14.44 3.14 0.17 0.010 1.21 0.88 2811	7.24 63.25 13.76 0.75 0.044 5.32 3.86 12311	1.65 0.88 1.60 0.17 0.010 0.28 0.11 2811	7.24 3.86 7.00 0.75 0.044 1.24 0.48 12311	Gas/Vapor	EE	
5E	Upward Vertical Stack	C-500	Compressor Engine #5	5C	Oxidation catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	1.65 14.44 3.14 0.17 0.010 1.21 0.88 2811	7.24 63.25 13.76 0.75 0.044 5.32 3.86 12311	1.65 0.88 1.60 0.17 0.010 0.28 0.11 2811	7.24 3.86 7.00 0.75 0.044 1.24 0.48 12311	Gas/Vapor	EE	
6E	Upward Vertical Stack	C-600	Compressor ngine #6	6C	Oxidation catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	1.65 14.44 3.14 0.17 0.010 1.21 0.88 2811	7.24 63.25 13.76 0.75 0.044 5.32 3.86 12311	1.65 0.88 1.60 0.17 0.010 0.28 0.11 2811	7.24 3.86 7.00 0.75 0.044 1.24 0.48 12311	Gas/Vapor	EE	
7E	Upward Vertical Stack	C-700	Compressor Engine #7	7C	Oxidation catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	1.65 14.44 3.14 0.17 0.010 1.21 0.88 2811	7.24 63.25 13.76 0.75 0.044 5.32 3.86 12311	1.65 0.88 1.60 0.17 0.010 0.28 0.11 2811	7.24 3.86 7.00 0.75 0.044 1.24 0.48 12311	Gas/Vapor	EE	

8E	Upward Vertical Stack	C-800	Compressor Engine #8	8C	Oxidation catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	1.65 14.44 3.14 0.17 0.010 1.21 0.88 2811	7.24 63.25 13.76 0.75 0.044 5.32 3.86 12311	1.65 0.88 1.60 0.17 0.010 0.28 0.11 2811	7.24 3.86 7.00 0.75 0.044 1.24 0.48 12311	Gas/Vapor	EE	
9E	Upward Vertical Stack	C-900	Compressor Engine #9	9C	Oxidation catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	1.65 14.44 3.14 0.17 0.010 1.21 0.88 2811	7.24 63.25 13.76 0.75 0.044 5.32 3.86 12311	1.65 0.88 1.60 0.17 0.010 0.28 0.11 2811	7.24 3.86 7.00 0.75 0.044 1.24 0.48 12311	Gas/Vapor	EE	
10E	Upward Vertical Stack	C-1000	Compressor Engine #10	10C	Oxidation catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	1.65 14.44 3.14 0.17 0.010 1.21 0.88 2811	7.24 63.25 13.76 0.75 0.044 5.32 3.86 12311	1.65 0.88 1.60 0.17 0.010 0.28 0.11 2811	7.24 3.86 7.00 0.75 0.044 1.24 0.48 12311	Gas/Vapor	EE	
11E	Upward Vertical Stack	C-1100	Compressor Engine #11	11C	Oxidation catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	1.65 14.44 3.14 0.17 0.010 1.21 0.88 2811	7.24 63.25 13.76 0.75 0.044 5.32 3.86 12311	1.65 0.88 1.60 0.17 0.010 0.28 0.11 2811	7.24 3.86 7.00 0.75 0.044 1.24 0.48 12311	Gas/Vapor	EE	

12E	Upward Vertical Stack	C-1200	Compressor Engine #12	12C	Oxidation catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	1.65 14.44 3.14 0.17 0.010 1.21 0.88 2811	7.24 63.25 13.76 0.75 0.044 5.32 3.86 12311	1.65 0.88 1.60 0.17 0.010 0.28 0.11 2811	7.24 3.86 7.00 0.75 0.044 1.24 0.48 12311	Gas/Vapor	EE	
13E	Upward Vertical Stack	GEN1	Natural Gas Turbine Generator	----	----	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	0.32 0.88 0.080 0.054 0.028 0.0085 0.0059 967.20	1.40 3.85 0.35 0.24 0.12 0.037 0.026 4237	0.32 0.88 0.080 0.054 0.028 0.0085 0.0059 967.20	1.40 3.85 0.35 0.24 0.12 0.037 0.026 4237	Gas/Vapor	EE	
14E	Upward Vertical Stack	DEHY1	Dehydrator Still Vent #1	15C	Thermal oxidizer - 98% Control	C	8,760	VOC Total HAPs Benzene Toluene Ethylbenzene Xylenes n-Hexane CO2e	74.22 10.12 1.01 3.56 0.88 2.50 2.17 2630	325.09 44.33 4.40 15.58 3.88 10.96 9.52 11521	1.48 0.20 0.020 0.071 0.018 0.050 0.044 54.15	6.50 0.89 0.088 0.31 0.078 0.22 0.19 237.2	Gas/Vapor	EE	
15E	Upward Vertical Stack or used as fuel in 16E	DFLSH1	Dehydrator Flash Tank #1	Used for Fuel in 16E or 15C	Reboiler or Thermal oxidizer - 98%	C	8,760	VOC Total HAPs Benzene Toluene Ethylbenzene Xylenes n-Hexane CO2e	17.85 0.33 0.0058 0.012 0.0016 0.0029 0.31 675.2	78.20 1.46 0.025 0.054 0.0071 0.013 1.36 2957	0.36 0.0066 1.2E-4 2.5E-4 3.2E-5 5.8E-5 6.2E-3 14.41	1.56 0.029 5.1E-4 1.1E-3 1.4E-4 2.5E-4 2.7E-2 63.13	Gas/Vapor	EE	

16E	Upward Vertical Stack	DREB1	Dehydrator Reboiler #1	---	----	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	0.15 0.12 0.0081 0.011 8.8E-4 0.0028 1.1E-4 176.1	0.64 0.54 0.035 0.049 0.0039 0.012 4.8E-4 771.2	0.15 0.12 0.0081 0.011 8.8E-4 0.0028 1.1E-4 176.1	0.64 0.54 0.035 0.049 0.0039 0.012 4.8E-4 771.2	Gas/Vapor	EE	
17E	Upward Vertical Stack	DEHY2	Dehydrator Still Vent #2	16C	Thermal oxidizer -98% Control	C	8,760	VOC Total HAPs Benzene Toluene Ethylbenzene Xylenes n-Hexane CO2e	74.22 10.12 1.01 3.56 0.88 2.50 2.17 2630	325.09 44.33 4.40 15.58 3.88 10.96 9.52 11521	1.48 0.20 0.020 0.071 0.018 0.050 0.044 54.15	6.50 0.89 0.088 0.31 0.078 0.22 0.19 237.2	Gas/Vapor	EE	
18E	Upward Vertical Stack or used as fuel in 19E	DFLSH2	Dehydrator Flash Tank #2	Used for Fuel in 19E or 16C	Reboiler or Thermal oxidizer - 98%	C	8,760	VOC Total HAPs Benzene Toluene Ethylbenzene Xylenes n-Hexane CO2e	17.85 0.33 0.0058 0.012 0.0016 0.0029 0.31 675.2	78.20 1.46 0.025 0.054 0.0071 0.013 1.36 2957	0.36 0.0066 1.2E-4 2.5E-4 3.2E-5 5.8E-5 6.2E-3 14.41	1.56 0.029 5.1E-4 1.1E-3 1.4E-4 2.5E-4 2.7E-2 63.13	Gas/Vapor	EE	
19E	Upward Vertical Stack	DREB2	Dehydrator Reboiler #2	---	----	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	0.15 0.12 0.0081 0.011 8.8E-4 0.0028 1.1E-4 176.1	0.64 0.54 0.035 0.049 0.0039 0.012 4.8E-4 771.2	0.15 0.12 0.0081 0.011 8.8E-4 0.0028 1.1E-4 176.1	0.64 0.54 0.035 0.049 0.0039 0.012 4.8E-4 771.2	Gas/Vapor	EE	

20E	Upward Vertical Stack	T01	Condensate Tank #1	13C/ 14C	VRUs-98% capture	C	8,760	VOC Total HAPs Benzene Toluene Ethylbenzene Xylenes n-Hexane CO2e	2.26 6.8e-2 9.2e-4 1.2e-3 3.8e-4 9.7e-4 6.4e-2 0.37	9.91 3.0e-1 4.0e-3 5.4e-3 1.7e-3 4.2e-3 2.8e-1 1.61	0.045 1.4e-3 1.8e-5 2.5e-5 7.7e-6 1.9e-5 1.3e-3 0.008	0.20 6.0e-3 8.1e-5 1.1e-4 3.4e-5 8.5e-5 5.6e-3 0.037	Gas/Vapor	EE	
21E	Upward Vertical Stack	T02	Condensate Tank #2	13C/ 14C	VRUs-98% capture	C	8,760	VOC Total HAPs Benzene Toluene Ethylbenzene Xylenes n-Hexane CO2e	2.26 6.8e-2 9.2e-4 1.2e-3 3.8e-4 9.7e-4 6.4e-2 0.37	9.91 3.0e-1 4.0e-3 5.4e-3 1.7e-3 4.2e-3 2.8e-1 1.61	0.045 1.4e-3 1.8e-5 2.5e-5 7.7e-6 1.9e-5 1.3e-3 0.008	0.20 6.0e-3 8.1e-5 1.1e-4 3.4e-5 8.5e-5 5.6e-3 0.037	Gas/Vapor	EE	
22E	Upward Vertical Stack	T03	Condensate Tank #3	13C/ 14C	VRUs-98% capture	C	8,760	VOC Total HAPs Benzene Toluene Ethylbenzene Xylenes n-Hexane CO2e	2.26 6.8e-2 9.2e-4 1.2e-3 3.8e-4 9.7e-4 6.4e-2 0.37	9.91 3.0e-1 4.0e-3 5.4e-3 1.7e-3 4.2e-3 2.8e-1 1.61	0.045 1.4e-3 1.8e-5 2.5e-5 7.7e-6 1.9e-5 1.3e-3 0.008	0.20 6.0e-3 8.1e-5 1.1e-4 3.4e-5 8.5e-5 5.6e-3 0.037	Gas/Vapor	EE	
23E	Upward Vertical Stack	T04	Settling Tank	13C/ 14C	VRUs-98% capture	C	8,760	VOC Total HAPs Benzene Toluene Ethylbenzene Xylenes n-Hexane CO2e	326.56 8.94 0.19 0.24 0.066 0.18 8.25 893.32	1430.3 39.15 0.84 1.07 0.29 0.79 36.16 3913	6.53 0.18 3.9e-3 4.9e-3 1.3e-3 3.6e-3 1.7e-1 18.27	28.61 0.78 1.7e-2 2.14e-2 5.8e-3 1.6e-2 7.2e-1 80.01	Gas/Vapor	EE	

24E	Upward Vertical Stack	T05	Produced Water Tank #1	13C/ 14C	VRUs-98% capture	C	8,760	VOC Total HAPs Benzene Toluene Ethylbenzene Xylenes n-Hexane CO2e	8.6e-5 3.4e-7 2.5e-7 6.7e-8 5.9e-9 9.4e-9 6.6e-9 2.6e-3	3.8e-4 1.5e-6 1.1e-6 2.9e-7 2.6e-8 4.1e-8 2.9e-8 0.011	1.7e-6 6.8e-9 5.1e-9 1.3e-9 1.2e-10 1.9e-10 1.3e-10 9.0e-5	7.6e-6 3.0e-8 2.2e-8 5.9e-9 5.1e-10 8.3e-10 5.8e-10 3.9e-4	Gas/Vapor	EE	
25E	Upward Vertical Stack	T06	Produced Water Tank #2	13C/ 14C	VRUs-98% capture	C	8,760	VOC Total HAPs Benzene Toluene Ethylbenzene Xylenes n-Hexane CO2e	8.6e-5 3.4e-7 2.5e-7 6.7e-8 5.9e-9 9.4e-9 6.6e-9 2.6e-3	3.8e-4 1.5e-6 1.1e-6 2.9e-7 2.6e-8 4.1e-8 2.9e-8 0.011	1.7e-6 6.8e-9 5.1e-9 1.3e-9 1.2e-10 1.9e-10 1.3e-10 9.0e-5	7.6e-6 3.0e-8 2.2e-8 5.9e-9 5.1e-10 8.3e-10 5.8e-10 3.9e-4	Gas/Vapor	EE	
26E	Upward Vertical Stack	T07	Produced Water Tank #3	13C/ 14C	VRUs-98% capture	C	8,760	VOC Total HAPs Benzene Toluene Ethylbenzene Xylenes n-Hexane CO2e	8.6e-5 3.4e-7 2.5e-7 6.7e-8 5.9e-9 9.4e-9 6.6e-9 2.6e-3	3.8e-4 1.5e-6 1.1e-6 2.9e-7 2.6e-8 4.1e-8 2.9e-8 0.011	1.7e-6 6.8e-9 5.1e-9 1.3e-9 1.2e-10 1.9e-10 1.3e-10 9.0e-5	7.6e-6 3.0e-8 2.2e-8 5.9e-9 5.1e-10 8.3e-10 5.8e-10 3.9e-4	Gas/Vapor	EE	
27E	Upward Vertical Stack	FUEL1	Fuel Conditioning Heater	---	---	C	8,760	NOx CO VOC PM10 SO2 Total HAPs CO2e	0.053 0.045 0.0029 0.0041 3.2E-4 0.0010 58.7	0.23 0.20 0.013 0.018 0.0014 0.0044 257.1	0.053 0.045 0.0029 0.0041 3.2E-4 0.0010 58.7	0.23 0.20 0.013 0.018 0.0014 0.0044 257.1	Gas/Vapor	EE	
28E	Upward Vertical Stack	TO-1	Thermal oxidizer 1	---	---	C	8,760	NOx CO VOC PM10 SO2 Total HAPs CO2e	--- --- --- --- --- --- ---	--- --- --- --- --- --- ---	0.47 2.27 3.4e-3 4.6e-3 3.7e-4 1.1e-3 777.5	2.05 9.95 1.5e-2 2.0e-2 1.6e-3 5.0e-3 3406	Gas/Vapor	EE	

29E	Upward Vertical Stack	TO-2	Thermal oxidizer 2	---	---	C	8,760	NOx CO VOC PM10 SO2 Total HAPs CO2e	--- --- --- --- --- --- ---	--- --- --- --- --- --- ---	0.47 2.27 3.4e-3 4.6e-3 3.7e-4 1.1e-3 777.5	2.05 9.95 1.5e-2 2.0e-2 1.6e-3 5.0e-3 3406	Gas/Vapor	EE	
31E	Relief Vent	VENT1	Venting Episodes	---	---	Intermittent	Variable	VOC Total HAPs Benzene Toluene Ethylbenzene Xylenes n-Hexane CO2e	--- --- --- --- --- --- --- ---	25.10 0.69 0.010 0.028 0.0066 0.013 0.63 1927.3	--- --- --- --- --- --- --- ---	25.10 0.69 0.010 0.028 0.0066 0.013 0.63 1927.3	Gas/Vapor	EE	
32E	Upward Vertical Stack	GEN2	PSI Natural Gas Generator	----	----	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	1.43 2.86 1.00 0.11 0.0033 0.18 0.12 657.5	6.27 12.53 4.39 0.48 0.014 0.80 0.50 2880	1.43 2.86 1.00 0.11 0.0033 0.18 0.12 657.5	6.27 12.53 4.39 0.48 0.014 0.80 0.50 2880	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_2, VOCs, H_2S, Inorganics, Lead, Organics, O_3, NO, NO_2, SO_2, SO_3, all applicable Greenhouse Gases (including CO_2 and methane), etc. **DO NOT LIST** H_2, H_2O, N_2, O_2, and Noble Gases.

[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^3) at standard conditions (68 °F and 29.92 inches Hg) (see 45CSR7). If the pollutant is SO_2, use units of ppmv (See 45CSR10).

Attachment J
EMISSION POINTS DATA SUMMARY SHEET

Table 2: Release Parameter Data

Emission Point ID No.	Inner Diameter (ft.)	Exit Gas			Emission Point Elevation (ft)		UTM Coordinates (km)	
		Temp. (°F)	Volumetric Flow [1] (acfm) *at operating conditions*	Velocity (fps)	Ground Level *(Height above mean sea level)*	Stack Height [2]	Northing	Easting
1E/1C	1.1	827	16056	282	870	25	4376.111	511.966
2E/2C	1.1	827	16056	282	870	25	4376.611	511.957
3E/3C	1.1	827	16056	282	870	25	4376.126	511.950
4E/4C	1.1	827	16056	282	870	25	4376.135	511.944
5E/5C	1.1	827	16056	282	870	25	4376.144	511.938
6E/6C	1.1	827	16056	282	870	25	4376.152	511.932
7E/7C	1.1	827	16056	282	870	25	4376.160	511.926
8E/8C	1.1	827	16056	282	870	25	4376.169	511.920
9E/9C	1.1	827	16056	282	870	25	4376.178	511.915
10E/10C	1.1	827	16056	282	870	25	4376.187	511.909
11E/11C	1.1	827	16056	282	870	25	4376.196	511.903
12E/12C	1.1	827	16056	282	870	25	4376.206	511.897
13E	0.5	535	5.3 kg/s mass flow	-------	870	12	4376.081	511.885
16E	0.75	350	530	20	870	~18	4376.082	511.895
19E	0.75	350	530	20	870	~18	4376.090	511.893
27E	0.75	350	530	20	870	~18	4376.089	511.882
28E/29E	2.3	1450	3994	15.6	870	20	4376.083	511.905
31E	Venting emissions occur at various locations across the facility							
32E	0.5	1382	3179	270	870	12	4376.081	511.885

Note: Points 14E and 15E are grouped into 28E. Points 17E and 18E are grouped into 29E. Points 20E-26E are sent to the VRUs in a closed loop.

[1] Give at operating conditions. Include inerts. [2] 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? ☒ Yes ☐ No ☒ If YES, then complete the HAUL ROAD EMISSIONS UNIT DATA SHEET.
2.) Will there be Storage Piles? ☐ Yes ☒ No ☐ If YES, complete Table 1 of the NONMETALLIC MINERALS PROCESSING EMISSIONS UNIT DATA SHEET.
3.) Will there be Liquid Loading/Unloading Operations? ☒ Yes ☐ No ☒ If YES, complete the BULK LIQUID TRANSFER OPERATIONS EMISSIONS UNIT DATA SHEET.
4.) Will there be emissions of air pollutants from Wastewater Treatment Evaporation? ☐ Yes ☒ No ☐ 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.)? ☒ Yes ☐ No ☒ 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? ☐ Yes ☒ No ☐ If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET.
7.) Will there be any other activities that generate fugitive emissions? ☐ Yes ☒ No ☐ If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET or the most appropriate form.
If you answered "NO" to all of the items above, it is not necessary to complete the following table, "Fugitive Emissions Summary."

FUGITIVE EMISSIONS SUMMARY	All Regulated Pollutants - Chemical Name/CAS [1]	Maximum Potential Uncontrolled Emissions [2]		Maximum Potential Controlled Emissions [3]		Est. Method Used [4]
		lb/hr	ton/yr	lb/hr	ton/yr	
Haul Road/Road Dust Emissions Paved Haul Roads						
Unpaved Haul Roads	PM-10 PM-2.5	0.33 0.033	1.43 0.14	0.33 0.033	1.43 0.14	EE
Storage Pile Emissions						
Loading/Unloading Operations	VOCs Total HAPs CO2e	80.84 2.21 223.20	16.90 0.46 46.68	80.84 2.21 223.20	16.90 0.46 46.68	EE
Wastewater Treatment Evaporation & Operations						
Equipment Leaks	VOCs Total HAPs CO2e	2.45 0.067 40.41	10.73 0.29 177.1	2.45 0.067 40.41	10.73 0.29 177.1	EE
General Clean-up VOC Emissions						
Other						

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

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

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

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

Attachment L.
Emission Unit Data Sheets

Compressor Engines

NATURAL GAS COMPRESSOR/GENERATOR ENGINE DATA SHEET

Source Identification Number[1]		1E		2E		3E	
Engine Manufacturer and Model		Caterpillar G3608		Caterpillar G3608		Caterpillar G3608	
Manufacturer's Rated bhp/rpm		2,500 bhp/1,000 rpm		2,500 bhp/1,000 rpm		2,500 bhp/1,000 rpm	
Source Status[2]		NS		NS		NS	
Date Installed/Modified/Removed[3]		October 2018		October 2018		October 2018	
Engine Manufactured/Reconstruction Date[4]		TBD		TBD		TBD	
Is this a Certified Stationary Spark Ignition Engine according to 40CFR60 Subpart JJJJ? (Yes or No)[5]		No		No		No	
Engine, Fuel and Combustion Data	Engine Type[6]	LB4S		LB4S		LB4S	
	APCD Type[7]	SCR		SCR		SCR	
	Fuel Type[8]	RG		RG		RG	
	H_2S (gr/100 scf)	0		0		0	
	Operating bhp/rpm	2,500 bhp/1,000 rpm		2,500 bhp/1,000 rpm		2,500 bhp/1,000 rpm	
	BSFC (Btu/bhp-hr)	6,850		6,850		6,850	
	Fuel throughput (ft^3/hr)	16,500		16,500		16,500	
	Fuel throughput ($MMft^3$/yr)	144.54		144.54		144.54	
	Operation (hrs/yr)	8,760		8,760		8,760	
Reference[9]	Potential Emissions[10]	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
MD	NO_X	1.65	7.24	1.65	7.24	1.65	7.24
MD	CO	0.88	3.86	0.88	3.86	0.88	3.86
MD	VOC	1.60	7.00	1.60	7.00	1.60	7.00
AP	SO_2	0.010	0.044	0.010	0.044	0.010	0.044
AP	PM_{10}	0.17	0.75	0.17	0.75	0.17	0.75
MD	Formaldehyde	0.11	0.48	0.11	0.48	0.11	0.48

Source Identification Number[1]		4E		5E		6E	
Engine Manufacturer and Model		Caterpillar G3608		Caterpillar G3608		Caterpillar G3608	
Manufacturer's Rated bhp/rpm		2,500 bhp/1,000 rpm		2,500 bhp/1,000 rpm		2,500 bhp/1,000 rpm	
Source Status[2]		NS		NS		NS	
Date Installed/Modified/Removed[3]		October 2018		October 2018		October 2018	
Engine Manufactured/Reconstruction Date[4]		TBD		TBD		TBD	
Is this a Certified Stationary Spark Ignition Engine according to 40CFR60 Subpart JJJJ? (Yes or No)[5]		No		No		No	
Engine, Fuel and Combustion Data	Engine Type[6]	LB4S		LB4S		LB4S	
	APCD Type[7]	SCR		SCR		SCR	
	Fuel Type[8]	RG		RG		RG	
	H_2S (gr/100 scf)	0		0		0	
	Operating bhp/rpm	2,500 bhp/1,000 rpm		2,500 bhp/1,000 rpm		2,500 bhp/1,000 rpm	
	BSFC (Btu/bhp-hr)	6,850		6,850		6,850	
	Fuel throughput (ft^3/hr)	16,500		16,500		16,500	
	Fuel throughput ($MMft^3$/yr)	144.54		144.54		144.54	
	Operation (hrs/yr)	8,760		8,760		8,760	
Reference[9]	Potential Emissions[10]	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
MD	NO_X	1.65	7.24	1.65	7.24	1.65	7.24
MD	CO	0.88	3.86	0.88	3.86	0.88	3.86
MD	VOC	1.60	7.00	1.60	7.00	1.60	7.00
AP	SO_2	0.010	0.044	0.010	0.044	0.010	0.044
AP	PM_{10}	0.17	0.75	0.17	0.75	0.17	0.75
MD	Formaldehyde	0.11	0.48	0.11	0.48	0.11	0.48

Source Identification Number[1]		7E		8E		9E	
Engine Manufacturer and Model		Caterpillar G3608		Caterpillar G3608		Caterpillar G3608	
Manufacturer's Rated bhp/rpm		2,500 bhp/1,000 rpm		2,500 bhp/1,000 rpm		2,500 bhp/1,000 rpm	
Source Status[2]		NS		NS		NS	
Date Installed/Modified/Removed[3]		October 2018		October 2018		October 2018	
Engine Manufactured/Reconstruction Date[4]		TBD		TBD		TBD	
Is this a Certified Stationary Spark Ignition Engine according to 40CFR60 Subpart JJJJ? (Yes or No)[5]		No		No		No	
Engine, Fuel and Combustion Data	Engine Type[6]	LB4S		LB4S		LB4S	
	APCD Type[7]	SCR		SCR		SCR	
	Fuel Type[8]	RG		RG		RG	
	H_2S (gr/100 scf)	0		0		0	
	Operating bhp/rpm	2,500 bhp/1,000 rpm		2,500 bhp/1,000 rpm		2,500 bhp/1,000 rpm	
	BSFC (Btu/bhp-hr)	6,850		6,850		6,850	
	Fuel throughput (ft^3/hr)	16,500		16,500		16,500	
	Fuel throughput ($MMft^3$/yr)	144.54		144.54		144.54	
	Operation (hrs/yr)	8,760		8,760		8,760	
Reference[9]	Potential Emissions[10]	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
MD	NO_X	1.65	7.24	1.65	7.24	1.65	7.24
MD	CO	0.88	3.86	0.88	3.86	0.88	3.86
MD	VOC	1.60	7.00	1.60	7.00	1.60	7.00
AP	SO_2	0.010	0.044	0.010	0.044	0.010	0.044
AP	PM_{10}	0.17	0.75	0.17	0.75	0.17	0.75
MD	Formaldehyde	0.11	0.48	0.11	0.48	0.11	0.48

Source Identification Number[1]		10E		11E		12E	
Engine Manufacturer and Model		Caterpillar G3608		Caterpillar G3608		Caterpillar G3608	
Manufacturer's Rated bhp/rpm		2,500 bhp/1,000 rpm		2,500 bhp/1,000 rpm		2,500 bhp/1,000 rpm	
Source Status[2]		NS		NS		NS	
Date Installed/Modified/Removed[3]		October 2018		October 2018		October 2018	
Engine Manufactured/Reconstruction Date[4]		TBD		TBD		TBD	
Is this a Certified Stationary Spark Ignition Engine according to 40CFR60 Subpart JJJJ? (Yes or No)[5]		No		No		No	
Engine, Fuel and Combustion Data	Engine Type[6]	LB4S		LB4S		LB4S	
	APCD Type[7]	SCR		SCR		SCR	
	Fuel Type[8]	RG		RG		RG	
	H_2S (gr/100 scf)	0		0		0	
	Operating bhp/rpm	2,500 bhp/1,000 rpm		2,500 bhp/1,000 rpm		2,500 bhp/1,000 rpm	
	BSFC (Btu/bhp-hr)	6,850		6,850		6,850	
	Fuel throughput (ft^3/hr)	16,500		16,500		16,500	
	Fuel throughput ($MMft^3$/yr)	144.54		144.54		144.54	
	Operation (hrs/yr)	8,760		8,760		8,760	
Reference[9]	Potential Emissions[10]	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
MD	NO_X	1.65	7.24	1.65	7.24	1.65	7.24
MD	CO	0.88	3.86	0.88	3.86	0.88	3.86
MD	VOC	1.60	7.00	1.60	7.00	1.60	7.00
AP	SO_2	0.010	0.044	0.010	0.044	0.010	0.044
AP	PM_{10}	0.17	0.75	0.17	0.75	0.17	0.75
MD	Formaldehyde	0.11	0.48	0.11	0.48	0.11	0.48

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 Based on typical operating conditions

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*.

G3608

GAS COMPRESSION APPLICATION

GAS ENGINE SITE SPECIFIC TECHNICAL DATA
8666

CATERPILLAR®

ENGINE SPEED (rpm):	1000	RATING STRATEGY:	STANDARD
COMPRESSION RATIO:	7.6	RATING LEVEL:	CONTINUOUS
AFTERCOOLER TYPE:	SCAC	FUEL SYSTEM:	GAV
AFTERCOOLER - STAGE 2 INLET (°F):	130		WITH AIR FUEL RATIO CONTROL
AFTERCOOLER - STAGE 1 INLET (°F):	174	**SITE CONDITIONS:**	
JACKET WATER OUTLET (°F):	190	FUEL:	Gas Analysis
ASPIRATION:	TA	FUEL PRESSURE RANGE(psig):	58.0-70.3
COOLING SYSTEM:	JW+1AC, OC+2AC	FUEL METHANE NUMBER:	65.1
CONTROL SYSTEM:	ADEM4	FUEL LHV (Btu/scf):	1039
EXHAUST MANIFOLD:	DRY	ALTITUDE(ft):	1140
COMBUSTION:	LOW EMISSION	MAXIMUM INLET AIR TEMPERATURE(°F):	100
NOx EMISSION LEVEL (g/bhp-hr NOx):	0.3	STANDARD RATED POWER:	2500 bhp@1000rpm
SET POINT TIMING:	17		

			MAXIMUM RATING	SITE RATING AT MAXIMUM INLET AIR TEMPERATURE		
RATING	**NOTES**	**LOAD**	**100%**	**100%**	**75%**	**50%**
ENGINE POWER (WITHOUT FAN)	(1)	bhp	2500	2500	1875	1250
INLET AIR TEMPERATURE		°F	100	100	100	100
ENGINE DATA						
FUEL CONSUMPTION (LHV)	(2)	Btu/bhp-hr	6850	6850	7077	7575
FUEL CONSUMPTION (HHV)	(2)	Btu/bhp-hr	7570	7570	7821	8372
AIR FLOW (@inlet air temp, 14.7 psia) (WET)	(3)(4)	ft3/min	6562	6562	4973	3381
AIR FLOW (WET)	(3)(4)	lb/hr	27899	27899	21142	14374
FUEL FLOW (60ºF, 14.7 psia)		scfm	275	275	213	152
INLET MANIFOLD PRESSURE	(5)	in Hg(abs)	102.9	102.9	77.8	54.3
EXHAUST TEMPERATURE - ENGINE OUTLET	(6)	°F	827	827	870	935
EXHAUST GAS FLOW (@engine outlet temp, 14.5 psia) (WET)	(7)(4)	ft3/min	16056	16056	12589	8996
EXHAUST GAS MASS FLOW (WET)	(7)(4)	lb/hr	28710	28710	21771	14823
EMISSIONS DATA - ENGINE OUT						
NOx (as NO2)	(8)(9)	g/bhp-hr	0.30	0.30	0.30	0.30
CO	(8)(9)	g/bhp-hr	2.62	2.62	2.62	2.62
THC (mol. wt. of 15.84)	(8)(9)	g/bhp-hr	4.49	4.49	4.76	4.84
NMHC (mol. wt. of 15.84)	(8)(9)	g/bhp-hr	1.26	1.26	1.33	1.35
NMNEHC (VOCs) (mol. wt. of 15.84)	(8)(9)(10)	g/bhp-hr	0.41	0.41	0.43	0.44
HCHO (Formaldehyde)	(8)(9)	g/bhp-hr	0.16	0.16	0.17	0.20
CO2	(8)(9)	g/bhp-hr	429	429	445	474
EXHAUST OXYGEN	(8)(11)	% DRY	11.6	11.6	11.3	10.9
HEAT REJECTION						
HEAT REJ. TO JACKET WATER (JW)	(12)	Btu/min	27608	27608	23006	18921
HEAT REJ. TO ATMOSPHERE	(12)	Btu/min	9197	9197	9684	9447
HEAT REJ. TO LUBE OIL (OC)	(12)	Btu/min	12834	12834	12204	11129
HEAT REJ. TO A/C - STAGE 1 (1AC)	(12)(13)	Btu/min	25471	25471	13030	3866
HEAT REJ. TO A/C - STAGE 2 (2AC)	(12)(13)	Btu/min	8738	8738	5571	2865

COOLING SYSTEM SIZING CRITERIA			
TOTAL JACKET WATER CIRCUIT (JW+1AC)	(13)(14)	Btu/min	57113
TOTAL STAGE 2 AFTERCOOLER CIRCUIT (OC+2AC)	(13)(14)	Btu/min	24576
A cooling system safety factor of 0% has been added to the cooling system sizing criteria.			

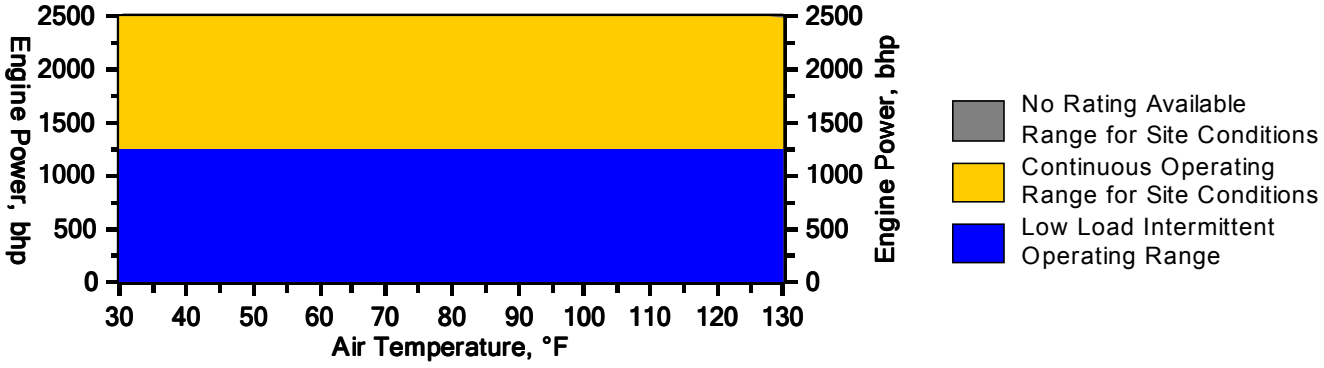
CONDITIONS AND DEFINITIONS

Engine rating obtained and presented in accordance with ISO 3046/1, adjusted for fuel, site altitude and site inlet air temperature. 100% rating at maximum inlet air temperature is the maximum engine capability for the specified fuel at site altitude and maximum site inlet air temperature. Maximum rating is the maximum capability at the specified aftercooler inlet temperature for the specified fuel at site altitude and reduced inlet air temperature. Lowest load point is the lowest continuous duty operating load allowed. No overload permitted at rating shown.

For notes information consult page three.

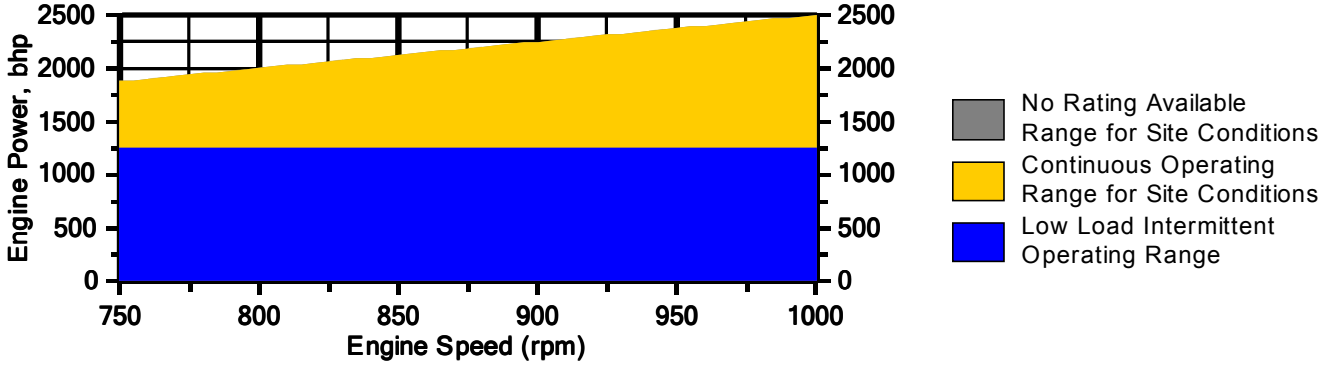
Engine Power vs. Inlet Air Temperature

Data represents temperature sweep at 1140 ft and 1000 rpm



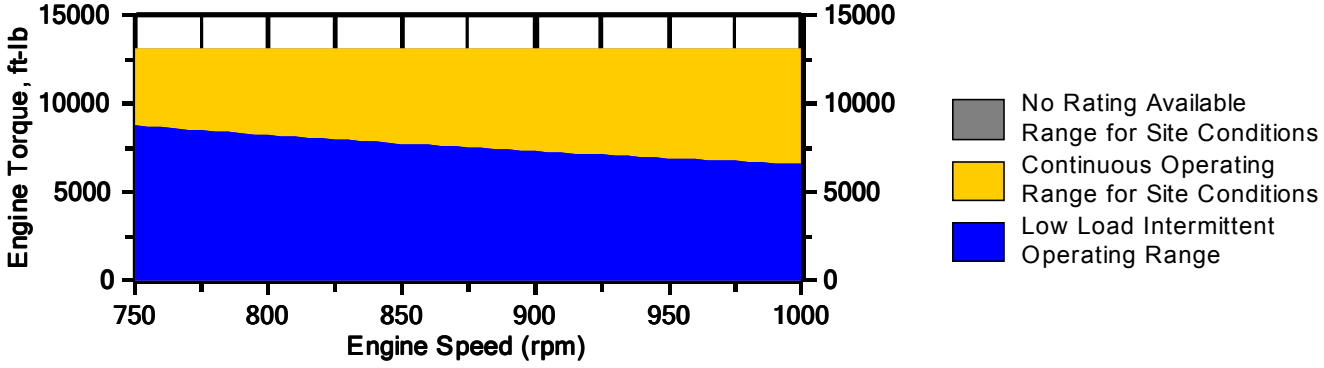
Engine Power vs. Engine Speed

Data represents speed sweep at 1140 ft and 100 ºF



Engine Torque vs. Engine Speed

Data represents speed sweep at 1140 ft and 100 ºF



Note: At site conditions of 1140 ft and 100°F inlet air temp., constant torque can be maintained down to 750 rpm. The minimum speed for loading at these conditions is 750 rpm.

NOTES

1. Engine rating is with two engine driven water pumps. Tolerance is ± 3% of full load.

2. Fuel consumption tolerance is ± 2.5% of full load data.

3. Air flow value is on a 'wet' basis. Flow is a nominal value with a tolerance of ± 5 %.

4. Inlet and Exhaust Restrictions must not exceed A&I limits based on full load flow rates from the standard technical data sheet.

5. Inlet manifold pressure is a nominal value with a tolerance of ± 5 %.

6. Exhaust temperature is a nominal value with a tolerance of (+)63°F, (-)54°F.

7. Exhaust flow value is on a "wet" basis. Flow is a nominal value with a tolerance of ± 6 %.

8. Emissions data is at engine exhaust flange prior to any after treatment.

9. Values listed are higher than nominal levels to allow for instrumentation, measurement, and engine-to-engine variations. They indicate the maximum values expected under steady state conditions. Fuel methane number cannot vary more than ± 3. THC, NMHC, and NMNEHC do not include aldehydes. An oxidation catalyst may be required to meet Federal, State or local CO or HC requirements.

10. VOCs - Volatile organic compounds as defined in US EPA 40 CFR 60, subpart JJJJ

11. Exhaust Oxygen level is the result of adjusting the engine to operate at the specified NOx level. Tolerance is ± 0.5.

12. Heat rejection values are nominal. Tolerances, based on treated water, are ± 10% for jacket water circuit, ± 50% for radiation, ± 20% for lube oil circuit, and ± 5% for aftercooler circuit.

13. Aftercooler heat rejection includes an aftercooler heat rejection factor for the site elevation and inlet air temperature specified. Aftercooler heat rejection values at part load are for reference only. Do not use part load data for heat exchanger sizing.

14. Cooling system sizing criteria are maximum circuit heat rejection for the site, with applied tolerances.

Constituent	Abbrev	Mole %	Norm
Water Vapor	H2O	0.0000	0.0000
Methane	CH4	84.8500	85.0712
Ethane	C2H6	11.1700	11.1991
Propane	C3H8	1.8400	1.8448
Isobutane	iso-C4H1O	0.0300	0.0301
Norbutane	nor-C4H1O	0.5700	0.5715
Isopentane	iso-C5H12	0.1500	0.1504
Norpentane	nor-C5H12	0.1500	0.1504
Hexane	C6H14	0.1000	0.1003
Heptane	C7H16	0.0500	0.0501
Nitrogen	N2	0.7000	0.7018
Carbon Dioxide	CO2	0.1000	0.1003
Hydrogen Sulfide	H2S	0.0000	0.0000
Carbon Monoxide	CO	0.0000	0.0000
Hydrogen	H2	0.0000	0.0000
Oxygen	O2	0.0000	0.0000
Helium	HE	0.0000	0.0000
Neopentane	neo-C5H12	0.0000	0.0000
Octane	C8H18	0.0200	0.0201
Nonane	C9H20	0.0100	0.0100
Ethylene	C2H4	0.0000	0.0000
Propylene	C3H6	0.0000	0.0000
TOTAL (Volume %)		99.7400	100.0001

Fuel Makeup:	Gas Analysis
Unit of Measure:	English

Calculated Fuel Properties

Caterpillar Methane Number:	65.1
Lower Heating Value (Btu/scf):	1039
Higher Heating Value (Btu/scf):	1148
WOBBE Index (Btu/scf):	1289
THC: Free Inert Ratio:	123.67
Total % Inerts (% N2, CO2, He):	0.8%
RPC (%) (To 905 Btu/scf Fuel):	100%
Compressibility Factor:	0.997
Stoich A/F Ratio (Vol/Vol):	10.80
Stoich A/F Ratio (Mass/Mass):	16.64
Specific Gravity (Relative to Air):	0.649
Specific Heat Constant (K):	1.295

CONDITIONS AND DEFINITIONS

Caterpillar Methane Number represents the knock resistance of a gaseous fuel. It should be used with the Caterpillar Fuel Usage Guide for the engine and rating to determine the rating for the fuel specified. A Fuel Usage Guide for each rating is included on page 2 of its standard technical data sheet.

RPC always applies to naturally aspirated (NA) engines, and turbocharged (TA or LE) engines only when they are derated for altitude and ambient site conditions.

Project specific technical data sheets generated by the Caterpillar Gas Engine Rating Pro program take the Caterpillar Methane Number and RPC into account when generating a site rating.

Fuel properties for Btu/scf calculations are at 60F and 14.696 psia.

Caterpillar shall have no liability in law or equity, for damages, consequently or otherwise, arising from use of program and related material or any part thereof.

FUEL LIQUIDS

Field gases, well head gases, and associated gases typically contain liquid water and heavy hydrocarbons entrained in the gas. To prevent detonation and severe damage to the engine, hydrocarbon liquids must not be allowed to enter the engine fuel system. To remove liquids, a liquid separator and coalescing filter are recommended, with an automatic drain and collection tank to prevent contamination of the ground in accordance with local codes and standards.

To avoid water condensation in the engine or fuel lines, limit the relative humidity of water in the fuel to 80% at the minimum fuel operating temperature.

Dehydrators

NATURAL GAS GLYCOL DEHYDRATION UNIT DATA SHEET

General Glycol Dehydration Unit Data		Manufacturer and Model		TBD, 225 MMscfd	
		Max Dry Gas Flow Rate (MMscf/day)		225	
		Design Heat Input (MMBtu/hr)		1.5	
		Design Type (DEG or TEG)		TEG	
		Source Status[2]		NS	
		Date Installed/Modified/Removed[3]		October 2018	
		Regenerator Still Vent APCD[4]		TO	
		Fuel HV (Btu/scf)		1,247	
		H_2S Content (gr/100 scf)		0	
		Operation (hrs/yr)		8,760	
Source ID #[1]	Vent	Reference[5]	Potential Emissions[6]	lbs/hr	tons/yr
16E	Reboiler Vent	AP	NO_X	0.15	0.64
		AP	CO	0.12	0.54
		AP	VOC	0.0081	0.035
		AP	SO_2	0.00088	0.0039
		AP	PM_{10}	0.011	0.049
14E	Glycol Regenerator Still Vent	GRI-GLYCalc™	VOC	1.48	6.50
		GRI-GLYCalc™	Total HAPs	0.20	0.89
		GRI-GLYCalc™	Benzene	0.020	0.088
		GRI-GLYCalc™	Ethylbenzene	0.018	0.078
		GRI-GLYCalc™	Toluene	0.071	0.31
		GRI-GLYCalc™	Xylenes	0.050	0.22
		GRI-GLYCalc™	n-Hexane	0.044	0.19
15E	Flash Gas Tank Vent	GRI-GLYCalc™	VOC	0.36	1.56
		GRI-GLYCalc™	Total HAPs	0.0066	0.029
		GRI-GLYCalc™	Benzene	0.00012	0.00051
		GRI-GLYCalc™	Ethylbenzene	0.000032	0.00014
		GRI-GLYCalc™	Toluene	0.00025	0.0011
		GRI-GLYCalc™	Xylenes	0.000058	0.00025
		GRI-GLYCalc™	n-Hexane	0.0062	0.027

General Glycol Dehydration Unit Data		Manufacturer and Model		TBD, 225 MMscfd	
		Max Dry Gas Flow Rate (mmscf/day)		225	
		Design Heat Input (mmBtu/hr)		1.5	
		Design Type (DEG or TEG)		TEG	
		Source Status[2]		NS	
		Date Installed/Modified/Removed[3]		October 2018	
		Regenerator Still Vent APCD[4]		TO	
		Fuel HV (Btu/scf)		1,247	
		H_2S Content (gr/100 scf)		0	
		Operation (hrs/yr)		8,760	
Source ID #[1]	Vent	Reference[5]	Potential Emissions[6]	lbs/hr	tons/yr
19E	Reboiler Vent	AP	NO_X	0.15	0.64
		AP	CO	0.12	0.54
		AP	VOC	0.0081	0.035
		AP	SO_2	0.00088	0.0039
		AP	PM_{10}	0.011	0.049
17E	Glycol Regenerator Still Vent	GRI-GLYCalc™	VOC	1.48	6.50
		GRI-GLYCalc™	Total HAPs	0.20	0.89
		GRI-GLYCalc™	Benzene	0.020	0.088
		GRI-GLYCalc™	Ethylbenzene	0.018	0.078
		GRI-GLYCalc™	Toluene	0.071	0.31
		GRI-GLYCalc™	Xylenes	0.050	0.22
		GRI-GLYCalc™	n-Hexane	0.044	0.19
18E	Flash Gas Tank Vent	GRI-GLYCalc™	VOC	0.36	1.56
		GRI-GLYCalc™	Total HAPs	0.0066	0.029
		GRI-GLYCalc™	Benzene	0.00012	0.00051
		GRI-GLYCalc™	Ethylbenzene	0.000032	0.00014
		GRI-GLYCalc™	Toluene	0.00025	0.0011
		GRI-GLYCalc™	Xylenes	0.000058	0.00025
		GRI-GLYCalc™	n-Hexane	0.0062	0.027

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

2. Enter the Source Status using the following codes:

NS	Construction of New Source	ES	Existing Source
MS	Modification of Existing Source	RS	Removal of Source

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

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

NA	None	CD	Condenser
FL	Flare	CC	Condenser/Combustion Combination
TO	Thermal Oxidizer		

5. Enter the Potential Emissions Data Reference designation using the following codes:

MD	Manufacturer's Data	AP	AP-42	
GR	GRI-GLYCalc™	OT	Other _____	(please list)

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

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

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

West Virginia Department of Environmental Protection

Division of Air Quality

40 CFR Part 63; Subpart HH & HHH Registration Form

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

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):	450,000,000 (225,000,000 per dehy)	
Affected facility actual annual average hydrocarbon liquid throughput: (bbl/day):	390	
The affected facility processes, upgrades, or stores hydrocarbon liquids prior to custody transfer.	(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.	(Yes)	No
The affected facility is: ☒ prior to a NG processing plant ☐ a NG processing plant ☐ 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).	(Yes)	No
The affected facility exclusively processes, stores, or transfers black oil.	Yes	(No)
Initial producing gas-to-oil ratio (GOR): _____scf/bbl API gravity: _____degrees		

Section B: Dehydration Unit (if applicable) [1]			
Description:	Middlebourne V Compressor Station Dehydrators (DEHY1 and DEHY2)		
Date of Installation:	August 2018	Annual Operating Hours: 8,760	Burner rating (MMbtu/hr): 1.5
Exhaust Stack Height (ft):	TBD	Stack Diameter (ft): TBD	Stack Temp. (°F): 200
Glycol Type:	☒ TEG ☐ EG ☐ Other:		
Glycol Pump Type:	☒ Electric ☐ Gas	If gas, what is the volume ratio? ____ACFM/gpm	
Condenser installed?	☐ Yes ☒ No	Exit Temp. ___ °F Condenser Pressure ___psig	
Incinerator/flare installed?	☐ Yes ☒ No	Destruction Eff. _____%	
Other controls installed?	☒ Yes ☐ No	Describe: Thermal oxidizer with 98% eff	
Wet Gas[2]: (Upstream of Contact Tower)	Gas Temp.: _120_°F Gas Pressure _1,200 psig Saturated Gas? ☒ Yes ☐ No If no, water content _____ lb/MMSCF		
Dry Gas: (Downstream of Contact Tower)	Gas Flowrate(MMSCFD) Actual _____ Design ___225____ Water Content ___7.0____ lb/MMSCF		
Lean Glycol:	Circulation rate (gpm) Actual[3] _____ Maximum[4] ___17.5____ Pump make/model: KERR Triplex T30MM		
Glycol Flash Tank (if applicable):	Temp.: __80__°F Pressure __60___ psig Vented? Yes ☐ No ☒ If no, describe vapor control: Vent gas used in reboiler as fuel or sent to thermal oxidizer.		
Stripping Gas (if applicable):	Source of gas: Dry gas, if used	Rate _52.5__ 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_1-C_8, benzene, ethylbenzene, toluene, xylene and n-Hexane, using Gas Processors Association (GPA) 2286 (or similar). A sample should be taken from the inlet gas line, downstream from any inlet separator, and using a manifold to remove entrained liquids from the sample and a probe to collect the sample from the center of the gas line. GPA standard 2166 reference method or a modified version of EPA Method TO-14, (or similar) should be used.
3. GRI-GLYCalc Ver. 3.0 aggregate report based on maximum Lean Glycol circulation rate and maximum throughput.
4. Detailed calculations of gas or hydrocarbon flow rate.

Section C: Facility NESHAPS Subpart HH/HHH status

Affected facility status: (choose only one)

- ☒ Subject to Subpart HH - applies, but is exempt through < 1 tpy benzene exemption
- ☐ Subject to Subpart HHH
- ☒ Not Subject because:
  - ☒ < 10/25 TPY
  - ☐ Affected facility exclusively handles black oil
  - ☐ The facility wide actual annual average NG throughput is < 650 thousand scf/day and facility wide actual annual average hydrocarbon liquid is < 250 bpd
  - ☐ No affected source is present

Generators

NATURAL GAS COMPRESSOR/GENERATOR ENGINE DATA SHEET

Source Identification Number[1]		13E		32E			
Engine Manufacturer and Model		Capstone C800 Standard		PSI Industrial 21.9L			
Manufacturer's Rated bhp/rpm		800 kWe		649 bhp/1800 rpm			
Source Status[2]		NS		NS			
Date Installed/Modified/Removed[3]		October 2018		October 2018			
Engine Manufactured/Reconstruction Date[4]		TBD		Post – July 1, 2007			
Is this a Certified Stationary Spark Ignition Engine according to 40CFR60 Subpart JJJJ? (Yes or No)[5]		N/A		Yes			
Engine, Fuel and Combustion Data	Engine Type[6]	N/A		RB4S			
	APCD Type[7]	N/A		Certified to meet emission limits			
	Fuel Type[8]	RG		RG			
	H_2S (gr/100 scf)	0		0			
	Operating kWe	800		649			
	BSFC	10,300 Btu/kW-hr		8,630 Btu/hp-hr			
	Fuel throughput (ft^3/hr)	6,605		4,490			
	Fuel throughput ($MMft^3$/yr)	57.86		39.33			
	Operation (hrs/yr)	8,760		8,760			
Reference[9]	Potential Emissions[10]	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
MD	NO_X	0.32	1.40	1.43	6.27		
MD	CO	0.88	3.85	2.86	12.53		
MD	VOC	0.080	0.35	1.00	4.39		
AP	SO_2	0.028	0.12	0.0033	0.014		
AP	PM_{10}	0.054	0.24	0.11	0.48		
AP	Formaldehyde	0.0059	0.026	0.12	0.50		

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

2. Enter the Source Status using the following codes:

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

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

4. Enter the date that the engine was manufactured, modified or reconstructed.

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

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

6. Enter the Engine Type designation(s) using the following codes:

LB2S	Lean Burn Two Stroke	RB4S	Rich Burn Four Stroke
LB4S	Lean Burn Four Stroke		

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

A/F	Air/Fuel Ratio	IR	Ignition Retard
HEIS	High Energy Ignition System	SIPC	Screw-in Precombustion Chambers
PSC	Prestratified Charge	LEC	Low Emission Combustion
NSCR	Rich Burn & Non-Selective Catalytic Reduction	SCR	Lean Burn & Selective Catalytic Reduction

8. Enter the Fuel Type using the following codes:

PQ	Pipeline Quality Natural Gas	RG	Raw Natural Gas

9. Enter the Potential Emissions Data Reference designation using the following codes. Attach all referenced data to this *Compressor/Generator Data Sheet(s)*.

MD	Manufacturer's Data	AP	AP-42	
GR	GRI-HAPCalc™	OT	Other _____	(please list)

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

C800 800kW Power Package
High-pressure Natural Gas

World's largest air-bearing microturbine produces 800kW 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 1MW with field installation of Capstone 200kW power module
- Internal fuel gas compressor available for low fuel pressure natural gas applications

C800 Power Package

Electrical Performance[1]

Electrical Power Output	800kW
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	1,160A RMS @ 400V, grid connect operation
	960A RMS @ 480V, grid connect operation
	1,240A RMS, stand alone operation[2]
Electrical Efficiency LHV	33%

Fuel/Engine Characteristics[1]

Natural Gas HHV	30.7–47.5 MJ/m^3 (825–1,275 BTU/scf)
Inlet Pressure[3]	517–552 kPa gauge (75–80 psig)
Fuel Flow HHV	9,600 MJ/hr (9,120,000 BTU/hr)
Net Heat Rate LHV	10.9 MJ/kWh (10,300 BTU/kWh)

Exhaust Characteristics[1]	Standard	Low-Emissions Version
NOx Emissions @ 15% O_2[4]	< 9 ppmvd (18 mg/m^3)	< 4 ppmvd (8 mg/m^3)
NOx / Electrical Output[4]	0.14 g/bhp-hr (0.4 lb/MWhe)	0.05 g/bhp-hr (0.14 lb/MWhe)
Exhaust Gas Flow	5.3 kg/s (11.7 lbm/s)	5.3 kg/s (11.7 lbm/s)
Exhaust Gas Temperature	280°C (535°F)	280°C (535°F)
Exhaust Energy	5,680 MJ/hr (5,400,000 BTU/hr)	5,680 MJ/hr (5,400,000 BTU/hr)

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

Dimensions & Weight[5]

Width x Depth x Height	2.4 x 9.1 x 2.9 m (96 x 360 x 114 in)
Weight - Grid Connect Model	14650 kg (32,300 lbs)
Weight - Dual Mode Model	15558 kg (34,300 lbs)

Minimum Clearance Requirements[6]

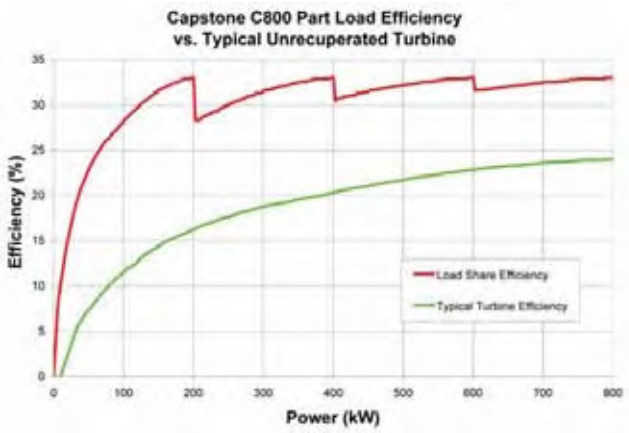
Vertical Clearance	0.6 m (24 in)
Horizontal Clearance	
Left	1.5 m (60 in)
Right	0.0 m (0 in)
Front	1.5 m (60 in)
Rear	2.0 m (80 in)

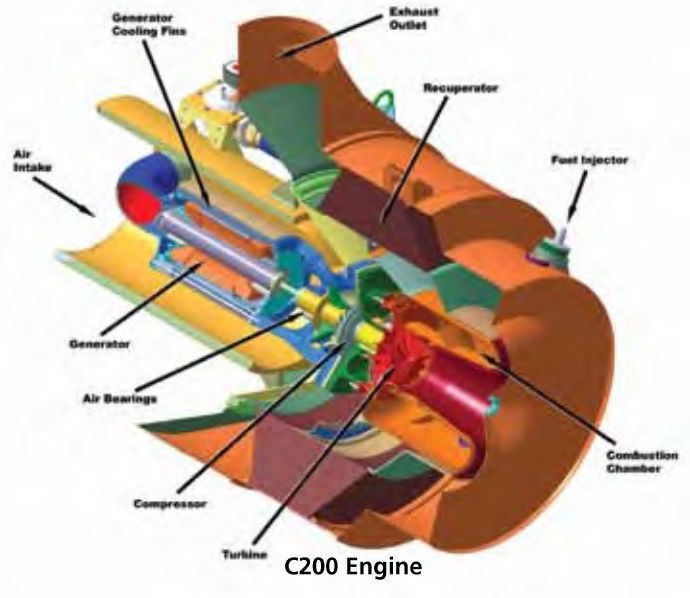
Sound Levels

Acoustic Emissions at Full Load Power	
Nominal at 10 m (33 ft)	65 dBA

Planned Certifications

- UL 2200 and UL 1741 for natural gas operation under existing UL files[7]
- 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/Nm³ (1,000 BTU/scf) (HHV)
(4) Emissions for standard natural gas at 39.4 MJ/Nm³ (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.

21211 Nordhoff Street • Chatsworth • CA • 91311 • 866.422.7786 • 818.734.5300 • www.capstoneturbine.com

Capstone Turbine Corporation • 21211 Nordhoff Street • Chatsworth • CA 91311 • USA
Phone: (818) 734-5300 • Fax: (818) 734-5320 • Web: www.microturbine.com

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_2). This CO_2 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 (5)
C30 NG	Natural Gas (1)	0.64	1.8	0.23
CR30 MBTU	Landfill Gas (2)	0.64	22.0	1.00
CR30 MBTU	Digester Gas (3)	0.64	11.0	1.00
C30 Liquid	Diesel #2 (4)	2.60	0.41	0.23
C65 NG Standard	Natural Gas (1)	0.46	1.25	0.10
C65 NG Low NOx	Natural Gas (1)	0.17	1.30	0.10
C65 NG CARB	Natural Gas (1)	0.17	0.24	0.05
CR65 Landfill	Landfill Gas (2)	0.46	4.0	0.10
CR65 Digester	Digester Gas (3)	0.46	4.0	0.10
C200 NG	Natural Gas (1)	0.40	1.10	0.10
C200 NG CARB	Natural Gas (1)	0.14	0.20	0.04
CR200 Digester	Digester Gas (3)	0.40	3.6	0.10

Notes:

(1) Emissions for standard natural gas at 1,000 BTU/scf (HHV) or 39.4 MJ/m3 (HHV)
(2) Emissions for surrogate gas containing 42% natural gas, 39% CO2, and 19% Nitrogen
(3) Emissions for surrogate gas containing 63% natural gas and 37% CO2
(4) Emissions for Diesel #2 according to ASTM D975-07b
(5) Expressed as Methane

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_2), 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 NOx 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_2, they are released in small quantities – especially from Capstone microturbines. So the major contributor of concern is carbon dioxide, or CO_2. Emission of CO_2 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_2 emissions due to combustion for different Capstone microturbine models at full power and ISO conditions. The values do not include CO_2 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_2 released is substantially less when useful thermal output is also considered in the measurement.

Table 5. CO_2 Emission for Capstone Microturbine Models in [lb/MWh]

Model	Fuel	CO_2	
		Electric Only	70% Total CHP
C30 NG	Natural Gas (1)	1,690	625
CR30 MBTU	Landfill Gas (1)	1,690	625
CR30 MBTU	Digester Gas (1)	1,690	625
C30 Liquid	Diesel #2 (2)	2,400	855
C65 NG Standard	Natural Gas (1)	1,520	625
C65 NG Low NOx	Natural Gas (1)	1,570	625
C65 NG CARB	Natural Gas (1)	1,570	625
CR65 Landfill	Landfill Gas (1)	1,520	625
CR65 Digester	Digester Gas (1)	1,520	625
C200 NG	Natural Gas (1)	1,330	625
C200 NG CARB	Natural Gas (1)	1,330	625
CR200 Digester	Digester Gas (1)	1,330	625

Notes:

(1) Emissions due to combustion, assuming natural gas with CO_2 content of 117 lb/MMBTU (HHV)

(2) Emissions due to combustion, assuming diesel fuel with CO_2 content of 160 lb/MMBTU (HHV)

SENTRY-PRO POWER SYSTEMS

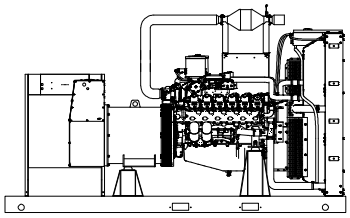
By Gillette Generators, Inc.

MODEL
SP-4250
60 HERTZ

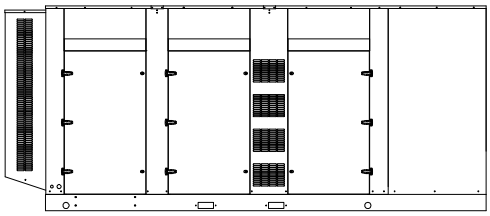
LIQUID COOLED NAT. GAS ENGINE GENERATOR SET

KW POWER RATINGS RANGE FOR 60 HZ

Model		STANDBY 130°C RISE
	HZ	N.G.
SP-4250-60 HERTZ	60	425



"OPEN" GEN-SET



"LEVEL 2" HOUSED GEN-SET

STANDARD FEATURES

- All generator sets are USA prototype built and thoroughly tested. Production models are USA factory built and 100% load tested.
- All generator sets meet NFPA-110. Level 1, when equipped with the necessary accessories and installed per NFPA standards.
- All generators are UL-1446 certified.
- Solid state, frequency compensated voltage regulation is standard on all gen-sets.
- Electronic engine governor incorporates a throttle body actuator, which allows precise isochronous frequency regulation.
- A brushless rotating field generator design with shunt wound excitation system and connectable at a broad range of 3 phase voltages.
- SENTINEL "ULTIMATE" digital controller allows programming to basic engine functions in the field. Controller has stop-manual-auto mode and engine shutdowns, signaled by full text LCD indicators.
- Heavy Duty Main Line Circuit Breaker is standard on all gen-sets.
- All generator set control systems components and accessories provide a 1-year limited warranty at time of initial start-up. Generators and engines are governed by separate warranties.
- "OPEN" Generator Sets: There is no enclosure, so gen-set must be placed within a weather protected area, un-inhabited by humans or animals, with proper ventilation. Muffler and flexible exhaust hose are not supplied, as installation requirements are not known. However, these two items are available as optional equipment.
- "LEVEL 2" Aluminum Housing: Full weather protection and superior sound attenuation for specific low noise applications. Critical grade muffler is standard.

GENERATOR RATINGS

GENERATOR MODEL	VOLTAGE		PH	HZ	NATURAL GAS FUEL		POWER LEAD CONNECTIONS
					130°C RISE STANDBY RATING		
	L-N	L-L			KW/KVA	AMP	
SP-4250-3-2	120	208	3	60	425/531	1476	12 LEAD LOW WYE
SP-4250-3-3	120	240	3	60	425/531	1280	12 LEAD HIGH DELTA
SP-4250-3-4	277	480	3	60	425/531	640	12 LEAD HIGH WYE
SP-4250-3-5	127	220	3	60	425/531	1396	12 LEAD LOW WYE
SP-4250-3-16	346	600	3	60	425/531	512	4 LEAD WYE 3PH

RATINGS: All three phase gen-sets are 12 lead windings, rated at .8 power factor. 130°C "STANDBY RATINGS" are strictly for gen-sets that are used for back-up emergency power to a failed normal utility power source. This standby rating allows varying loads, with no overload capability, for the entire duration of utility power outage. All gen-set power ratings are based on temperature rise measured by resistance method as defined by MIL-STD 705C and IEEE STD 115, METHOD 6.4.4. All generators have class H (180°C) insulation system on both rotor and stator windings. All factory tests and KW/KVA charts shown above are based on 130°C (standby) R/R winding temperature, within a maximum 40°C ambient condition. Generators operated at standby power ratings must not exceed the temperature rise limitation for class H insulation system, as specified in NEMA MG1-22.40. Specifications & ratings are subject to change without prior notice.

APPLICATION AND ENGINEERING DATA FOR MODEL SP-4250-60 HZ

GENERATOR SPECIFICATIONS

Manufacturer ..... Marathon Electric Generators
Model & Type .....572RSL4025, 4 Pole, 12 Lead, Three Phase
..... 572RSS4270, 4 Pole, 4 Lead, 600V, Three Phase
Exciter .....Brushless, shunt excited
Voltage Regulator ..... Solid State, HZ/Volts
Voltage Regulation .....½%, No load to full load
Frequency.....Field convertible, 60 HZ to 50 HZ
Frequency Regulation .....½% (½ cycle, no load to full load)
Unbalanced Load Capability..... 100% of standby amps
Total Stator and Load Insulation.....Class H, 180°C
Temperature Rise ..... 130°C R/R, standby rating @ 40°C amb.
3 Ø Motor Starting @ 30% Voltage Dip (208-240V).....860 kVA
3 Ø Motor Starting @ 30% Voltage Dip (480V) .....1100 kVA
Bearing..... 1, Pre-lubed and sealed
Coupling.....Direct flexible disc
Total Harmonic Distortion ..... Max 3½% (MIL-STD705B)
Telephone Interference Factor .....Max 50 (NEMA MG1-22)
Deviation Factor..... Max 5% (MIL-STD 405B)
Ltd. Warranty Period..... 24 Months from date of start-up or
..... 1000 hours use, first to occur.

GENERATOR FEATURES

- World Renown Marathon Electric Generator having UL-1446 certification.
- Full generator protection with **SENTINEL "ULTIMATE"** controller, having UL-508 certification.
- Automatic voltage regulator with over-excitation, under-frequency compensation, under-speed protection, and EMI filtering. Entire solid-state board is encapsulated for moisture protection.
- Generator power ratings are based on temperature rise, measured by resistance method, as defined in MIL-STD 705C and IEEE STD 115, Method 6.4.4.
- Power ratings will not exceed temperature rise limitation for class H insulation as per NEMA MG1-22.40.
- Insulation resistance to ground, exceeds 1.5 meg-ohm.
- Stator receives 2000 V. hi-potential test on main windings, and rotor windings receive a 1500 V. hi-potential test, as per MIL-STD 705B.
- Full amortisseur windings with UL-1446 certification.
- Complete engine-generator torsional acceptance, confirmed during initial prototype testing.
- Full load testing on all engine-generator sets, before shipping.
- Self ventilating and drip-proof & revolving field design

ENGINE SPECIFICATIONS AND APPLICATIONS DATA

ENGINE

Manufacturer.....Power Solutions Inc. (PSI)
Model and Type .....Heavy Duty, 21.9LTCAC HO, 4 cycle
Aspiration.....Turbocharged & Charge Air Cooled
Cylinder Arrangement..... 12 Cylinders, Vee
Displacement Cu. In. (Liters).....1338 (21.9)
Bore & Stroke In. (Cm.).....5.04 x 5.59 (128 x 142)
Compression Ratio..... 10.5:1
Main Bearings & Style..... 14, Precision Half-Shell
Cylinder Head .....Cast Iron
Pistons.....Cast Aluminum
Crankshaft.....Forged Steel
Exhaust Valve .....Inconel, A193
Governor .....Electronic
Frequency Reg. (no load-full load) .....Isochronous
Frequency Reg. (steady state) .....± 1/4%
Air Cleaner.....Dry, Replaceable Cartridge
Engine Speed 1800
Piston Speed, ft/min (m./min)…… .1830 (558)
Max Power, bhp (kwm) Standby/NG..... .....649 (484)
Ltd. Warranty Period.....12 Months or 2000 hrs., first to occur

FUEL SYSTEM

Type .....NAT. GAS, Vapor Withdrawal
Fuel Pressure (kpa), in. H_2O .....(1.74), 7"
Secondary Fuel Regulator.....NG Vapor System
Auto Fuel Lock-Off Solenoid ..... Standard on all sets
Fuel Supply Inlet Line..... (2) 3" NPTF

FUEL CONSUMPTION

NAT. GAS: FT^3/HR (M^3/HR)	STANDBY
100% LOAD	4490 (127.0)
75% LOAD	3500 (99.00)
50% LOAD	2456 (69.54)
NG = 1000 BTU X FT^3/HR = Total BTU/HR	

OIL SYSTEM

Type ..... Full Pressure
Oil Pan Capacity qt. (L) 42.3 (40.0)
Oil Pan Cap. W/ filter qt. (L) 49.1 (47.1)
Oil Filter..... 2, Replaceable Spin-On

ELECTRICAL SYSTEM

Ignition System .....Electronic
Eng. Alternator/Starter: 24 VDC, negative ground, 45 amp/hr.

Recommended battery to -18°C (0° F): ....(2) 12 VDC, BCI# 31, Max. Dimensions: 14"lg x 6 3/4" wi x 10" hi, with standard round posts. Min output 1000 CCA. Battery tray (max. dim. at 15"lg x 7"wi). This model has (2) battery trays, (2) hold down straps, (2) sets of battery cables, and (1) battery charger. Installation of (2) 12VDC starting batteries connected in series for 24VDC output is required, with possible higher AMP/HR rating, as described above, if the normal environment temperature averages -13° F (-25°C) or cooler.

APPLICATION AND ENGINEERING DATA FOR MODEL SP-4250-60 HZ

COOLING SYSTEM

Type of System ..... Pressurized, closed recovery
Coolant Pump .....Pre-lubricated, self-sealing
Cooling Fan Type (no. of blades) .....Pusher (8)
Fan Diameter inches (mm)..... 52" (1321)
Ambient Capacity of Radiator °F (°C).....125 (51.6)
Engine Jacket Coolant Capacity Gal (L).....14 (53.0)
Radiator Coolant Capacity Gal. (L) 50 (189)
Maximum Restriction of Cooling Air Intake
and discharge side of radiator in. H_20 (kpa)..... 0.5 (.125)
Water Pump Capacity gpm (L/min)..... .....174 (660)
Heat Reject Coolant: Btu/min (kw) 25,760 (453)
Low Radiator Coolant Level Shutdown……...Standard
Note: Coolant temp. shut-down switch setting at 230°F (110°C) with 50/50 (water/antifreeze) mix.

AIR REQUIREMENTS

Combustion Air, cfm (m^3/min) 1027 (29.1)
Radiator Air Flow cfm (m^3/min)…… ....…29,000 (821)
Heat Rejected to Ambient:
Engine: kw (btu/min)..... .....66 (3765)
Alternator: kw (btu/min)..... .....23 (1309)

EXHAUST SYSTEM

Exhaust Outlet Size.....(2) 5"
Max. Back Pressure, in. hg (KPA).....3.0 (10.2)
Exhaust Flow, at rated kw: cfm (m^3/min) ....……3179 (89.8)
Exhaust Temp., at rated kw: °F (ºC) ……..….1382 (750)
Engines are EPA certified for Natural Gas.

SOUND LEVELS MEASURED IN dB(A)

	Open Set	Level 2 Encl.
Level 2, Critical Silencer	96	81
Level 3, Hospital Silencer	91	76

Note: Open sets (no enclosure) has (2) optional silencer system choices due to unknown job-site applications. Level 2 enclosure has installed critical silencer with upgrade to hospital silencer. Sound tests are averaged from several test points and taken at 23 ft. (7 m) from source of noise at normal operation.

DERATE GENERATOR FOR ALTITUDE

3% per 1000 ft.(305m) above 3000 ft. (914m) from sea level

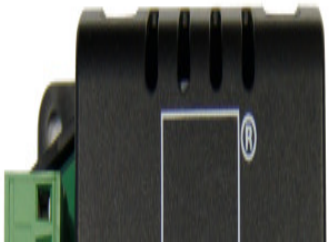
DERATE GENERATOR FOR TEMPERATURE

2% per 10°F(5.6°C) above 85°F (29.4°C)

DIMENSIONS AND WEIGHTS

	Open Set	Level 2 Enclosure
Length in (cm)	168 (427)	226 (574)
Width in (cm)	82 (208)	82 (208)
Height in (cm)	92 (234)	100 (254)
3 Ø Net Weight lbs (kg)	9550 (4332)	12050 (5466)
3 Ø Ship Weight lbs (kg)	9950 (4513)	12450 (5647)

SENTINEL ULTIMATE DIGITAL MICROPROCESSOR CONTROLLER



SENTINEL ULTIMATE
The "**Ultimate**" controller is an auto start mains (utility) failure module for single gen-set applications. This controller includes a backlit LCD display which continuously displays the status of the engine and generator at all times.

The "**Ultimate**" controller will also monitor speed, frequency, voltage, current, oil pressure, coolant temp., and fuel levels. These modules have been designed to display warning and shut down status. It also includes: (11) configurable inputs • (8) configurable outputs • voltage monitoring • mains (utility) failure detection • (250) event logs • configurable timers • automatic shutdown or warning during fault detection • remote start (on load) • engine preheat • advanced metering capability • hour meter • text LCD displays • protected solid state outputs • test buttons for: stop/reset • manual mode • auto mode • lamp test • start button • power monitoring (kWh, kVAr, kVAh, kVArh)

This controller includes the "**Ultimate**" in expansion features including RS232, RS484 (using MODBUS-RTU/TCP), direct USB connection with PC, expansion optioned using DSENet for remote annunciation and remote relay interfacing for a distance of up to 3300FT. The controller software is freely downloadable from the internet and allows monitoring with direct USB cable, LAN, or by internet via the built in web interface.

Further expansion is available by adding the optional "WebNet" gateway interface module. This device will allow comprehensive monitoring of the generator via the cloud including identification, location, and status. Some advantages of this module include: reduced site visits and maintenance costs • remote fuel management • fault analysis • asset tracking • automatic system alerts • maximized system up-time.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
2014 MODEL YEAR
CERTIFICATE OF CONFORMITY
WITH THE CLEAN AIR ACT OF 1990

OFFICE OF TRANSPORTATION AND AIR QUALITY
ANN ARBOR, MICHIGAN 48105

Certificate Issued To: **Power Solutions International, Inc.**
(U.S. Manufacturer or Importer)

Certificate Number: EPSIB21.9NGP-012

Effective Date: 10/28/2013

Expiration Date: 12/31/2014

Byron J. Bunker, Division Director
Compliance Division

Issue Date: 10/28/2013

Revision Date: N/A

Manufacturer: Power Solutions International, Inc.
Engine Family: EPSIB21.9NGP
Certificate Number: EPSIB21.9NGP-012
Certification Type: Mobile and Stationary
Fuel : LPG/Propane
Natural Gas (CNG/LNG)
Emission Standards : CO (g/kW-hr) : 4.4
HC + NOx (g/kW-hr) : 2.7
NMHC + NOx (g/kW-hr) : 2.7NOx (g/Hp-hr) : 1
CO (g/Hp-hr) : 2
VOC (g/Hp-hr) : 0.7
Emergency Use Only : N

Pursuant to Section 213 of the Clean Air Act (42 U.S.C. section 7547) and 40 CFR Part 1048, 40 CFR Part 60, 1065, 1068, and 60 (stationary only and combined stationary and mobile) and subject to the terms and conditions prescribed in those provisions, this certificate of conformity is hereby issued with respect to the test engines which have been found to conform to applicable requirements and which represent the following nonroad engines, by engine family, more fully described in the documentation required by 40 CFR Part 1048, 40 CFR Part 60 and produced in the stated model year.

This certificate of conformity covers only those new nonroad spark-ignition engines which conform in all material respects to the design specifications that applied to those engines described in the documentation required by 40 CFR Part 1048, 40 CFR Part 60 and which are produced during the model year stated on this certificate of the said manufacturer, as defined in 40 CFR Part 1048, 40 CFR Part 60. This certificate of conformity does not cover nonroad engines imported prior to the effective date of the certificate.

It is a term of this certificate that the manufacturer shall consent to all inspections described in 40 CFR 1068.20 and authorized in a warrant or court order. Failure to comply with the requirements of such a warrant or court order may lead to revocation or suspension of this certificate for reasons specified in 40 CFR Part 1048, 40 CFR Part 60. It is also a term of this certificate that this certificate may be revoked or suspended or rendered void *ab initio* for other reasons specified in 40 CFR Part 1048, 40 CFR Part 60.

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

Storage Tanks

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**), 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 Condensate Tank 1
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) T01	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 20E
5. Date of Commencement of Construction (for existing tanks)	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable)	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ 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)	13B. Maximum daily throughput (gal/day)
1,533,000	4,200

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 96.05

15. Maximum tank fill rate (gal/min): TBD

16. Tank fill method: ☐ Submerged ☒ Splash ☐ Bottom Loading

17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☒ 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):

☒ Fixed Roof X vertical ___ horizontal ___ flat roof __ cone roof X dome roof
___ other (describe)

☐ External Floating Roof ___ pontoon roof ___ double deck roof

☐ Domed External (or Covered) Floating Roof

☐ Internal Floating Roof ___ vertical column support ___ self-supporting

☐ Variable Vapor Space ___ lifter roof ___ diaphragm

☐ Pressurized ___ spherical ___ cylindrical

☐ Underground

☐ Other (describe)

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

19. Tank Shell Construction:

☐ Riveted ☐ Gunite lined ☐ Epoxy-coated rivets ☐ Other (describe)

20A. Shell Color	20B. Roof Color	20C. Year Last Painted

21. Shell Condition (if metal and unlined):

☐ No Rust ☐ Light Rust ☐ Dense Rust ☐ Not applicable

22A. Is the tank heated? ☐ YES ☐ NO

22B. If YES, 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 **Vertical Fixed Roof Tanks** ☐ Does Not Apply

24A. For dome roof, provide roof radius (ft)

24B. For cone roof, provide slope (ft/ft)

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

25A. Year Internal Floaters Installed:

25B. Primary Seal Type: (check one)
☐ Metallic (Mechanical) Shoe Seal ☐ Liquid Mounted Resilient Seal
☐ Vapor Mounted Resilient Seal ☐ Other (describe):

25C. Is the Floating Roof equipped with a Secondary Seal? ☐ YES ☐ NO

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

25E. Is the Floating Roof equipped with a weather shield? ☐ YES ☐ NO

25F. Describe deck fittings; 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 ☐ Does Not Apply	
26A. Deck Type: ☐ Bolted ☐ Welded	
26B. For Bolted decks, provide deck construction:	
26C. Deck seam: ☐ Continuous sheet construction 5 feet wide ☐ Continuous sheet construction 6 feet wide ☐ Continuous sheet construction 7 feet wide ☐ Continuous sheet construction 5 × 7.5 feet wide ☐ Continuous sheet construction 5 × 12 feet wide ☐ Other (describe)	
26D. Deck seam length (ft)	26E. Area of deck (ft^2)
For column supported tanks: 26F. Number of columns:	26G. Diameter of each column:

IV. SITE INFORMANTION (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^2·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[1]
- ☐ Condenser[1]
- ☐ Conservation Vent (psig)
  - Vacuum Setting — Pressure Setting
- ☐ Emergency Relief Valve (psig)
- ☐ Inert Gas Blanket of
- ☐ Insulation of Tank with
- ☐ Liquid Absorption (scrubber)[1]
- ☐ Refrigeration of Tank
- ☐ Rupture Disc (psig)
- ☐ Vent to Incinerator[1]
- ☒ Other[1] (describe): Vapor Recovery Unit and vapors recycled back into system

[1] Complete appropriate Air Pollution Control Device Sheet.

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

Material Name & CAS No.	Breathing Loss (lb/hr)	Working Loss Amount	Working Loss Units	Annual Loss (lb/yr)	Estimation Method[1]
VOC	0.027	0.019	lb/hr	396.5	O - ProMax 4.0
Emissions are controlled value					

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

☒ Remember to attach emissions calculations, including TANKS Summary Sheets 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**), 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 Condensate Tank 2
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) T02	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 21E
5. Date of Commencement of Construction (for existing tanks)	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable)	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ 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)	13B. Maximum daily throughput (gal/day)
1,533,000	4,200

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 96.05

15. Maximum tank fill rate (gal/min): TBD

16. Tank fill method: ☐ Submerged ☒ Splash ☐ Bottom Loading

17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☒ 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):

☒ Fixed Roof X vertical ___ horizontal ___ flat roof __ cone roof X dome roof
___ other (describe)

☐ External Floating Roof ___ pontoon roof ___ double deck roof

☐ Domed External (or Covered) Floating Roof

☐ Internal Floating Roof ___ vertical column support ___ self-supporting

☐ Variable Vapor Space ___ lifter roof ___ diaphragm

☐ Pressurized ___ spherical ___ cylindrical

☐ Underground

☐ Other (describe)

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

19. Tank Shell Construction:

☐ Riveted ☐ Gunite lined ☐ Epoxy-coated rivets ☐ Other (describe)

20A. Shell Color	20B. Roof Color	20C. Year Last Painted

21. Shell Condition (if metal and unlined):

☐ No Rust ☐ Light Rust ☐ Dense Rust ☐ Not applicable

22A. Is the tank heated? ☐ YES ☐ NO

22B. If YES, 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 **Vertical Fixed Roof Tanks** ☐ Does Not Apply

24A. For dome roof, provide roof radius (ft)

24B. For cone roof, provide slope (ft/ft)

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

25A. Year Internal Floaters Installed:

25B. Primary Seal Type: (check one)
☐ Metallic (Mechanical) Shoe Seal ☐ Liquid Mounted Resilient Seal
☐ Vapor Mounted Resilient Seal ☐ Other (describe):

25C. Is the Floating Roof equipped with a Secondary Seal? ☐ YES ☐ NO

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

25E. Is the Floating Roof equipped with a weather shield? ☐ YES ☐ NO

25F. Describe deck fittings; 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 ☐ Does Not Apply	
26A. Deck Type: ☐ Bolted ☐ Welded	
26B. For Bolted decks, provide deck construction:	
26C. Deck seam: ☐ Continuous sheet construction 5 feet wide ☐ Continuous sheet construction 6 feet wide ☐ Continuous sheet construction 7 feet wide ☐ Continuous sheet construction 5 × 7.5 feet wide ☐ Continuous sheet construction 5 × 12 feet wide ☐ Other (describe)	
26D. Deck seam length (ft)	26E. Area of deck (ft^2)
For column supported tanks: 26F. Number of columns:	26G. Diameter of each column:

IV. SITE INFORMANTION (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^2·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[1]
- ☐ Condenser[1]
- ☐ Conservation Vent (psig)
  - Vacuum Setting — Pressure Setting
- ☐ Emergency Relief Valve (psig)
- ☐ Inert Gas Blanket of
- ☐ Insulation of Tank with
- ☐ Liquid Absorption (scrubber)[1]
- ☐ Refrigeration of Tank
- ☐ Rupture Disc (psig)
- ☐ Vent to Incinerator[1]
- ☒ Other[1] (describe): Vapor Recovery Unit and vapors recycled back into system

[1] Complete appropriate Air Pollution Control Device Sheet.

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

Material Name & CAS No.	Breathing Loss (lb/hr)	Working Loss Amount	Working Loss Units	Annual Loss (lb/yr)	Estimation Method[1]
VOC	0.027	0.019	lb/hr	396.5	O - ProMax 4.0
Emissions are controlled value					

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

☒ Remember to attach emissions calculations, including TANKS Summary Sheets 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**), 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 Condensate Tank 3
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) T03	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 22E
5. Date of Commencement of Construction (for existing tanks)	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable)	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ 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)	13B. Maximum daily throughput (gal/day)
1,533,000	4,200

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 96.05

15. Maximum tank fill rate (gal/min): TBD

16. Tank fill method: ☐ Submerged ☒ Splash ☐ Bottom Loading

17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☒ 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):

☒ Fixed Roof X vertical ___ horizontal ___ flat roof __ cone roof X dome roof
___ other (describe)

☐ External Floating Roof ___ pontoon roof ___ double deck roof

☐ Domed External (or Covered) Floating Roof

☐ Internal Floating Roof ___ vertical column support ___ self-supporting

☐ Variable Vapor Space ___ lifter roof ___ diaphragm

☐ Pressurized ___ spherical ___ cylindrical

☐ Underground

☐ Other (describe)

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

19. Tank Shell Construction:

☐ Riveted ☐ Gunite lined ☐ Epoxy-coated rivets ☐ Other (describe)

20A. Shell Color	20B. Roof Color	20C. Year Last Painted

21. Shell Condition (if metal and unlined):

☐ No Rust ☐ Light Rust ☐ Dense Rust ☐ Not applicable

22A. Is the tank heated? ☐ YES ☐ NO

22B. If YES, 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 **Vertical Fixed Roof Tanks** ☐ Does Not Apply

24A. For dome roof, provide roof radius (ft)

24B. For cone roof, provide slope (ft/ft)

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

25A. Year Internal Floaters Installed:

25B. Primary Seal Type: (check one)
☐ Metallic (Mechanical) Shoe Seal ☐ Liquid Mounted Resilient Seal
☐ Vapor Mounted Resilient Seal ☐ Other (describe):

25C. Is the Floating Roof equipped with a Secondary Seal? ☐ YES ☐ NO

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

25E. Is the Floating Roof equipped with a weather shield? ☐ YES ☐ NO

25F. Describe deck fittings; 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 ☐ Does Not Apply	
26A. Deck Type: ☐ Bolted ☐ Welded	
26B. For Bolted decks, provide deck construction:	
26C. Deck seam: ☐ Continuous sheet construction 5 feet wide ☐ Continuous sheet construction 6 feet wide ☐ Continuous sheet construction 7 feet wide ☐ Continuous sheet construction 5 × 7.5 feet wide ☐ Continuous sheet construction 5 × 12 feet wide ☐ Other (describe)	
26D. Deck seam length (ft)	26E. Area of deck (ft^2)
For column supported tanks: 26F. Number of columns:	26G. Diameter of each column:

IV. SITE INFORMANTION (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^2·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[1]
- ☐ Condenser[1]
- ☐ Conservation Vent (psig)
  - Vacuum Setting — Pressure Setting
- ☐ Emergency Relief Valve (psig)
- ☐ Inert Gas Blanket of
- ☐ Insulation of Tank with
- ☐ Liquid Absorption (scrubber)[1]
- ☐ Refrigeration of Tank
- ☐ Rupture Disc (psig)
- ☐ Vent to Incinerator[1]
- ☒ Other[1] (describe): Vapor Recovery Unit and vapors recycled back into system

[1] Complete appropriate Air Pollution Control Device Sheet.

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

Material Name & CAS No.	Breathing Loss (lb/hr)	Working Loss Amount	Working Loss Units	Annual Loss (lb/yr)	Estimation Method[1]
VOC	0.027	0.019	lb/hr	396.5	O - ProMax 4.0
Emissions are controlled value					
					쐔 쐼 쑤 쐀 h 55

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

☒ Remember to attach emissions calculations, including TANKS Summary Sheets 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**), 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 *Equipment List Form*) T04	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 23E
5. Date of Commencement of Construction (for existing tanks)	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable)	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ 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. 500 barrel	
9A. Tank Internal Diameter (ft) 12	9B. Tank Internal Height (or Length) (ft) 25
10A. Maximum Liquid Height (ft) 24	10B. Average Liquid Height (ft) 12.5
11A. Maximum Vapor Space Height (ft) 1	11B. Average Vapor Space Height (ft) 12.5
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights. 475 barrel	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
5,978,700	16,380

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 299.7

15. Maximum tank fill rate (gal/min): TBD

16. Tank fill method: ☐ Submerged ☒ Splash ☐ Bottom Loading

17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☒ 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):

☒ Fixed Roof X vertical ___ horizontal ___ flat roof __ cone roof X dome roof
___ other (describe)

☐ External Floating Roof ___ pontoon roof ___ double deck roof

☐ Domed External (or Covered) Floating Roof

☐ Internal Floating Roof ___ vertical column support ___ self-supporting

☐ Variable Vapor Space ___ lifter roof ___ diaphragm

☐ Pressurized ___ spherical ___ cylindrical

☐ Underground

☐ Other (describe)

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

19. Tank Shell Construction:

☐ Riveted ☐ Gunite lined ☐ Epoxy-coated rivets ☐ Other (describe)

20A. Shell Color	20B. Roof Color	20C. Year Last Painted

21. Shell Condition (if metal and unlined):

☐ No Rust ☐ Light Rust ☐ Dense Rust ☐ Not applicable

22A. Is the tank heated? ☐ YES ☐ NO

22B. If YES, 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 **Vertical Fixed Roof Tanks** ☐ Does Not Apply

24A. For dome roof, provide roof radius (ft)

24B. For cone roof, provide slope (ft/ft)

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

25A. Year Internal Floaters Installed:

25B. Primary Seal Type: (check one)
☐ Metallic (Mechanical) Shoe Seal ☐ Liquid Mounted Resilient Seal
☐ Vapor Mounted Resilient Seal ☐ Other (describe):

25C. Is the Floating Roof equipped with a Secondary Seal? ☐ YES ☐ NO

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

25E. Is the Floating Roof equipped with a weather shield? ☐ YES ☐ NO

25F. Describe deck fittings; 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 ☐ Does Not Apply	
26A. Deck Type: ☐ Bolted ☐ Welded	
26B. For Bolted decks, provide deck construction:	
26C. Deck seam: ☐ Continuous sheet construction 5 feet wide ☐ Continuous sheet construction 6 feet wide ☐ Continuous sheet construction 7 feet wide ☐ Continuous sheet construction 5 × 7.5 feet wide ☐ Continuous sheet construction 5 × 12 feet wide ☐ Other (describe)	
26D. Deck seam length (ft)	26E. Area of deck (ft^2)
For column supported tanks: 26F. Number of columns:	26G. Diameter of each column:

IV. SITE INFORMANTION (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^2·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[1]
- ☐ Condenser[1]
- ☐ Conservation Vent (psig)
  - Vacuum Setting — Pressure Setting
- ☐ Emergency Relief Valve (psig)
- ☐ Inert Gas Blanket of
- ☐ Insulation of Tank with
- ☐ Liquid Absorption (scrubber)[1]
- ☐ Refrigeration of Tank
- ☐ Rupture Disc (psig)
- ☐ Vent to Incinerator[1]
- ☒ Other[1] (describe): Vapor Recovery Unit and vapors recycled back into system

[1] Complete appropriate Air Pollution Control Device Sheet.

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

Material Name & CAS No.	Breathing Loss (lb/hr)	Working Loss Amount	Working Loss Units	Annual Loss (lb/yr)	Estimation Method[1]
VOC	0.041	0.027	lb/hr	57,212.5	O - ProMax 4.0
Emissions are controlled values					includes flashing emissions

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

☒ Remember to attach emissions calculations, including TANKS Summary Sheets 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**), 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 Produced Water Tank 1
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) T05	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 24E
5. Date of Commencement of Construction (for existing tanks)	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable)	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ 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)	13B. Maximum daily throughput (gal/day)
459,900	1,260

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 28.82

15. Maximum tank fill rate (gal/min): TBD

16. Tank fill method: ☐ Submerged ☒ Splash ☐ Bottom Loading

17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☒ 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):
- ☒ Fixed Roof X vertical ___ horizontal ___ flat roof __ cone roof X dome roof ___ other (describe)
- ☐ External Floating Roof ___ pontoon roof ___ double deck roof
- ☐ Domed External (or Covered) Floating Roof
- ☐ Internal Floating Roof ___ vertical column support ___ self-supporting
- ☐ Variable Vapor Space ___ lifter roof ___ diaphragm
- ☐ Pressurized ___ spherical ___ cylindrical
- ☐ Underground
- ☐ Other (describe)

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

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

20A. Shell Color	20B. Roof Color	20C. Year Last Painted

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

22A. Is the tank heated? ☐ YES ☐ NO

22B. If YES, 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 **Vertical Fixed Roof Tanks** ☐ Does Not Apply

24A. For dome roof, provide roof radius (ft)

24B. For cone roof, provide slope (ft/ft)

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

25A. Year Internal Floaters Installed:

25B. Primary Seal Type: (check one)
☐ Metallic (Mechanical) Shoe Seal ☐ Liquid Mounted Resilient Seal
☐ Vapor Mounted Resilient Seal ☐ Other (describe):

25C. Is the Floating Roof equipped with a Secondary Seal? ☐ YES ☐ NO

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

25E. Is the Floating Roof equipped with a weather shield? ☐ YES ☐ NO

25F. Describe deck fittings; 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 ☐ Does Not Apply	
26A. Deck Type: ☐ Bolted ☐ Welded	
26B. For Bolted decks, provide deck construction:	
26C. Deck seam: ☐ Continuous sheet construction 5 feet wide ☐ Continuous sheet construction 6 feet wide ☐ Continuous sheet construction 7 feet wide ☐ Continuous sheet construction 5 × 7.5 feet wide ☐ Continuous sheet construction 5 × 12 feet wide ☐ Other (describe)	
26D. Deck seam length (ft)	26E. Area of deck (ft^2)
For column supported tanks: 26F. Number of columns:	26G. Diameter of each column:

IV. SITE INFORMANTION (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^2·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[1]
- ☐ Condenser[1]
- ☐ Conservation Vent (psig)
  - Vacuum Setting — Pressure Setting
- ☐ Emergency Relief Valve (psig)
- ☐ Inert Gas Blanket of
- ☐ Insulation of Tank with
- ☐ Liquid Absorption (scrubber)[1]
- ☐ Refrigeration of Tank
- ☐ Rupture Disc (psig)
- ☐ Vent to Incinerator[1]
- ☒ Other[1] (describe): Vapor Recovery Unit and vapors recycled back into system

[1] Complete appropriate Air Pollution Control Device Sheet.

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

Material Name & CAS No.	Breathing Loss (lb/hr)	Working Loss Amount	Working Loss Units	Annual Loss (lb/yr)	Estimation Method[1]
VOC	1.06E-06	1.44E-06	lb/hr	0.022	O - ProMax 4.0
Emissions are controlled values					

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

☒ Remember to attach emissions calculations, including TANKS Summary Sheets 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**), 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 Produced Water Tank 2
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) T06	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 25E
5. Date of Commencement of Construction (for existing tanks)	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable)	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ 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)	13B. Maximum daily throughput (gal/day)
459,900	1,260

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 28.82

15. Maximum tank fill rate (gal/min): TBD

16. Tank fill method: ☐ Submerged ☒ Splash ☐ Bottom Loading

17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☒ 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):
- ☒ Fixed Roof X vertical ___ horizontal ___ flat roof __ cone roof X dome roof ___ other (describe)
- ☐ External Floating Roof ___ pontoon roof ___ double deck roof
- ☐ Domed External (or Covered) Floating Roof
- ☐ Internal Floating Roof ___ vertical column support ___ self-supporting
- ☐ Variable Vapor Space ___ lifter roof ___ diaphragm
- ☐ Pressurized ___ spherical ___ cylindrical
- ☐ Underground
- ☐ Other (describe)

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

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

20A. Shell Color	20B. Roof Color	20C. Year Last Painted

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

22A. Is the tank heated? ☐ YES ☐ NO

22B. If YES, 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 **Vertical Fixed Roof Tanks** ☐ Does Not Apply

24A. For dome roof, provide roof radius (ft)

24B. For cone roof, provide slope (ft/ft)

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

25A. Year Internal Floaters Installed:

25B. Primary Seal Type: (check one)
☐ Metallic (Mechanical) Shoe Seal ☐ Liquid Mounted Resilient Seal
☐ Vapor Mounted Resilient Seal ☐ Other (describe):

25C. Is the Floating Roof equipped with a Secondary Seal? ☐ YES ☐ NO

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

25E. Is the Floating Roof equipped with a weather shield? ☐ YES ☐ NO

25F. Describe deck fittings; 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 ☐ Does Not Apply	
26A. Deck Type: ☐ Bolted ☐ Welded	
26B. For Bolted decks, provide deck construction:	
26C. Deck seam: ☐ Continuous sheet construction 5 feet wide ☐ Continuous sheet construction 6 feet wide ☐ Continuous sheet construction 7 feet wide ☐ Continuous sheet construction 5 × 7.5 feet wide ☐ Continuous sheet construction 5 × 12 feet wide ☐ Other (describe)	
26D. Deck seam length (ft)	26E. Area of deck (ft^2)
For column supported tanks: 26F. Number of columns:	26G. Diameter of each column:

IV. SITE INFORMANTION (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^2·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[1]
- ☐ Condenser[1]
- ☐ Conservation Vent (psig)
  - Vacuum Setting — Pressure Setting
- ☐ Emergency Relief Valve (psig)
- ☐ Inert Gas Blanket of
- ☐ Insulation of Tank with
- ☐ Liquid Absorption (scrubber)[1]
- ☐ Refrigeration of Tank
- ☐ Rupture Disc (psig)
- ☐ Vent to Incinerator[1]
- ☒ Other[1] (describe): Vapor Recovery Unit and vapors recycled back into system

[1] Complete appropriate Air Pollution Control Device Sheet.

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

Material Name & CAS No.	Breathing Loss (lb/hr)	Working Loss Amount	Working Loss Units	Annual Loss (lb/yr)	Estimation Method[1]
VOC	1.06E-06	1.44E-06	lb/hr	0.022	O - ProMax 4.0
Emissions are controlled values					

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

☒ Remember to attach emissions calculations, including TANKS Summary Sheets 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**), 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 Produced Water Tank 3
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) T07	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 26E
5. Date of Commencement of Construction (for existing tanks)	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable)	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ 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)	13B. Maximum daily throughput (gal/day)
459,900	1,260

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 28.82

15. Maximum tank fill rate (gal/min): TBD

16. Tank fill method: ☐ Submerged ☒ Splash ☐ Bottom Loading

17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☒ 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):
- ☒ Fixed Roof X vertical ___ horizontal ___ flat roof __ cone roof X dome roof ___ other (describe)
- ☐ External Floating Roof ___ pontoon roof ___ double deck roof
- ☐ Domed External (or Covered) Floating Roof
- ☐ Internal Floating Roof ___ vertical column support ___ self-supporting
- ☐ Variable Vapor Space ___ lifter roof ___ diaphragm
- ☐ Pressurized ___ spherical ___ cylindrical
- ☐ Underground
- ☐ Other (describe)

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

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

20A. Shell Color	20B. Roof Color	20C. Year Last Painted

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

22A. Is the tank heated? ☐ YES ☐ NO

22B. If YES, 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 **Vertical Fixed Roof Tanks** ☐ Does Not Apply

24A. For dome roof, provide roof radius (ft)

24B. For cone roof, provide slope (ft/ft)

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

25A. Year Internal Floaters Installed:

25B. Primary Seal Type (check one): ☐ Metallic (Mechanical) Shoe Seal ☐ Liquid Mounted Resilient Seal ☐ Vapor Mounted Resilient Seal ☐ Other (describe):

25C. Is the Floating Roof equipped with a Secondary Seal? ☐ YES ☐ NO

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

25E. Is the Floating Roof equipped with a weather shield? ☐ YES ☐ NO

25F. Describe deck fittings; 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 ☐ Does Not Apply	
26A. Deck Type: ☐ Bolted ☐ Welded	
26B. For Bolted decks, provide deck construction:	
26C. Deck seam: ☐ Continuous sheet construction 5 feet wide ☐ Continuous sheet construction 6 feet wide ☐ Continuous sheet construction 7 feet wide ☐ Continuous sheet construction 5 × 7.5 feet wide ☐ Continuous sheet construction 5 × 12 feet wide ☐ Other (describe)	
26D. Deck seam length (ft)	26E. Area of deck (ft^2)
For column supported tanks: 26F. Number of columns:	26G. Diameter of each column:

IV. SITE INFORMANTION (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^2·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[1]
- ☐ Condenser[1]
- ☐ Conservation Vent (psig)
  - Vacuum Setting — Pressure Setting
- ☐ Emergency Relief Valve (psig)
- ☐ Inert Gas Blanket of
- ☐ Insulation of Tank with
- ☐ Liquid Absorption (scrubber)[1]
- ☐ Refrigeration of Tank
- ☐ Rupture Disc (psig)
- ☐ Vent to Incinerator[1]
- ☒ Other[1] (describe): Vapor Recovery Unit and vapors recycled back into system

[1] Complete appropriate Air Pollution Control Device Sheet.

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

Material Name & CAS No.	Breathing Loss (lb/hr)	Working Loss Amount	Working Loss Units	Annual Loss (lb/yr)	Estimation Method[1]
VOC	1.06E-06	1.44E-06	lb/hr	0.022	O – ProMax 4.0
Emissions are controlled values					

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

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

Fuel Conditioning Heater

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*): 27E

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

   Fuel Conditioning Heater - 500,000 Btu/hr

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

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

   Natural Gas as fuel - 534 scf/hr

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

   Heater is used to increase temperature of fuel before use by the compressor engines to allow more complete combustion.

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

   Combustion process

* 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:

Natural gas as fuel - 534 scf/hr

(b) Chemical analysis of proposed fuel(s), excluding coal, including maximum percent sulfur and ash:

Same as onsite gas analysis - see Attachment N

(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:

500,000 Btu/hr. Natural gas.

(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: × 10^6 BTU/hr.

7. Projected operating schedule:

Hours/Day	24	Days/Week	7	Weeks/Year	52

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

@ °F and psia

a.	NO_X	0.053	lb/hr	grains/ACF
b.	SO_2	0.00032	lb/hr	grains/ACF
c.	CO	0.045	lb/hr	grains/ACF
d.	PM_{10}	0.0041	lb/hr	grains/ACF
e.	Hydrocarbons		lb/hr	grains/ACF
f.	VOCs	0.0029	lb/hr	grains/ACF
g.	Pb		lb/hr	grains/ACF
h.	Specify other(s)			
	Total HAP (including HCHO)	0.0010	lb/hr	grains/ACF
	CO2e	58.69	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	RECORDKEEPING
see Attachment O	see Attachment O
REPORTING	TESTING
see Attachment O	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

Venting Emissions

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*): 31E (VENT1)

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

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

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

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

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

   - compressor blowdown - 0.012 tons VOC per event, 0.94 tons CO2e per event
   - compressor startup - 0.0056 tons VOC per event, 0.43 tons CO2e per event
   - plant shutdown - 0.54 tons VOC per event, 41.11 tons CO2e per event
   - low pressure pigging venting - 0.0028 tons VOC per event, 0.21 tons CO2e per event
   - high pressure pigging venting - 0.015 tons VOC per event, 1.15 tons CO2e per event

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

   none

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

6. Combustion Data (if applicable):

(a) Type and amount in appropriate units of fuel(s) to be burned:

(b) Chemical analysis of proposed fuel(s), excluding coal, including maximum percent sulfur and ash:

(c) Theoretical combustion air requirement (ACF/unit of fuel):

@ °F and psia.

(d) Percent excess air:

(e) Type and BTU/hr of burners and all other firing equipment planned to be used:

(f) If coal is proposed as a source of fuel, identify supplier and seams and give sizing of the coal as it will be fired:

(g) Proposed maximum design heat input: × 10^6 BTU/hr.

7. Projected operating schedule:

Hours/Day	not a regular schedule	Days/Week	not a regular schedule	Weeks/Year	not a regular schedule

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

@ venting events are uncontrolled °F and psia

a.	NO_X		lb/hr	grains/ACF
b.	SO_2		lb/hr	grains/ACF
c.	CO		lb/hr	grains/ACF
d.	PM_{10}		lb/hr	grains/ACF
e.	Hydrocarbons		lb/hr	grains/ACF
f.	VOCs	Not on a regular schedule	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	RECORDKEEPING
See Attachment O	See Attachment O
REPORTING	**TESTING**
See Attachment O	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

Bulk Loading and Fugitives

Attachment L
EMISSIONS UNIT DATA SHEET
CHEMICAL PROCESS

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

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

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

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

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

4. List Products and Maximum Production and ☐ attach MSDSs

Description and CAS Number	Maximum Hourly (lb/hr)	Maximum Annual (ton/year)
Dry Natural Gas	18.75 MMscf/hour	164,250 MMscf/year
Condensate	12.5 barrels/hour	109,500 barrels/year
Produced Water	3.75 barrels/hour	32,850 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.

   Will reference developed and implemented Leak Detection and Repair (LDAR) plan per 40 CFR Part 60 Subpart OOOOa.

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.

MONITORING	RECORDKEEPING
See Attachment O	**See Attachment O**
REPORTING	TESTING
See Attachment O	**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 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

LEAK SOURCE DATA SHEET

Source Category	Pollutant	Number of Source Components[1]	Number of Components Monitored by Frequency[2]	Average Time to Repair (days)[3]	Estimated Annual Emission Rate (lb/yr)[4]
Pumps[5]	light liquid VOC[6,7]				
	heavy liquid VOC[8]				
	Non-VOC[9]				
Valves[10]	Gas VOC	750	NA	1st attempt – 5 days	12,750 – EE
	Light Liquid VOC	160	NA	1st attempt – 5 days	5,634 – EE
	Heavy Liquid VOC				
	Non-VOC				
Safety Relief Valves[11]	Gas VOC				
	Non VOC				
Open-ended Lines[12]	VOC				
	Non-VOC				
Sampling Connections[13]	VOC				
	Non-VOC				
Compressors	VOC	36	NA	1st attempt – 5 days	1,197 – EE
	Non-VOC				
Flanges	Gas VOC	850	NA	1st attempt – 5 days	1,252 – EE
	Light Liquid VOC	400	NA	1st attempt – 5 days	620 – EE
Other	VOC				
	Non-VOC				

Attachment L
FUGITIVE EMISSIONS FROM UNPAVED HAULROADS

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

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

Item Number	Description	Number of Wheels	Mean Vehicle Weight (tons)	Mean Vehicle Speed (mph)	Miles per Trip	Maximum Trips per Hour	Maximum Trips per Year	Control Device ID Number	Control Efficiency (%)
1	Condensate Tank Truck	4	40	--	1.33	1	730	NA	NA
2	Produced Water Tank Truck	4	40	--	1.33	1	365	NA	NA
3	Passenger Vehicles	4	3	--	1.33	1	1,460	NA	NA
4									
5									
6									
7									
8									

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

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

Where:

		PM	PM-10
k =	Particle size multiplier	0.80	0.36
s =	Silt content of road surface material (%)	4.8	4.8
S =	Mean vehicle speed (mph)	---	---
W =	Mean vehicle weight (tons)	18.9	18.9
w =	Mean number of wheels per vehicle	4	4
p =	Number of days per year with precipitation >0.01 in.	160	160

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

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

SUMMARY OF UNPAVED HAULROAD EMISSIONS

Item No.	PM				PM-10			
	Uncontrolled		Controlled		Uncontrolled		Controlled	
	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
1	0.37	1.60	0.37	1.60	0.093	0.41	0.093	0.41
2	0.18	0.80	0.18	0.80	0.047	0.20	0.047	0.20
3	0.73	3.21	0.73	3.21	0.19	0.82	0.19	0.82
4								
5								
6								
7								
8								
TOTALS	1.28	5.61	1.28	5.61	0.33	1.43	0.33	1.43

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 *Equipment List Form*): 30E (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): □ Drums □ Marine Vessels □ Rail Tank Cars X 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	Six as each tank has a connection, but not likely that there will be six at one time. T04 does not have a loading connection.
4. Does ballasting of marine vessels occur at this loading area? □ Yes □ No X 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? □ Yes X 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		Condensate	Produced Water				
Max. daily throughput (1000 gal/day)		12.6	3.78				
Max. annual throughput (1000 gal/yr)		4,599	1,379.7				
Loading Method [1]		SUB	SUB				
Max. Fill Rate (gal/min)		240	240				
Average Fill Time (min/loading)		45	45				
Max. Bulk Liquid Temperature (°F)		52	52				
True Vapor Pressure [2]		12.4	0.28				
Cargo Vessel Condition [3]		U	U				
Control Equipment or Method [4]		None	None				
Minimum control efficiency (%)		NA	NA				
Maximum Emission Rate	Loading (lb/hr)	80.04	0.80				
	Annual (lb/yr)	33708.47	100.76				
Estimation Method [5]		EPA	EPA				

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

[2] At maximum bulk liquid temperature

[3] B = Ballasted Vessel, C = Cleaned, U = Uncleaned (dedicated service), O = other (describe)
[4] List as many as apply (complete and submit appropriate *Air Pollution Control Device Sheets*):CA = Carbon Adsorption LOA = Lean Oil AdsorptionCO = Condensation SC = Scrubber (Absorption)CRA = Compressor-Refrigeration-Absorption TO = Thermal Oxidation or Incineration CRC = Compression-Refrigeration-Condensation VB = Dedicated Vapor Balance (closed system) O = other (descibe)
[5] EPA = EPA Emission Factor as stated in AP-42 MB = Material Balance TM = Test Measurement based upon test data submittal O = other (describe)

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

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 M.
Air Pollution Control Device Sheets

Oxidation Catalysts

Attachment M
Air Pollution Control Device Sheet
(OTHER COLLECTORS)

Control Device ID No. (must match Emission Units Table): 1C through 12C

Equipment Information

1. Manufacturer: TBD – efficiencies per attached specification sheet Model No.	2. Control Device Name: 1C through 12C – Catalyst for C-100 through C-1200 Type: Oxidation 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: 16,056 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 of disposal. Replace Catalyst elements when necessary	

Gas Stream Characteristics

14. Are halogenated organics present?	☐ Yes	☒ No
Are particulates present?	☒ Yes	☐ No
Are metals present?	☐ Yes	☒ No

15. Inlet Emission stream parameters:	Maximum	Typical
Pressure (mmHg):	Not specified	
Heat Content (BTU/scf):	1,400	1,247
Oxygen Content (%):	Not specified	
Moisture Content (%):	Not specified	
Relative Humidity (%):	Not specified	

16. Type of pollutant(s) controlled: ☐ SO_x ☐ Odor
☐ Particulate (type): ☒ Other CO, VOC, HCHO

17. Inlet gas velocity: 282 ft/sec

18. Pollutant specific gravity:

19. Gas flow into the collector:
16,056 ACF @ 827°F and PSIA

20. Gas stream temperature:
Inlet: 827 °F
Outlet: 827 °F

21. Gas flow rate:
Design Maximum: 16,056 ACFM
Average Expected: 16,056 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 CO	14.44		--	0.88		94
B VOC	3.14		--	1.60		49
C HCHO	0.88		--	0.11		88
D	***Note: VOC on the catalyst specification sheet does not include formaldehyde. The VOC values shown here include formaldehyde emissions and the efficiency also reflects formaldehyde with the VOCs.**					
E			--			

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: Weight % for Size Range	Fraction Efficiency of Collector: 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:	RECORDKEEPING:
See Attachment O	**See Attachment O**
REPORTING:	TESTING:
See Attachment O	**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.
CO: 94%, VOC: 49%, HCHO: 88%

32. Manufacturer's Guaranteed Control Efficiency for each air pollutant.
CO: 94%, VOC: 49%, HCHO: 88%

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.

Prepared For:
Barry Schatz
Antero

Date: February 1, 2017

APPLICATION INFORMATION

DRIVER

Make:	Caterpillar
Model:	G3608 A4
Horsepower:	2500
RPM:	1000
Compression Ratio:	7.6
Exhaust Flow Rate:	16056
Exhaust Temperature:	827
Reference:	EM1410-03-001
Fuel:	Custom
Annual Operating Hours:	8760

UNCONTROLLED EMISSIONS DATA

	g/bhp-hr	lb/hr	Tons/Year
NO_x:	0.30	1.65	7.24
CO:	2.62	14.44	63.25
THC:	4.49	24.75	108.39
NMHC:	1.26	6.94	30.42
NMNEHC:	0.41	2.26	9.90
HCHO:	0.16	0.88	3.86
Oxygen:	11.60%		

CATALYST ELEMENT

Model:	RT-3615-H
Catalyst Type:	Oxidation, Premium
Substrate Type:	Brazed
Element Size:	Rectangle, 36" x 15" x 3.5"
Element Quantity:	5

POST CATALYST EMISSIONS DATA

	g/bhp-hr	lb/hr
NO_x:	Unaffected By Oxidation Catalyst	
CO	< 0.16	0.88
VOC	< 0.27	1.49
HCHO	< 0.02	0.11

EMIT Technologies, Inc.
772 Airfield Lane
Sheridan, WY. 82801

WARRANTY

EMIT Technologies,Inc. warrants that the goods supplied will be free from defects in workmanship by EMIT Technologies, Inc. for a period of one (1) year 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 an 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.

Unless otherwise stated the exhaust temperature operating range at the converter inlet is 600°F minimum for oxidation catalyst and 750°F for NSCR catalyst and 1250°F maximum.

If a high temperature shut down switch is not installed, thermal deactivation of catalyst at temperatures above 1300 °F is not covered.

The catalyst conversion efficiencies (% reduction) will be guaranteed for engine loads of 50 to 100 percent.

Engine lubrication oil shall contain less than 0.6% ash (by weight) with a maximum allowable specific oil consumption of 0.01 gal/bhp-hr. The maximum ash loading on the catalyst shall be limited to 350 g/m3. Phosphorous and zinc additives are limited to 0.03% (by weight).

The catalyst must not be exposed to the following known poisoning agents, including: iron, nickel, sodium, chromium, arsenic, zinc, lead, phosphorous, silicon, potassium, magnesium, copper, tin, and mercury. Total poison concentrations in the gas are limited to 0.3 ppm.

Shipment - Promised shipping dates are approximate and are not guaranteed and are from the point of manufacture. 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.

Thermal Oxidizers

Attachment M
Air Pollution Control Device Sheet
(FLARE SYSTEM)

Control Device ID No. (must match Emission Units Table): 15C/28E, 16C/29E

Equipment Information

1. Manufacturer: EnviroTherm™

   Model No. DVC-36

   6.0 MMBtu/hr

2. Method:
   - ☐ Elevated flare
   - ☐ Ground flare
   - ☒ Other
     Describe **Thermal Oxidizer**

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:
   ☐ Steam-assisted ☐ Air-assisted ☐ Pressure-assisted ☒ Non-assisted

5. Maximum capacity of flare:
   6.0 MMBtu/hr each

6. Dimensions of stack:
   Diameter 2.3 ft.
   Height 20 ft.

7. Estimated combustion efficiency:
   (Waste gas destruction efficiency)
   Estimated: 98 %
   Minimum guaranteed: 98 %

8. Fuel used in burners:
   - ☒ Natural Gas
   - ☐ Fuel Oil, Number
   - ☐ Other, Specify:

9. Number of burners:
   Rating: 6,000,000 each BTU/hr

10. Will preheat be used? ☐ Yes ☒ No

11. Describe method of controlling flame:
    Enclosed unit

12. Flare height: 20 ft

13. Flare tip inside diameter: 2.3 ft

14. Natural gas flow rate to flare pilot flame per pilot light: 8.3 scf/min
    500 scf/hr

15. Number of pilot lights: 1
    Total 623,721 each BTU/hr

16. Will automatic re-ignition be used?
    ☐ Yes ☒ No

17. If automatic re-ignition will be used, describe the method:

18. Is pilot flame equipped with a monitor? ☒ Yes ☐ No
    If yes, what type?
    - ☒ Thermocouple
    - ☐ Infra-Red
    - ☐ Ultra Violet
    - ☐ Camera with monitoring control room
    - ☐ Other, Describe:

19. Hours of unit operation per year: **8,760**

Steam Injection

20. Will steam injection be used? ☐ Yes ☒ No	21. Steam pressure PSIG Minimum Expected: 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_2S/100 ft^3	Quantity (LB/hr, ft^3/hr, etc)	Source of Material
DEHY1 for 16C	0	20,830 scfh	Dehy Still Vent and Flash Tank
DEHY2 for 17C	0	20,830 scfh	Dehy Still Vent and Flash Tank

30. Estimate total combustible to flare: (Maximum mass flow rate of waste gas)	20,830 scfh each 347 scfm each
31. Estimated total flow rate to flare including materials to be burned, carrier gases, auxiliary fuel, etc.: 20,830 LB/hr or (SCF/hr) each	
32. Give composition of carrier gases:	
33. Temperature of emission stream: 1,450 -1,600 °F Heating value of emission stream: ~1,247 BTU/ft^3 Mean molecular weight of emission stream: MW =	34. Identify and describe all auxiliary fuels to be burned. BTU/scf BTU/scf BTU/scf BTU/scf
35. Temperature of flare gas: > 1450 °F	36. Flare gas flow rate: acf/min
37. Flare gas heat content: 1,247 BTU/ft^3	38. Flare gas exit velocity: ft/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 ***Flare Control Device*** 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:	RECORDKEEPING:
see Attachment O	**see Attachment O**
REPORTING:	TESTING:
see Attachment O	**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.
Minimum operating temperature is 1,450 degrees F and minimum residence time is 1 second

Technical Summary

Standard Design Conditions :.

Overhead Stream Inlet:

Inlet Temperature:	212 °F
Inlet Pressure:	>2.0 IWC
Flow Rate:	5,556 SCFH
Heat Release:	52.36 BTU/FT^3

Flash Gas Stream Inlet:

Inlet Temperature:	120 °F
Inlet Pressure:	20-50 PSIG
Flow Rate:	1804 SCFH
Heat Release:	713 BTU/FT^3

Stack Summary:

Exit Diameter:	28 IN I.D.
Mass Flow @ 1450deg F:	239,622 ACFH
Exit Velocity:	15.57 FT/SEC
Max Design loading:	6 MMBTU/HR
Combustion Chamber Temp:	1450 – 1600 deg F
Destruction Efficiency:	≥98.0%
Residence Time:	≥1.0 Sec.

Site Conditions:

Wind Speed	90 MPH
Seismic Zone	1
Elevation	2,500 ft.
Humidity	High

Utilities:

Gas Service Required for Burner	1000 SCFH – Natural Gas Intermittent use, Only on when temp <1450 deg F
Electrical Service Required	120 VAC, 5 amps
Gas Consumption at Start-up	1.0 MMBtu/hr
Gas Consumption under load	≤ 1000 SCFH, Dependant on BTU value of waste stream

Vapor Recovery Units

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	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.** **VRU-100 is the primary VRU to collect storage tank vapors and VRU-200 is the backup VRU. In the unlikely event that both VRU-100 and VRU-200 are under maintenance or are shutdown, a bypass system is in place to route tank vapors to the facility inlet.**	
8. Attached efficiency curve and/or other efficiency information.	
9. Design inlet volume: TBD	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 of disposal. **Collected materials get recycled back into gas system – closed loop**	

Gas Stream Characteristics

14. Are halogenated organics present?	☐ Yes	☒ No
Are particulates present?	☐ Yes	☒ No
Are metals present?	☐ Yes	☒ No

15. Inlet Emission stream parameters:	**Maximum**	**Typical**
Pressure (mmHg):	0.01 psig	
Heat Content (BTU/scf):	Not specified	
Oxygen Content (%):	Not specified	
Moisture Content (%):	Not specified	
Relative Humidity (%):	Not specified	

16. Type of pollutant(s) controlled: ☐ Particulate (type):	☐ SO_x ☐ Odor ☒ Other VOC, HAPs, C1, C2
17. Inlet gas velocity: N/A ft/sec	18. Pollutant specific gravity:
19. Gas flow into the collector: 71.56 ACFM @ ambient temp and ambient 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	333.35		98	6.67		N/A
B HAPs	9.14		98	0.18		N/A
C CO2e	894.44		98	18.29		N/A
D						
E						

24. Dimensions of stack: Height NA ft. Diameter NA 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: Weight % for Size Range	Fraction Efficiency of Collector: 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. However, claiming 98% to account for down time with a back up VRU.

32. Manufacturer's Guaranteed Control Efficiency for each air pollutant.
100% - Closed loop system. However, claiming 98% to account for down time with a back up VRU.

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	2. Control Device Name: 14C (VRU-200) 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.** **VRU-100 is the primary VRU to collect storage tank vapors and VRU-200 is the backup VRU in times when the primary VRU is undergoing maintenance or shutdown. In the unlikely event that both VRU-100 and VRU-200 are under maintenance or are shutdown, a bypass system is in place to route tank vapors to the facility inlet.**	
8. Attached efficiency curve and/or other efficiency information.	
9. Design inlet volume: TBD Mscfd	10. Capacity: TBD Mscfd
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 of disposal. **Collected materials get recycled back into gas system – closed loop**	

Gas Stream Characteristics

14. Are halogenated organics present?	☐ Yes	☒ No
Are particulates present?	☐ Yes	☒ No
Are metals present?	☐ Yes	☒ No

15. Inlet Emission stream parameters:	**Maximum**	**Typical**
Pressure (mmHg):	0.01 psig	
Heat Content (BTU/scf):	Not specified	
Oxygen Content (%):	Not specified	
Moisture Content (%):	Not specified	
Relative Humidity (%):	Not specified	

16. Type of pollutant(s) controlled: ☐ SO_x ☐ Odor
☐ Particulate (type): ☒ Other VOC, HAPs, C1, C2

17. Inlet gas velocity: N/A ft/sec

18. Pollutant specific gravity:

19. Gas flow into the collector:
71.56 ACFM @ ambient temp and ambient 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	333.35		98	6.67		N/A
B HAPs	9.14		98	0.18		N/A
C CO2e	894.44		98	18.29		N/A
D						
E						

24. Dimensions of stack: Height NA ft. Diameter NA 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. However, claiming 98% to account for down time with a back up VRU.

32. Manufacturer's Guaranteed Control Efficiency for each air pollutant.
100% - Closed loop system. However, claiming 98% to account for down time with a back up VRU.

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:	**Middlebourne V Compressor Station**
Facility Location:	**Tyler County, West Virginia**

UNCONTROLLED POTENTIAL EMISSION SUMMARY

Source	NOx		CO		VOC		SO_2		PM-10		HAPs		Formaldehyde		CO_2e
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	tpy
Engines															
Compressor Engine 1	1.65	7.24	14.44	63.25	3.14	13.76	0.010	0.044	0.17	0.75	1.21	5.32	0.88	3.86	12,311
Compressor Engine 2	1.65	7.24	14.44	63.25	3.14	13.76	0.010	0.044	0.17	0.75	1.21	5.32	0.88	3.86	12,311
Compressor Engine 3	1.65	7.24	14.44	63.25	3.14	13.76	0.010	0.044	0.17	0.75	1.21	5.32	0.88	3.86	12,311
Compressor Engine 4	1.65	7.24	14.44	63.25	3.14	13.76	0.010	0.044	0.17	0.75	1.21	5.32	0.88	3.86	12,311
Compressor Engine 5	1.65	7.24	14.44	63.25	3.14	13.76	0.010	0.044	0.17	0.75	1.21	5.32	0.88	3.86	12,311
Compressor Engine 6	1.65	7.24	14.44	63.25	3.14	13.76	0.010	0.044	0.17	0.75	1.21	5.32	0.88	3.86	12,311
Compressor Engine 7	1.65	7.24	14.44	63.25	3.14	13.76	0.010	0.044	0.17	0.75	1.21	5.32	0.88	3.86	12,311
Compressor Engine 8	1.65	7.24	14.44	63.25	3.14	13.76	0.010	0.044	0.17	0.75	1.21	5.32	0.88	3.86	12,311
Compressor Engine 9	1.65	7.24	14.44	63.25	3.14	13.76	0.010	0.044	0.17	0.75	1.21	5.32	0.88	3.86	12,311
Compressor Engine 10	1.65	7.24	14.44	63.25	3.14	13.76	0.010	0.044	0.17	0.75	1.21	5.32	0.88	3.86	12,311
Compressor Engine 11	1.65	7.24	14.44	63.25	3.14	13.76	0.010	0.044	0.17	0.75	1.21	5.32	0.88	3.86	12,311
Compressor Engine 12	1.65	7.24	14.44	63.25	3.14	13.76	0.010	0.044	0.17	0.75	1.21	5.32	0.88	3.86	12,311
Fuel Conditioning Heater	0.053	0.23	0.045	0.20	0.0029	0.013	0.00032	0.0014	0.0041	0.018	0.0010	0.0044	0.000040	0.00018	257
Generators															
Microturbine Generator - Capstone	0.32	1.40	0.88	3.85	0.080	0.35	0.028	0.12	0.054	0.24	0.0085	0.037	0.0059	0.026	4,237
Natural Gas Generator - PSI	1.43	6.27	2.86	12.53	1.00	4.39	0.0033	0.014	0.11	0.48	0.18	0.80	0.11	0.50	2,880
Dehydrator															
TEG Dehydrator 1	---	---	---	---	92.08	403.29	---	---	---	---	10.45	45.79	---	---	14,478
TEG Dehydrator 2	---	---	---	---	92.08	403.29	---	---	---	---	10.45	45.79	---	---	14,478
Reboiler 1	0.15	0.64	0.12	0.54	0.0081	0.035	0.00088	0.0039	0.011	0.049	0.0028	0.012	0.00011	0.00048	771
Reboiler 2	0.15	0.64	0.12	0.54	0.0081	0.035	0.00088	0.0039	0.011	0.049	0.0028	0.012	0.00011	0.00048	771
Thermal Oxidizers															
Thermal Oxidizer 1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Thermal Oxidizer 2	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Hydrocarbon Loading															
Truck Loadout	---	---	---	---	80.84	16.90	---	---	---	---	2.21	0.46	---	---	47
Venting Emissions															
Compressor Blowdown Emissions	---	---	---	---	---	11.41	---	---	---	---	---	0.31	---	---	876
Startup and Shutdown Emissions	---	---	---	---	---	6.33	---	---	---	---	---	0.17	---	---	486
Pigging Emissions	---	---	---	---	---	7.36	---	---	---	---	---	0.20	---	---	565
Fugitive Emissions															
Component Leak Emissions	---	---	---	---	2.45	10.73	---	---	---	---	0.067	0.29	---	---	177
Haul Road Dust Emissions	---	---	---	---	---	---	---	---	0.33	1.43	---	---	---	---	---
Storage Tanks															
Produced Water Tanks	---	---	---	---	0.00026	0.0011	---	---	---	---	1.03E-06	4.50E-06	---	---	0.03
Settler Tank	---	---	---	---	326.56	1,430.3	---	---	---	---	8.94	39.15	---	---	3,913
Condensate Tanks	---	---	---	---	6.79	29.72	---	---	---	---	0.20	0.89	---	---	5
Total Facility PTE =	**21.94**	**96.10**	**177.31**	**776.64**	**639.58**	**2,489.29**	**0.15**	**0.68**	**2.57**	**11.25**	**47.09**	**197.73**	**10.70**	**46.88**	**191,669**

Emissions Summary Total

Company:	**Antero Midstream LLC**
Facility Name:	**Middlebourne V Compressor Station**
Facility Location:	**Tyler County, West Virginia**

CONTROLLED POTENTIAL EMISSION SUMMARY

Source	NOx		CO		VOC		SO_2		PM-10		HAPs		Formaldehyde		CO_2e
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	tpy
Engines															
Compressor Engine 1	1.65	7.24	0.88	3.86	1.60	7.00	0.010	0.044	0.17	0.75	0.28	1.24	0.11	0.48	12,311
Compressor Engine 2	1.65	7.24	0.88	3.86	1.60	7.00	0.010	0.044	0.17	0.75	0.28	1.24	0.11	0.48	12,311
Compressor Engine 3	1.65	7.24	0.88	3.86	1.60	7.00	0.010	0.044	0.17	0.75	0.28	1.24	0.11	0.48	12,311
Compressor Engine 4	1.65	7.24	0.88	3.86	1.60	7.00	0.010	0.044	0.17	0.75	0.28	1.24	0.11	0.48	12,311
Compressor Engine 5	1.65	7.24	0.88	3.86	1.60	7.00	0.010	0.044	0.17	0.75	0.28	1.24	0.11	0.48	12,311
Compressor Engine 6	1.65	7.24	0.88	3.86	1.60	7.00	0.010	0.044	0.17	0.75	0.28	1.24	0.11	0.48	12,311
Compressor Engine 7	1.65	7.24	0.88	3.86	1.60	7.00	0.010	0.044	0.17	0.75	0.28	1.24	0.11	0.48	12,311
Compressor Engine 8	1.65	7.24	0.88	3.86	1.60	7.00	0.010	0.044	0.17	0.75	0.28	1.24	0.11	0.48	12,311
Compressor Engine 9	1.65	7.24	0.88	3.86	1.60	7.00	0.010	0.044	0.17	0.75	0.28	1.24	0.11	0.48	12,311
Compressor Engine 10	1.65	7.24	0.88	3.86	1.60	7.00	0.010	0.044	0.17	0.75	0.28	1.24	0.11	0.48	12,311
Compressor Engine 11	1.65	7.24	0.88	3.86	1.60	7.00	0.010	0.044	0.17	0.75	0.28	1.24	0.11	0.48	12,311
Compressor Engine 12	1.65	7.24	0.88	3.86	1.60	7.00	0.010	0.044	0.17	0.75	0.28	1.24	0.11	0.48	12,311
Fuel Conditioning Heater	0.053	0.23	0.045	0.20	0.0029	0.013	0.00032	0.0014	0.0041	0.018	0.0010	0.0044	0.000040	0.00018	257
Generators															
Microturbine Generator - Capstone	0.32	1.40	0.88	3.85	0.080	0.35	0.028	0.12	0.054	0.24	0.0085	0.037	0.0059	0.026	4,237
Natural Gas Generator - PSI	1.43	6.27	2.86	12.53	1.00	4.39	0.0033	0.014	0.11	0.48	0.18	0.80	0.11	0.50	2,880
Dehydrator															
TEG Dehydrator 1	---	---	---	---	1.84	8.07	---	---	---	---	0.21	0.92	---	---	300
TEG Dehydrator 2	---	---	---	---	1.84	8.07	---	---	---	---	0.21	0.92	---	---	300
Reboiler 1	0.15	0.64	0.12	0.54	0.0081	0.035	0.00088	0.0039	0.011	0.049	0.0028	0.012	0.00011	0.00048	771
Reboiler 2	0.15	0.64	0.12	0.54	0.0081	0.035	0.00088	0.0039	0.011	0.049	0.0028	0.012	0.00011	0.00048	771
Thermal Oxidizers															
Thermal Oxidizer 1	0.47	2.05	2.27	9.95	0.0034	0.015	0.00037	0.0016	0.0046	0.020	0.0011	0.0050	---	---	3,406
Thermal Oxidizer 2	0.47	2.05	2.27	9.95	0.0034	0.015	0.00037	0.0016	0.0046	0.020	0.0011	0.0050	---	---	3,406
Hydrocarbon Loading															
Truck Loadout	---	---	---	---	80.84	16.90	---	---	---	---	2.21	0.46	---	---	47
Venting Emissions															
Compressor Blowdown Emissions	---	---	---	---	---	11.41	---	---	---	---	---	0.31	---	---	876
Startup and Shutdown Emissions	---	---	---	---	---	6.33	---	---	---	---	---	0.17	---	---	486
Pigging Emissions	---	---	---	---	---	7.36	---	---	---	---	---	0.20	---	---	565
Fugitive Emissions															
Component Leak Emissions	---	---	---	---	2.45	10.73	---	---	---	---	0.067	0.29	---	---	177
Haul Road Dust Emissions	---	---	---	---	---	---	---	---	0.33	1.43	---	---	---	---	---
Storage Tanks															
Produced Water Tanks	---	---	---	---	5.18E-06	2.27E-05	---	---	---	---	2.05E-08	8.99E-08	---	---	0.0012
Settler Tank	---	---	---	---	6.53	28.61	---	---	---	---	0.18	0.78	---	---	80
Condensate Tanks	---	---	---	---	0.14	0.59	---	---	---	---	0.0041	0.018	---	---	0.11
Total Facility PTE =	**22.88**	**100.21**	**19.16**	**83.91**	**113.92**	**186.92**	**0.15**	**0.68**	**2.58**	**11.29**	**6.46**	**19.77**	**1.44**	**6.32**	**166,287**

HAP Emissions Summary Total

Company:	**Antero Midstream LLC**
Facility Name:	**Middlebourne V Compressor Station**
Facility Location:	**Tyler County, West Virginia**

CONTROLLED POTENTIAL EMISSION SUMMARY

Source	Benzene		Toluene		Ethylbenzene		Xylenes		n-Hexane		Acetaldehyde		Acrolein		Methanol	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Engines																
Compressor Engine 1	0.0038	0.017	0.0036	0.016	0.00035	0.0015	0.0016	0.0070	0.010	0.042	0.073	0.32	0.045	0.20	0.022	0.10
Compressor Engine 2	0.0038	0.017	0.0036	0.016	0.00035	0.0015	0.0016	0.0070	0.010	0.042	0.073	0.32	0.045	0.20	0.022	0.10
Compressor Engine 3	0.0038	0.017	0.0036	0.016	0.00035	0.0015	0.0016	0.0070	0.010	0.042	0.073	0.32	0.045	0.20	0.022	0.10
Compressor Engine 4	0.0038	0.017	0.0036	0.016	0.00035	0.0015	0.0016	0.0070	0.010	0.042	0.073	0.32	0.045	0.20	0.022	0.10
Compressor Engine 5	0.0038	0.017	0.0036	0.016	0.00035	0.0015	0.0016	0.0070	0.010	0.042	0.073	0.32	0.045	0.20	0.022	0.10
Compressor Engine 6	0.0038	0.017	0.0036	0.016	0.00035	0.0015	0.0016	0.0070	0.010	0.042	0.073	0.32	0.045	0.20	0.022	0.10
Compressor Engine 7	0.0038	0.017	0.0036	0.016	0.00035	0.0015	0.0016	0.0070	0.010	0.042	0.073	0.32	0.045	0.20	0.022	0.10
Compressor Engine 8	0.0038	0.017	0.0036	0.016	0.00035	0.0015	0.0016	0.0070	0.010	0.042	0.073	0.32	0.045	0.20	0.022	0.10
Compressor Engine 9	0.0038	0.017	0.0036	0.016	0.00035	0.0015	0.0016	0.0070	0.010	0.042	0.073	0.32	0.045	0.20	0.022	0.10
Compressor Engine 10	0.0038	0.017	0.0036	0.016	0.00035	0.0015	0.0016	0.0070	0.010	0.042	0.073	0.32	0.045	0.20	0.022	0.10
Compressor Engine 11	0.0038	0.017	0.0036	0.016	0.00035	0.0015	0.0016	0.0070	0.010	0.042	0.073	0.32	0.045	0.20	0.022	0.10
Compressor Engine 12	0.0038	0.017	0.0036	0.016	0.00035	0.0015	0.0016	0.0070	0.010	0.042	0.073	0.32	0.045	0.20	0.022	0.10
Fuel Conditioning Heater	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Generators																
Microturbine Generator - Capstone	0.00010	0.00043	0.0011	0.0047	0.00026	0.0012	0.00053	0.0023	---	---	0.00033	0.0014	0.000053	0.00023	---	---
Natural Gas Generator - PSI	0.0088	0.039	0.0031	0.014	0.00014	0.00061	0.0011	0.0048	---	---	0.016	0.068	0.015	0.065	0.017	0.075
Dehydrator																
TEG Dehydrator 1	0.020	0.089	0.071	0.31	0.018	0.078	0.050	0.22	0.050	0.22	---	---	---	---	---	---
TEG Dehydrator 2	0.020	0.089	0.071	0.31	0.018	0.078	0.050	0.22	0.050	0.22	---	---	---	---	---	---
Reboiler 1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Reboiler 2	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Thermal Oxidizers																
Thermal Oxidizer 1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Thermal Oxidizer 2	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Hydrocarbon Loading																
Truck Loadout	0.048	0.010	0.061	0.013	0.016	0.0034	0.045	0.0094	2.04	0.43	---	---	---	---	---	---
Venting Emissions																
Compressor Blowdown Emissions	---	0.0044	---	0.013	---	0.0030	---	0.0060	---	0.29	---	---	---	---	---	---
Startup and Shutdown Emissions	---	0.0024	---	0.0072	---	0.0017	---	0.0033	---	0.16	---	---	---	---	---	---
Pigging Emissions	---	0.0028	---	0.0083	---	0.0019	---	0.0038	---	0.18	---	---	---	---	---	---
Fugitive Emissions																
Component Leak Emissions	0.0011	0.005	0.0025	0.011	0.00060	0.0026	0.0013	0.0057	0.061	0.27	---	---	---	---	---	---
Haul Road Dust Emissions	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Storage Tanks																
Produced Water Tanks	1.52E-08	6.66E-08	4.01E-09	1.76E-08	3.52E-10	1.54E-09	5.66E-10	2.48E-09	3.99E-10	1.75E-09	---	---	---	---	---	---
Settler Tank	3.86E-03	1.69E-02	4.88E-03	2.14E-02	1.31E-03	5.76E-03	3.63E-03	1.59E-02	1.65E-01	7.23E-01	---	---	---	---	---	---
Condensate Tanks	5.52E-05	2.42E-04	7.44E-05	3.26E-04	2.31E-05	1.01E-04	5.81E-05	2.54E-04	3.86E-03	1.69E-02	---	---	---	---	---	---
Total Facility PTE =	**0.15**	**0.46**	**0.26**	**0.90**	**0.058**	**0.19**	**0.17**	**0.57**	**2.49**	**3.01**	**0.89**	**3.90**	**0.55**	**2.42**	**0.28**	**1.22**

Compressor Engine Emission Calculations

Company:	**Antero Midstream LLC**
Facility Name:	**Middlebourne V Compressor Station**
Facility Location:	**Tyler County, West Virginia**
Source Description:	**Compressor Engines**
Emission Point IDs:	**1E through 12E**

Source Information-Per Engine

Emission Unit ID:	C-100 through C-1200	
Engine Make/Model	Caterpillar G3608	
Service	Compression	
Controls - Y or N / Type	Y	Oxidation
Site Horsepower Rating[1]	2,500	hp
Fuel Consumption (BSFC)[1]	6,850	Btu/(hp-hr)
Heat Rating[2]	17.13	MMBtu/hr
Fuel Consumption[2,4]	144.54	MMscf/yr
Fuel Consumption[1]	16,500	scf/hr
Fuel Heating Value[3]	1,247	Btu/scf
Operating Hours	8,760	hrs/yr

Notes:

1. Values from Caterpillar specification sheet
2. Calculated values
3. Based on representative gas analysis

Potential Emissions per Engine

	Uncontrolled					***Controlled***					
Pollutant	**Emission Factor**		**Estimated Emissions[2]**			**Emission Factor**		**Estimated Emissions[2]**			**Source of Emissions Factors**
	(lb/MMBtu)	**(g/bhp-hr)**	**(lb/hr)**	**(lb/yr)**	**(tpy)**	**(lb/MMBtu)**	**(g/bhp-hr)**	**(lb/hr)**	**(lb/yr)**	**(tpy)**	
NOx[1]	---	0.30	1.65	---	7.24	---	0.30	1.65	---	7.24	Manufacturer's Specs - uncontrolled and controlled
CO[1]	---	2.62	14.44	---	63.25	---	0.16	0.88	---	3.86	Manufacturer's Specs - uncontrolled, Catalyst specs - controlled
VOC[1]	---	0.57	3.14	---	13.76	---	0.29	1.60	---	7.00	Manufacturer's Specs - uncontrolled, Catalyst specs - controlled. Emissions are NMNEHC+HCHO.
SO_2	5.88E-04	---	0.010	---	0.044	5.88E-04	---	0.010	---	0.044	AP-42, Chapter 3.2, Table 3.2-2
$PM_{2.5}/PM_{10}$	9.99E-03	---	0.17	---	0.75	9.99E-03	---	0.17	---	0.75	AP-42, Chapter 3.2, Table 3.2-2, Filterable and condensible
1,3-Butadiene	2.67E-04	---	0.0046	40.05	0.020	1.36E-04	---	0.0023	20.38	0.010	AP-42, Chapter 3.2, Table 3.2-2 - uncontrolled, see note 5 - controlled
2-Methylnaphthalene	3.32E-05	---	0.00057	4.98	0.0025	3.32E-05	---	0.00057	4.98	0.0025	AP-42, Chapter 3.2, Table 3.2-2
2,2,4-Trimethylpentane	2.50E-04	---	0.0043	37.50	0.019	1.27E-04	---	0.0022	19.08	0.010	AP-42, Chapter 3.2, Table 3.2-2 - uncontrolled, see note 5 - controlled
Acenaphthene	1.25E-06	---	0.000021	0.19	0.000094	1.25E-06	---	0.000021	0.19	0.000094	AP-42, Chapter 3.2, Table 3.2-2
Acenaphthylene	5.53E-06	---	0.000095	0.83	0.00041	5.53E-06	---	0.000095	0.83	0.00041	AP-42, Chapter 3.2, Table 3.2-2
Acetaldehyde	8.36E-03	---	0.14	1,254	0.63	4.25E-03	---	0.073	638.1	0.32	AP-42, Chapter 3.2, Table 3.2-2 - uncontrolled, see note 5 - controlled
Acrolein	5.14E-03	---	0.088	771.1	0.39	2.62E-03	---	0.045	392.3	0.20	AP-42, Chapter 3.2, Table 3.2-2 - uncontrolled, see note 5 - controlled
Benzene	4.40E-04	---	0.0075	66.01	0.033	2.24E-04	---	0.0038	33.58	0.017	AP-42, Chapter 3.2, Table 3.2-2 - uncontrolled, see note 5 - controlled
Benzo(b)fluoranthene	1.66E-07	---	0.0000028	0.025	0.000012	1.66E-07	---	0.0000028	0.025	0.000012	AP-42, Chapter 3.2, Table 3.2-2
Benzo(e)pyrene	4.15E-07	---	0.0000071	0.062	0.000031	4.15E-07	---	0.0000071	0.062	0.000031	AP-42, Chapter 3.2, Table 3.2-2
Benzo(g,h,i)perylene	4.14E-07	---	0.0000071	0.062	0.000031	4.14E-07	---	0.0000071	0.062	0.000031	AP-42, Chapter 3.2, Table 3.2-2
Biphenyl	2.12E-04	---	0.0036	31.80	0.016	1.08E-04	---	0.0018	16.18	0.008	AP-42, Chapter 3.2, Table 3.2-2 - uncontrolled, see note 5 - controlled
Chrysene	6.93E-07	---	0.000012	0.10	0.000052	6.93E-07	---	0.000012	0.10	0.000052	AP-42, Chapter 3.2, Table 3.2-2
Ethylbenzene	3.97E-05	---	0.00068	5.96	0.0030	2.02E-05	---	0.00035	3.03	0.0015	AP-42, Chapter 3.2, Table 3.2-2 - uncontrolled, see note 5 - controlled
Fluoranthene	1.11E-06	---	0.000019	0.17	0.000083	1.11E-06	---	0.000019	0.17	0.000083	AP-42, Chapter 3.2, Table 3.2-2
Fluorene	5.67E-06	---	0.00010	0.85	0.00043	5.67E-06	---	0.00010	0.85	0.00043	AP-42, Chapter 3.2, Table 3.2-2
Formaldehyde[1]	---	0.16	0.88	7,725	3.86	---	0.020	0.11	965.6	0.48	Manufacturer's Specs - uncontrolled, Catalyst specs - controlled
Methanol	2.50E-03	---	0.043	375.0	0.19	1.27E-03	---	0.022	190.8	0.10	AP-42, Chapter 3.2, Table 3.2-2 - uncontrolled, see note 5 - controlled
Methylene Chloride	2.00E-05	---	0.00034	3.00	0.0015	1.02E-05	---	0.00017	1.53	0.0008	AP-42, Chapter 3.2, Table 3.2-2 - uncontrolled, see note 5 - controlled
n-Hexane	1.11E-03	---	0.019	166.5	0.083	5.65E-04	---	0.010	84.7	0.042	AP-42, Chapter 3.2, Table 3.2-2 - uncontrolled, see note 5 - controlled
Naphthalene	7.44E-05	---	0.0013	11.16	0.0056	3.79E-05	---	0.00065	5.68	0.0028	AP-42, Chapter 3.2, Table 3.2-2 - uncontrolled, see note 5 - controlled
PAH	2.69E-05	---	0.00046	4.04	0.0020	2.69E-05	---	0.00046	4.04	0.0020	AP-42, Chapter 3.2, Table 3.2-2
Phenanthrene	1.04E-05	---	0.00018	1.56	0.00078	1.04E-05	---	0.00018	1.56	0.00078	AP-42, Chapter 3.2, Table 3.2-2
Phenol	2.40E-05	---	0.00041	3.60	0.0018	1.22E-05	---	0.00021	1.83	0.0009	AP-42, Chapter 3.2, Table 3.2-2 - uncontrolled, see note 5 - controlled
Pyrene	1.36E-06	---	0.000023	0.20	0.00010	1.36E-06	---	0.000023	0.20	0.00010	AP-42, Chapter 3.2, Table 3.2-2
Tetrachloroethane	2.48E-06	---	0.000042	0.37	0.00019	1.26E-06	---	0.000022	0.19	0.00009	AP-42, Chapter 3.2, Table 3.2-2 - uncontrolled, see note 5 - controlled
Toluene	4.08E-04	---	0.0070	61.21	0.031	2.08E-04	---	0.0036	31.14	0.016	AP-42, Chapter 3.2, Table 3.2-2 - uncontrolled, see note 5 - controlled
Vinyl Chloride	1.49E-05	---	0.00026	2.24	0.0011	7.58E-06	---	0.00013	1.14	0.00057	AP-42, Chapter 3.2, Table 3.2-2 - uncontrolled, see note 5 - controlled
Xylenes	1.84E-04	---	0.0032	27.60	0.014	9.36E-05	---	0.0016	14.04	0.0070	AP-42, Chapter 3.2, Table 3.2-2 - uncontrolled, see note 5 - controlled
Other HAPs[2]	2.62E-04	---	0.0045	39.26	0.020	2.62E-04	---	0.0045	39.26	0.020	AP-42, Chapter 3.2, Table 3.2-2
Total HAPS			1.21	10,634	5.32			0.28	2,472	1.24	
Pollutant	**Emission Factor**		**Estimated Emissions[2]**			**Emission Factor**		**Estimated Emissions[2]**			**Source of Emissions Factors**
	(kg/MMBtu)	**(g/bhp-hr)**	**(lb/hr)**	**(lb/yr)**	**(tpy)**	**(kg/MMBtu)**	**(g/bhp-hr)**	**(lb/hr)**	**(lb/yr)**	**(tpy)**	
CO_2[1]	---	429	2,364	---	10,356	---	429	2,364	---	10,356	Manufacturer's Specs
CH_4[1]	---	3.23	17.80	---	77.97	---	3.23	17.80	---	77.97	Manufacturer's Specs. THC minus NMHC emission factor
N_2O	0.0001	---	0.0038	---	0.017	0.0001	---	0.0038	---	0.017	40 CFR Part 98, Subpart C, Table C-2
CO_2e[2]	---	---	2,811	---	12,311	---	---	2,811	---	12,311	40 CFR Part 98, Subpart A, Table A-1, effective January 2014

Notes:

4. Annual Emissions are based on engines operating with 100% fuel of total fuel usage
5. Those HAPs that are also VOCs are assumed to be controlled by the same efficiency by the oxidation catalyst.

Natural Gas Fueled Fuel Conditioning Heater Emissions

Company:	**Antero Midstream LLC**
Facility Name:	**Middlebourne V Compressor Station**
Location:	**Tyler County, West Virginia**
Source Description:	**Fuel Conditioning Heater**
Emission Point ID:	**27E**

Source Information

Emission Unit ID:	FUEL1	
Source Description:	Fuel Conditioning Heater	
Hours of Operation	8,760	hr/yr
Design Heat Rate	0.50	MMBtu/hr
Fuel Heat Value	1,020	Btu/scf
Fuel Use	4.68	MMscf/yr

Emission Calculations per Heater

Pollutant	Emission Factor (lb/MMscf)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
NO_X	100	0.053	0.23	AP-42 Ch. 1.4 Table 1.4-1
CO	84	0.045	0.20	AP-42 Ch. 1.4 Table 1.4-1
VOC	5.5	0.0029	0.013	AP-42 Ch. 1.4 Table 1.4-2
PM_{10}	7.6	0.0041	0.018	AP-42 Ch. 1.4 Table 1.4-2
SO_2	0.6	0.00032	0.0014	AP-42 Ch. 1.4 Table 1.4-2
Formaldehyde	0.075	0.000040	0.00018	AP-42 Ch. 1.4 Table 1.4-3
Total HAPs (including HCHO)[1]	1.9	0.0010	0.0044	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	58.63	256.8	40 CFR Part 98, Subpart C, Table C-1
Methane	0.001	0.0011	0.0048	40 CFR Part 98, Subpart C, Table C-2
Nitrous Oxide	0.0001	0.00011	0.00048	40 CFR Part 98, Subpart C, Table C-2
CO_2e	----	58.69	257.1	40 CFR Part 98, Subpart A, Table A-1

1. Only those HAP pollutants above detection thresholds were included.

Sample Calculations:

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

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

Natural Gas Microturbine Generator Emission Calculations

Company:	**Antero Midstream LLC**
Facility Name:	**Middlebourne V Compressor Station**
Facility Location:	**Tyler County, West Virginia**
Source Description:	**Natural Gas Microturbine Generator**
Emission Unit ID:	**GEN1**
Emission Point ID:	**13E**

Source Information

Make/Model	Capstone C800	
Generator Rating	800	kW
BSFC	10,300	Btu/kWhe
Heating Input[1]	8.24	MMBtu/hr
Annual Fuel Consumption[1]	57.86	MMscf/yr
Fuel Heating Value	1,247	Btu/scf
Operating Hours	8,760	hrs/yr

Notes:

1) Calculated

Potential Emissions

Pollutant	Emission Factor		Estimated Emissions[1]			Source of Emissions Factors
	(lb/MMBtu)	(lb/MWhe)	(lb/hr)	(lb/yr)	(tpy)	
NOx	---	0.40	0.32	---	1.40	Manufacturer's Specs - uncontrolled and controlled
CO	---	1.10	0.88	---	3.85	Manufacturer's Specs - uncontrolled and controlled
VOC	---	0.10	0.080	---	0.35	Manufacturer's Specs - uncontrolled and controlled
SO_2	3.40E-03	---	0.028	---	0.12	AP-42, Chapter 3.2, Table 3.1-2a - footnote h of table
$PM_{2.5}$	6.60E-03	---	0.054	---	0.24	AP-42, Chapter 3.2, Table 3.1-2a - total PM emission factor
PM_{10}	6.60E-03	---	0.054	---	0.24	AP-42, Chapter 3.2, Table 3.1-2a - total PM emission factor
1,3-Butadiene	4.30E-07	---	3.54E-06	0.031	1.55E-05	AP-42, Chapter 3.2, Table 3.1-3
Acetaldehyde	4.00E-05	---	3.30E-04	2.89	1.44E-03	AP-42, Chapter 3.2, Table 3.1-3
Acrolein	6.40E-06	---	5.27E-05	0.46	2.31E-04	AP-42, Chapter 3.2, Table 3.1-3
Benzene	1.20E-05	---	9.89E-05	0.87	4.33E-04	AP-42, Chapter 3.2, Table 3.1-3
Ethylbenzene	3.20E-05	---	2.64E-04	2.31	1.15E-03	AP-42, Chapter 3.2, Table 3.1-3
Formaldehyde	7.10E-04	---	5.85E-03	51.25	2.56E-02	AP-42, Chapter 3.2, Table 3.1-3
Naphthalene	1.30E-06	---	1.07E-05	0.094	4.69E-05	AP-42, Chapter 3.2, Table 3.1-3
PAH	2.20E-06	---	1.81E-05	0.16	7.94E-05	AP-42, Chapter 3.2, Table 3.1-3
Propylene Oxide	2.90E-05	---	2.39E-04	2.09	1.05E-03	AP-42, Chapter 3.2, Table 3.1-3
Toluene	1.30E-04	---	1.07E-03	9.38	4.69E-03	AP-42, Chapter 3.2, Table 3.1-3
Xylenes	6.40E-05	---	5.27E-04	4.62	2.31E-03	AP-42, Chapter 3.2, Table 3.1-3
Total HAPS			0.0085	74.16	0.037	

Pollutant	Emission Factor	Estimated Emissions[1]			Source of Emissions Factors
	(kg/MMBtu)	(lb/hr)		(tpy)	
CO_2	53.06	966.2	---	4,232	40 CFR Part 98, Subpart C, Table C-1
CH_4	0.001	0.018	---	0.080	40 CFR Part 98, Subpart C, Table C-2
N_2O	0.0001	0.0018	---	0.0080	40 CFR Part 98, Subpart C, Table C-2
CO_2e	---	967.2	---	4,237	40 CFR Part 98, Subpart A, Table A-1, effective January 2014

Example Calculations

lb/hr = (kg/MMBtu) * (MMBtu/hr) * (2.21 lb/kg) = (lb/MMBtu) * (MMBtu/hr) = (g/bhp-hr) * hp * (1 lb/ 453.59 g)

tpy = (lb/hr) * (hr/yr) * (ton/2000 lb)

Natural Gas Generator Emission Calculations

Company:	**Antero Midstream LLC**
Facility Name:	**Middlebourne V Compressor Station**
Facility Location:	**Tyler County, West Virginia**
Source Description:	**Natural Gas Generator**
Emission Unit ID:	**GEN2**
Emission Point ID:	**32E**

Source Information

Make/Model	PSI Industrial 21.9L	
Horsepower at Rated kW	649	bhp
Fuel Consumption	4,490	scf/hr
BSFC	8,630	Btu/hp-hr
Heating Value[1]	5.60	MMBtu/hr
Annual Fuel Consumption[1]	39.33	MMscf/yr
Fuel Heating Value	1,247	Btu/scf
Operating Hours	8,760	hrs/yr

Notes:

1) Calculated

Potential Emissions

Pollutant	Emission Factor		Estimated Emissions[1]			Source of Emissions Factors
	(lb/MMBtu)	(g/bhp-hr)	(lb/hr)	(lb/yr)	(tpy)	
NOx	---	1.00	1.43	---	6.27	Emissions Certification - uncontrolled and controlled
CO	---	2.00	2.86	---	12.53	Emissions Certification - uncontrolled and controlled
VOC	---	0.70	1.00	---	4.39	Emissions Certification - uncontrolled and controlled
SO_2	5.88E-04	---	0.0033	---	0.014	AP-42, Chapter 3.2, Table 3.2-3
$PM_{2.5}$	1.94E-02	---	0.11	---	0.48	AP-42, Chapter 3.2, Table 3.2-3
PM_{10}	1.94E-02	---	0.11	---	0.48	AP-42, Chapter 3.2, Table 3.2-3
1,1,2,2-Tetrachloroethane	2.53E-05	---	1.42E-04	1.24	6.21E-04	AP-42, Chapter 3.2, Table 3.2-3
1,3-Butadiene	6.63E-04	---	3.71E-03	32.53	1.63E-02	AP-42, Chapter 3.2, Table 3.2-3
Acetaldehyde	2.79E-03	---	1.56E-02	136.89	6.84E-02	AP-42, Chapter 3.2, Table 3.2-3
Acrolein	2.63E-03	---	1.47E-02	129.04	6.45E-02	AP-42, Chapter 3.2, Table 3.2-3
Benzene	1.58E-03	---	8.85E-03	77.52	3.88E-02	AP-42, Chapter 3.2, Table 3.2-3
Ethylbenzene	2.48E-05	---	1.39E-04	1.217	6.08E-04	AP-42, Chapter 3.2, Table 3.2-3
Formaldehyde	2.05E-02	---	1.15E-01	1,005.83	5.03E-01	AP-42, Chapter 3.2, Table 3.2-3
Methanol	3.06E-03	---	1.71E-02	150.14	7.51E-02	AP-42, Chapter 3.2, Table 3.2-3
Methylene Chloride	4.12E-05	---	2.31E-04	2.02	1.01E-03	AP-42, Chapter 3.2, Table 3.2-3
PAH	1.41E-04		7.90E-04	6.92	3.46E-03	AP-42, Chapter 3.2, Table 3.2-3
Toluene	5.58E-04	---	3.13E-03	27.38	1.37E-02	AP-42, Chapter 3.2, Table 3.2-3
Xylenes	1.95E-04	---	1.09E-03	9.57	4.78E-03	AP-42, Chapter 3.2, Table 3.2-3
Other HAPs	2.10E-04	---	1.17E-03	10.29	5.15E-03	AP-42, Chapter 3.2, Table 3.2-3
Total HAPS			0.18	1,590.6	0.80	

Pollutant	Emission Factor	Estimated Emissions[1]			Source of Emissions Factors
	(kg/MMBtu)	(lb/hr)		(tpy)	
CO_2	53.06	656.8	---	2,877	40 CFR Part 98, Subpart C, Table C-1
CH_4	0.001	0.012	---	0.054	40 CFR Part 98, Subpart C, Table C-2
N_2O	0.0001	0.0012	---	0.0054	40 CFR Part 98, Subpart C, Table C-2
CO_2e	---	657.5	---	2,880	40 CFR Part 98, Subpart A, Table A-1, effective January 2014

Example Calculations

lb/hr = (kg/MMBtu) * (MMBtu/hr) * (2.21 lb/kg) = (lb/MMBtu) * (MMBtu/hr) = (g/bhp-hr) * hp * (1 lb/ 453.59 g)

tpy = (lb/hr) * (hr/yr) * (ton/2000 lb)

Dehydrator Emissions

Company:	**Antero Midstream LLC**
Facility Name:	**Middlebourne V Compressor Station**
Facility Location:	**Tyler County, West Virginia**
Source Description:	**Dehydrator Units**
Emission Point IDs:	**14E and 15E, 17E and 18E**

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)
Uncontrolled Emissions [1]				
VOC	74.22	325.09	17.85	78.20
Total HAPs	10.12	44.33	0.33	1.46
Benzene	1.01	4.40	0.0058	0.025
Toluene	3.56	15.58	0.012	0.054
Ethylbenzene	0.88	3.88	0.0016	0.0071
Xylenes	2.50	10.96	0.0029	0.013
n-Hexane	2.17	9.52	0.31	1.36
Methane	105.2	460.6	26.97	118.1
Carbon Dioxide	1.57	6.88	0.93	4.07
CO_2e	2,630	11,521	675.2	2,957
Controlled Emissions [2]				
VOC	1.48	6.50	0.36	1.56
Total HAPs	0.20	0.89	0.0066	0.029
Benzene	0.020	0.088	0.00012	0.00051
Toluene	0.071	0.31	0.00025	0.0011
Ethylbenzene	0.018	0.078	0.000032	0.00014
Xylenes	0.050	0.22	0.000058	0.00025
n-Hexane	0.044	0.19	0.0062	0.027
Methane	2.10	9.21	0.54	2.36
Carbon Dioxide	1.57	6.88	0.93	4.07
CO_2e	54.15	237.2	14.41	63.13

Pollutant	Dehydrator Emission Totals	
	(lb/hr)	(tpy)
Uncontrolled Emissions [1]		
VOC	92.08	403.3
Total HAPs	10.45	45.79
Benzene	1.01	4.43
Toluene	3.57	15.63
Ethylbenzene	0.89	3.88
Xylenes	2.50	10.97
n-Hexane	2.48	10.87
Methane	132.1	578.7
Carbon Dioxide	2.50	10.95
CO_2e	3,306	14,478
Controlled Emissions [2]		
VOC	1.84	8.07
Total HAPs	0.21	0.92
Benzene	0.020	0.089
Toluene	0.071	0.31
Ethylbenzene	0.018	0.078
Xylenes	0.050	0.22
n-Hexane	0.050	0.22
Methane	2.64	11.57
Carbon Dioxide	2.50	10.95
CO_2e	68.56	300.3

[1]Output from GRI-GLYCalc 4.0 for both the still vent and flash tank gas emissions.

[2]Controlled emissions assume that the glycol still vent is controlled by a thermal oxidizer with a 98% control efficiency. Controlled emissions also assume that the flash tank is controlled by either the reboiler or a thermal oxidizer, both with 98% control efficiency.

Natural Gas Fueled Dehydrator Reboiler Emissions

Company:	**Antero Midstream LLC**
Facility Name:	**Middlebourne V Compressor Station**
Location:	**Tyler County, West Virginia**
Source Description:	**Dehydrator Reboilers**
Emission Point IDs:	**16E and 19E**

Source Information

Emission Unit ID:	DREB1 and DREB2	
Source Description:	Dehydrator Reboiler	
Hours of Operation	8,760	hr/yr
Design Heat Rate	1.5	MMBtu/hr
Fuel Heat Value	1,020	Btu/scf
Fuel Use	12.9	MMscf/yr

Emission Calculations per Reboiler

Pollutant	Emission Factor (lb/MMscf)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
NO_X	100	0.15	0.64	AP-42 Ch. 1.4 Table 1.4-1
CO	84	0.12	0.54	AP-42 Ch. 1.4 Table 1.4-1
VOC	5.5	0.0081	0.035	AP-42 Ch. 1.4 Table 1.4-2
PM_{10}	7.6	0.011	0.049	AP-42 Ch. 1.4 Table 1.4-2
SO_2	0.6	0.00088	0.0039	AP-42 Ch. 1.4 Table 1.4-2
Formaldehyde	0.075	0.00011	0.00048	AP-42 Ch. 1.4 Table 1.4-3
Total HAPs (including HCHO)	1.9	0.0028	0.012	AP-42 Ch. 1.4 Table 1.4-3
Pollutant	**Emission Factor (kg/MMBtu)**	**Emissions (lb/hr)**	**Emissions (tpy)**	**Emission Factor Source**
Carbon Dioxide	53.06	175.9	770.4	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_2e	----	176.1	771.2	40 CFR Part 98, Subpart A, Table A-1

Sample Calculations:

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

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

Thermal Oxidizer Emissions

Company:	**Antero Midstream LLC**
Facility Name:	**Middlebourne V Compressor Station**
Facility Location:	**Tyler County, West Virginia**
Source Description:	**Thermal Oxidizer for Dehydrators**
Emission Unit ID:	**TO-1 and TO-2**
Emission Point ID:	**28E and 29E**

Combusted Gas Emissions

Flare Heat Input :	6.00	MMBtu/hr	Per thermal oxidizer
Hours of Operation:	8,760	hr/yr	

Pollutant	Emission Factor[1] (lb/MMBtu)	Emissions (lbs/hr)	Emissions (tons/yr)
Particulate Matter ($PM/PM_{10}/PM_{2.5}$)	N/A - Smokeless Design		
Nitrogen Oxides (NO_x)	0.068	0.41	1.79
Carbon Monoxide (CO)	0.37	2.22	9.72

[1] Emission Factors from Table 13.5-1 of AP-42 Section 13.5 (Sept 1991)

Pilot Emissions

Pilot Heating Value:	1,247	Btu/scf
Hours of Operation:	8,760	hr/yr
Total Pilot Natural Gas Usage:	5.00E-04	MMscf/hr

Pollutant	Emission Factor (lb/MMscf)	Emissions (lbs/hr)	Emissions (tons/yr)
Particulate Matter ($PM/PM_{10}/PM_{2.5}$)[2]	7.6	4.65E-03	2.04E-02
Nitrogen Oxides (NOx)	100	6.11E-02	2.68E-01
Sulfur Dioxide (SO_2)[2]	0.6	3.67E-04	1.61E-03
Carbon Monoxide (CO)[2]	84	5.14E-02	2.25E-01
Volatile Organic Compounds (VOC)[2]	5.5	3.36E-03	1.47E-02
Total HAPs[2,3]	1.88	1.15E-03	5.04E-03

[2] Emission Factors from AP-42 Tables 1.4-1, 1.4-2, 1.4-3, and 1.4-4 (7/98).

[3] 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 (lbs/hr)	Total Potential Emission Rate (tons/year)
Particulate Matter ($PM/PM_{10}/PM_{2.5}$)	4.65E-03	2.04E-02
Nitrogen Oxides (NOx)	0.47	2.05
Sulfur Dioxide (SO_2)	3.67E-04	1.61E-03
Carbon Monoxide (CO)	2.27	9.95
Volatile Organic Compounds (VOC)	3.36E-03	1.47E-02
Total HAPs	1.15E-03	5.04E-03

Greenhouse Gas Emissions

Pollutant	Emission Factor (kg/MMBtu)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
Carbon Dioxide	53.06	776.7	3,402	40 CFR Part 98, Subpart C, Table C-1
Methane	0.0010	0.015	0.064	40 CFR Part 98, Subpart C, Table C-2
Nitrogen Dioxide	0.00010	0.0015	0.0064	40 CFR Part 98, Subpart C, Table C-2
CO_2e	----	777.5	3,406	40 CFR Part 98, Subpart A, Table A-1

Storage Tank Flashing Emissions Calculated by ProMax Simulation

Company:	**Antero Midstream LLC**
Facility Name:	**Middlebourne V Compressor Station**
Facility Location:	**Tyler County, West Virginia**
Source Description:	**Settling Tank**
Emission Unit ID:	**T04**
Emission Point ID:	**23E**

Settling Tank Flashing Emissions

Component	Uncontrolled Flashing Emissions [1] (lb/hr)	Uncontrolled Flashing Emissions (tons/yr)	Controlled Flashing Emissions [2,3] (lb/hr)	Controlled Flashing Emissions [2,3] (tons/yr)
Methane	35.69	156.3	0.71	3.13
Ethane	85.32	373.7	1.71	7.47
Propane	123.0	538.7	2.46	10.77
i-Butane	31.76	139.1	0.64	2.78
n-Butane	76.36	334.4	1.53	6.69
i-Pentane	28.85	126.4	0.58	2.53
n-Pentane	31.68	138.7	0.63	2.77
Hexanes	15.58	68.23	0.31	1.36
Heptanes	5.05	22.11	0.10	0.44
Octanes	1.72	7.53	0.034	0.15
Nonanes	0.22	0.96	0.0044	0.019
Decanes+	0.12	0.54	0.0025	0.011
Benzene	0.19	0.84	0.0038	0.017
Toluene	0.24	1.06	0.0048	0.021
Ethylbenzene	0.065	0.29	0.0013	0.0057
Xylenes	0.18	0.79	0.0036	0.016
n-Hexane	8.16	35.74	0.16	0.71
Water	2.62	11.49	2.62	11.49
Nitrogen	0.17	0.72	0.17	0.72
Carbon Dioxide	0.41	1.78	0.41	1.78
VOC Subtotal	323.2	1,415	6.46	28.31
HAP Subtotal	8.84	38.71	0.18	0.77
CO_2e Subtotal	892.8	3,910	18.25	79.96
Total	447.4	1,959	12.08	52.91

Notes:

1. Flashing emissions calculated by ProMax 4.0. Flash gas is "Flash Gas" of the associated ProMax simulation. Flashing only occurs in the settling tank as all pressurized fluids flow into the settling tank and then separate out at atmospheric conditions to the condensate and produced water tanks.

2. Tanks are controlled by a VRU with assumed 98% capture efficiency; but will likely be higher as vapors are recycled back into the system.

3. VRU-100 is the primary VRU to collect storage tank vapors and VRU-200 is the backup VRU in times when the primary VRU is undergoing maintenance or shutdown.

Storage Tank Working and Breathing Emissions

Company:	**Antero Midstream LLC**
Facility Name:	**Middlebourne V Compressor Station**
Facility Location:	**Tyler County, West Virginia**
Source Description:	**Condensate, Settling, and Produced Water Tanks**
Emission Unit IDs:	**T01 through T07**
Emission Point IDs:	**20E through 26E**

TANK DESCRIPTION	Uncontrolled VOC Emissions[1] (tons/yr)	Uncontrolled Benzene Emissions[1] (tons/yr)	Uncontrolled Toluene Emissions[1] (tons/yr)	Uncontrolled Ethylbenzene Emissions[1] (tons/yr)	Uncontrolled Xylene Emissions[1] (tons/yr)	Uncontrolled n-Hexane Emissions[1] (tons/yr)	Uncontrolled CH_4 Emissions[1] (tons/yr)	Uncontrolled CO_2e Emissions (tons/yr)
400 bbl Hydrocarbon Storage Tank (T01)	9.91	0.0040	0.0054	0.0017	0.0042	0.28	0.064	1.61
400 bbl Hydrocarbon Storage Tank (T02)	9.91	0.0040	0.0054	0.0017	0.0042	0.28	0.064	1.61
400 bbl Hydrocarbon Storage Tank (T03)	9.91	0.0040	0.0054	0.0017	0.0042	0.28	0.064	1.61
500 bbl Settling Tank (T04)	14.90	0.0061	0.0082	0.0025	0.0064	0.42	0.10	2.43
400 bbl Produced Water Storage Tank (T05)	0.00038	1.11E-06	2.93E-07	2.57E-08	4.13E-08	2.91E-08	0.00044	0.011
400 bbl Produced Water Storage Tank (T06)	0.00038	1.11E-06	2.93E-07	2.57E-08	4.13E-08	2.91E-08	0.00044	0.011
400 bbl Produced Water Storage Tank (T07)	0.00038	1.11E-06	2.93E-07	2.57E-08	4.13E-08	2.91E-08	0.00044	0.011
TOTAL	**44.63**	**0.0182**	**0.024**	**0.0076**	**0.019**	**1.27**	**0.29**	**7.31**

TANK DESCRIPTION	Controlled VOC Emissions[1,2] (tons/yr)	Controlled Benzene Emissions[1,2] (tons/yr)	Controlled Toluene Emissions[1,2] (tons/yr)	Controlled Ethylbenzene Emissions[1,2] (tons/yr)	Controlled Xylene Emissions[1,2] (tons/yr)	Controlled n-Hexane Emissions[1,2] (tons/yr)	Controlled CH_4 Emissions[1,2] (tons/yr)	Controlled CO_2e Emissions[1,2] (tons/yr)
400 bbl Hydrocarbon Storage Tank (T01)	0.20	8.06E-05	1.09E-04	3.37E-05	8.48E-05	5.64E-03	1.29E-03	0.037
400 bbl Hydrocarbon Storage Tank (T02)	0.20	8.06E-05	1.09E-04	3.37E-05	8.48E-05	5.64E-03	1.29E-03	0.037
400 bbl Hydrocarbon Storage Tank (T03)	0.20	8.06E-05	1.09E-04	3.37E-05	8.48E-05	5.64E-03	1.29E-03	0.037
500 bbl Settling Tank (T04)	0.30	1.21E-04	1.63E-04	5.07E-05	1.28E-04	8.48E-03	1.94E-03	0.056
400 bbl Produced Water Storage Tank (T05)	7.56E-06	2.22E-08	5.86E-09	5.14E-10	8.26E-10	5.82E-10	8.88E-06	3.93E-04
400 bbl Produced Water Storage Tank (T06)	7.56E-06	2.22E-08	5.86E-09	5.14E-10	8.26E-10	5.82E-10	8.88E-06	3.93E-04
400 bbl Produced Water Storage Tank (T07)	7.56E-06	2.22E-08	5.86E-09	5.14E-10	8.26E-10	5.82E-10	8.88E-06	3.93E-04
TOTAL	**0.89**	**0.00036**	**0.00049**	**0.00015**	**0.00038**	**0.025**	**0.0058**	**0.17**

Notes:

1. ProMax 4.0 used to calculate standing, working, and breathing (S,W,B) emissions
2. Tanks are controlled by a VRU with assumed 98% capture efficiency; but will likely be higher as vapors are recycled back into the system.
3. VRU-100 is the primary VRU to collect storage tank vapors and VRU-200 is the backup VRU in times when the primary VRU is undergoing maintenance or shutdown.

Truck Loading Emissions

Company:	**Antero Midstream LLC**
Facility Name:	**Middlebourne V Compressor Station**
Facility Location:	**Tyler County, West Virginia**
Source Description:	**Production Liquids Truck Loadout**
Emission Unit ID:	**LDOUT1**
Emission Point ID:	**30E**

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

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

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

								Uncontrolled						
Source	S[1]	P (psia)[2]	M[3]	T (ºF)[4]	T (ºR)	L_L (lb/1000 gal)	Production (bbl/day)	VOC (tpy)	Benzene (tpy)	Toluene (tpy)	E-Benzene (tpy)	Xylene (tpy)	n-Hexane (tpy)	CO_2e[5] (tpy)
Condensate	0.6	12.4	40.4	52	511.90	7.33	300	16.85	0.010	0.013	0.0034	0.0094	0.43	46.54
Produced Water	0.6	0.28	18.0	52	511.90	0.073	90	0.050	2.98E-05	3.77E-05	1.02E-05	2.81E-05	1.27E-03	0.14

Notes:
1. Saturation factor from AP-42, Table 5.2-1 (Submerged loading (bottom loading): dedicated normal service)
2. True vapor pressure retrieved from tank-specific ProMax 4.0 simulation for both liquids.
3. Molecular weight of the liquid vapor is retrieved from a ProMax simulation for both liquids.
4. Temperature is the annual average temperature of Charleston, WV retrieved from ProMax working & breathing report.
5. CO2e emissions estimated assuming 8% of the vent gas by weight is methane and 72% by weight are VOCs (per ProMax simulation).
6. HAP emissions estimated assuming 2% by weight of the vent gas are HAPs and 72% by weight are VOCs (per ProMax simulation).

Assume 1 truck loaded per hour, 260 bbl truck, for short term emissions

								Uncontrolled						
Source	S[1]	P (psia)[2]	M[3]	T (ºF)[4]	T (ºR)	L_L (lb/1000 gal)	Loading (bbl/hr)	VOC (lb/hr)	Benzene (lb/hr)	Toluene (lb/hr)	E-Benzene (lb/hr)	Xylene (lb/hr)	n-Hexane (lb/hr)	CO_2e[5] (lb/hr)
Condensate	0.6	12.4	40.4	52	511.90	7.33	260	80.04	0.047	0.060	0.016	0.045	2.02	221.0
Produced Water	0.6	0.28	18.0	52	511.90	0.073	260	0.80	4.72E-04	5.97E-04	1.61E-04	4.44E-04	2.01E-02	2.20

Venting Episodes

Company:	**Antero Midstream LLC**
Facility Name:	**Middlebourne V Compressor Station**
Facility Location:	**Tyler County, West Virginia**
Source Description:	**Venting Episodes**
Emission Unit ID:	**VENT1**
Emission Point ID:	**31E**

VOC Venting Emissions						
Type of Event[1]	**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[4]**	**VOC Emissions (ton/yr)**
Compressor Blowdown[2]	936	2,276	20.97	58.85	0.19	11.41
Compressor Startup	936	1,050	20.97	27.15	0.19	5.26
Plant Shutdown	2	100,000	20.97	5.53	0.19	1.07
Low Pressure Pig Venting[3]	520	516	20.97	7.41	0.19	1.44
High Pressure Pig Venting[3]	395	2,801	20.97	30.58	0.19	5.93
Total Emissions (tons/yr)						**25.10**

HAPs Venting Emissions										
Type of Event[1]	**Benzene Weight Fraction[4]**	**Benzene Emissions (tpy)**	**Toluene Weight Fraction[4]**	**Toluene Emissions (tpy)**	**Ethylbenzene Weight Fraction[4]**	**Ethylbenzene Emissions (tpy)**	**Xylene Weight Fraction[4]**	**Xylene Emissions (tpy)**	**n-Hexane Weight Fraction[4]**	**n-Hexane Emissions (tpy)**
Compressor Blowdown[2]	7.45E-05	0.0044	2.20E-04	0.013	5.06E-05	0.0030	1.01E-04	0.0060	4.85E-03	0.29
Compressor Startup	7.45E-05	0.0020	2.20E-04	0.0060	5.06E-05	0.0014	1.01E-04	0.0027	4.85E-03	0.13
Plant Shutdown	7.45E-05	0.00041	2.20E-04	0.0012	5.06E-05	0.00028	1.01E-04	0.00056	4.85E-03	0.027
Low Pressure Pig Venting[3]	7.45E-05	0.00055	2.20E-04	0.0016	5.06E-05	0.00038	1.01E-04	0.00075	4.85E-03	0.036
High Pressure Pig Venting[3]	7.45E-05	0.0023	2.20E-04	0.0067	5.06E-05	0.0015	1.01E-04	0.0031	4.85E-03	0.15
Total Emissions (tons/yr)		**0.010**		**0.028**		**0.0066**		**0.013**		**0.63**

GHG Venting Emissions								
Type of Event[1]	**Number Of Events (event/yr)**	**Amount Vented per Event (scf/event)**	**Molecular Weight of Vented Gas (lb/lb-mol)**	**CH_4 Weight Fraction[4]**	**CO_2 Weight Fraction[4]**	**CH_4 Emissions (ton/yr)**	**CO_2 Emissions (ton/yr)**	**CO_2e Emissions (tpy)**
Compressor Blowdown[2]	936	2,276	20.97	0.60	0.0035	35.02	0.20	875.75
Compressor Startup	936	1,050	20.97	0.60	0.0035	16.16	0.094	404.02
Plant Shutdown	2	100,000	20.97	0.60	0.0035	3.29	0.019	82.22
Low Pressure Pig Venting[3]	520	516	20.97	0.60	0.0035	4.41	0.026	110.30
High Pressure Pig Venting[3]	395	2,801	20.97	0.60	0.0035	18.20	0.11	455.05
Total Emissions (tons/yr)						**77.08**	**0.45**	**1,927.3**

1) Estimated number of events and venting per event from engineering.

2) Total number of compressor blowdowns based on 18 blowdowns per week.

3) Total number of pigging events based on expected operations.

4) Weight fractions are from a representative gas analysis.

Component Fugitive Emissions

Company:	**Antero Midstream LLC**
Facility Name:	**Middlebourne V Compressor Station**
Facility Location:	**Tyler County, West Virginia**
Source Description:	**Fugitive Emissions - Component Leaks**

VOC Fugitive Emissions						
Equipment Type and Service	**Number of Units [1]**	**Hours of Operation (hours/yr)**	**THC Emission Factor[2] (kg/hr-unit)**	**VOC Weight Fraction[3]**	**THC Emissions (tpy)**	**VOC Emissions (tpy)**
Flanges - Gas Service	850	8,760	3.90E-04	0.20	3.21	0.63
Valves - Gas Service	750	8,760	4.50E-03	0.20	32.67	6.37
Compressor Seals Gas Service	36	8,760	8.80E-03	0.20	3.07	0.60
Flanges - Liquid Service	400	8,760	1.10E-04	0.73	0.43	0.31
Valves - Liquid Service	160	8,760	2.50E-03	0.73	3.87	2.82
Total Emissions (tons/yr)					**43.24**	**10.73**

HAPs Fugitive Emissions										
Equipment Type and Service	**Benzene Weight Fraction[3]**	**Benzene Emissions (tpy)**	**Toluene Weight Fraction[2]**	**Toluene Emissions (tpy)**	**Ethylbenzene Weight Fraction[2]**	**Ethylbenzene Emissions (tpy)**	**Xylene Weight Fraction[2]**	**Xylene Emissions (tpy)**	**n-Hexane Weight Fraction[2]**	**n-Hexane Emissions (tpy)**
Flanges - Gas Service	7.50E-05	0.00024	2.21E-04	0.00071	5.10E-05	0.00016	1.02E-04	0.00033	4.88E-03	0.016
Valves - Gas Service	7.50E-05	0.0025	2.21E-04	0.0072	5.10E-05	0.0017	1.02E-04	0.0033	4.88E-03	0.16
Compressor Seals Gas Service	7.50E-05	0.00023	2.21E-04	0.00068	5.10E-05	0.00016	1.02E-04	0.00031	4.88E-03	0.015
Flanges - Liquid Service	4.31E-04	0.00018	5.45E-04	0.00023	1.47E-04	0.000062	4.05E-04	0.00017	1.84E-02	0.0078
Valves - Liquid Service	4.31E-04	0.0017	5.45E-04	0.0021	1.47E-04	0.00057	4.05E-04	0.0016	1.84E-02	0.071
Total Emissions (tons/yr)		**0.0048**		**0.011**		**0.0026**		**0.0057**		**0.27**

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. A LDAR program will be implemented per NSPS OOOOa, so it is likely emissions will be lower.

3) Gas weight fractions from a representative gas analysis and liquid weight fractions from a ProMax model run using a representative analysis.

GHG Fugitive Emissions								
Equipment Type	**Number of Units [1]**	**Hours of Operation (hours/yr)**	**Emission Factor[2] (scf/hr-unit)**	**CH_4 Concentration[3]**	**CO_2 Concentration[3]**	**CH_4 Emissions (tpy)**	**CO_2 Emissions (tpy)**	**CO_2e Emissions (tpy)**
Flanges	1,250	8,760	0.003	0.98	0.011	0.68	0.021	16.97
Valves	910	8,760	0.027	0.98	0.011	4.44	0.14	111.17
Compressor Seals	36	8,760	0.300	0.98	0.011	1.95	0.060	48.87
Total Emissions (tons/yr)						**7.07**	**0.22**	**177.01**

1) Component counts from engineering lists.

2) Emission factors from 40 CFR Part 98 Subpart W, Table W1-A.

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

Fugitive Dust Emissions

Company:	**Antero Midstream LLC**
Facility Name:	**Middlebourne V Compressor Station**
Facility Location:	**Tyler County, West Virginia**
Source Description:	**Fugitive Dust Emissions**

Gravel Access Road	Loaded Truck Weight[1]	Trips per year[2]	Trips per day[2]	Distance per round trip (truck in and out)[3]		VMT per year[4]
	tons			feet	miles	miles
Condensate Tank Truck	40.00	730	2.0	7,000	1.33	968
Produced Water Tank Truck	40.00	365	1.0	7,000	1.33	484
Passenger Trucks	3.00	1,460	4.0	7,000	1.33	1,936

Equation Parameter	PM-10/PM2.5	PM-Total
E, annual size-specific emission factor for PM_{10} & $PM_{2.5}$ (upaved industrial roads) extrapolated for natural mitigation[6]	**see table below**	**see table below**
k, Particle size multiplier for particle size range (PM_{10}), (lb/VMT) (Source: AP-42 Table 13.2.2-2)	**1.5**	**4.9**
k, Particle size multiplier for particle size range ($PM_{2.5}$), (lb/VMT) (Source: AP-42 Table 13.2.2-2)	**0.15**	
s, surface material silt content, (%) (Source: AP-42 Table 13.2.2-1)	**4.8**	**4.8**
W, mean weight (tons) of the vehicles traveling the road	**18.9**	**18.9**
a, constant for PM_{10} and $PM_{2.5}$ on industrial roads (Source: AP-42 Table 13.2.2-2)	**0.9**	**0.7**
b, constant for PM_{10} and $PM_{2.5}$ on industrial roads (Source: AP-42 Table 13.2.2-2)	**0.45**	**0.45**
P, number of "wet" days with at least 0.254 mm (0.01 in) of precipitation during the averaging period, based on AP-42 Figure 13.2.2-1.	**160**	**160**

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

Source of Equation: AP-42 Section 13.2.2

PM_{10} Emissions

Emission Factor (lb/VMT)	Vehicle miles traveled (VMT/yr)[4]	Annual Uncontrolled PM_{10} Emissions (tpy)
0.84	3,387	1.43

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

Emission Factor (lb/VMT)	Vehicle miles traveled (VMT/yr)[4]	Annual Uncontrolled $PM_{2.5}$ Emissions (tpy)
0.084	3,387	0.14

PM- Total Emissions (tons/yr)

Emission Factor (lb/VMT)	Vehicle miles traveled (VMT/yr)[4]	Annual Uncontrolled PM-Total Emissions (tpy)
3.31	3,387	5.61

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 two condensate trucks (260 bbl truck), one produced water truck (260 bbl truck), and four passenger trucks will be onsite per day.
3. Distance per round trip is based on the site layout. The one way distance is measured as 3,500 feet for the gravel access road.
4. VMT/yr = Trips/yr x Roundtrip Distance
5. Hourly emissions determined from tons per year calculation using 2,000 lb/ton and 8,760 hours per year.

Facility Gas Analysis

	MOL %	MW	Component Weight lb/lb-mol	Wt. Fraction
Methane	77.79	16.04	12.48	0.60
Ethane	14.24	30.07	4.28	0.20
Propane	4.55	44.10	2.01	0.096
i-Butane	0.60	58.12	0.35	0.017
n-Butane	1.26	58.12	0.73	0.035
i-Pentane	0.32	72.15	0.23	0.011
n-Pentane	0.34	72.15	0.24	0.012
Hexanes	0.10	106.72	0.11	0.0053
Heptanes	0.13	100.20	0.13	0.0063
Octanes	0.051	114.23	0.058	0.0028
Nonanes	0.028	128.26	0.036	0.0017
Decanes	0.038	142.29	0.054	0.0026
n-Hexane	0.12	86.18	0.10	0.0048
Benzene	0.0020	78.11	0.0016	0.000075
Toluene	0.0050	92.14	0.0046	0.00022
Ethylbenzene	0.0010	106.17	0.0011	0.000051
Xylenes	0.0020	106.16	0.0021	0.00010
Nitrogen	0.25	28.01	0.070	0.0034
Carbon Dioxide	0.17	44.01	0.073	0.0035
Oxygen	0.00	32.01	0.00	0.00
Totals	100.00		20.97	1.00

Heating Value (Btu/scf)	1,247.4
Molecular weight	20.97
VOC weight fraction	0.19
Methane weight fraction	0.60
THC weight fraction	0.99
VOC of THC wt fraction	0.20
Methane of THC wt fraction	0.60
Benzene of THC wt fraction	0.000075
Toluene of THC wt fraction	0.00022
E-benzene of THC wt fraction	0.000051
Xylene of THC wt fraction	0.00010
n-Hexane of THC wt fraction	0.0049

1. Gas analysis is a representative sample from a nearby compressor station.

Facility Tank Vent Gas Analysis

	MOL %	MW	Component Weight lb/lb-mol	Wt. Fraction
Methane	20.11	16.04	3.23	0.080
Ethane	25.65	30.07	7.71	0.19
Propane	25.21	44.10	11.12	0.27
i-Butane	4.94	58.12	2.87	0.071
n-Butane	11.88	58.12	6.90	0.17
i-Pentane	3.62	72.15	2.61	0.064
n-Pentane	3.97	72.15	2.86	0.071
Hexanes	1.63	86.18	1.41	0.035
Heptanes	0.46	100.20	0.46	0.011
Octanes	0.14	114.23	0.16	0.0038
Nonanes	0.015	128.26	0.020	0.00049
Decanes+	0.0078	142.28	0.011	0.00027
n-Hexane	0.86	86.18	0.74	0.018
Benzene	0.022	78.11	0.017	0.00043
Toluene	0.024	92.14	0.022	0.00054
Ethylbenzene	0.0055	106.17	0.0059	0.00015
Xylenes	0.015	106.17	0.016	0.00040
Nitrogen	0.053	28.01	0.015	0.00037
Carbon Dioxide	0.084	44.01	0.037	0.00091
Water	1.32	18.02	0.24	0.0059
Totals	100.00		40.44	1.00

Molecular weight	40.44
VOC weight fraction	0.72
Methane weight fraction	0.080
THC weight fraction	0.99
VOC of THC wt fraction	0.73
Methane of THC wt fraction	0.080
Benzene of THC wt fraction	0.00043
Toluene of THC wt fraction	0.00054
E-benzene of THC wt fraction	0.00015
Xylene of THC wt fraction	0.00041
n-Hexane of THC wt fraction	0.018

1. Tank vent gas analysis retrieved from "Flash Gas" stream from ProMax 4.0 simulation.

ProMax 4.0

Bryan Research & Engineering, Inc.

ProMax® 4.0

Simulation Report

Project: Middlebourne V Promax.pmx

Licensed to Kleinfelder, Inc. and Affiliates

Client Name: Antero Midstream LLC
Location: Tyler County, West Virginia
Job: Middlebourne V CS

ProMax Filename: W:\20182162_Antero_MiddlebourneV_Air\2.0 Technical Information\WVDEQ Application\Attachment N\Promax\Middlebourne V Promax.pmx
ProMax Version: 4.0.16071.0
Simulation Initiated: 10/6/2017 11:05:25 AM

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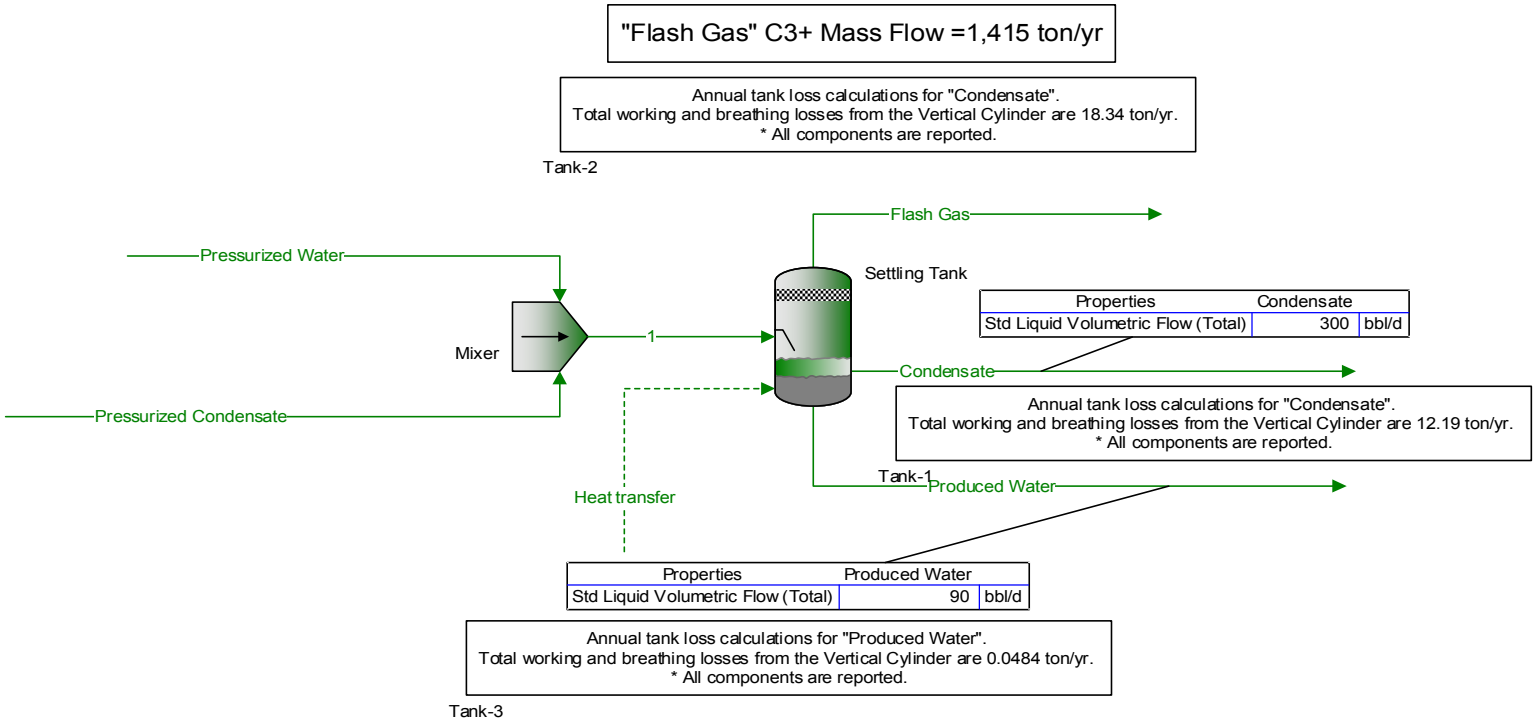
Report Navigator can be activated via the ProMax Navigator Toolbar.
An asterisk (*), throughout the report, denotes a user specified value.
A question mark (?) after a value, throughout the report, denotes an extrapolated or approximate value.


"Flash Gas" C3+ Mass Flow =1,415 ton/yr
Annual tank loss calculations for "Condensate".
Total working and breathing losses from the Vertical Cylinder are 18.34 ton/yr.
* All components are reported.
Tank-2
Flash Gas
Pressurized Water
Settling Tank
Properties Condensate
Std Liquid Volumetric Flow (Total) 300 bbl/d
Mixer
1
Condensate
Pressurized Condensate
Annual tank loss calculations for "Condensate".
Total working and breathing losses from the Vertical Cylinder are 12.19 ton/yr.
* All components are reported.
Tank-1
Heat transfer
Produced Water
Properties Produced Water
Std Liquid Volumetric Flow (Total) 90 bbl/d
Annual tank loss calculations for "Produced Water".
Total working and breathing losses from the Vertical Cylinder are 0.0484 ton/yr.
* All components are reported.
Tank-3

Process Streams		Condensate	Flash Gas	Pressurized Condensate	Pressurized Water	Produced Water	1
Composition	**Status:**	Solved	Solved	Solved	Solved	Solved	Solved
Phase: **Total**	**From Block:**	Settling Tank	Settling Tank	--	--	Settling Tank	Mixer
	To Block:	--	--	Mixer	Mixer	--	Settling Tank
Mole Fraction		%	%	%	%	%	%
Methane		0.115987	20.1136	5.33589*	0.533996*	0.000578116	1.95959
Ethane		1.03785	25.6505	7.46685*	0.746995*	0.00123563	2.74200
Propane		3.99926	25.2120	9.55181*	0.954993*	0.000873996	3.50723
i-Butane		2.11615	4.93928	2.86094*	0.285998*	0.000139717	1.05045
n-Butane		7.72625	11.8757	8.83682*	0.883994*	0.000373360	3.24504
i-Pentane		6.33767	3.61533	5.64989*	0.564996*	9.00150E-05	2.07461
n-Pentane		9.48913	3.96899	8.08284*	0.807994*	3.14826E-05	2.96776
2-Methylpentane		10.2349	1.63401	8.02584*	0.802994*	2.00552E-05	2.94732
n-Heptane		14.8012	0.455475	11.1098*	1.11099*	2.14885E-06	4.07945
n-Octane		15.5755	0.136131	11.6018*	1.15999*	2.47397E-07	4.25996
n-Nonane		6.35186	0.0154265	4.72091*	0.471997*	4.07971E-08	1.73342
Benzene		0.205216	0.0221487	0.157997*	0.0159999*	0.000123538	0.0581562
Toluene		0.824177	0.0237347	0.617988*	0.0619996*	9.78599E-05	0.227062
Ethylbenzene		0.671324	0.00554615	0.499990*	0.0499997*	2.25435E-05	0.183594
p-Xylene		1.88894	0.0153285	1.40597*	0.140999*	4.05213E-05	0.516546
n-Hexane		7.95959	0.855858	6.13488*	0.612996*	4.95153E-06	2.25234
2,2,4-Trimethylpentane		0	0	0*	0*	0	0
Carbon Dioxide		0.00143474	0.0836813	0.0229995*	0.00229998*	5.45285E-05	0.00844530
Nitrogen		8.29884E-05	0.0533988	0.0139997*	0.00139999*	7.50039E-07	0.00514062
Water		0.0244328	1.31609	0*	89.9994*	99.9963	63.2802
n-Decane		10.6391	0.00780705	7.90284*	0.789994*	5.52852E-09	2.90167
Mass Fraction		%	%	%	%	%	%
Methane		0.0196980	7.97885	1.06155*	0.352865*	0.000514782	0.766569
Ethane		0.330364	19.0719	2.78433*	0.925201*	0.00206227	2.01049
Propane		1.86688	27.4905	5.22330*	1.73458*	0.00213916	3.77115
i-Butane		1.30206	7.09881	2.06212*	0.684706*	0.000450744	1.48879
n-Butane		4.75392	17.0679	6.36945*	2.11636*	0.00120450	4.59914
i-Pentane		4.84061	6.44995	5.05513*	1.67909*	0.000360480	3.64989
n-Pentane		7.24764	7.08091	7.23197*	2.40124*	0.000126078	5.22123
2-Methylpentane		9.33700	3.48191	8.57704*	2.85033*	9.59285E-05	6.19335
n-Heptane		15.7005	1.12855	13.8053*	4.58549*	1.19514E-05	9.96763
n-Octane		18.8346	0.384512	16.4347*	5.45794*	1.56858E-06	11.8657
n-Nonane		8.62416	0.0489239	7.50868*	2.49352*	2.90430E-07	5.42117
Benzene		0.169695	0.0427805	0.153048*	0.0514793*	0.000535620	0.110771
Toluene		0.803901	0.0540760	0.706129*	0.235303*	0.000500476	0.510153
Ethylbenzene		0.754492	0.0145597	0.658274*	0.218649*	0.000132844	0.475284
p-Xylene		2.12296	0.0402402	1.85107*	0.616590*	0.000238783	1.33723
n-Hexane		7.26131	1.82375	6.55621*	2.17590*	2.36843E-05	4.73295
2,2,4-Trimethylpentane		0	0	0*	0*	0	0
Carbon Dioxide		0.000668438	0.0910657	0.0125525*	0.00416937*	0.000133201	0.00906309
Nitrogen		2.46107E-05	0.0369894	0.00486350*	0.00161544*	1.16624E-06	0.00351152
Water		0.00465968	0.586281	0*	66.7851*	99.9915	27.7986
n-Decane		16.0248	0.0274673	13.9443*	4.62990*	4.36612E-08	10.0673
Mass Flow		lb/h	lb/h	lb/h	lb/h	lb/h	lb/h
Methane		0.585634	35.6944	29.3342*	6.95265*	0.00676036	36.2868
Ethane		9.82194	85.3208	76.9402*	18.2296*	0.0270827	95.1698
Propane		55.5034	122.983	144.337*	34.1772*	0.0280924	178.514
i-Butane		38.7109	31.7575	56.9833*	13.4911*	0.00591938	70.4743
n-Butane		141.337	76.3557	176.009*	41.6996*	0.0158181	217.708
i-Pentane		143.914	28.8547	139.690*	33.0838*	0.00473400	172.774
n-Pentane		215.477	31.6774	199.843*	47.3128*	0.00165571	247.156
2-Methylpentane		277.595	15.5768	237.012*	56.1612*	0.00125978	293.173
n-Heptane		466.786	5.04872	381.485*	90.3500*	0.000156952	471.835
n-Octane		559.965	1.72017	454.145*	107.540*	2.05993E-05	561.685
n-Nonane		256.401	0.218868	207.489*	49.1309*	3.81407E-06	256.620
Benzene		5.04513	0.191384	4.22923*	1.01432*	0.00703401	5.24355
Toluene		23.9005	0.241916	19.5127*	4.63629*	0.00657249	24.1490
Ethylbenzene		22.4315	0.0651348	18.1903*	4.30814*	0.00174456	22.4984
p-Xylene		63.1168	0.180020	51.1510*	12.1489*	0.00313581	63.2999
n-Hexane		215.883	8.15878	181.169*	42.8728*	0.000311033	224.042
2,2,4-Trimethylpentane		0	0	0*	0*	0	0
Carbon Dioxide		0.0198731	0.407395	0.346866*	0.0821509*	0.00174926	0.429017
Nitrogen		0.000731691	0.165477	0.134394*	0.0318297*	1.53156E-05	0.166224
Water		0.138535	2.62280	0*	1315.90*	1313.13	1315.90
n-Decane		476.428	0.122879	385.326*	91.2251*	5.73380E-07	476.551

Process Streams		Condensate	Flash Gas	Pressurized Condensate	Pressurized Water	Produced Water	1
Properties	**Status:**	Solved	Solved	Solved	Solved	Solved	Solved
Phase: **Total**	**From Block:**	Settling Tank	Settling Tank	--	--	Settling Tank	Mixer
	To Block:	--	--	Mixer	Mixer	--	Settling Tank
Property	**Units**						
Temperature	°F	52.23	52.23*	120*	120*	52.23	119.782
Pressure	psig	0	0*	300*	300*	0	300
Mole Fraction Vapor	%	0	100	0	0	0	0
Mole Fraction Light Liquid	%	100	0	100	9.98464	100	36.7477
Mole Fraction Heavy Liquid	%	0	0	0	90.0154	0	63.2523
Molecular Weight	lb/lbmol	94.4624	40.4408	80.6374	24.2773	18.0162	41.0096
Mass Density	lb/ft^3	43.0568	0.109908	39.2422	51.8582	62.4277	43.6790
Molar Flow	lbmol/h	31.4735	11.0622	34.2686	81.1598	72.8927	115.428
Mass Flow	lb/h	2973.06	447.363	2763.33	1970.34	1313.25	4733.67
Vapor Volumetric Flow	ft^3/h	69.0498	4070.35	70.4173	37.9948	21.0363	108.374
Liquid Volumetric Flow	gpm	8.60880	507.473	8.77930	4.73702	2.62271	13.5116
Std Vapor Volumetric Flow	MMSCFD	0.286648	0.100750	0.312105	0.739172	0.663879	1.05128
Std Liquid Volumetric Flow	sgpm	8.74555	1.86874	8.57773*	4.66207*	2.62551	13.2398
Compressibility		0.00586903	0.984331	0.103951	0.0236826	0.000772029	0.0475141
Specific Gravity		0.690355	1.39631	0.629193	0.831474	1.00094	0.700332
API Gravity		74.6194		81.9700	34.4910	10.0038	62.4851
Mass Cp	Btu/(lb*°F)	0.505847	0.402328	0.565046	0.842899	0.983985	0.680577
Ideal Gas CpCv Ratio		1.05934	1.14027	1.06258	1.22831	1.32668	1.12785
Net Ideal Gas Heating Value	Btu/ft^3	4797.73	2113.51	4114.41	411.437	0.0783996	1510.78
Net Liquid Heating Value	Btu/lb	19115.0	19682.2	19205.6	5671.33	-1058.03	13572.1
Gross Ideal Gas Heating Value	Btu/ft^3	5173.38	2300.41	4441.97	489.470	50.3931	1662.89
Gross Liquid Heating Value	Btu/lb	20624.1	21436.0	20747.1	6891.08	1.77543	14979.7

Settling Tank

Process Stream	Condensate	
Tank Geometry	Vertical Cylinder	
Shell Length	25	ft
Shell Diameter	12	ft
Number of Storage Tanks Employed	1	
Location	Charleston, WV	
Time Frame	Year	
Net Throughput	390	bbl/day
Report Components	All	
Set Bulk Temperature to Stream Temperature?	TRUE	
Use AP42 Raoult's Vapor Pressure?	TRUE	
Maximum Fraction Fill of Tank	90	%
Average Fraction Fill of Tank	50	%
Material Category	Light Organics	
Tank Color	Dark Green	
Tank Condition	Light Rust	
Shell Paint Condition	Good	
Operating Pressure	0	psig
Breather Vent Pressure	0.03	psig
Breather Vacuum Pressure	-0.03	psig
Roof Type	Dome	
Radius of Domed Roof	6	ft
Roof Color	Dark Green	
Roof Paint Condition	Good	

ProMax AP-42 Emissions Report
Annual Emissions
Vertical Cylinder

Components	WorkingLosses (ton/yr)	BreathingLosses (ton/yr)	TotalLosses (ton/yr)
Mixture	11.08	7.27	18.34
Methane	0.058	0.038	0.097
Ethane	2.01	1.32	3.34
Propane	3.24	2.13	5.37
i-Butane	0.87	0.57	1.44
n-Butane	2.19	1.44	3.63
i-Pentane	0.83	0.54	1.37
n-Pentane	0.91	0.60	1.51
2-Methylpentane	0.47	0.31	0.77
n-Heptane	0.16	0.10	0.26
n-Octane	0.055	0.036	0.091
n-Nonane	0.0073	0.0048	0.012
Benzene	0.0037	0.0024	0.0061
Toluene	0.0049	0.0032	0.0082
Ethylbenzene	0.0015	0.0010	0.0025
p-Xylene	0.0039	0.0025	0.0064
n-Hexane	0.26	0.17	0.42
2,2,4-Trimethylpentane	0	0	0
CarbonDioxide	0.0043	0.0029	0.0072
Nitrogen	0.000019	0.000012	0.000031
Water	0.000011	0.0000074	0.000019
n-Decane	0.0040	0.0026	0.0066

Condensate Tank

Process Stream	Condensate	
Tank Geometry	Vertical Cylinder	
Shell Length	20	ft
Shell Diameter	12	ft
Number of Storage Tanks Employed	1	
Location	Charleston, WV	
Time Frame	Year	
Net Throughput	100	bbl/day
Report Components	All	
Set Bulk Temperature to Stream Temperature?	TRUE	
Use AP42 Raoult's Vapor Pressure?	TRUE	
Maximum Fraction Fill of Tank	90	%
Average Fraction Fill of Tank	50	%
Material Category	Light Organics	
Tank Color	Dark Green	
Shell Paint Condition	Good	
Operating Pressure	0	psig
Breather Vent Pressure	0.03	psig
Breather Vacuum Pressure	-0.03	psig
Roof Type	Dome	
Radius of Domed Roof	6	ft
Roof Color	Dark Green	
Roof Paint Condition	Good	

ProMax AP-42 Emissions Report
Annual Emissions
Vertical Cylinder

Components	Working Losses (ton/yr)	Breathing Losses (ton/yr)	Total Losses (ton/yr)
Mixture	5.03	7.16	12.19
Methane	0.027	0.038	0.064
Ethane	0.92	1.30	2.22
Propane	1.47	2.10	3.57
i-Butane	0.39	0.56	0.96
n-Butane	1.00	1.42	2.41
i-Pentane	0.38	0.53	0.91
n-Pentane	0.41	0.59	1.00
2-Methylpentane	0.21	0.30	0.51
n-Heptane	0.071	0.10	0.17
n-Octane	0.025	0.035	0.060
n-Nonane	0.0033	0.0047	0.0081
Benzene	0.0017	0.0024	0.0040
Toluene	0.0022	0.0032	0.0054
Ethylbenzene	0.00070	0.00099	0.0017
p-Xylene	0.0018	0.0025	0.0042
n-Hexane	0.12	0.17	0.28
2,2,4-Trimethylpentane	0	0	0
CarbonDioxide	0.0020	0.0028	0.0048
Nitrogen	0.0000086	0.000012	0.000021
Water	0.0000051	0.0000072	0.000012
n-Decane	0.0018	0.0026	0.0044

Produced Water Tank

Process Stream	Produced Water	
Tank Geometry	Vertical Cylinder	
Shell Length	20	ft
Shell Diameter	12	ft
Number of Storage Tanks Employed	1	
Location	Charleston, WV	
Time Frame	Year	
Net Throughput	30	bbl/day
Report Components	All	
Set Bulk Temperature to Stream Temperature?	TRUE	
Use AP42 Raoult's Vapor Pressure?	TRUE	
Maximum Fraction Fill of Tank	90	%
Average Fraction Fill of Tank	50	%
Material Category	Light Organics	
Tank Color	Dark Green	
Shell Paint Condition	Good	
Operating Pressure	0	psig
Breather Vent Pressure	0.03	psig
Breather Vacuum Pressure	-0.03	psig
Roof Type	Dome	
Radius of Domed Roof	6	ft
Roof Color	Dark Green	
Roof Paint Condition	Good	

ProMax AP-42 Emissions Report
Annual Emissions
Vertical Cylinder

Components	Working Losses (ton/yr)	Breathing Losses (ton/yr)	Total Losses (ton/yr)
Mixture	0.028	0.021	0.048
Methane	0.00026	0.00019	0.00044
Ethane	0.00084	0.00062	0.0015
Propane	0.00018	0.00013	0.00031
i-Butane	1.22E-05	8.99E-06	2.12E-05
n-Butane	2.37E-05	1.75E-05	4.13E-05
i-Pentane	2.34E-06	1.73E-06	4.07E-06
n-Pentane	3.99E-07	2.94E-07	6.93E-07
2-Methylpentane	1.42E-07	1.05E-07	2.47E-07
n-Heptane	1.96E-09	1.45E-09	3.41E-09
n-Octane	3.79E-11	2.80E-11	6.58E-11
n-Nonane	2.17E-12	1.60E-12	3.77E-12
Benzene	6.37E-07	4.70E-07	1.11E-06
Toluene	1.69E-07	1.25E-07	2.93E-07
Ethylbenzene	1.48E-08	1.09E-08	2.57E-08
p-Xylene	2.38E-08	1.75E-08	4.13E-08
n-Hexane	1.67E-08	1.23E-08	2.91E-08
2,2,4-Trimethylpentane	0	0	0
CarbonDioxide	9.83E-05	7.26E-05	0.00017
Nitrogen	3.40E-07	2.51E-07	5.91E-07
Water	0.026	0.020	0.046
n-Decane	3.12E-14	2.31E-14	5.43E-14

GlyCalc 4.0

GRI-GLYCalc VERSION 4.0 - SUMMARY OF INPUT VALUES

Case Name: Middlebourne V Compressor Station
File Name: W:\20182162_Antero_MiddlebourneV_Air\2.0 Technical Information\WVDEQ Application\Attachment N\GlyCalc\Middlebourne V_2 Dehys.ddf
Date: November 21, 2017

DESCRIPTION:

Description: 225 MMSCFD TEG Dehydration Unit

Annual Hours of Operation: 8760.0 hours/yr

WET GAS:

Temperature: 120.00 deg. F
Pressure: 1200.00 psig
Wet Gas Water Content: Saturated

Component	Conc. (vol %)
Carbon Dioxide	0.1650
Nitrogen	0.2510
Methane	77.7890
Ethane	14.2440
Propane	4.5540
Isobutane	0.6020
n-Butane	1.2630
Isopentane	0.3150
n-Pentane	0.3360
n-Hexane	0.1180
Cyclohexane	0.0120
Other Hexanes	0.0920
Heptanes	0.1010
Methylcyclohexane	0.0300
Benzene	0.0020
Toluene	0.0050
Ethylbenzene	0.0010
Xylenes	0.0020
C8+ Heavies	0.1170

DRY GAS:

Flow Rate: 225.0 MMSCF/day
Water Content: 7.0 lbs. H2O/MMSCF

LEAN GLYCOL:

Glycol Type: TEG
Water Content: 1.5 wt% H2O

GlyCalc_Input_2dehys
Flow Rate: 17.5 gpm

PUMP:

Glycol Pump Type: Electric/Pneumatic

FLASH TANK:

Flash Control: Combustion device
Flash Control Efficiency: 98.00 %
Temperature: 80.0 deg. F
Pressure: 60.0 psig

STRIPPING GAS:

Source of Gas: Dry Gas
Gas Flow Rate: 52.500 scfm

REGENERATOR OVERHEADS CONTROL DEVICE:

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: Middlebourne V Compressor Station
File Name: W:\20182162_Antero_MiddlebourneV_Air\2.0 Technical Information\WVDEQ Application\Attachment N\GlyCalc\Middlebourne V_2 Dehys.ddf
Date: November 21, 2017

DESCRIPTION:

Description: 225 MMSCFD TEG Dehydration Unit

Annual Hours of Operation: 8760.0 hours/yr

EMISSIONS REPORTS:

CONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	2.1030	50.472	9.2112
Ethane	0.7964	19.113	3.4881
Propane	0.4535	10.884	1.9864
Isobutane	0.0900	2.159	0.3941
n-Butane	0.2199	5.278	0.9632
Isopentane	0.0656	1.574	0.2872
n-Pentane	0.0809	1.942	0.3544
n-Hexane	0.0435	1.043	0.1904
Cyclohexane	0.0150	0.360	0.0656
Other Hexanes	0.0287	0.688	0.1255
Heptanes	0.0604	1.450	0.2647
Methylcyclohexane	0.0413	0.991	0.1809
Benzene	0.0201	0.483	0.0881
Toluene	0.0711	1.707	0.3116
Ethylbenzene	0.0177	0.425	0.0775
Xylenes	0.0500	1.201	0.2192
C8+ Heavies	0.2267	5.441	0.9930
Total Emissions	4.3838	105.211	19.2010
Total Hydrocarbon Emissions	4.3838	105.211	19.2010
Total VOC Emissions	1.4844	35.626	6.5017
Total HAP Emissions	0.2024	4.859	0.8867
Total BTEX Emissions	0.1590	3.815	0.6963

UNCONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	105.1505	2523.613	460.5593
Ethane	39.8190	955.656	174.4072
Propane	22.6754	544.209	99.3182
Isobutane	4.4986	107.966	19.7038

n-Butane	10.9955	263.892	48.1602
Isopentane	3.2790	78.695	14.3618
n-Pentane	4.0453	97.088	17.7185
n-Hexane	2.1731	52.154	9.5180
Cyclohexane	0.7491	17.978	3.2811
Other Hexanes	1.4328	34.386	6.2755
Heptanes	3.0217	72.520	13.2350
Methylcyclohexane	2.0653	49.566	9.0458
Benzene	1.0055	24.132	4.4040
Toluene	3.5568	85.363	15.5788
Ethylbenzene	0.8849	21.237	3.8758
Xylenes	2.5017	60.041	10.9575
C8+ Heavies	11.3359	272.062	49.6513
Total Emissions	219.1899	5260.558	960.0518
Total Hydrocarbon Emissions	219.1899	5260.558	960.0518
Total VOC Emissions	74.2204	1781.289	325.0853
Total HAP Emissions	10.1219	242.927	44.3341
Total BTEX Emissions	7.9489	190.773	34.8161

FLASH GAS EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	0.5394	12.946	2.3626
Ethane	0.3977	9.544	1.7418
Propane	0.1970	4.728	0.8629
Isobutane	0.0320	0.768	0.1401
n-Butane	0.0708	1.700	0.3102
Isopentane	0.0166	0.399	0.0728
n-Pentane	0.0185	0.444	0.0811
n-Hexane	0.0062	0.149	0.0271
Cyclohexane	0.0009	0.021	0.0039
Other Hexanes	0.0050	0.120	0.0219
Heptanes	0.0046	0.112	0.0204
Methylcyclohexane	0.0017	0.041	0.0076
Benzene	0.0001	0.003	0.0005
Toluene	0.0002	0.006	0.0011
Ethylbenzene	<0.0001	0.001	0.0001
Xylenes	0.0001	0.001	0.0003
C8+ Heavies	0.0032	0.078	0.0142
Total Emissions	1.2942	31.060	5.6684
Total Hydrocarbon Emissions	1.2942	31.060	5.6684
Total VOC Emissions	0.3571	8.570	1.5641
Total HAP Emissions	0.0066	0.159	0.0291
Total BTEX Emissions	0.0005	0.011	0.0020

FLASH TANK OFF GAS

Component	lbs/hr	lbs/day	tons/yr

Methane	26.9698	647.276	118.1279
Ethane	19.8835	477.205	87.0899
Propane	9.8509	236.421	43.1469
Isobutane	1.5994	38.385	7.0052
n-Butane	3.5415	84.996	15.5118
Isopentane	0.8310	19.944	3.6399
n-Pentane	0.9254	22.210	4.0533
n-Hexane	0.3096	7.432	1.3563
Cyclohexane	0.0441	1.059	0.1933
Other Hexanes	0.2499	5.997	1.0944
Heptanes	0.2325	5.580	1.0183
Methylcyclohexane	0.0863	2.070	0.3778
Benzene	0.0058	0.139	0.0254
Toluene	0.0123	0.295	0.0538
Ethylbenzene	0.0016	0.039	0.0071
Xylenes	0.0029	0.069	0.0126
C8+ Heavies	0.1617	3.880	0.7080
Total Emissions	64.7082	1552.997	283.4220
Total Hydrocarbon Emissions	64.7082	1552.997	283.4220
Total VOC Emissions	17.8548	428.516	78.2042
Total HAP Emissions	0.3322	7.973	1.4552
Total BTEX Emissions	0.0226	0.542	0.0989

COMBINED REGENERATOR VENT/FLASH GAS EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	2.6424	63.418	11.5737
Ethane	1.1941	28.657	5.2299
Propane	0.6505	15.613	2.8493
Isobutane	0.1220	2.927	0.5342
n-Butane	0.2907	6.978	1.2734
Isopentane	0.0822	1.973	0.3600
n-Pentane	0.0994	2.386	0.4354
n-Hexane	0.0497	1.192	0.2175
Cyclohexane	0.0159	0.381	0.0695
Other Hexanes	0.0337	0.808	0.1474
Heptanes	0.0651	1.562	0.2851
Methylcyclohexane	0.0430	1.033	0.1885
Benzene	0.0202	0.485	0.0886
Toluene	0.0714	1.713	0.3127
Ethylbenzene	0.0177	0.426	0.0777
Xylenes	0.0501	1.202	0.2194
C8+ Heavies	0.2300	5.519	1.0072
Total Emissions	5.6780	136.271	24.8695
Total Hydrocarbon Emissions	5.6780	136.271	24.8695
Total VOC Emissions	1.8415	44.196	8.0658
Total HAP Emissions	0.2091	5.018	0.9158
Total BTEX Emissions	0.1594	3.826	0.6983

COMBINED REGENERATOR VENT/FLASH GAS EMISSION CONTROL REPORT:

Component	Uncontrolled tons/yr	Controlled tons/yr	% Reduction
Methane	578.6873	11.5737	98.00
Ethane	261.4970	5.2299	98.00
Propane	142.4651	2.8493	98.00
Isobutane	26.7091	0.5342	98.00
n-Butane	63.6720	1.2734	98.00
Isopentane	18.0017	0.3600	98.00
n-Pentane	21.7717	0.4354	98.00
n-Hexane	10.8743	0.2175	98.00
Cyclohexane	3.4743	0.0695	98.00
Other Hexanes	7.3699	0.1474	98.00
Heptanes	14.2533	0.2851	98.00
Methylcyclohexane	9.4236	0.1885	98.00
Benzene	4.4294	0.0886	98.00
Toluene	15.6326	0.3127	98.00
Ethylbenzene	3.8829	0.0777	98.00
Xylenes	10.9701	0.2194	98.00
C8+ Heavies	50.3593	1.0072	98.00
Total Emissions	1243.4738	24.8695	98.00
Total Hydrocarbon Emissions	1243.4738	24.8695	98.00
Total VOC Emissions	403.2895	8.0658	98.00
Total HAP Emissions	45.7893	0.9158	98.00
Total BTEX Emissions	34.9150	0.6983	98.00

EQUIPMENT REPORTS:

COMBUSTION DEVICE

Ambient Temperature: 0.00 deg. F
Excess Oxygen: 0.00 %
Combustion Efficiency: 98.00 %
Supplemental Fuel Requirement: 1.29e+000 MM BTU/hr

Component	Emitted	Destroyed
Methane	2.00%	98.00%
Ethane	2.00%	98.00%
Propane	2.00%	98.00%
Isobutane	2.00%	98.00%
n-Butane	2.00%	98.00%
Isopentane	2.00%	98.00%
n-Pentane	2.00%	98.00%

n-Hexane	2.00%	98.00%
Cyclohexane	2.00%	98.00%
Other Hexanes	2.00%	98.00%
Heptanes	2.00%	98.00%
Methylcyclohexane	2.00%	98.00%
Benzene	2.00%	98.00%
Toluene	2.00%	98.00%
Ethylbenzene	2.00%	98.00%
Xylenes	2.00%	98.00%
C8+ Heavies	2.00%	98.00%

ABSORBER

Calculated Absorber Stages:	1.77	
Specified Dry Gas Dew Point:	7.00	lbs. H2O/MMSCF
Temperature:	120.0	deg. F
Pressure:	1200.0	psig
Dry Gas Flow Rate:	225.0000	MMSCF/day
Glycol Losses with Dry Gas:	19.7072	lb/hr
Wet Gas Water Content:	Saturated	
Calculated Wet Gas Water Content:	89.56	lbs. H2O/MMSCF
Calculated Lean Glycol Recirc. Ratio:	1.36	gal/lb H2O

Component	Remaining in Dry Gas	Absorbed in Glycol
Water	7.80%	92.20%
Carbon Dioxide	99.89%	0.11%
Nitrogen	99.99%	0.01%
Methane	99.99%	0.01%
Ethane	99.98%	0.02%
Propane	99.97%	0.03%
Isobutane	99.96%	0.04%
n-Butane	99.95%	0.05%
Isopentane	99.96%	0.04%
n-Pentane	99.95%	0.05%
n-Hexane	99.93%	0.07%
Cyclohexane	99.72%	0.28%
Other Hexanes	99.95%	0.05%
Heptanes	99.90%	0.10%
Methylcyclohexane	99.74%	0.26%
Benzene	97.41%	2.59%
Toluene	96.90%	3.10%
Ethylbenzene	96.65%	3.35%
Xylenes	95.25%	4.75%
C8+ Heavies	99.80%	0.20%

FLASH TANK

Flash Control:	Combustion device	
Flash Control Efficiency:	98.00	%
Flash Temperature:	80.0	deg. F

Flash Pressure: 60.0 psig

Component	Left in Glycol	Removed in Flash Gas
Water	99.99%	0.01%
Carbon Dioxide	51.04%	48.96%
Nitrogen	4.96%	95.04%
Methane	5.52%	94.48%
Ethane	17.68%	82.32%
Propane	37.88%	62.12%
Isobutane	49.93%	50.07%
n-Butane	58.07%	41.93%
Isopentane	62.82%	37.18%
n-Pentane	68.88%	31.12%
n-Hexane	81.20%	18.80%
Cyclohexane	93.98%	6.02%
Other Hexanes	75.86%	24.14%
Heptanes	90.42%	9.58%
Methylcyclohexane	95.66%	4.34%
Benzene	99.45%	0.55%
Toluene	99.68%	0.32%
Ethylbenzene	99.83%	0.17%
Xylenes	99.90%	0.10%
C8+ Heavies	98.56%	1.44%

REGENERATOR

Regenerator Stripping Gas: Dry Product Gas

Stripping Gas Flow Rate: 52.5000 scfm

Component	Remaining in Glycol	Distilled Overhead
Water	16.00%	84.00%
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	0.80%	99.20%
n-Pentane	0.73%	99.27%
n-Hexane	0.62%	99.38%
Cyclohexane	3.41%	96.59%
Other Hexanes	1.32%	98.68%
Heptanes	0.55%	99.45%
Methylcyclohexane	4.18%	95.82%
Benzene	5.03%	94.97%
Toluene	7.94%	92.06%
Ethylbenzene	10.45%	89.55%
Xylenes	12.99%	87.01%

C8+ Heavies	12.23%	87.77%

STREAM REPORTS:

WET GAS STREAM

Temperature: 120.00 deg. F
Pressure: 1214.70 psia
Flow Rate: 9.39e+006 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	1.89e-001	8.41e+002
Carbon Dioxide	1.65e-001	1.79e+003
Nitrogen	2.51e-001	1.74e+003
Methane	7.76e+001	3.08e+005
Ethane	1.42e+001	1.06e+005
Propane	4.55e+000	4.96e+004
Isobutane	6.01e-001	8.65e+003
n-Butane	1.26e+000	1.81e+004
Isopentane	3.14e-001	5.62e+003
n-Pentane	3.35e-001	5.99e+003
n-Hexane	1.18e-001	2.51e+003
Cyclohexane	1.20e-002	2.50e+002
Other Hexanes	9.18e-002	1.96e+003
Heptanes	1.01e-001	2.50e+003
Methylcyclohexane	2.99e-002	7.28e+002
Benzene	2.00e-003	3.86e+001
Toluene	4.99e-003	1.14e+002
Ethylbenzene	9.98e-004	2.62e+001
Xylenes	2.00e-003	5.25e+001
C8+ Heavies	1.17e-001	4.92e+003
Total Components	100.00	5.20e+005

DRY GAS STREAM

Temperature: 120.00 deg. F
Pressure: 1214.70 psia
Flow Rate: 9.38e+006 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	1.47e-002	6.56e+001
Carbon Dioxide	1.65e-001	1.79e+003
Nitrogen	2.51e-001	1.74e+003
Methane	7.78e+001	3.08e+005
Ethane	1.42e+001	1.06e+005
Propane	4.55e+000	4.96e+004

	GlyCalc_Output_2dehy	
Isobutane	6.02e-001	8.64e+003
n-Butane	1.26e+000	1.81e+004
Isopentane	3.15e-001	5.61e+003
n-Pentane	3.36e-001	5.99e+003
n-Hexane	1.18e-001	2.51e+003
Cyclohexane	1.20e-002	2.49e+002
Other Hexanes	9.20e-002	1.96e+003
Heptanes	1.01e-001	2.50e+003
Methylcyclohexane	2.99e-002	7.26e+002
Benzene	1.95e-003	3.76e+001
Toluene	4.84e-003	1.10e+002
Ethylbenzene	9.67e-004	2.54e+001
Xylenes	1.91e-003	5.00e+001
C8+ Heavies	1.17e-001	4.92e+003
Total Components	100.00	5.19e+005

LEAN GLYCOL STREAM

Temperature: 120.00 deg. F
Flow Rate: 1.75e+001 gpm

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.85e+001	9.70e+003
Water	1.50e+000	1.48e+002
Carbon Dioxide	1.93e-012	1.90e-010
Nitrogen	1.94e-013	1.91e-011
Methane	9.74e-018	9.59e-016
Ethane	1.16e-007	1.14e-005
Propane	6.55e-009	6.46e-007
Isobutane	9.73e-010	9.59e-008
n-Butane	2.13e-009	2.10e-007
Isopentane	1.13e-004	1.12e-002
n-Pentane	1.51e-004	1.49e-002
n-Hexane	8.36e-005	8.24e-003
Cyclohexane	2.38e-004	2.35e-002
Other Hexanes	1.05e-004	1.04e-002
Heptanes	1.23e-004	1.21e-002
Methylcyclohexane	8.07e-004	7.95e-002
Benzene	5.34e-004	5.26e-002
Toluene	3.08e-003	3.03e-001
Ethylbenzene	1.04e-003	1.02e-001
Xylenes	3.77e-003	3.71e-001
C8+ Heavies	1.37e-002	1.35e+000
Total Components	100.00	9.85e+003

RICH GLYCOL STREAM

Temperature: 120.00 deg. F
Pressure: 1214.70 psia

Flow Rate: 1.93e+001 gpm
NOTE: Stream has more than one phase.

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.03e+001	9.69e+003
Water	8.61e+000	9.23e+002
Carbon Dioxide	1.77e-002	1.90e+000
Nitrogen	1.77e-003	1.90e-001
Methane	2.66e-001	2.85e+001
Ethane	2.25e-001	2.42e+001
Propane	1.48e-001	1.59e+001
Isobutane	2.98e-002	3.19e+000
n-Butane	7.87e-002	8.45e+000
Isopentane	2.08e-002	2.24e+000
n-Pentane	2.77e-002	2.97e+000
n-Hexane	1.54e-002	1.65e+000
Cyclohexane	6.84e-003	7.33e-001
Other Hexanes	9.65e-003	1.04e+000
Heptanes	2.26e-002	2.43e+000
Methylcyclohexane	1.85e-002	1.99e+000
Benzene	9.80e-003	1.05e+000
Toluene	3.58e-002	3.84e+000
Ethylbenzene	9.14e-003	9.80e-001
Xylenes	2.67e-002	2.86e+000
C8+ Heavies	1.04e-001	1.12e+001
Total Components	100.00	1.07e+004

FLASH TANK OFF GAS STREAM

Temperature: 80.00 deg. F
Pressure: 74.70 psia
Flow Rate: 1.03e+003 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	1.40e-001	6.88e-002
Carbon Dioxide	7.76e-001	9.29e-001
Nitrogen	2.37e-001	1.80e-001
Methane	6.18e+001	2.70e+001
Ethane	2.43e+001	1.99e+001
Propane	8.21e+000	9.85e+000
Isobutane	1.01e+000	1.60e+000
n-Butane	2.24e+000	3.54e+000
Isopentane	4.23e-001	8.31e-001
n-Pentane	4.71e-001	9.25e-001
n-Hexane	1.32e-001	3.10e-001
Cyclohexane	1.93e-002	4.41e-002
Other Hexanes	1.07e-001	2.50e-001
Heptanes	8.52e-002	2.32e-001
Methylcyclohexane	3.23e-002	8.63e-002

	GlyCalc_Output_2dehy	
Benzene	2.72e-003	5.79e-003
Toluene	4.90e-003	1.23e-002
Ethylbenzene	5.65e-004	1.63e-003
Xylenes	9.95e-004	2.88e-003
C8+ Heavies	3.49e-002	1.62e-001
Total Components	100.00	6.59e+001

FLASH TANK GLYCOL STREAM

Temperature: 80.00 deg. F
Flow Rate: 1.91e+001 gpm

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.09e+001	9.69e+003
Water	8.66e+000	9.23e+002
Carbon Dioxide	9.08e-003	9.68e-001
Nitrogen	8.83e-005	9.41e-003
Methane	1.48e-002	1.58e+000
Ethane	4.01e-002	4.27e+000
Propane	5.64e-002	6.01e+000
Isobutane	1.50e-002	1.60e+000
n-Butane	4.60e-002	4.90e+000
Isopentane	1.32e-002	1.40e+000
n-Pentane	1.92e-002	2.05e+000
n-Hexane	1.25e-002	1.34e+000
Cyclohexane	6.46e-003	6.89e-001
Other Hexanes	7.37e-003	7.85e-001
Heptanes	2.06e-002	2.19e+000
Methylcyclohexane	1.78e-002	1.90e+000
Benzene	9.81e-003	1.05e+000
Toluene	3.59e-002	3.82e+000
Ethylbenzene	9.18e-003	9.79e-001
Xylenes	2.68e-002	2.86e+000
C8+ Heavies	1.04e-001	1.10e+001
Total Components	100.00	1.07e+004

FLASH GAS EMISSIONS

Flow Rate: 4.18e+003 scfh
Control Method: Combustion Device
Control Efficiency: 98.00

Component	Conc. (vol%)	Loading (lb/hr)
Water	6.16e+001	1.22e+002
Carbon Dioxide	3.78e+001	1.83e+002
Nitrogen	5.85e-002	1.80e-001
Methane	3.06e-001	5.39e-001
Ethane	1.20e-001	3.98e-001

Propane	4.06e-002	1.97e-001
Isobutane	5.00e-003	3.20e-002
n-Butane	1.11e-002	7.08e-002
Isopentane	2.09e-003	1.66e-002
n-Pentane	2.33e-003	1.85e-002
n-Hexane	6.53e-004	6.19e-003
Cyclohexane	9.53e-005	8.83e-004
Other Hexanes	5.27e-004	5.00e-003
Heptanes	4.22e-004	4.65e-003
Methylcyclohexane	1.60e-004	1.73e-003
Benzene	1.35e-005	1.16e-004
Toluene	2.42e-005	2.46e-004
Ethylbenzene	2.79e-006	3.26e-005
Xylenes	4.92e-006	5.75e-005
C8+ Heavies	1.72e-004	3.23e-003
Total Components	100.00	3.07e+002

REGENERATOR OVERHEADS STREAM

Temperature: 212.00 deg. F
Pressure: 14.70 psia
Flow Rate: 1.98e+004 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	8.26e+001	7.76e+002
Carbon Dioxide	6.84e-002	1.57e+000
Nitrogen	4.06e-002	5.93e-001
Methane	1.26e+001	1.05e+002
Ethane	2.54e+000	3.98e+001
Propane	9.86e-001	2.27e+001
Isobutane	1.48e-001	4.50e+000
n-Butane	3.63e-001	1.10e+001
Isopentane	8.72e-002	3.28e+000
n-Pentane	1.08e-001	4.05e+000
n-Hexane	4.84e-002	2.17e+000
Cyclohexane	1.71e-002	7.49e-001
Other Hexanes	3.19e-002	1.43e+000
Heptanes	5.78e-002	3.02e+000
Methylcyclohexane	4.03e-002	2.07e+000
Benzene	2.47e-002	1.01e+000
Toluene	7.40e-002	3.56e+000
Ethylbenzene	1.60e-002	8.85e-001
Xylenes	4.52e-002	2.50e+000
C8+ Heavies	1.28e-001	1.13e+001
Total Components	100.00	9.97e+002

COMBUSTION DEVICE OFF GAS STREAM

Temperature: 1000.00 deg. F
Pressure: 14.70 psia

GlyCalc_Output_2dehy

Flow Rate: 6.84e+001 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Methane	7.27e+001	2.10e+000
Ethane	1.47e+001	7.96e-001
Propane	5.70e+000	4.54e-001
Isobutane	8.59e-001	9.00e-002
n-Butane	2.10e+000	2.20e-001
Isopentane	5.04e-001	6.56e-002
n-Pentane	6.22e-001	8.09e-002
n-Hexane	2.80e-001	4.35e-002
Cyclohexane	9.87e-002	1.50e-002
Other Hexanes	1.84e-001	2.87e-002
Heptanes	3.35e-001	6.04e-002
Methylcyclohexane	2.33e-001	4.13e-002
Benzene	1.43e-001	2.01e-002
Toluene	4.28e-001	7.11e-002
Ethylbenzene	9.25e-002	1.77e-002
Xylenes	2.61e-001	5.00e-002
C8+ Heavies	7.38e-001	2.27e-001
Total Components	100.00	4.38e+000

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 Middlebourne V Compressor Station, including federal and state regulatory requirements.

1. Summary of Key Operational Throughput Limits

a. Maximum dry gas throughput into each dehydrator: 225 MMscf/day or 82,125 MMscf/year.

b. Maximum liquids loaded out: 5,978,700 gallons per year.

2. Operational Requirements

a. Compressor engines will operate with the catalytic converter in place at all times and will be fueled by natural gas only.

b. Catalysts installed on all compressor engines will be operated per manufacturer instructions.

c. Reciprocating compressor rod packing will be replaced within 36 months of last packing, startup, or within 26,000 operating hours, whichever comes first.

d. The generators will be fueled by natural gas only.

e. Each dehydrator reboiler will operate at no more than 1.5 MMBtu/hr and be fueled only by natural gas or off-gases from the dehydrator flash tanks.

f. No fuel-burning unit of any kind will have opacity greater than 10 percent based on a six minute block average observation.

g. Each dehydrator thermal oxidizer capacity will not exceed 6.0 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 dehydrator thermal oxidizers will be operated per manufacturer instructions.

i. Produced water, condensate, and settling storage tanks' potential emissions will be routed to the VRU with recovery greater than 98 percent at all times.

j. Storage tanks will be covered and routed to a closed vent system with no detectable emissions.

k. Liquid loadout trucks will use the submerged-fill method.

l. Dehydrator still vents will be controlled by the thermal oxidizers.

m. Dehydrator flash tanks' vent gas will be used in the reboilers as fuel or will be routed to the thermal oxidizers.

3. Monitoring

a. The non-certified compressor engines will be stack tested within 1 year of startup and every 8,760 hours of operation thereafter.

b. Catalyst inlet temperature will be monitored.

c. Compressor run time or number of months since compressor rod repacking will be monitored or tracked.

d. Rolling 12-month average of the dry gas throughput for the dehydrators will be monitored.

e. An initial Method 22 observation of the thermal oxidizers will be conducted for a minimum of 2 hours.

f. Monthly olfactory, visual, and auditory inspections will be conducted of the tanks closed vent and control system for leaks or defects that could result in emissions. Leaks will be repaired as soon as practicable, and no later than 5 days for the first attempt.

g. The presence of the thermal oxidizers' flame will be continuously monitored.

h. Monthly and rolling twelve-month average amount of liquids loaded out will be monitored.

i. The initial and subsequent leak detection and repair (LDAR) inspections will be conducted per the implemented LDAR monitoring plan. Repair procedures will be followed per the implemented LDAR monitoring plan.

4. Recordkeeping

a. Records will be kept for a minimum of 5 years.

b. Records of inspection, observations, preventive maintenance, malfunctions, and shutdowns of all onsite equipment will be kept.

c. Records of the date, time, duration of each time that a flame is not present at the thermal oxidizers and startup, shutdown, malfunctions of the thermal oxidizers will be kept.

d. Records of engine maintenance and engine run time will be kept.

e. Records of catalyst inlet temperature will be kept.

f. Records of the actual annual average natural gas throughput in each of the dehydrators will be kept.

g. Records of LDAR inspections, repaired leaks, and the LDAR monitoring plan will be kept.

5. Notifications and Reports

a. WVDAQ will be notified within 30 calendar days of startup.

b. Upon startup, a Certificate to Operate (CTO) application will be filed and fees to WVDAQ will be paid for the period from startup to the following June 30 and then annually renew the CTO and pay fees. CTO will be maintained on-site.

c. An annual report of compliance with 40 CFR 60 Subpart OOOOa for applicable affected facilities will be submitted within 90 days after one year of operations startup.

d. For stack testing, a protocol will be filed at least 30 days prior to test and notify WVDAQ and EPA of the test at least 15 days prior to test. Results will be reported within 60 days of the test.

e. If operations are suspended for 60 days or more, WVDAQ will be notified within 2 weeks after the 60th day.

Attachment P.
Public Notice

AIR QUALITY PERMIT NOTICE
Notice of Application – Middlebourne V Compressor Station

Notice is given that Antero Midstream LLC has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for an initial 45CSR13 construction permit application for a natural gas compressor station located 3.75 miles norrtheast of Middlebourne in Tyler County, West Virginia. The latitude and longitude coordinates are: 39.535469N, 80.861751W.

Regulated Pollutant	Potential Emissions (tpy)
Nitrogen Oxides (NOx)	100.21
Carbon Monoxide (CO)	83.91
Volatile Organic Compounds (VOC)	186.92
Sulfur Dioxide (SO_2)	0.68
Particulate Matter less than 10 micrometers (PM_{10})	11.29
Particulate Matter less than 2.5 micrometers ($PM_{2.5}$)	10.00
Total Hazardous Air Pollutants (HAPs)	19.77
Benzene	0.46
Toluene	0.90
Ethylbenzene	0.19
Xylenes	0.57
Formaldehyde	6.32
n-Hexane	3.01
Acetaldehyde	3.90
Acrolein	2.42
Methanol	1.22
Carbon Dioxide Equivalent (CO_2e)	166,287

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

Any questions regarding this permit application should be directed to the DAQ at (304) 926-0499, extension 1250, during normal business hours.
Dated the 19th day of December 2017.

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

Attachment R.
Authority/Delegation of Authority

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

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

DATE: August 5 , 2015

ATTN.: Director

Corporation's / other business entity's Federal Employer I.D. Number 46-5517375

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

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

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

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

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

Ward McNeilly, Vice President - Vice President Reserves Planning & Midstream

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

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

Secretary

Antero Midstream LLC
Name of Corporation or business entity