March 7, 2017

Mr. Jerry Williams
WV Department of Environmental Protection
Division of Air Quality
601 57th Street, SE
Charleston, WV 25304

RE: Antero Treatment LLC – Antero Clearwater Facility
West Virginia Department of Environmental Protection, Division of Air Quality,
45CSR13 Class II Administrative Update, R13-3260A

Mr. Williams,

On behalf of Antero Treatment LLC, please find attached the 45CSR13 Air Permit Class II Administrative Update for the Antero Clearwater Facility (017-00157) located in Doddridge County, West Virginia. The Antero Clearwater Facility (the Facility) is currently permitted under permit number R13-3260A.

Proposed updates to the Facility include the following:

1. Update to the boiler fuel use language in permit R13-3260A. Currently the boilers (2E and 3E) are limited to each using 1,794.6 MMscf per year of natural gas as fuel. However, the boilers may not operate equally in actual operations and one boiler may operate more than the other. It is requested that permit condition 6.1.1 state that the boilers together are limited to using 3,589.3 MMscf per year of natural gas on a 12 month rolling total. Additionally, it is requested that the table in permit condition 6.1.2 show the emission totals for both boilers together. The emissions in Attachment N have been updated to show the emissions for the boilers together. Note that the annual fuel use limit and emission totals have not changed since the permit application for R13-3260A, rather it is being requested that the values are written in the permit as a collective value rather than a per boiler value.
2. For purposes of completion, it is being noted that there are three (3) proposed Calcium Chloride storage tanks (TK-6100A – TK-6100C) to be installed at the Facility. These tanks will each have a capacity of 200 barrels and will store a calcium chloride brine that is a byproduct of the process at the Facility. This brine will be offloaded for product use. The tanks are not expected to have any emissions and are being noted for purposes of submitting a complete equipment inventory to the WVDEP.
3. The Stage 1 Filtrate Tank (TK-1130) is currently permitted to be routed to the thermal oxidizer for control of the off-gases. However, due to safety concerns, this tank cannot be routed to this control device. It is being proposed that this tank now be routed to a carbon canister for control of the off-gases. This application contains information on the adsorptive control device. Because the carbon canister has at least a 98% capture efficiency, the emission values from TK-1130 will not change due to this change in control device.
4. Lastly, based on new production information, it is expected that the gas stream coming into the fuel conditioning skid will now contain liquids to be separated out and not just dry gas as was previously expected. There will be an additional gunbarrel tank (TK-GB) that will be pressurized. The flash gas from the gunbarrel tank will be used as fuel gas in a closed loop system. The liquids from the pressurized gunbarrel tank will be loaded at

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

approximately 40 psig into pressurized trucks (LD-GB). Because the gunbarrel tank itself is pressurized, it will not have any emissions. The only emissions from the pressurized loading process is when the hose is disconnected. The emissions from the loading process are less than the modification thresholds of 6 lbs/hr and 10 tons/year.

Enclosed is the original hard copy application plus two copies on CDs, including the permit application form and the required attachments. Per 45CSR13, a $300 application fee is also enclosed, which covers the base Class II Administrative Update application fee.

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

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

Sincerely,
KLEINFELDER

Michele Steyskal

Michele Steyskal
Air Quality Specialist

Enclosures: Antero Clearwater Facility Air Permit Class II Administrative Update

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Antero Treatment LLC

Antero Clearwater Facility

NSR Permit Class II Administrative Update Application
West Virginia Department of Environmental Protection
Division of Air Quality
45CSR13 – R13-3260A

Doddridge County, West Virginia

March 2017

Prepared by:

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

DEN17O55039

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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 Treatment LLC

2. Federal Employer ID No. ***(FEIN):***
300882879

3. Name of facility *(if different from above):*
Antero Clearwater Facility

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:
364 Gum Run Road
Pennsboro, WV 26415

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 Treatment 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.): Water treatment facility for oil and gas operation support

10. North American Industry Classification System **(NAICS)** code for the facility:
213112

11A. DAQ Plant ID No. (for existing facilities only):
0 1 7 – 0 0 1 5 7

11B. List all current 45CSR13 and 45CSR30 (Title V) permit numbers associated with this process (for existing facilities only):
R13-3260A

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 Greenwood, WV (north of US-50), head southeast on Sunnyside Road and follow for approximately 0.3 miles. After going across US-50, turn right onto Gum Run Road (50/36). Facility access road will be off of Gum Run Road.

12.B. New site address (if applicable):	12C. Nearest city or town:	12D. County:
364 Gum Run Road Pennsboro, WV 26415	Greenwood	Doddridge
12.E. UTM Northing (KM): 4346.659	12F. UTM Easting (KM): 509.222	12G. UTM Zone: 17

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

Stage 1 Filtrate tank off-gases routed to a carbon canister rather than the thermal oxidizer due to safety concerns, change in language for the fuel use of the boilers, addition of three calcium chloride storage tanks with no emissions, and addition of a gunbarrel tank and associated pressurized truck loading to the fuel conditioning skid.

14A. Provide the date of anticipated installation or change: Upon permit issuance – If this is an **After-The-Fact** permit application, provide the date upon which the proposed change did happen: / /	14B. Date of anticipated Start-Up if a permit is granted: September 1, 2017

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:		

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 :

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 _____ *(Please use blue ink)* DATE: 3/7/2017 *(Please use blue ink)*

35B. Printed name of signee: Al Schopp		35C. Title: Regional Senior Vice President and Chief Administrative Officer
35D. E-mail: aschopp@anteroresources.com	36E. Phone: (303) 357-7325	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

Antero Clearwater Facility –

Closest Antero Facilities

1. Common Control: Only those facilities that are owned and managed by Antero were included in the aggregation discussion. This includes all facilities owned and operated by Antero Resources Corporation, Antero Midstream LLC, and Antero Treatment LLC.

2. SIC Code: The Antero Clearwater Facility will operate under SIC code 1389 (oil and gas field services). The closest facility owned by Antero Resources Corporation is a production facility located 0.66 miles northeast of the water treatment facility. However, this production facility operates under the SIC code of 1311. The closest facility owned by Antero Midstream LLC is located 2 miles northeast of the water treatment facility and does not operate under SIC code 1389. The closest facility owned by Antero Treatment LLC and operating under SIC code 1389 is the Antero Landfill (Clearwater Landfill). This facility is approximately 0.5 miles away.

3. Contiguous or Adjacent: The land between the Antero Landfill and the Antero Clearwater Facility is owned and managed by Antero Treatment LLC. Additionally, the Antero Landfill is a support facility for the Antero Clearwater Facility.

Based on this three-pronged evaluation, the Antero Clearwater Facility will aggregate emissions with the Antero Landfill.

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 TREATMENT LLC

Control Number: 9ABIM

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 September 17, 2015, 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 September 17, 2015

Natalie E Tennant

Secretary of State

FILED

SEP 09 2015

IN THE OFFICE OF SECRETARY OF STATE

Submitted by:
CT Corporation Rep-Terry Stamper
Terry.Stamper@wolterskluwer.com
304-776-1152

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

Penney Barker, Manager
Business & Licensing Division
Tel: (304)558-8000
Fax: (304)558-8381
Website: www.wvsos.com
E-mail: business@wvsos.com

FILE ONE ORIGINAL
(Two if you want a filed stamped copy returned to you.)

FILING FEE: $150
*** Fee Waived for Veteran-owned organization**

WEST VIRGINIA APPLICATION FOR CERTIFICATE OF AUTHORITY OF LIMITED LIABILITY COMPANY

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

Control # 9ABLM

***** The undersigned, having authority to transact business on behalf of a foreign (out-of-state) registered entity, agrees to *** comply with the requirements of West Virginia Code §31B-10-1002 to apply for Certificate of Authority.**

1. The **name** of the **limited liability company** as registered in its home state is: Antero Treatment 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 formation 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 formation.**

2. The **business 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 in Section 1. above,** if available in West Virginia
   (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. Click here to see a sample Letter of Resolution.)

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. See (*) note at the right.]

   ☒ **regular LLC**

   ☐ **Professional LLC*** for the profession of: _____

   * In most cases, a **Letter of Authorization/Approval from the appropriate State Licensing Board** is required to process the application. See attached instructions.

4. The **address** of the **principal office** of the company will be:

   Street: 1615 Wynkoop Street
   City: Denver State: CO Zip Code: 80202

   Located in the **County** of (required): County: Denver

   The **mailing address** of the above location, if different, will be:

   Street: _____
   City: _____ State: _____ Zip Code: _____

5. The **address** of the initial **designated** (physical) office of the company in West Virginia, if any, will be:

   Street: _____
   City: _____ State: _____ Zip Code: _____

   Located in the **County** of: County: _____

RECEIVED

SEP 09 2015

5. (*Continued from previous page....*)

The **mailing address** of the above location, if different, will be:

Street: _____

City: _____ State: _____ Zip Code: _____

6. **Agent of Process:** may be sent, if any, will be:

Name: CT Corporation System

Street: 5400 D Big Tyler Road

City: Charleston State: WV Zip Code: 25313

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

8. **Website address** of the business, if any (*ex: yourdomainname.com*): anteroresources.com

9. Do you **own or operate more than one business in West Virginia**?
☐ **Yes** * *Answer a. and b. below.* ☐ **No** ■ **Decline to answer**

If "**Yes**"... a. How many businesses? _____ b. Located in how many West Virginia counties? _____

10. The company is: (required)
■ an **AT-WILL** company, conducting business for an indefinite period.
☐ a **TERM** company, conducting business for the term of _____ years.

11. The company is: (required)
■ **MEMBER**-MANAGED [List the names and addresses of all **members** below.]
☐ **MANAGER**-MANAGED [List the names and addresses of all **managers** below.]

List the **name(s) and address(es) of the Member(s)/Manager(s)** of the company (required; attach additional pages if necessary):

Name	No. & Street Address	City	State	Zip Code
Antero Midstream Partners LP	1615 Wynkoop Street	Denver	CO	80202

12. 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 (required):
■ **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.

13. The **purpose(s)** for which this limited liability company is formed is as follows:
[Describe the type(s) of business activity which will be conducted, for example, "real estate," "construction of residential and commercial buildings," "commercial painting," "professional practice of law" (see **Section 2.** for acceptable "professional" business activities). Purpose may conclude with words "...including the transaction of any or all lawful business for which corporations may be incorporated in West Virginia."]

Any lawful business or activity under the laws of this state.

14. 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 Section 15.]
■ **No** [Proceed to Section 15.]

15. Other provisions which may be set forth in the operating agreement or matters not inconsistent with law:
[See instructions for further information; use extra pages if necessary.]

16. The number of pages attached and included in these Articles is: _____

17. 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 and time of filing** in the Secretary of State's Office.

☐ the following date _____ and time _____ .

18. Is the organization a "**veteran-owned**" organization?

Effective **JULY 1, 2015**, to meet the requirements for a "**veteran-owned**" organization, the entity filing the registration must meet the following criteria per West Virginia Code §59-1-2a:

1. A "**veteran**" must be honorably discharged or under honorable conditions, and
2. A "**veteran-owned business**" means a business that meets one of the following criteria:
   - o Is at least fifty-one percent (51%) unconditionally owned by one or more veterans; or
   - o In the case of a publicly owned business, at least fifty-one percent (51%) of the stock is unconditionally owned by one or more veterans.

☐ **Yes** (If "Yes," attach **Form DD214**) ➡ ☐ **CHECK BOX** indicating you have attached **Veteran Affairs Form DD214**

☒ **No**

You may obtain a copy of your Veterans Affairs Form DD214 by contacting:

National Personnel Records Center
Military Personnel Records
1 Archives Drive
St. Louis, MO 63138
Toll free: 1-86-NARA-NARA or 1-866-272-6272
Phone: 314-801-0800
www.archives.gov/veterans/military-service-records

Per WV Code 59-1-2(j) effective July 1, 2015, the **registration fee is waived** for entities that meet the requirements as a "**veteran-owned**" organization. See attached instructions to determine if the organization qualifies for this waiver. In addition, a "**veteran-owned**" entity will have **four (4) consecutive years of Annual Report fees waived** AFTER the organization's initial formation [see WV Code 59-1-2a(m)].

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

a. Contact person to reach in case there is a problem with filing: Sean Roberts Phone: +1 (713) 758-3380

b. Print or type name of signer: Alvyn A. Schopp Title/Capacity of signer: Chief Admin/Regional VP

c. **Signature:** Alvyn A. Schopp **Date:** 8/26/2015

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.

Important Note: This form is a public document. Please **do NOT provide any personal identifiable information on this form** such as social security number, bank account numbers, credit card numbers, tax identification or driver's license numbers.

Reset Form Print Form

Delaware

The First State

I, JEFFREY W. BULLOCK, SECRETARY OF STATE OF THE STATE OF DELAWARE, DO HEREBY CERTIFY "ANTERO TREATMENT 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 THIRTY-FIRST DAY OF AUGUST, A.D. 2015.

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

Jeffrey W. Bullock, Secretary of State

5803812 8300

151238375

AUTHENTICATION: 2690344

DATE: 08-31-15

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

Attachment B.
Area and Topographic Maps

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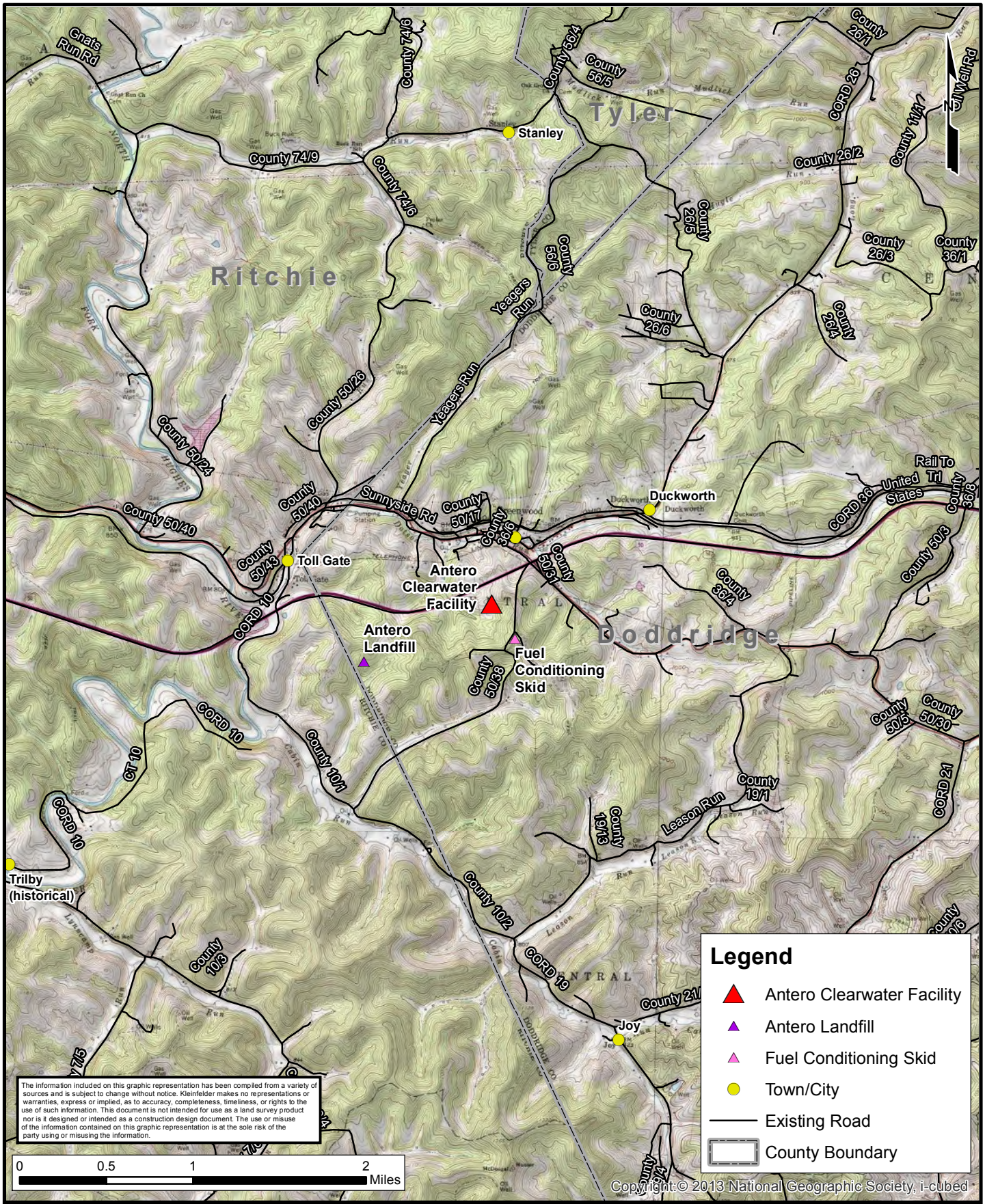
PROJECT NO.	20171640
DRAWN:	9/26/2016
DRAWN BY:	A.Leonard
CHECKED BY:	K.Meszaros
FILE NAME:	AnteroClearwaterWaterTreatment_Receptor.mxd

Antero Treatment LLC

Antero Clearwater Facility
Doddridge County, West Virginia

FIGURE



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PROJECT NO.	20171640
DRAWN:	9/23/2016
DRAWN BY:	A.Leonard
CHECKED BY:	K.Meszaros
FILE NAME:	AnteroClearwaterWaterTreatment_Topo.mxd

Antero Treatment LLC

Antero Clearwater Facility
Doddridge County, West Virginia

FIGURE

Attachment C.
Installation and Startup Schedule

Antero Clearwater Facility – Installation and Startup Schedule

The Antero Clearwater Facility will be an updated facility located in Doddridge County, WV, approximately 0.5 miles south of Greenwood, WV. Ground clearing and other site preparation activities have already begun. Installation of equipment currently permitted under R13-3260A is also occurring. The proposed carbon canister is scheduled to be installed September 1, 2017. Installation of the new calcium chloride tanks will occur in 2018. Installation of the proposed equipment at the fuel conditioning skid is scheduled for Spring 2017. Facility operations are scheduled to begin on or around March 2017 for currently permitted equipment.

Attachment D.
Regulatory Discussion

Antero Clearwater Facility – Regulatory Discussion
Federal Regulations

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

I. *Subpart Db – Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units*

Applicability: Subpart Db applies to steam generating units that commence construction, modification, or reconstruction after June 19, 1984 with a heat input capacity of more than 29 MW or 100 MMBtu/hr. Subpart Db applies to the two (2) onsite boilers at the Antero Clearwater Facility. The Subpart outlines SO_2, PM, and NOx emission standards, however since these boilers will only fire low sulfur natural gas, they will be exempt from all emissions standards except for NOx and for opacity.

II. *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)). Storage vessels with a capacity greater than or equal to 151 m^3 storing a liquid with a maximum true vapor pressure less than 3.5 kilopascals (0.5 psia) or with a capacity greater than or equal to 75 m^3 but less than 151 m^3 storing a liquid a liquid with a maximum true vapor pressures less than 15 kPa (2.18 psia) are exempt from this Subpart (§60.110b(b)). The following storage vessels have a maximum capacity less than 75 m^3 and/or do not contain a volatile liquid and are therefore exempt from this Subpart:

Oil collection tank (TK-1065)	Clarifier effluent tank (TK-2015)	Stage 1 clarifier pump tank (TK-1115)
Stage 1 filtrate tank (TK-1130)	Boiler blowdown flash tank (TK-2450)	4B disposal centrate tank (TK-2460)
CIP tank (TK-2320)	Process distillate level tank (TK-2120)	Steam condensate level tank (TK-2085)
4A disposal centrate tank (TK-2160)	Boiler deaerator tank (TK-2315)	Brine maker tank (TK-2149)
Post treatment effluent tank (TK-2515)	Post treatment sludge tank (TK-2520)	Breakpoint chlorination frac tank (TK-2800)
Sodium sulfate day tank (TK-4039)	Sodium bicarbonate day tank (TK-4017)	Lime slurry tank A and B (TK-4049A and TK-4049B)
Ferric chloride storage tank (TK-4000)	Caustic bulk storage tank (TK-4020)	Post Treatment polymer system aging tank (TK-4170)
Calcium chloride bulk tank (TK-4200)	Breakpoint chlorination sodium hypochlorite tank (TK-4500)	Methanol bulk storage tank (TK-4115)
Barometric condenser hot well (TK-2130)	Hydrogen peroxide tank (TK-4025)	Sodium bisulfite tank (TK-4080)
All totes (TK-4054, 4057, 4120, 4155, 4015, 4125, 4150, 4065, 4185, 4190, 4210, 4220, 4230, 4240, 4250, 4260, 4310, 4255, 4270)		Calcium Chloride storage tanks (TK-6100A – TK-6100C)

The Clarifier Pump Tanks A & B (TK-1060A and TK-1060B) each have a capacity between 75 m^3 and 151 m^3 with a vapor pressure less than 15 kPa (2.18 psia) and are therefore exempt from this Subpart. The following tanks have a maximum storage capacity greater than 151 m^3 and are exempt from this Subpart since their vapor pressure will be less than 3.5 kPa.

Grit clarifier tank (TK-1055A)	Equalization tank (TK-1070)	Thermal feed tank (TK-2040)
Sludge holding tank (TK-2020)	Boiler feedwater tank (TK-2180)	Recovered water tank (TK-2140)
Post treatment tank 1 (TK-2500)	Post treatment tank 2 (TK-2550)	Post treatment tank 3 (TK-2555)
Product water storage tank (TK-2545)	Stage 1 Clarifier (TK-1055B)	Solids Clarifier Tank (TK-2010)
Post treatment system tanks (CF-2510)	Stage 1 sludge holding tank (TK-1120)	Stage 1 reaction tanks A & B (TK-1105A & TK-1105B)

All onsite storage tanks were addressed for applicability to Subpart Kb. With the determinations above, Subpart Kb is not applicable to the Antero Clearwater Facility.

III. *Subpart QQQ – Standards of Performance for VOC Emissions from Petroleum Refinery Wastewater Systems*

Applicability: Subpart QQQ applies to facilities constructed, modified, or reconstructed after May 4, 1987 that operate an oil-water separator at a petroleum refinery (§60.690(a)(3)). Though the Antero Clearwater Facility will be constructed after May 4, 1987, it is not considered a petroleum refinery. Therefore, Subpart QQQ does not apply to the Antero Clearwater Facility.

IV. *Subpart IIII - Standards of Performance for Compression Ignition Internal Combustion Engines*

Applicability: Subpart IIII applies to compression ignition engines that commence construction after July 11, 2005 and are manufactured after April 1, 2006 and are not fire pump engines (§60.4200(a)(2)(i)). Thus, Subpart IIII applies to the Antero Clearwater Facility since the emergency generator engine will be installed after July 2005 and manufactured after April 2006. The emergency generator engine will operate as a true emergency engine as defined in §60.4219.

Subpart IIII also applies to compression ignition engines that are fire pump engines that commence construction after July 11, 2005 and are manufactured after July 1, 2006 (§60.4200(a)(2)(ii)). Thus, Subpart IIII applies to the Antero Clearwater Facility since the fire pump engine was manufactured after July 1, 2006.

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 Antero Clearwater Facility because none of the components will have fluid (i.e., water) that is over 10 percent by weight of any VHAP.

II. *Subpart FF – National Emission Standard for Benzene Waste Operations*

Applicability: Subpart FF applies to owners and operators of chemical manufacturing plants, coke by-product recovery plants, and petroleum refineries. The Antero Clearwater Facility is not categorized as any of those facilities, therefore is not applicable to Subpart FF.

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

I. *Subpart DD – National Emission Standards for Hazardous Air Pollutants from Off-Site Waste and Recovery Operations*

Applicability: Subpart DD applies to certain provisions of wastewater treatment facilities that are a major source of hazardous air pollutants (§63.6804(a)). Since the Antero Clearwater Facility is not a major source of hazardous air pollutants, it is not applicable to Subpart DD.

II. *Subpart VV – National Emission Standards for Oil-Water Separators and Organic-Water Separators*

Applicability: Subpart VV applies to those facilities that reference this Subpart in 40 CFR Parts 60, 61, and 63 to use the emission controls of Subpart VV to demonstrate compliance with the applicable subparts. The Antero Clearwater Facility is not subject to any Subpart of 40 CFR Parts 60, 61, or 63 therefore is not applicable to the provisions of Subpart VV.

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 Antero Clearwater Facility as it is not a major source of HAP emissions.

IV. *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 Antero Clearwater Facility as the generator engine and fire pump engine will be new RICE. These engines will meet Subpart ZZZZ by meeting 40 CFR Part 60, Subpart IIII as the Antero Clearwater Facility is an area source of HAP emissions (§63.6590(c)(1)).

V. *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 Antero Clearwater Facility as it is not a major source of HAP emissions.

VI. *Subpart JJJJJJ - National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers Area Sources*

Applicability: Subpart JJJJJJ applies to industrial boilers at major and area sources of HAP emissions (§63.11193). The boilers are located at an area source of HAP emissions and will be firing natural gas only, and therefore meet the exemption criteria outlined in §63.11193. Subpart JJJJJJ does not apply to the Antero Clearwater Facility.

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 Antero Clearwater Facility:

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

II. *45CSR2A – Testing, Monitoring, Recordkeeping and Reporting Requirements Under 45CSR2*

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

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

V. *45CSR8 – Ambient Air Quality Standards*

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

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

VIII. *45CSR16 – Standards of Performance for New Stationary Sources Pursuant to 40 CFR, Part 60*

IX. *45CSR20 – Good Engineering Practice as Applicable to Stack Heights*

X. *45CSR22 – Air Quality Management Fee Program*

XI. *45CSR27 – To Prevent and Control the Emissions of Toxic Air Pollutants*

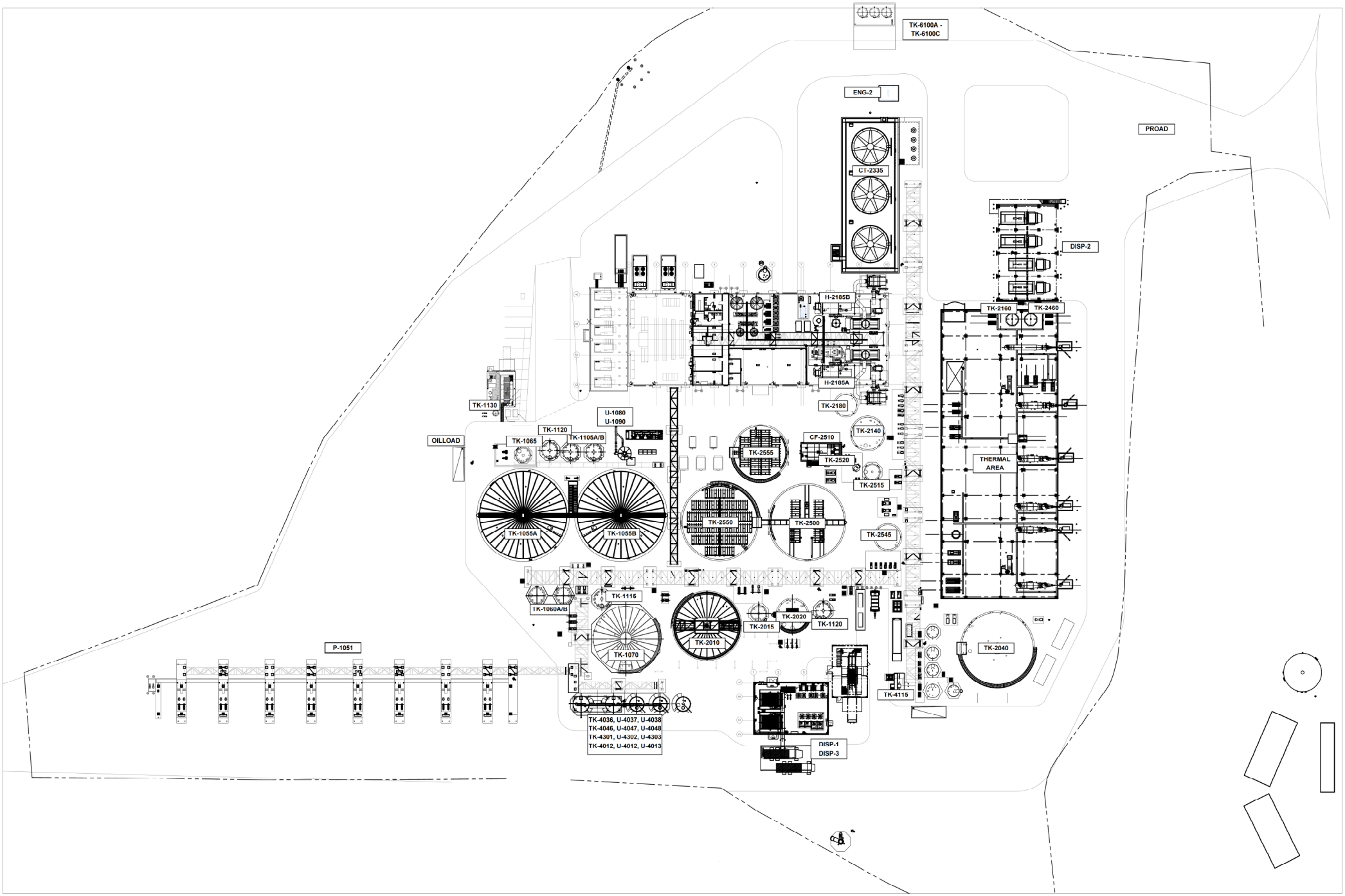
XII. *45CSR33 – Acid Rain Provisions and Permits*

XIII. *45CSR34 – Emission Standards for Hazardous Air Pollutants for Source Categories Pursuant to 40 CFR, Part 63*

XIV. *45CSR38 – Provisions for Determination of Compliance with Air Quality Management Rules*

XV. *45CSR42 – Greenhouse Gas Emissions Inventory*

Attachment E.
Plot Plan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TK-6100C
ENG-2
PROAD
CT-Z335
DISP-2
II-2105D
II-2105A
TK-2160
TK-2460
TK-1130
U-1080
U-1090
TK-2180
TK-1120
TK-1105A/B
TK-1065
OILLOAD
TK-2140
CF-2510
TK-2555
TK-2520
THERMAL
AREA
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TK-1055B
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TK-2500
TK-2545
TK-1115
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TK-2020
TK-2015
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TK-2010
TK-2040
P-1051
TK-1070
TK-4115
TK-4036, U-4037, U-4038
TK-4046, U-4047, U-4048
TK-4301, U-4302, U-4303
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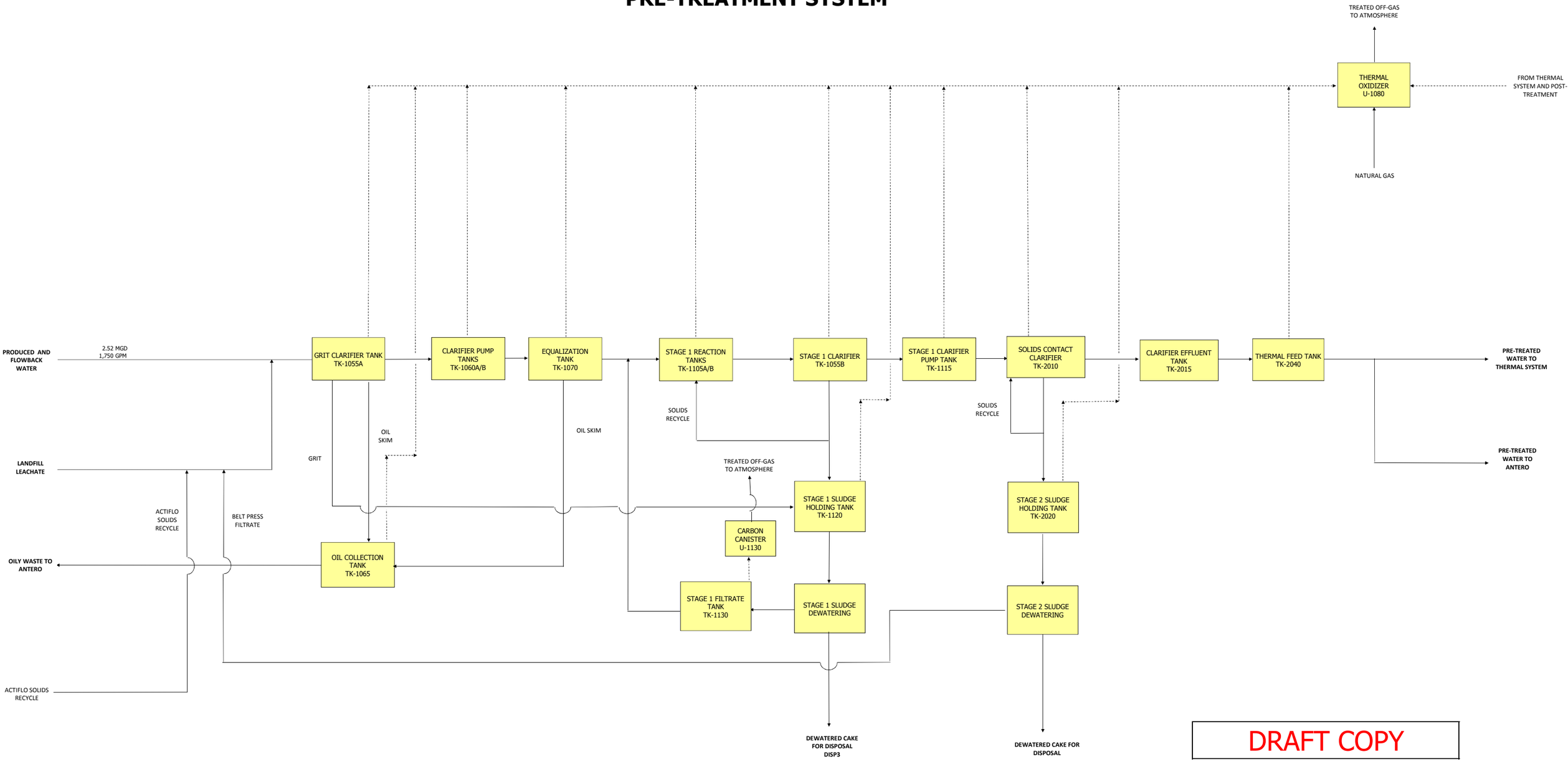
DISP-1
DISP-3

Attachment F.
Process Flow Diagram

PRE-TREATMENT SYSTEM



DRAFT COPY

REV. NO.	ISSUE DATE	DRAWN BY	CHECKED BY	REVIEWED BY	APPROVED BY	APPROVED BY (OPTIONAL)	DESCRIPTION
C	7/25/16	HLK	BAB	CDB			
B	11/9/15	HLK	BAB	CDB			
A	8/10/15	HLK	BAB	CDB			

DESIGN/DRAFTING — ENGINEERING

DRAWINGS WITH ALPHA REVISIONS ARE PRELIMINARY AND SHALL NOT BE USED FOR FINAL DESIGN WORK OR FABRICATION.

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SCALE

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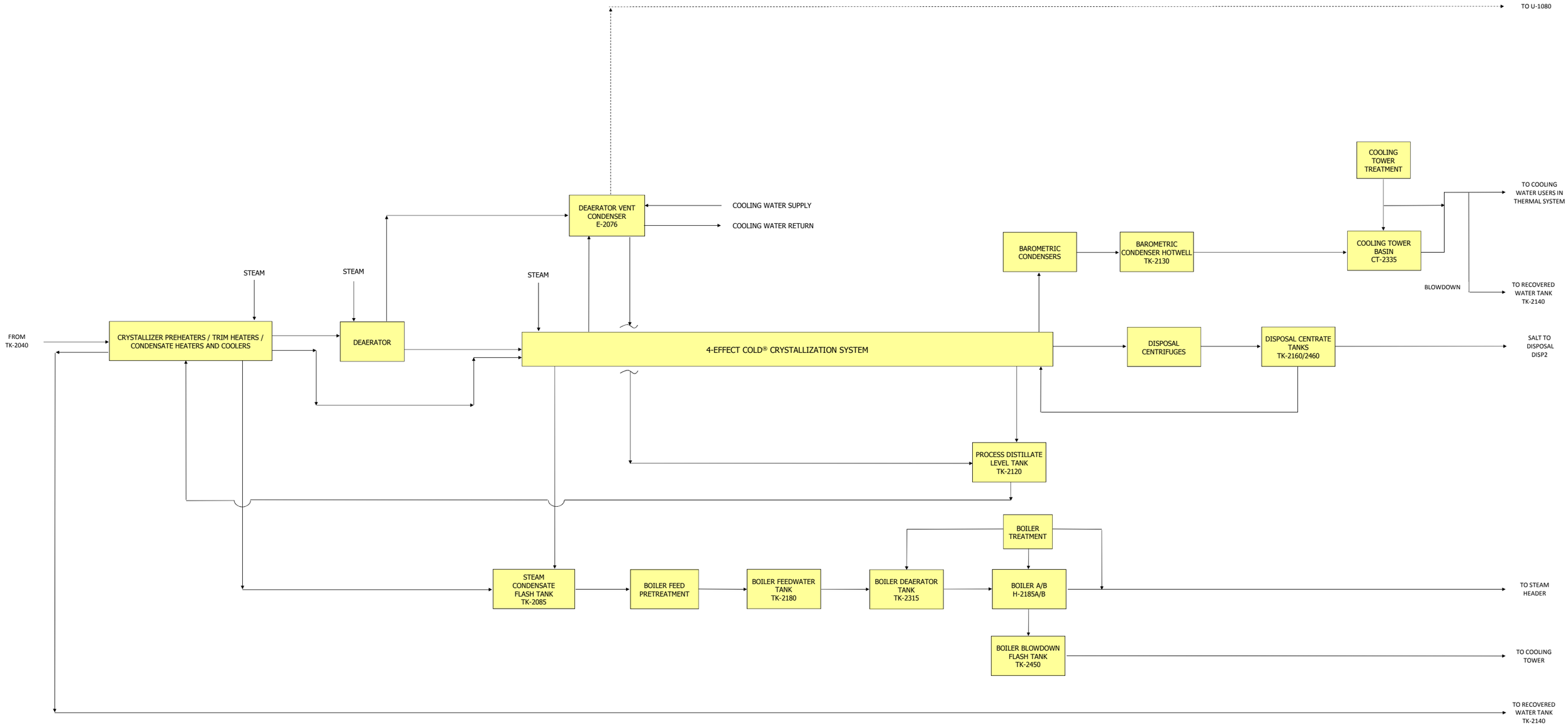
TITLE

ANTERO CLEARWATER FACILITY

LINE DRAWING
PAGE 1 OF 3

CONTRACT NO.	DWG. NO.	REV.
5600215036	FBD-215036A	C

THERMAL SYSTEM



PAGE 2

REV. NO.	ISSUE DATE	DRAWN BY	CHECKED BY	REVIEWED BY	APPROVED BY	APPROVED BY (OPTIONAL)	DESCRIPTION
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DESIGN/DRAFTING | ENGINEERING

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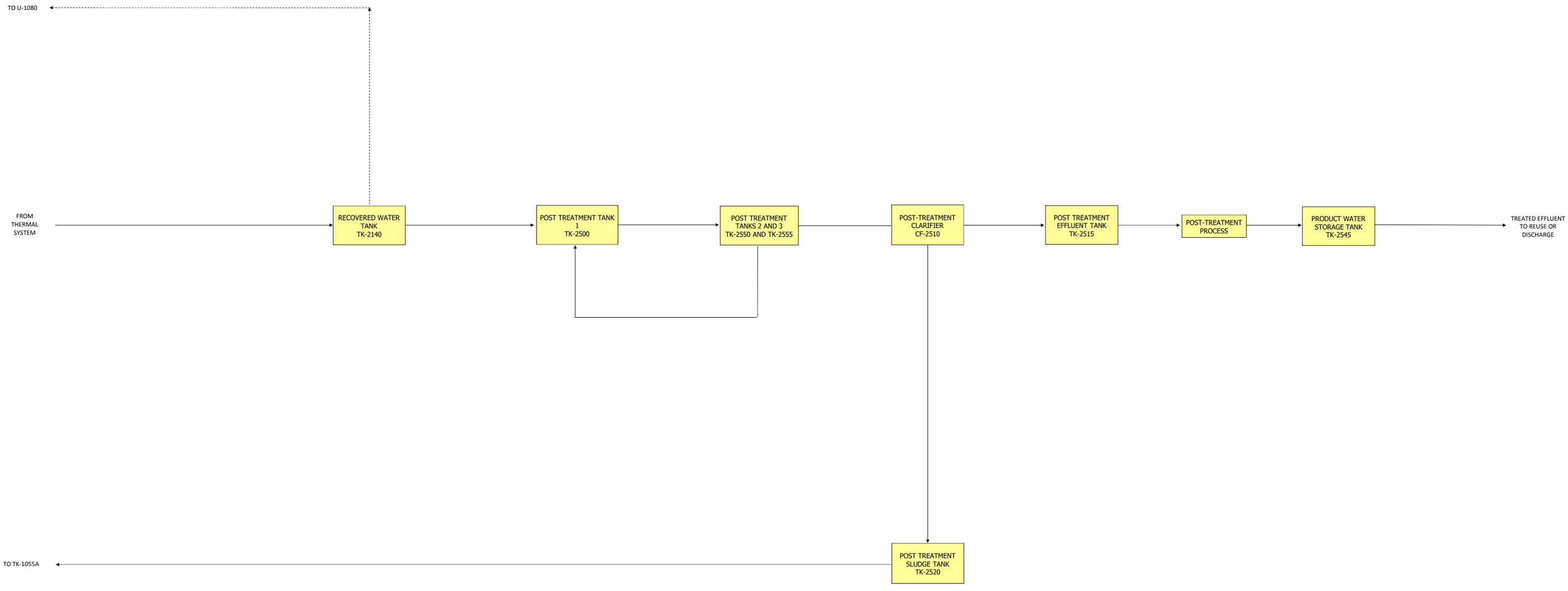
TITLE

ANTERO CLEARWATER FACILITY

LINE DRAWING
PAGE 2 OF 3

CONTRACT NO.	DWG. NO.	REV.
5600114141	FBD-114141B	1

POST-TREATMENT SYSTEM



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		DESIGN/DRAFTING		ENGINEERING			

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TITLE

ANTERO CLEARWATER FACILITY

LINE DRAWING
PAGE 3 OF 3

CONTRACT NO. 5600114141

DWG. NO. FBD-114141B

REV. 1

Attachment G.
Process Description

Attachment G – Summarized Process Description
Antero Clearwater Water Treatment Facility

The water treatment facility was designed to treat wastewater associated with shale development to an effluent water purity suitable for surface discharge or reuse with future oil and gas operations. The treatment system includes the following processes:

- Brine pre-treatment system including truck offloading, clarification, equalization, solids contact clarifier for selective ion removal and equalization
- Thermal brine treatment system
- Post-treatment system

All processes are planned to operate 24 hours a day 7 days a week. A basic process flow diagram (PFD) of the entire treatment process is provided in Attachment F.

Upstream Equipment – Truck Off-loading Station

The influent to the water treatment facility will be delivered by trucks (PROAD). An offloading station will be provided with 16 truck bays (P-1051). The water will flow from offload bays to the clarifiers (TK-1055A and TK-1055B). All pumping units at the facility are electric-powered and have no associated emissions. Leachate from the Antero Landfill may also be pumped to the influent water stream for treatment at the Clearwater Facility.

Pre-Treatment Technology Description

Grit Clarifiers

The raw influent is transferred to two Grit Clarifiers (TK-1055A and TK-1055B) operating in parallel. Each clarifier is designed to be able to accept simultaneous flow from all of the sixteen truck offloading stations if required (i.e., if one clarifier is out of service), but normally, flow will be split equally between the two clarifiers. Each clarifier will have the capability for solids and oil removal. Solids from the Grit Clarifiers (TK-1055A and TK-1055B) will be pumped to the Sludge Holding Tank (TK-2020). Oil that is removed from the Grit Clarifiers (TK-1055A and TK-1055B) will be pumped to the Oil Collection Tank (TK-1065). Water will flow from the Grit Clarifiers (TK-1055A and TK-1055B) into the small Clarifier Pump Tanks (TK-1060A and TK-1060B) before being pumped to a larger Equalization Tank (TK-1070). The Grit Clarifiers (TK-1055A and TK-1055B) and the Clarifier Pump Tanks (TK-1060A and TK-1060B) will all be covered and vented, with all off-gas being routed to a Thermal Oxidizer (U-1080).

Equalization Tank

Water will be pumped from the Clarifier Pump Tanks (TK-1060A and TK-1060B) to an Equalization Tank (TK-1070). The Equalization Tank (TK-1070) will include an oil removal device. Oil that is removed from the tank will also be pumped to the Oil Collection Tank (TK-1065). The Clarifier Pump Tanks (TK-1060A and TK-1060B) and Equalization Tank (TK-

1070) will be covered and vented, with all off-gas being routed to the Thermal Oxidizer (U-1080).

Oil Collection Tank

Oil from the Grit Clarifiers (TK-1055A and TK-1055B) and the Equalization Tank (TK-1070) is pumped to an Oil Collection Tank (TK-1065) and then trucked offsite (OILLOAD). The Oil Collection Tank (TK-1065) will be covered and vented, with all off-gas being routed to the Thermal Oxidizer (U-1080).

Solids Contact Clarifier

The water is pumped from the Equalization Tank (TK-1070) and enters the Solids Clarifier Tank (TK-2010) where select constituents are chemically removed. Select constituent removal aids in both incremental water treatment, as well as protection and optimal water chemistry for the thermal system's equipment and process.

The solids generated during pretreatment are removed from the Solids Clarifier Tank (TK-2010) and pumped to the Sludge Holding Tank (TK-2020). The clarified effluent from the Solids Clarifier Tank (TK-2010) will flow into a Clarifier Effluent Tank (TK-2015). All of the tanks in this process are covered and vented with all off-gas routed for emissions control by the Thermal Oxidizer (U-1080).

Pre-Treatment Dewatering System

The volumetric feed to the Sludge Holding Tank (TK-2020) will consist of sludge from the Solids Clarifier Tank (TK-2010) and sludge from the Grit Clarifiers (TK-1055A and TK-1055B).

The sludge is continuously pumped from the Sludge Holding Tank (TK-2020) to Dewatering Equipment which is housed in a building. Recovered filtrate from dewatering equipment is then sent to the Sludge Filtrate Sump (SP-2030) for temporary storage before it is recycled to the Grit Clarifiers (TK-1055A and TK-1055B) to be retreated. The dewatered cake will be transferred to appropriate disposal containers which are filled directly on truck under a covered canopy. The dewatered cake will be transported to an appropriate landfill for disposal (DISP1). The dewatering equipment will also be operated 24 hours per day, 7 days per week.

Thermal Feed Tank

Effluent from the Solids Clarifier Tank (TK-2010) will flow into a small Clarifier Effluent Tank (TK-2015) and will then be pumped to the Thermal Feed Tank (TK-2040). The Thermal Feed Tank (TK-2040) will be covered and vented, with all off-gas being routed to a Thermal Oxidizer (U-1080). An off-spec line will also be added so that the water can be recycled back to the front of the pre-treatment system in the event that it is not acceptable as feed to the thermal system.

Stage 1 Sludge Segregation System

The pre-treatment portion of the facility will initially be operated as described above. In the later stages of commissioning a Stage 1 Sludge Segregation System will be integrated and from that point forward the pre-treatment operation will occur as described below.

Grit Clarifiers

When the Stage 1 Sludge Segregation System is integrated, the raw influent will be transferred to a single Grit Clarifier (TK-1055A), while the other Grit Clarifier (TK-1055B) will be re-purposed downstream. At this time, solids from the Grit Clarifier (TK-1055A) will be pumped (i.e., redirected) to a Stage 1 Sludge Holding Tank (TK-1120). The rest of the Grit Clarifier System will operate as described above under the original pre-treatment scheme.

Equalization Tank

The Equalization Tank will operate in an identical manner as described above under the original pre-treatment scheme.

Oil Collection Tank

The Oil Collection Tank will operate in an identical manner as described above under the original pre-treatment scheme.

Stage 1 Reaction Tanks and Clarifier

The water is pumped from the Equalization Tank (TK-1070) and enters the Stage 1 Reaction Tanks (TK-1105A and TK-1105B) where select constituents (including radium) are chemically precipitated and then removed in the downstream Stage 1 Clarifier (TK-1055B; repurposed Grit Clarifier). These precipitated solids are routed to Stage 1 Sludge Dewatering System which is housed in a building and transferred to appropriate disposal containers also loaded inside a building. These dewatered solids will be transferred offsite for disposal at an appropriate landfill (DISP 3).

The solids generated during this step are removed from the Stage 1 Clarifier (TK-1055B) and pumped to the Stage 1 Sludge Holding Tank (TK-1120). The clarified effluent from the Stage 1 Clarifier (TK-1055B) will flow into a Stage 1 Clarifier Pump Tank (TK-1115). All of the tanks in this process are covered and vented with all off-gas routed for emissions control by the Thermal Oxidizer (U-1080).

Stage 1 Sludge Dewatering System

The volumetric feed to the Stage 1 Sludge Holding Tank (TK-1120) will consist of sludge from the Stage 1 Clarifier (TK-1055B) and sludge from the Grit Clarifier (TK-1055A).

The sludge is intermittently pumped from the Stage 1 Sludge Holding Tank (TK-1120) to the Stage 1 Dewatering Equipment. Recovered filtrate from dewatering equipment is then sent to the Stage 1 Filtrate Tank (TK-1130) for temporary storage before it is recycled to the Stage 1 Reaction Tanks (TK-1105A and TK-1105B) to be retreated. The dewatered cake will be

transferred to an appropriate landfill for disposal (DISP3). Off-gases from the Stage 1 Filtrate Tank (TK-1130) are routed to a carbon canister (U-1130) for capture of emissions.

Solids Contact Clarifier

The water is pumped from the Stage 1 Clarifier Pump Tank (TK-1115) and enters the Solids Clarifier Tank (TK-2010) where select constituents are chemically removed. Select constituent removal aids in both incremental water treatment, as well as protection and optimal water chemistry for the thermal system's equipment and process.

The solids generated during pretreatment are removed from the Solids Clarifier Tank (TK-2010) and pumped to the Stage 2 Sludge Holding Tank (TK-2020). The clarified effluent from the Solids Clarifier Tank (TK-2010) will flow into an Clarifier Effluent Tank (TK-2015). All of the tanks in this process are covered and vented with all off-gas routed for emissions control by the Thermal Oxidizer (U-1080).

Solids Contact Clarifier Dewatering System

The volumetric feed to the Stage 2 Sludge Holding Tank (TK-2020) will consist of sludge from the Solids Clarifier Tank (TK-2010).

The sludge is continuously pumped from the Stage 2 Sludge Holding Tank (TK-2020) to the Stage 2 Dewatering Equipment. Recovered filtrate from dewatering equipment is then sent to the Stage 2 Sludge Filtrate Sump (SP-2030) for temporary storage before it is recycled to the Grit Clarifier (TK-1055A) to be retreated. The dewatered cake will be transferred to an appropriate landfill for disposal (DISP1).

Thermal Feed Tank

The Thermal Feed Tank (TK-2040) will operate in an identical manner as described above under the original pre-treatment scheme.

Thermal Process System

Thermal Feed brine is pumped from the Crystallizer Feed Tank (TK-2040) into the thermal system. Steam from two (2) natural gas-fired boilers (H-2185A and H-2185B) provides the energy to drive the thermal process.

A small amount of steam is passed through the Deaerator (E-2076) counter-current to the feed brine. The vent from the Deaerator (E-2076) will include components such as ammonia and volatile organics which are sent to the thermal oxidizer (U-1080). Deaerator brine from the Deaerator is temporarily stored in the Process Distillate Level Tank (TK-2120).

Slurry from the thermal process is pumped to the dewatering building where solids are removed for disposal (DISP2). Centrate from the dewatering process is returned to the thermal process after temporary storage in the Disposal Centrate Tanks (TK-2160 and TK-2460).

The vast majority of the water that enters the system leaves as clean, recovered distillate. Condensed vapors from the thermal system flow by gravity to a Barometric Condenser Hot Well (TK-2130) before being transferred to the Recovered Water Tank (TK-2140). Vapors from the Recovered Water Tank (TK-2140) are sent to the Thermal Oxidizer (U-1080). Most often, this distillate is planned to be reused in future oil and gas operations. If distillate production exceeds the need for recycled fracing water, the balance of the distillate stream may be discharged to a surface water source, but only if the chemical makeup of that distillate complies with strict water quality standards designated by appropriate government permits. This water treatment facility has been designed to meet those anticipated discharge water quality requirements.

Condensate from the Thermal System is collected in a Steam Condensate Flash Tank (TK-2085) before being transferred to a Condensate Treatment System and then collected in a Boiler Feedwater Tank (TK-2180). The condensate leaves the Boiler Feedwater Tank (TK-2180) and is pumped to the Boiler Deaerator Tank (TK-2315) prior to feeding the Boiler System. Blowdown from the Boiler System is collected in the Boiler Blowdown Flash Tank (TK-2450) and recycled into the process. The Condensate Treatment Process includes an ion exchange system that needs to be regenerated with brine. The brine will be stored in the Brine Maker (TK-2149) until it is required for regeneration.

Cooling water is required for various uses. Plant service water is used as make-up water to the cooling tower (CT-2335); this water is treated distillate, so it is of high quality. Blowdown from the tower will be released based on cooling water conductivity.

A cooling tower treatment package is included to satisfy regulatory requirements associated with the operation of the tower. One or more biocides will be added to control biological activity and to control health risks.

In the event that chemical cleaning is required in the Thermal System, the CIP Tank (TK-2320) will be used to store the cleaning solution that will be fed to the Thermal System.

Post-Treatment

From the Thermal System, distillate will flow to the Recovered Water Tank (TK-2140), which will be covered and vented with all off-gas being routed to the Thermal Oxidizer (U-1080). Distillate will then flow to Post Treatment Tank 1 (TK-2500) followed by Post Treatment Tanks 2 and 3 (TK-2550 and TK-2555). This is where the distillate will be post-treated for reduction of ammonia and benzene in order to achieve a water quality that is suitable for discharge to the environment. The treated water will then flow into the Post Treatment Clarifier (CF-2510) and the Post Treatment Effluent Tank (TK-2515), through one final post treatment process, and finally to the Product Water Storage Tank (TK-2545) before leaving site as qualifying effluent. Any sludge generated in the post treatment process will be sent to the Post Treatment Sludge Tank (TK-2520) and ultimately the same dewatering system as the pretreatment sludge by being returned to the Grit Clarifier in the pretreatment process.

During initial commissioning, a Breakpoint Chlorination Frac Tank (TK-2800) will be utilized to temporarily treat the distillate water for ammonia reduction.

Chemical Storage

Throughout the process flow, a number of chemicals will be stored and pumped throughout the site to assist in water treatment. These chemical material safety data sheets have been included in Attachment H of this application. Below is a tabled reference to all of the small storage bins and tanks that hold these chemicals. Some of these storage vessels hold inorganic materials or solids therefore have no resulting emissions. Please see the Emissions Summary in Attachment N for a full explanation for each vessel.

Ferric Chloride Storage Tank (TK-4000)	Sodium Bicarbonate Silo (TK-4012)	Caustic Bulk Storage Tank (TK-4020)
Hydrogen Peroxide Bulk Tank (TK-4025)	Sodium Sulfate Silo (TK-4036)	Sodium Sulfate Day Tank (TK-4039)
Lime Silos A/B (TK-4046A/B)	Lime Slurry Tanks A&B (TK-4049A/B)	Polymer Totes (TK-4054, TK-4057, TK-4120, TK-4155, and TK-4310)
Urea Tote (TK-4065)	Sodium Bisulfite Bulk Tank (TK-4080)	Methanol Bulk Storage Tank (TK-4115)
Phosphoric Acid Tote (TK-4125)	Micronutrient Tote (TK-4150)	Sodium Hypochlorite Tote (TK-4185)
Hydrex 2252 Tote (TK-4190)	Calcium Chloride Bulk Tank (TK-4200)	Hydrex 2233 Tote (TK-4210)
Hydrex 1425 Tote (TK-4220)	Hydrex 1317 Tote (TK-4230)	Hydrex 1565 Tote (TK-4240)
Hydrex 1605 Tote (TK-4250)	Demulsifier Tote (TK-4260)	Calcium Carbonate Silo (TK-4301)
Actiflo Polymer System Aging Tank (TK-4170)	Antiscalant Tote (TK-4255)	Liquid Carbon Dioxide Tank (TK-4075)
Breakpoint Chlorination System Sodium Hypochlorite Bulk Tank (TK-4500)	Antifoam Tote (TK-4015)	Crystallizer Antifoam Tote (TK-4270)
Sodium Bicarbonate Day Tank (TK-4017)		

Fuel Conditioning Skid

An offsite fuel conditioning skid will be used to condition the fuel gas that will be used at the Clearwater Facility. This skid will contain two (2) - 2.4 MMBtu/hr heaters (HTFUEL1 and HTFUEL2), and a pig receiver (VENT1). Other equipment located at the skid, such as a 500 gallon dry gas tank (TK-SLOP), an inlet separator, scrubber, and pressure vessel, will be in a

closed loop and will not produce any emissions. The gas stream coming into the fuel conditioning skid will contain liquids to be separated out. The gas stream will enter a pressurized gunbarrel (TK-GB) tank. The flash gas from the gunbarrel tank will be used as fuel gas in a closed loop system, and the liquids from the pressurized gunbarrel tank will be loaded at approximately 40 psig into pressurized trucks from the fuel conditioning skid (LD-GB).

Other Support Equipment

An emergency generator (GEN-1) is located at the Facility and will be used to shut down the Facility in case of emergency. This generator will not supply long term backup power. An emergency flare (U-1090) located at the Facility will be used to treat the gas blanket (waste gas header) bleed stream when the thermal oxidizer is down for maintenance. Lastly, a fire water pump engine (ENG-2) will provide fire water to the cooling tower only in case of emergency.

Attachment H.
Material Safety Data Sheets

Note: The MSDS included in this attachment is representative and may not reflect the selected chemical supplier as the exact supplier is not known at this time.

Material Safety Data Sheet

Section 1 - Product Identification and Use

Product Identifier: **GRANULAR ACTIVATED CARBON (GAC)**

Description: Black granule, pellet or powder, activated carbon

Product Use: Water filtration & treatment/air treatment

Manufacturer's Name:
PICA USA Inc.
432 McCormick Boulevard
Columbus, Ohio 43213-1585
Phone: [614] 864-8100
Emergency Phone: [800] 424-9300

Supplier's Name:
AWI (Anthratech Western Inc.)
4450 – 46 Avenue, SE
Calgary, Alberta T2B 3N7
Emergency Phone: [403] 255-7377

* Activated Carbon is manufactured by PICA USA Inc. and is distributed by AWI.

Section 2 - Hazardous Ingredients

This material is composed of 100% activated carbon. Caution should be taken not to inhale dust.

CARBON:	LD50-Oral:	N/A	C.A.S. #:	7440-44-0
	LC50:	N/A	Range % (w/w):	90-100
	LD50-Dermal:	N/A	T.L.V.:	3.5 mg/cu.m

Section 3 - Physical Data

Boiling Point:	N/A	Incompatibility:	Avoid contact with strong oxidizers
Solubility in Water:	Not soluble	Flash Point:	N/A
Specific Gravity:	0.30 - 0.50 @ 25 °C	Stability:	Stable
Melting Point:	3500 °C	pH:	8-10, 10% suspension in water
Appearance and Odour:	Odourless black solid, flake, granule or pellet, no odour		

Section 4 - Fire and Explosion Data

Flash Point:	N/A	Extinguishing Media:	Water, foam, CO_2 , or dry chemical
Upper Flammable Limit:	N/A	Lower Flammable Limit:	N/A

General Fire Hazards: When exposed to air activated carbon can be a potential fire hazard because of its very high surface area and absorptive capacity. Accumulation of airborne dusts may present an explosion or fire hazard in the presence of an ignition source.

Hazardous Combustion Products: Upon combustion, this product may emit carbon monoxide, carbon dioxide and/or low molecular weight hydrocarbons. Other materials absorbed onto the carbon may also be released during combustion.

Section 5 - Reactivity Data

Stability:	Stable
Incompatibility:	Oxidizers, nitric acid, hydrogen, peroxide, metals, oxosalts, potassium, nitric acid, sodium sulphide, halogens, oxygen, ozone bromates, chlorates, iodates and nitrates.
Hazardous Polymerization:	Will not occur
Hazardous Decomposition:	Normal combustion

Section 6 - Toxicological Properties

Potential Health Effects:

Eye Contact:	Contact may produce mechanical eye irritation.
Skin Contact:	Skin irritation would not be expected from single short term exposure to this product. Prolonged or repeated contact may produce some irritation.
Ingestion:	Ingestion of this product may cause gastrointestinal irritation, nausea, vomiting and constipation. Small amounts of this product in solution, if aspirated into lungs, may cause mild to severe pulmonary injury, possibly death.
Inhalation:	Chronic inhalation may produce carbon deposition in the lungs. Oral LD50 rats: >5g/kg.

No carcinogenicity data available for this product.

Section 7 - Preventative Measures

Spilled or released material may be swept up and discarded or repackaged

Waste Disposal:	Non toxic. Dispose of in accordance with all federal, provincial and local regulations.
Handling/Storage:	Provide adequate ventilation. Store away from heat, ignition sources, combustible materials and incompatible materials.

CAUTION! Wet activated carbon removes oxygen from the air causing a severe hazard to workers in confined spaces. Sampling and work procedures for low oxygen levels should be taken whenever workers may be entering carbon vessels, enclosed, or confined spaces. All federal, provincial, and local regulations should be observed.

Respiratory:	Wear approved dust and mist respirator NIOSH/OHSA
Eyes:	Approved safety glasses with side shields must be worn at all times.
Gloves:	(protective) None required
Ventilation:	Local exhaust
Clothing:	Proper work clothing to be worn to prevent skin contact
Hygiene:	Maintain clean environment

Section 8 - First Aid Measures

Eyes:	Immediately flush eyes with plenty of water for at least 15 minutes. Seek medical attention if irritation persists.
Skin:	Wash with soap and large amounts of water. If irritation persists, seek medical attention.
Ingestion:	If material is swallowed, get immediate medical attention or advice – DO NOT induce vomiting unless instructed to do so by medical personnel.
Inhalation:	Remove source of contamination or move victim to fresh air. Seek medical attention if irritation persists.

Section 9 - Preparation of Date of MSDS

Prepared by:	Kellsie Donaldson (Safety Officer) AWI, 4450 – 46 Ave SE; Calgary, AB T2B 3N7
Telephone Number:	[403] 255- 7377
Date Prepared:	January 13, 2010

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]
GEN-1	1E	Emergency Generator	2016	2,923 hp	NA	NA
H-2185A	2E	Boiler #1	2016	275.3 MMBtu/hr	NA	NA
H-2185B	3E	Boiler #2	2016	275.3 MMBtu/hr	NA	NA
U-1080	4E	Thermal Oxidizer	2016	11 MMBtu/hr	NA	1C
TK-1055A	4E	Grit Clarifier Tank	2016	562,000 gal	NA	1C
TK-1055B	4E	Stage 1 Clarifier Tank	2016	562,000 gal	NA	1C
TK-1060A	4E	Clarifier Pump Tank A	2016	23,000 gal	NA	1C
TK-1060B	4E	Clarifier Pump Tank B	2016	23,000 gal	NA	1C
TK-1065	4E	Oil Collection Tank	2016	13,500 gal	NA	1C
TK-1070	4E	Equalization Tank	2016	1,030,000 gal	NA	1C
TK-2010	4E	Solids Clarifier Tank	2016	435,000 gal	NA	1C
TK-2015	4E	Clarifier Effluent Tank	2016	12,000 gal	NA	1C
TK-2020	4E	Stage 2 Sludge Holding Tank	2016	103,000 gal	NA	1C
TK-2040	4E	Thermal Feed Tank	2016	1,400,000 gal	NA	1C
TK-2140	4E	Recovered Water Tank	2016	230,000 gal	NA	1C
E-2076	4E	Deaerator Vent Condenser	2016	1,121 lb/hr flow	NA	1C
TK-1120	4E	Stage 1 Sludge Holding Tank	2016	27,000 gal	NA	1C
TK-1105A	4E	Stage 1 Reaction Tank A	2016	32,000 gal	NA	1C
TK-1105B	4E	Stage 1 Reaction Tank B	2016	32,000 gal	NA	1C
TK-1115	4E	Stage 1 Clarifier Pump Tank	2016	18,000 gal	NA	1C
TK-1130	4E	Stage 1 Filtrate Tank	2016	1,700 gal	Modified	2C
TK-2120	20E	Process Distillate Level Tank	2015	5,575 gal	NA	NA
TK-2500	21E	Post Treatment Tank 1	2015	770,000 gal	NA	NA
TK-2550	22E	Post Treatment Tank 2	2015	770,000 gal	NA	NA

TK-2555	23E	Post Treatment Tank 3	2015	406,100 gal	NA	NA
TK-2515	24E	Post Treatment Effluent Tank	2015	12,000 gal	NA	NA
TK-2520	25E	Post Treatment Sludge Tank	2015	1,270 gal	NA	NA
TK-4115	26E	Methanol Bulk Storage Tank	2016	8,000 gal	NA	NA
CT-2335	28E	Cooling Tower Basin	2015	34,500 gpm	NA	NA
U-1090	29E	Emergency Flare	2016	2.2 MMBtu/hr	NA	2C
ENG-2	30E	Fire Water Pump Engine	2016	136 hp	NA	NA
HTFUEL1	31E	Fuel Skid Heater 1	2016	2.4 MMBtu/hr	NA	NA
HTFUEL2	32E	Fuel Skid Heater 2	2016	2.4 MMBtu/hr	NA	NA
U-1130	33E	Carbon Canister	2017	20 cfm	New	2C

[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	GEN-1	Emergency Generator			Emergency use	500	NOx CO VOC PM10 SO2 Total HAPs CO2e	25.78 16.83 2.69 0.96 0.033 0.03 3598	6.44 4.21 0.67 0.24 0.0083 0.0075 899.5	25.78 16.83 2.69 0.96 0.033 0.03 3598	6.44 4.21 0.67 0.24 0.0083 0.0075 899.5	Gas/Vapor	EE	
2E and 3E	Upward vertical stacks	H-2185A and H-2185B	Boiler 1 and 2			C	8,760 each	NOx CO VOC PM10 SO2 Total HAPs CO2e	20.05 20.34 2.20 5.51 0.32 1.02 64631	78.42 79.57 8.61 21.54 1.27 3.97 252786	20.05 20.34 2.20 5.51 0.32 1.02 64631	78.42 79.57 8.61 21.54 1.27 3.97 252786	Gas/Vapor	EE	
4E	Upward vertical stack	U-1080 (TK-1055A/B, TK-1060A/B, TK-1070 TK-1105A/B, TK-1115 TK-2010, TK-2015, TK-2040, TK-1065 TK-1120, TK-2020, TK-2140, E-2076)	Thermal oxidizer	1C	Thermal oxidizer	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Ammonia CO2e	--- --- 220.21 --- --- 0.47 57.63 167.57	--- --- 777.53 --- --- 1.33 243.84 274.04	1.08 0.93 4.40 1.3e-4 1.1e-5 9.4e-3 1.15 1461	4.74 4.08 15.55 5.9e-4 4.6e-5 2.7e-2 4.88 5939	Gas/Vapor	EE	

20E	Upward vertical stack	TK-2120	Process Distillate Level Tank			C	8,760	Ammonia	0.29	1.18	0.29	1.18	Gas/Vapor	EE	
21E	Open Top tank	TK-2500	Post Treatment Tank 1			C	8,760	VOC Total HAPs Ammonia	1.18 0.012 1.96	4.74 0.049 7.87	1.18 0.012 1.96	4.74 0.049 7.87	Gas/Vapor	EE	
22E	Open Top tank	TK-2550	Post Treatment Tank 2			C	8,760	CO2e	60.18	239.62	60.18	239.62	Gas/Vapor	EE	
23E	Open Top tank	TK-2555	Post Treatment Tank 3			C	8,760	CO2e	60.18	239.62	60.18	239.62	Gas/Vapor	EE	
24E	Upward vertical stack	TK-2515	Post Treatment Effluent Tank			C	8,760	VOC Total HAPs Ammonia CO2e	0.77 0.0005 0.0014 0.95	3.10 0.0021 0.0057 3.81	0.77 0.0005 0.0014 0.95	3.10 0.0021 0.0057 3.81	Gas/Vapor	EE	
25E	Open Top tank	TK-2520	Post Treatment Sludge Tank			C	8,760	VOC Total HAPs Ammonia CO2e	0.015 5.0E-5 0.0009 0.027	0.064 0.00023 0.0039 0.12	0.015 5.0E-5 0.0009 0.027	0.064 0.00023 0.0039 0.12	Gas/Vapor	EE	
26E	Upward vertical stack	TK-4115	Methanol Bulk Storage Tank			C	8,760	VOC Total HAPs	0.067 0.067	0.25 0.25	0.067 0.067	0.25 0.25	Gas/Vapor	EE	
28E	Upward vertical stack	CT-2335	Cooling Tower Basin			C	8,760	PM10 PM2.5	0.94 0.94	4.12 4.12	0.94 0.94	4.12 4.12	Gas/Vapor	EE	

29E	Upward vertical stack	U-1090	Emergency Flare			Emergency use	120 (pilot 8760)	NOx CO VOC PM10 SO2 Total HAPs CO2e	--- --- --- --- --- --- ---	--- --- --- --- --- --- ---	0.16 0.69 4.0e-4 5.5e-4 4.4e-5 1.4e-4 12.3	0.041 0.068 1.7e-3 2.4e-3 1.9e-4 6.0-4 53.75	Gas/Vapor	EE	
30E	Upward vertical stack	ENG-2	Fire Water Pump Engine			Emergency use	500	NOx CO VOC PM10 SO2 Total HAPs CO2e	0.85 1.11 0.045 0.066 0.27 0.0035 155	0.21 0.28 0.011 0.016 0.069 0.0009 38.75	0.85 1.11 0.045 0.066 0.27 0.004 155	0.21 0.28 0.011 0.016 0.069 0.0009 38.75	Gas/Vapor	EE	
31E	Upward vertical stack	HTFUEL1	Fuel Skid Heater 1			C	8,760	NOx CO VOC PM10 SO2 Total HAPs CO2e	0.24 0.20 0.013 0.018 0.0014 0.0044 140.86	1.03 0.87 0.057 0.078 0.0062 0.019 616.97	0.24 0.20 0.013 0.018 0.0014 0.0044 140.9	1.03 0.87 0.057 0.078 0.0062 0.019 616.97	Gas/Vapor	EE	
32E	Upward vertical stack	HTFUEL2	Fuel Skid Heater 2			C	8,760	NOx CO VOC PM10 SO2 Total HAPs CO2e	0.24 0.20 0.013 0.018 0.0014 0.0044 140.86	1.03 0.87 0.057 0.078 0.0062 0.019 616.97	0.24 0.20 0.013 0.018 0.0014 0.0044 140.9	1.03 0.87 0.057 0.078 0.0062 0.019 616.97	Gas/Vapor	EE	
33E	Upward vertical stack	U-1130 (TK-1130)	Carbon Canister	2C	Carbon Canister	C	8760	VOC Total HAPs Ammonia CO2e	0.43 0.0018 0.044 0.11	1.67 0.0072 0.19 0.36	0.009 3.7e-5 0.044 0.11	0.033 1.4e-4 0.19 0.36	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	1.17	979	19209	149 dual exhaust	1029	17	TBD	TBD
2E	5.5	322	68799	48	1029	50	4346.745	509.333
3E	5.5	322	68799	48	1029	50	4346.753	509.333
4E	2.7	872	9727	28.3	1029	63.5	4346.718	509.276
20E	0.17	144	unknown	unknown	1029	10	4346.742	509.318
21E	Open tanks	80-90	unknown	unknown	1029	N/A	4346.701	509.324
22E	Open tanks	80-90	unknown	unknown	1029	N/A	4346.701	509.301
23E	Open tanks	80-90	unknown	unknown	1029	N/A	4346.719	509.312
24E	0.17	80-90	unknown	unknown	1029	0.17	4346.715	509.341
25E	Open tank	80-90	unknown	unknown	1029	N/A	4346.715	509.337
26E	0.17	atmospheric	unknown	unknown	1029	10	4346.658	509.349
28E	unknown	unknown	unknown	unknown	1029	38.84	4346.788	509.340
29E	1	unknown	unknown	unknown	1029	60	4346.718	509.276
30E	unknown	unknown	unknown	unknown	1029	TBD	4346.816	509.344
31E	1.25	300	unknown	unknown	1029	18	TBD	TBD
32E	1.25	300	unknown	unknown	1029	18	TBD	TBD
33E	0.16	80	20	16.6	1029	11	4346.705	509.238

[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						
Paved Haul Roads (PROAD)	PM-10 PM-2.5	1.41 0.35	5.55 1.36	1.41 0.35	5.55 1.36	EE
Storage Pile Emissions						
Loading/Unloading Operations (P-1051, OILLOAD, LD-GB)	VOCs Total HAPs CO2e	77.83 0.68 52,409	64.51 0.51 47,822	37.21 0.41 16,459	27.33 0.26 15,018	EE
Wastewater Treatment Evaporation & Operations (DISP1, DISP2,and DISP3)	VOCs Total HAPs CO2e NH3	4.66 0.00077 0.0073 0.071	20.39 0.0034 0.032 0.31	4.66 0.00077 0.0073 0.071	20.39 0.0034 0.032 0.31	MB
Equipment Leaks						
General Clean-up VOC Emissions						
Other - Venting from Pigging Operations (VENT1)	VOCs Total HAPs CO2e	7.53 0.18 710.3	0.20 0.0047 18.47	7.53 0.18 710.3	0.20 0.0047 18.47	EE
Other all Transfer Points (TK-4036, U-4037, U-4038, TK-4046A/B, U-4047A/B, U-4048A/B, TK-4012, U-4012, U-4013, TK-4301, U-4302, U-4303)	PM-10 PM-2.5	2.65 0.75	5.64 1.59	2.65 0.75	5.64 1.59	EE

[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

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 Pre-Treatment	2. Tank Name Stage 1 Filtrate Tank
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) TK-1130	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 33E
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) Tank off gas no longer goes to the thermal oxidizer due to safety concerns and now goes to a carbon canister	
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. 1,700 gallons	
9A. Tank Internal Diameter (ft) 6	9B. Tank Internal Height (or Length) (ft) 8
10A. Maximum Liquid Height (ft) 5	10B. Average Liquid Height (ft) 5
11A. Maximum Vapor Space Height (ft) 3	11B. Average Vapor Space Height (ft) 3
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights. 1,000 gallons	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
12,088,800	144,000

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume)
12089

15. Maximum tank fill rate (gal/min) 100

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 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): atmospheric

24. Complete the following section for **Vertical Fixed Roof Tanks** ☐ Does Not Apply

24A. For dome roof, provide roof radius (ft) 3

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. Elkins, West Virginia	
28. Daily Average Ambient Temperature (°F)	49.06
29. Annual Average Maximum Temperature (°F)	61.15
30. Annual Average Minimum Temperature (°F)	36.97
31. Average Wind Speed (miles/hr)	6.17
32. Annual Average Solar Insulation Factor (BTU/(ft^2·day))	1,193.89
33. Atmospheric Pressure (psia)	13.73

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

34. Average daily temperature range of bulk liquid:	
34A. Minimum (°F) 40	34B. Maximum (°F) 80
35. Average operating pressure range of tank:	
35A. Minimum (psig) atmospheric	35B. Maximum (psig) atmospheric
36A. Minimum Liquid Surface Temperature (°F) 40	36B. Corresponding Vapor Pressure (psia) 0.13
37A. Average Liquid Surface Temperature (°F) 60	37B. Corresponding Vapor Pressure (psia) 0.26
38A. Maximum Liquid Surface Temperature (°F) 80	38B. Corresponding Vapor Pressure (psia) 0.51

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	Stage 1 Filtrate		
39B.	CAS Number			
39C.	Liquid Density (lb/gal)	8.34		
39D.	Liquid Molecular Weight (lb/lb-mole)	~18		
39E.	Vapor Molecular Weight (lb/lb-mole)	~18		

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

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): Carbon Canister

[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]
VOCs				66.99	O, WATER9
Ammonia				378	
Benzene				0.29	
Ethylbenzene				----	
Toluene				----	
Xylenes				----	
Carbon dioxide				728	

[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.

Pressurized Truck Loading

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*): LD-GB	
1. Loading Area Name: Pressurized loading at the fuel skid from the gunbarrel	
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:	1
Number of liquids loaded:	1 – condensate/water
Maximum number of marine vessels, tank trucks, tank cars, and/or drums loading at one time	One
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	24	24	24	24
days/week	7	7	7	7
weeks/quarter	all	all	all	all

8. Bulk Liquid Data *(add pages as necessary):*							
Pump ID No.		N/A					
Liquid Name		condensate					
Max. daily throughput (1000 gal/day)		21					
Max. annual throughput (1000 gal/yr)		7665					
Loading Method [1]		pressurized					
Max. Fill Rate (gal/min)		TBD					
Average Fill Time (min/loading)		TBD					
Max. Bulk Liquid Temperature (°F)		80					
True Vapor Pressure [2]		~12					
Cargo Vessel Condition [3]		U					
Control Equipment or Method [4]		None					
Minimum control efficiency (%)		0					
Maximum Emission Rate	Loading (lb/hr)	1.92					
	Annual (lb/yr)	3,500					
Estimation Method [5]		MB					

[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

Attachment M.
Air Pollution Control Device Sheets

Carbon Canister

Attachment M
Air Pollution Control Device Sheet
(ADSORPTION SYSTEM)

Control Device ID No. (must match Emission Units Table): 2C (33E)

Equipment Information

1. Name of Control Device: Carbon Canister (U-1130)	2. Manufacturer: Carbonair Model No. GPC3
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.	

Gas Stream Characteristics

4. Gas Flow Rate into the Collector:
   ACFM 20 @ 80 °F
   Relative Humidity 100% PSIA

5. Emission Rate of each Pollutant (Specify) into and out of Collector:

	IN			OUT		
Pollutant	**lb/hr**	**grains/acf**	**ppm (volume)**	**lb/hr**	**grains/acf**	**ppm (volume)**
A VOC	0.43			0.0086		
B HAPs	0.0018			0.000037		
C						
D						
E						

6. LEL (lower explosive limit) for most volatile pollutant: Pollutant PPM

7. List vapor pressure (mmHg) at the operating temperature for each pollutant in inlet stream:

	Pollutant	**Temp**	**MmHg**
A			
B			
C			
D			
E			

Adsorbent Characteristics

8. Adsorbent: Type: Granular activated carbon Manufacturer: TBD Grade No.: Specifications:	9. Maximum adsorbate loading: lb pollutant/lb of adsorbent
10. Pressure drop across unit: 1 (in inches of water)	11. Number of beds per unit: 1
12. Weight of adsorbent material per bed: 200 lb	13. Adsorbent media average particle size: microns
14. Adsorber geometry: Length: N/A ft Diameter: ft Bed Depth: ft Bed Surface Area: ft^2 Bed Volume: ft^3	15. Temperature Range Adsorption: Min. Temp. °F Max. Temp. °F Average Temp. °F
16. Cycle time for adsorption: hr	17. Frequency of adsorbent replacement: every 28,816 hours or every 3.3 years yr
18. Cycle time for drying before adsorbing: hr	
19. Saturation Capacity of Pollutant on adsorbent (supply units):	
20. Length of mass transfer zone: in	

Regenerative Systems

21. Type of regeneration: ☐ Replacement ☐ Stream ☐ Other, specify:

22. Method of Regeneration:
☐ Alternate use of entire units ☐ Source shut down
☐ Alternate use of beds in a single unit ☐ Other (describe):

23. Cycle time for regeneration: hr

24. Emission steam velocity through bed: ft/min

25. Steam flow rate: lb/min
Steam temp.: °F
Steam pressure: PSIA

26. Disposition of vapors during regeneration:

27. Guaranteed minimum efficiency per pollutant captured:

	Captured Pollutant	Minimum Efficiency
A		%
B		%
C		%
D		%

28. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):

29. Describe the collection material disposal system:

30. Have you included ***Adsorption Control Device*** in the Emissions Points Data Summary Sheet?

31. **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.

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

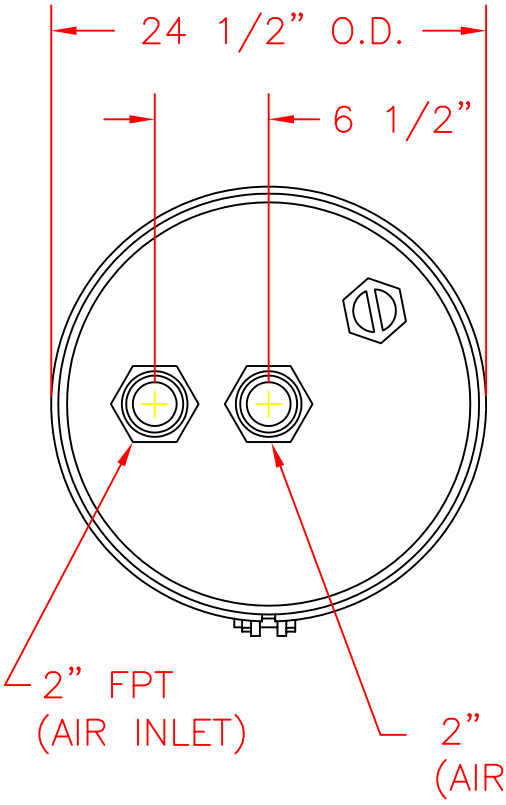
99% capture efficiency for total hydrocarbons, however 98% assumed in emissions for time when the carbon is to be replaced.

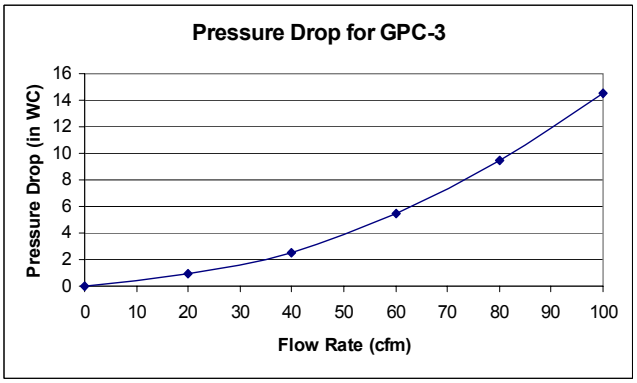
33. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

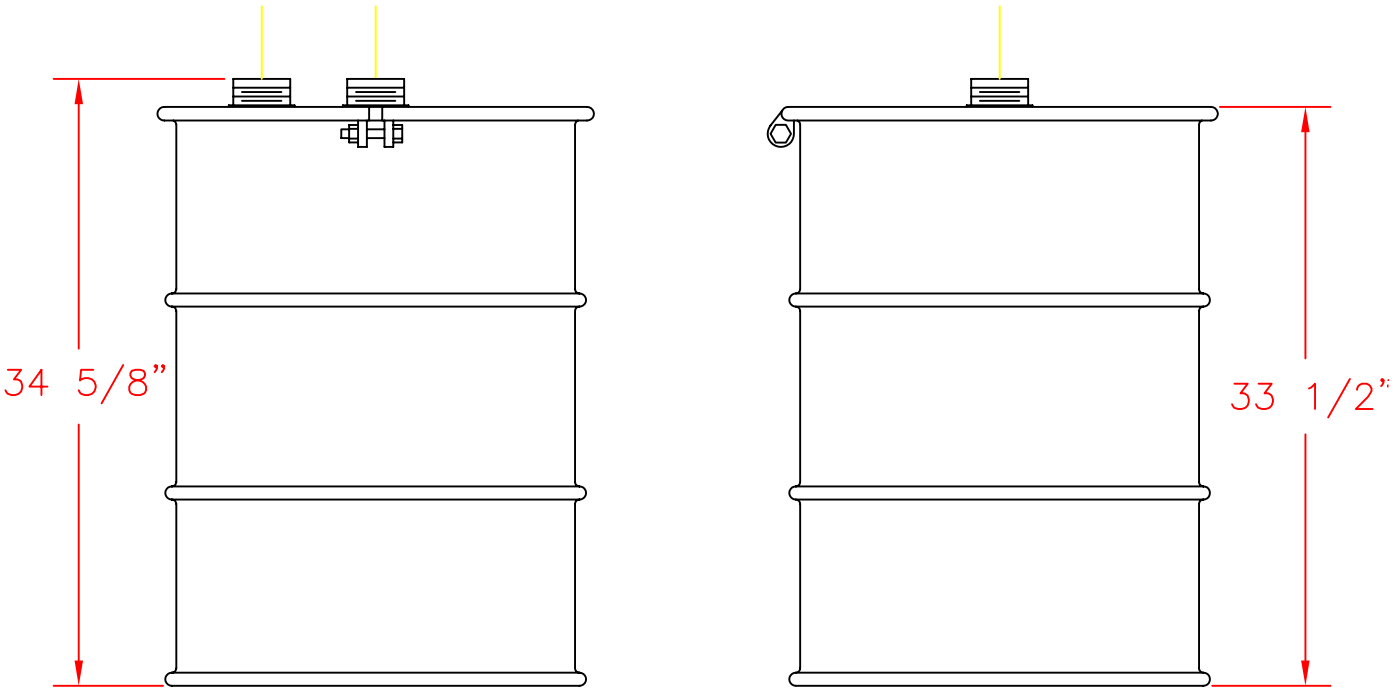
N/A

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

at 20 cfm the activated carbon will have a life of 28,816 hours. Surges of 60 cfm for 10 minutes a day will not affect carbon life.







Sales Drawing #119776
03/22/05

Call: 1.877.759.8143

Products For Sale: Vapor Phase Carbon Vessels

Carbonair's GPC Series vapor phase carbon vessels are designed to provide an efficient and economical means to reduce VOC concentrations, corrosive gases, toxic vapors, and to control odor. Carbonair's GPC Series Vapor Phase Carbon Vessels can be filled with several types of granular activated carbons and other specialty media for a variety of applications.

Carbonair's GPC Series vapor phase carbon vessels are constructed of high quality steel and treated with corrosion resistant paint inside and out. The GPC Series is designed to provide the most efficient use of the granular activated carbon in the bed and to provide the lowest pressure drop possible in order to minimize back pressure on blowers and other equipment. Some vessels use slotted plastic pipe to distribute the air flow across the carbon bed. This tends to create excessive back pressure and can cause channeling of the carbon bed, causing the waste of some of the carbon in the bed and premature breakthrough. Carbonair GPC vessels employ a carbon bed supported on a screened grate above a plenum. The air stream enters the vessel through the plenum where it is evenly distributed across the entire cross section of the carbon bed, providing the lowest pressure drop and most efficient use of the carbon. Click here for specifications for our GPC Drum Series, GPC Round Series, and GPC Series of vapor phase carbon filters.

Vapor Phase Carbon Vessel Specifications; <1000 cfm

Model	GPC 3	GPC 3H	GPC 5R	GPC 7R	GPC 13R
Dimensions	24.5″ OD x 36.5″ H	24.5″ OD x 36.5″ H	30″ OD x 5'7″ H	3'2″ OD x 7′ H	4′ OD x 7′ H
Bed Area (Square Feet)	2.7	2.7	4.91	7.07	12.57<
Nominal Flow Rate (cfm)	100	270	400	500	800
Carbon Capacity (pounds)	200	180	500	1,000	1,500
Fittings	2″ NPT	4″ NPT	4-1/2″ nozzle	6-5/8″ nozzle	8-5/8″ nozzle
Empty Weight (pounds)	65	65	550	790	1,090
Operating Weight (pounds)	265	265	1,050	1,790	2,590<

Vapor Phase Carbon Vessel Specifications; >1000 cfm

Model	GPC 20R	GPC 28R	GPC 50R	GPC 70	GPC 120

Dimensions	5′ OD x 7′ H	6′ OD x 7’3″ H	8′ OD x 7′ H	16′ L x 5′ W x 8’6″ H	16’6″ L x 8′ W x 8’6″ H
Bed Area (Square Feet)	19.63	28.30	50.27	69.80	120.00
Nominal Flow Rate (cfm)	2,000	2,500	4,000	7,000	12,000
Carbon Capacity (pounds)	2,000	3,000	5,000	10,000	13,500
Fittings	8-5/8″ nozzle	8-5/8″ nozzle	12-3/4″ nozzle	12-3/4″ nozzle	12-3/4″ nozzle
Empty Weight (pounds)	1,425	1,795	3,970	5,850	9,250
Operating Weight (pounds)	3,425	4,795	8,970	15,850	22,750

Applications

We offer full service application support, from equipment sizing, carbon usage modeling, activated carbon analysis, on-site carbon change-out, filter exchange and spent carbon recycling. Typical applications include:

- VOC control from SVE systems and air strippers
- NESHAPS emissions control
- Wastewater, product storage tank and similar vents
- Odor and H2S control

Standard Features

- Galvanized steel drum (GPC 3, 3H)
- Two 4″ PVC connections (GPC 3, 3H)
- Baked enamel exterior (GPC 3, 3H)
- PVC internals (GPC 3, 3H)
- Welded steel construction.
- Forkliftable tubes
- Epoxy coated interior & exterior
- One condensation drain
- FRP grate with screen
- Nozzle connections

Optional Components

- Blowers Humidity control
- Influent/effluent ducting
- Discharge stack
- Additional sampling ports and valves
- Vapor monitors

More Products:

STAT Low Profile Air Strippers for Rent
STAT Low Profile Air Strippers for Sale
Liquid Phase Carbon Vessels for Rent
Liquid Phase Carbon Vessels for Sale
Liquid Phase Carbon and Specialty Media
Vapor Phase Carbon Vessels for Rent
Vapor Phase Carbon and Specialty Media

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www.carbonair.com | sales@carbonair.com

Customer: Water Technologies
Site: Tank Venting – **(Application # 2)**

Design Basis:

Flow rate:	20	cfm (2 hrs/day)
	60	cfm (surges 10 minutes/day)
Air temperature:	80	^{o}F (assumed)
Relative humidity:	100	% (assumed)

Contaminant	Influent Conc. (ppmv)	Influent Conc. (μg/L)
TPHg (as benzene)	0.5	1.6

Note: Conc. in μg/L = (Conc. in ppmv)(MW/22.4)(273/T)
where MW = Molecular weight (gm/mole)
T = Temperature (Kelvin)

Recommendations: Vapor Phase Carbon Adsorbers

One GPC3 drum with 200 lbs of granular activated carbon

- At 20 cfm, the carbon usage rate is predicted to be 0.179 lbs/24 hrs (0.00746 lbs/hr) (see the modeling output below).
- The GPC3 drum is predicted to last 28,816 hrs of continuous operation or 13,407 days of 2 hrs/day operation at 20 cfm.
- The effect of surges at 60 cfm for 10 min/day is believed to have a minimal effect on the carbon bed lfie.

VAPOR-PHASE CARBON MODEL CALCULATIONS
VERSION 1.2

CARBONAIR ENVIRONMENTAL SYSTEMS
1480 COUNTY ROAD C WEST
ROSEVILLE, MN 55113
PHONE: 800-526-4999
FAX: 651-202-2985

DESIGN COMPOUD:	TPH AS GASOLINE
EXPECTED CONC. (UG/L):	1.600
MODEL CONC. (UG/L):	1.600
TEMPERATURE (F):	90.000
RELATIVE HUMIDITY (%):	50.000
OPERATING PRESS (MM MERCURY):	760.000
MOLECULAR WEIGHT (GM/MOLE):	78.000
VAPOR PRESS (MM MERCURY):	131.580
COMPOUND DENSITY (GM/ML):	0.880
SOLUBILITY LIMIT (PPM):	1780.000
K VALUE (LIQUID)(UMOLE/GM)(L/UMOLE)**1/N:	61.000
1/N VALUE (LIQUID)(DIMENSIONLESS):	0.470
K VALUE (VAPOR)(UMOLE/GM)(L/UMOLE)**1/N:	1049.601
1/N VALUE (VAPOR)(DIMENSIONLESS):	0.423
CARBON ADSORPTIVE CAPACITY (%):	1.603
AIR FLOW RATE (CFM):	20.000
CARBON USAGE (LBS/DAY):	0.179

Note: The model concentration results from the impact of the other background compounds, which is determined by using a competitive adsorption model.

UG = microgram, UMOLE = micromole

DISCLAIMER: ACTUAL RESULTS MAY VARY SIGNIFICANTLY FROM THE MODEL. THE MODEL IS BASED ON THE ASSUMPTIONS THAT THE FLOW RATE AND INFLUENT CONCENTRATION ARE CONSTANT, AND ONLY THE CONTAMINANTS PROVIDED TO CARBONAIR ARE PRESENT IN THE AIR. VARYING OPERATING CONDITIONS CAN HAVE ADVERSE EFFECTS ON CARBON ADSORPTIVE CAPACITY. THE PREDICTED CARBON USAGE RATE IS NOT GUARANTEED.

Attachment N.
Supporting Emissions Calculations

Emission Calculations

Antero Treatment LLC - Antero Clearwater Facility
Equipment Summary and Emissions

ACCESS ROADS				
PROAD	Paved Facility Roads	AP-42 Section 13.2.1 Paved Roads, Final Section, January 2011.	Paved roads to the facility and inside facility	Not modified
TRUCK OFF-LOADING STATION				
P-1051	Influent water unloading	AP-42 Section 5.2 Equation 1	Influent water is trucked in. Effluent oil is piped. Effluent water is piped and is treated.	Not modified
TRUCK OIL LOADING STATION				
OILLOAD	Oil Offloading	AP-42 Section 5.2 Equation 1	Oil from TK-1065 is trucked out of the facility	Not modified
PRE-TREATMENT				
TK-1055A	Grit Clarifier Tank	WATER9 program. Material Balance Stream 102 as influent water.	Covered and controlled by thermal oxidizer. 75' D x 17' H - 560,000 gallons working volume	Not modified
TK-1055B	Stage 1 Clarifier Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 75' D x 17' H - 560,000 gallons working volume	Not modified
TK-1060A/TK-1060B	Clarifier Pump Tank A and B	WATER9 program.	Covered and controlled by thermal oxidizer. 14' D x 20' H - 21,000 gallons working volume	Not modified
TK-1070	Equalization Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 56' D x 56' H - 900,000 gallons working volume	Not modified
TK-1065	Oil Collection Tank	TANKS 4.0.9d. Assume all crude to be conservative.	Covered and controlled by thermal oxidizer. 12' D x 16' H - 12,000 gallons working volume	Not modified
TK-2010	Solids Clarifier Tank	WATER9 program. Solids recycle added in.	Covered and controlled by thermal oxidizer. 66' D x 17' H 385,000 gallons working volume	Not modified
TK-2015	Clarifier Effluent Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 12' D x 14' H - 10,000 gallons working volume	Not modified
TK-2040	Thermal Feed Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 62' D x 62' H - 1,240,000 gallons working volume	Not modified
TK-1120	Stage 1 Sludge Holding Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 14' D x 24' H - 20,000 gallons working volume. Mixed Tank.	Not modified
TK-1105A/TK-1105B	Stage 1 Reaction Tanks	WATER9 program. Solids recycle added in.	Covered and controlled by thermal oxidizer. 14' D x 28' H - 30,000 gallons working volume. Mixed Tank.	Not modified
TK-1115	Stage 1 Clarifier Pump Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 14' D x 15.5' H - 10,000 gallons working volume.	Not modified
TK-1130	Stage 1 Filtrate Tank	WATER9 program.	Covered and controlled by carbon canister. 6' D x 8' H - 1,000 gallons working volume. Mixed Tank.	Modified to be removed from thermal oxidizer and carbon canister added
TK-2020	Stage 2 Sludge Holding Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 26' D x 26' H - 90,000 gallons working volume. Mixed Tank	Not modified
	Stage 1 Sludge Dewatering	No emissions from the enclosed dewatering system. Emissions are calculated upon disposal however.		Not modified
	Stage 2 Sludge Dewatering	No emissions from the enclosed dewatering system. Emissions are calculated upon disposal however.		Not modified
DISP1	Dewatered Stage 2 Sludge Disposal	Mass Balance of Stream 126 and assumed short term storage. 10% volatilize based on EPA-453/R-94-080A Section 9		Not modified
DISP3	Dewatered Stage 1 Sludge Disposal	Mass Balance of Stream 118 and assumed short term storage. 10% volatilize based on EPA-453/R-94-080A Section 9		Not modified

Antero Treatment LLC - Antero Clearwater Facility
Equipment Summary and Emissions

THERMAL PROCESS SYSTEM				
	Thermal System	No emissions. Steam from the boiler is used as a heat source. Also contains heat exchangers.		
TK-2320	CIP Tank	Flat cover tank. No emissions. Contains mild acid solution for descaling (dilute hydrochloric or citric)	1,950 gallons	Not modified
E-2076	Deaerator Vent Condenser	Mass Balance Stream 225	Vents to thermal oxidizer	Not modified
TK-2085	Steam Condensate Flash Tank	Incoming and outgoing streams show only water with no organics. No emissions.	4,800 gallons - non-pressurized bullet tank	Not modified
TK-2180	Boiler Feedwater Tank	Only water with no organics. No emissions.	17.5' D x 17.5' H - 54,200 gallons	Not modified
TK-2149	Brine Maker Tank	Based on surrounding material streams only water without organics. No emissions		Not modified
TK-2120	Process Distillate Level Tank	Influent - Material Balance Streams 226, 251, 261, 271. TANKS 4.0.9d	5,575 gallons - non-pressurized bullet tank	Not modified
TK-2130	Barometric Condenser Hot Well	Due to change in process, VOCs are vented prior to this tank or condensed out and vented downstream in TK-2140. No Emissions	Size is 7,580 working gallon or 18,000 gallons design and vented to atmosphere. Was 100,000 gallon tank working volume and vented to thermal oxidizer	Not modified
TK-2160	4A Disposal Centrate Tank	Updated material balance shows no VOC vapor emissions from this tank.	Covered - 7,560 gallons working volume - 10' D x 13' 9" H Mixed tank	Not modified
DISP2	Salt Disposal	Mass Balance Stream 269 and 283. Assumed 100% of GROs volatilize.	Comprised of streams 4A and 4B	Not modified
TK-2140	Recovered Water Tank	Material Balance Stream 263	230,000 gallons - Vents to thermal oxidizer	Not modified
TK-2315	Boiler Deaerator Tank	Incoming stream shows only water and no organics. No emissions -pressurized.	Bullet type tank - 15 psi - 9,942 gallons	Not modified
TK-2450	Boiler Blowdown Flash Tank	Based on influent stream to tank, only water without organics. No emissions	1,000 gallons - 7' D x 8.5' H	Not modified
TK-2460	4B Disposal Centrate Tank	Updated material balance shows no VOC vapor emissions from this tank.	7,560 gallons working volume - 10' D x 13' 9" H	Not modified
CT-2335	Cooling Tower Basin	AP-42 Chapter 13.4 and manufacturer data	Three fans	Not modified
H-2185A/B	Boiler A/B	AP-42 Chapter 1.4 and manufacturer spec sheet		Not modified
	Boiler Chemical Treatment A/B	DeMinimis Source #9 from 45CSR13 Table 45-13B - Boiler water treatment operations		Not modified
POST TREATMENT SYSTEM				
TK-2500	Post Treatment Tank 1	Material Balance Streams 402, 405. Material Balance. See notes on emission tab	Open top -726,500 gal - 64' D x 32'	Not modified
TK-2550 and TK-2555	Post Treatment Tank 2 and 3	Material Balance Stream 403. See notes on emission tab	open top - 726,500 gal - 64' D x 32'. Aerated tank open top - 363,300 gal - 48' D x 30' Aerated tank	Not modified
CF-2510	Post Treatment Clarifier	Mass Balance Streams 406. Open top tanks and mixed. See notes on emission tab		Not modified
TK-2515	Post Treatment Effulent Tank	Mass Balance Stream 407. WATER9	Closed top - 10,000 gal - 12' D x 14'	Not modified
TK-2520	Post Treatment Sludge Tank	Mass Balance Stream 408 - Mixed tank. WATER9	Open top - 750 gal - 6' D x 6'	Not modified
TK-2545	Product Water Storage Tank	DeMinimis Source #15 from 45CSR13 Table 45-13B - demineralized water tank	Covered 22' D x 24' H - 60,000 gallons	Not modified

Antero Treatment LLC - Antero Clearwater Facility
Equipment Summary and Emissions

CHEMICAL FEED				
TK-2800	Breakpoint Chlorination Frac Tank	New Tank - Mobile unit. No emissions of VOC or ammonia.	17,850 gallon tank. 43' L x 8' W x 11'9" H	Not modified
TK-4036	Sodium Sulfate Silo	AP-42 8.12 for Sodium Carbonate	90 ton - 2,200 ft^3	Not modified
U-4037/U-4038	Sodium Sulfate Bin Discharger and Feeder	AP-42 8.12 for Sodium Carbonate	200-2000 lbs/hr	Not modified
TK-4039	Sodium Sulfate Day Tank	Inorganic material and wet process - Insignificant emissions	2,200 gallons - was 1,500 gallons in previous version	Not modified
TK-4046A/TK-4046B	Lime Silo A/B	AP-42 11.17	160 ton - 9,000 ft^3	Not modified
U-4047A/U-4047B	Lime Bin Discharger A/B	AP-42 11.17	1,500 - 8,000 lb/hr	Not modified
TK-4049A/TK-4049B	Lime Slurry Tank A/B	Inorganic material and wet process - no emissions	5,000 gallons each - was 15,000 gallons in previous version	Not modified
TK-4011	Sodium Bicarbonate Silo	AP-42 8.12 for Sodium Carbonate		Not modified
U-4012/U-4013	Sodium Bicarbonate Bin Discharger and Feeder	AP-42 8.12 for Sodium Carbonate		Not modified
TK-4017	Sodium Bicarbonate Day Tank	Mixed Tank - Inorganic material and wet process - no emissions	950 gallons - was 1,000 gallons in previous version	Not modified
TK-4170	Post Treatment Polymer System Aging Tank	Insignificant emissions - Polymer contains no volatiles or other components of concern.	Closed top - 75 gallons	Not modified
U-4075	CO2 Feeder System	CO2 is pressurized and dissolved in water. No emissions from the feeder system due to pressurizing.		Not modified
TK-4000	Ferric Chloride Storage Tank	Inorganic material and wet process - Insignificant emissions	Closed top - 6,000 gallons	Not modified
TK-4020	Caustic Bulk Storage Tank	Sodium hydroxide in dilute solution - Insignificant emissions	Closed top - 7,000 gallons	Not modified
TK-4115	Methanol Bulk Storage Tank	TANKS 4.0.9	Closed top - 8,000 gallons	Not modified
TK-4025	Hydrogen Peroxide Tank	Insignificant emissions- inorganic material	6,000 gallons - was 320 gallons in previous version	Not modified
TK-4080	Sodium Bisulfite Tank	Insignificant emissions- inorganic material	5,400 gallons - was 320 gallons in previous version	Not modified
TK-4054/4057/4120 /4155	Polymer Totes	Insignificant emissions - Polymer contains no volatiles or other components of concern.	320 gallons	Not modified
TK-4015	Antifoam Tote	Insignificant emissions - Antifoam contains no volatiles or other components of concern.	320 gallons	Not modified
TK-4125	Phosphoric Acid Tote	Insignificant emissions - small tank, inogranic, stable liquid, low vapor pressure	320 gallons	Not modified
TK-4150	Micronutrient Tote	Insignificant Emissions - Micro Stimulant blend of micronutrients, trace minerals, amio acids and vitamins	320 gallons	Not modified
TK-4065	Urea Tote	Insignificant Emissions - small tank, insignificant volatility, 50/50 mix water and urea	320 gallons	Not modified
TK-4185	Sodium Hypochlorite Tote	Insignificant emissions - small tank, inorganic material, < 15% solution	320 gallons	Not modified
TK-4190	Hydrex 2252 Tote	Insignificant emissions - small tank, no constituents of concern	320 gallons	Not modified
TK-4200	Calcium Chloride Bulk Tank	Inorganic material and wet process - Insignificant emissions	6,000 gallons	Not modified

TK-4210	Hydrex 2233 Totes	Insignificant emissions - small tank, no constituents of concern	320 gallons	Not modified
TK-4220	Hydrex 1425 Totes	Insignificant emissions - small tank, no constituents of concern	320 gallons	Not modified
TK-4230	Hydrex 1317 Totes	Insignificant emissions - small tank, no constituents of concern	320 gallons	Not modified
TK-4240	Hydrex 1565 Totes	Insignificant emissions - small tank, no constituents of concern	320 gallons	Not modified
TK-4250	Hydrex 1605 Totes	Insignificant emissions - small tank, no constituents of concern	320 gallons	Not modified
TK-4260	Demulsifier Tote	Insignificant emissions - small tank, no constituents of concern	320 gallons	Not modified
TK-4270	Crystallizer Antifoam Tote	Insignificant emissions - small tank, no constituents of concern	320 gallons	Not modified
TK-4301	Calcium Carbonate Silo	AP-42 8.12 for Sodium Carbonate	36 ton - 1,200 ft^3	Not modified
TK-4309	Calcium Carbonate Hopper	AP-42 8.12 for Sodium Carbonate	25 ft^3	Not modified
TK-4310	Stage 1 Clarifier Polymer Tote	Insignificant emissions - small tank, no constituents of concern	320 gallons	Not modified
TK-4255	Antiscalant Tote	Insignificant emissions - small tank, no constituents of concern	320 gallons	Not modified
TK-4500	Breakpoint Chlorination Sodium Hypochlorite Tank	Insignificant emissions- inorganic material	4,000 gallons	Not modified
TK-6001A	Calcium Chloride Storage Tank A	Stores brine byproduct - no emissions	200 barrels - 12' D x 10' H	New Tank
TK-6001B	Calcium Chloride Storage Tank B	Stores brine byproduct - no emissions	200 barrels - 12' D x 10' H	New Tank
TK-6001C	Calcium Chloride Storage Tank C	Stores brine byproduct - no emissions	200 barrels - 12' D x 10' H	New Tank
GENERAL				
	Fugitive Component Leaks	DeMinimis emissions. Most processes are in liquid phase or have <1% VOCs. Once process is in vapor phase, volatiles and oils have been removed or get adsorbed by the solids or otherwise consumed in the		Not modified
U-1080	Thermal Oxidizer	11 MMBtu/hr	Controls gas from waste gas header	Not modified
GEN-1	Emergency Generator	EPA Tier 2 emission factors and AP-42 Section 3.3		Not modified
U-1090	Emergency Flare	Meant to handle gas blanket bleed system while thermal oxidizer is down for maintenance		Not modified
ENG-2	Fire Water Pump Engine	EPA certified. Will meet 40 CFR Part 60, Subpart IIII emission limits. AP-42 for HAPs		Not modified
VENT1	Fuel Skid Pig Venting	6" receiver expected to operate at 1100 psi with 1025 cubic foot volume at standard conditions		Not modified
TK-SLOP	Fuel Skid Slop Tank	No liquids stored in tank - just dry gas running through. No emissions as it is a closed system.	500 gallons	Not modified
HTFUEL1	Fuel Skid Heater 1	2.4 MMBtu/hr natural gas heater - AP-42 Section 1.4 Emission Factors		Not modified
HTFUEL2	Fuel Skid Heater 2	2.4 MMBtu/hr natural gas heater - AP-42 Section 1.4 Emission Factors		Not modified
TK-GB	Gunbarrel Tank	Pressurized. Flash gas used as fuel in closed loop. Liquids are piped out. No Emissions.		New Tank
LD-GB	Pressurized Truck Loading	Loading from gunbarrel tank at approximately 40 psig		New Source
	Fuel Skid	Will also contain inlet separator, measurement skid, fuel gas scrubber, and pressure vessel - no emissions as closed loop		Not modified

Emissions Summary Total

Company:	**Antero Treatment LLC**
Facility Name:	**Antero Clearwater Facility**
Facility Location:	**Doddridge County, WV**

UNCONTROLLED POTENTIAL EMISSION SUMMARY

Source	NOx		CO		VOC		SO_2		PM-10		PM-2.5		HAPs		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															
Emergency Generator	25.78	6.44	16.83	4.21	2.69	0.67	0.03	0.008	0.96	0.240	0.96	0.240	0.030	0.0075	900
Fire Pump Engine	0.85	0.21	1.11	0.28	0.045	0.011	0.27	0.069	0.066	0.016	0.066	0.016	0.0035	0.00087	38.7
Boilers															
Boiler A and Boiler B	20.05	78.42	20.34	79.57	2.20	8.61	0.32	1.27	5.51	21.54	5.51	21.54	1.02	3.97	252,786
Thermal Oxidizer															
Oxidizer, Pilot and Waste Gas-controlled Process Tanks	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Emergency Flare	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Carbon Canister															
Process Tank with Canister	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Truck Unloading															
Truck Unloading Influent Water	---	---	---	---	59.22	54.04	---	---	---	---	---	---	0.40	0.36	47,820
Truck Loading of Oil	---	---	---	---	16.70	8.72	---	---	---	---	---	---	0.28	0.15	1.80
Pressurized Loading at Fuel Skid	---	---	---	---	1.92	1.75	---	---	---	---	---	---	---	---	0.24
Cooling Tower															
Cooling Tower	---	---	---	---	---	---	---	---	0.94	4.12	0.94	4.12	---	---	---
Tanks															
Process Tanks	---	---	---	---	222.62	787.11	---	---	---	---	---	---	0.49	1.39	758
Storage Tanks	---	---	---	---	0.067	0.25	---	---	---	---	---	---	0.067	0.25	---
Heaters															
Fuel Skid Heaters	0.47	2.06	0.40	1.73	0.026	0.11	0.0028	0.012	0.036	0.16	0.036	0.16	0.0089	0.039	1,234
Fugitive Emissions															
Sludge and Salt Disposal	---	---	---	---	4.66	20.39	---	---	---	---	---	---	0.00077	0.0034	0.032
Bulk Transfer Points	---	---	---	---	---	---	---	---	2.65	5.64	0.75	1.59	---	---	---
Fugitive Dust Emissions	---	---	---	---	---	---	---	---	1.41	5.55	0.35	1.36	---	---	---
Fuel Skid Pig Venting	---	---	---	---	7.53	0.20	---	---	---	---	---	---	0.18	0.0047	18
Facility PTE =	**47.15**	**87.14**	**38.68**	**85.79**	**317.67**	**881.86**	**0.63**	**1.36**	**11.57**	**37.26**	**8.60**	**29.03**	**2.47**	**6.18**	**303,556**

Emissions Summary Total

Company:	**Antero Treatment LLC**
Facility Name:	**Antero Clearwater Facility**
Facility Location:	**Doddridge County, WV**

CONTROLLED POTENTIAL EMISSION SUMMARY

Source	NOx		CO		VOC		SO_2		PM-10		PM-2.5		HAPs		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															
Emergency Generator	25.78	6.44	16.83	4.21	2.69	0.67	0.03	0.008	0.96	0.240	0.96	0.240	0.030	0.0075	900
Fire Pump Engine	0.85	0.21	1.11	0.28	0.045	0.011	0.27	0.069	0.066	0.016	0.066	0.016	0.0035	0.00087	38.7
Boilers															
Boiler A and Boiler B	20.05	78.42	20.34	79.57	2.20	8.61	0.32	1.27	5.51	21.54	5.51	21.54	1.02	3.97	252,786
Thermal Oxidizer															
Oxidizer, Pilot and Waste Gas-controlled Process Tanks	1.08	4.74	0.93	4.08	4.40	15.55	1.06E-05	4.64E-05	1.34E-04	5.87E-04	1.34E-04	5.87E-04	9.46E-03	2.68E-02	5,939
Emergency Flare	0.16	0.057	0.69	0.141	1.25	0.21	4.38E-05	1.92E-04	5.54E-04	2.43E-03	5.54E-04	2.43E-03	1.37E-04	6.01E-04	82
Carbon Canister															
Process Tank with Canister	---	---	---	---	0.0086	0.033	---	---	---	---	---	---	3.68E-05	1.43E-04	0.36
Truck Unloading															
Truck Unloading Influent Water	---	---	---	---	18.59	16.86	---	---	---	---	---	---	0.12	0.11	15,015
Truck Loading of Oil	---	---	---	---	16.70	8.72	---	---	---	---	---	---	0.28	0.15	1.80
Pressurized Loading at Fuel Skid	---	---	---	---	1.92	1.75	---	---	---	---	---	---	---	---	0.24
Cooling Tower															
Cooling Tower	---	---	---	---	---	---	---	---	0.94	4.12	0.94	4.12	---	---	---
Tanks															
Process Tanks	---	---	---	---	1.97	7.90	---	---	---	---	---	---	0.013	0.052	483
Storage Tanks	---	---	---	---	0.067	0.25	---	---	---	---	---	---	0.067	0.25	---
Heaters															
Fuel Skid Heaters	0.47	2.06	0.40	1.73	0.026	0.11	0.0028	0.012	0.036	0.16	0.036	0.16	0.0089	0.039	1234
Fugitive Emissions															
Sludge and Salt Disposal	---	---	---	---	4.66	20.39	---	---	---	---	---	---	0.00077	0.0034	3.18E-02
Bulk Transfer Points	---	---	---	---	---	---	---	---	2.65	5.64	0.75	1.59	---	---	---
Fugitive Dust Emissions	---	---	---	---	---	---	---	---	1.41	5.55	0.35	1.36	---	---	---
Fuel Skid Pig Venting	---	---	---	---	7.53	0.20	---	---	---	---	---	---	0.18	0.0047	18
Facility PTE =	**48.39**	**91.94**	**40.30**	**90.01**	**62.07**	**81.27**	**0.63**	**1.36**	**11.57**	**37.27**	**8.61**	**29.03**	**1.73**	**4.61**	**276,498**

Emissions Summary Total

Company:	**Antero Treatment LLC**
Facility Name:	**Antero Clearwater Facility**
Facility Location:	**Doddridge County, WV**

SPECIATED HAPS UNCONTROLLED POTENTIAL EMISSION SUMMARY

Source	BENZENE		TOLUENE		ETHYLBENZENE		XYLENES		FORMALDEHYDE		n-HEXANE		METHANOL		AMMONIA*	
	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																
Emergency Generator	1.70E-02	4.26E-03	6.16E-03	1.54E-03	---	---	4.23E-03	1.06E-03	1.73E-03	4.33E-04	---	---	---	---	---	---
Fire Pump Engine	8.82E-04	2.20E-04	3.86E-04	9.66E-05	---	---	2.69E-04	6.73E-05	1.12E-03	2.79E-04	---	---	---	---	---	---
Boilers																
Boiler A and Boiler B	1.13E-03	4.43E-03	1.84E-03	7.18E-03	---	---	---	---	4.05E-02	1.58E-01	9.72E-01	3.80E+00	---	---	---	---
Thermal Oxidizer																
Oxidizer, Pilot and Waste Gas-controlled Process Tanks	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Emergency Flare	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Carbon Canister																
Process Tank with Canister	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Truck Unloading																
Truck Unloading Influent Water	2.89E-01	2.64E-01	2.25E-02	2.05E-02	1.48E-02	1.35E-02	7.01E-02	6.40E-02	---	---	1.70E-04	1.55E-04	---	---	---	---
Truck Loading of Oil	7.05E-03	3.68E-03	1.16E-02	6.04E-03	4.67E-03	2.44E-03	1.04E-02	5.45E-03	---	---	2.48E-01	1.29E-01	---	---	---	---
Pressurized Loading at Fuel Skid	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Cooling Tower																
Cooling Tower	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Tanks																
Process Tanks	2.24E-01	5.86E-01	2.15E-01	6.40E-01	7.31E-03	2.35E-02	3.84E-02	1.36E-01	---	---	---	---	---	---	59.65	251.90
Storage Tanks	---	---	---	---	---	---	---	---	---	---	---	---	6.67E-02	2.46E-01	0.29	1.18
Heaters																
Fuel Skid Heaters	---	---	---	---	---	---	---	---	3.53E-04	1.55E-03	---	---	---	---	---	---
Fugitive Emissions																
Sludge and Wetcake Disposal	3.94E-04	1.73E-03	2.27E-04	9.96E-04	1.10E-05	4.83E-05	1.38E-04	6.06E-04	---	---	---	---	---	---	0.071	0.31
Bulk Transfer Points	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Fugitive Dust Emissions	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Fuel Skid Pig Venting	5.37E-03	1.40E-04	1.51E-02	3.92E-04	3.22E-03	8.37E-05	2.79E-03	7.25E-05	---	---	1.53E-01	3.99E-03	---	---	---	---
Facility PTE =	**0.55**	**0.86**	**0.27**	**0.68**	**0.030**	**0.040**	**0.13**	**0.21**	**0.044**	**0.16**	**1.37**	**3.93**	**0.067**	**0.25**	**60.0**	**253.4**

*Ammonia is not a HAP but is included in the speciated table

Emissions Summary Total

Company:	**Antero Treatment LLC**
Facility Name:	**Antero Clearwater Facility**
Facility Location:	**Doddridge County, WV**

SPECIATED HAPS CONTROLLED POTENTIAL EMISSION SUMMARY

Source	BENZENE		TOLUENE		ETHYLBENZENE		XYLENES		FORMALDEHYDE		n-HEXANE		METHANOL		AMMONIA*	
	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																
Emergency Generator	1.70E-02	4.26E-03	6.16E-03	1.54E-03	---	---	4.23E-03	1.06E-03	1.73E-03	4.33E-04	---	---	---	---	---	---
Fire Pump Engine	8.82E-04	2.20E-04	3.86E-04	9.66E-05	---	---	2.69E-04	6.73E-05	1.12E-03	2.79E-04	---	---	---	---	---	---
Boilers																
Boiler A and Boiler B	1.13E-03	4.43E-03	1.84E-03	7.18E-03	---	---	---	---	4.05E-02	1.58E-01	9.72E-01	3.80E+00	---	---	---	---
Thermal Oxidizer																
Oxidizer, Pilot and Waste Gas-controlled Process Tanks	4.38E-03	1.13E-02	4.20E-03	1.24E-02	1.42E-04	4.52E-04	7.06E-04	2.48E-03	1.32E-06	5.80E-06	3.18E-05	1.39E-04	---	---	1.15	4.88
Emergency Flare	1.53E-07	6.71E-07	2.48E-07	1.09E-06	---	---	---	---	5.47E-06	2.40E-05	1.31E-04	5.75E-04	---	---	---	---
Carbon Canister																
Process Tank with Canister	3.68E-05	1.43E-04	1.90E-25	4.59E-25	1.09E-25	4.59E-25	1.19E-26	5.17E-26	---	---	---	---	---	---	4.42E-02	1.89E-01
Truck Unloading																
Truck Unloading Influent Water	9.08E-02	8.24E-02	7.06E-03	6.40E-03	4.65E-03	4.22E-03	2.20E-02	2.00E-02	---	---	5.34E-05	4.85E-05	---	---	---	---
Truck Loading of Oil	7.05E-03	3.68E-03	1.16E-02	6.04E-03	4.67E-03	2.44E-03	1.04E-02	5.45E-03	---	---	2.48E-01	1.29E-01	---	---	---	---
Pressurized Loading at Fuel Skid	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Cooling Tower																
Cooling Tower	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Tanks																
Process Tanks	3.29E-03	1.32E-02	5.20E-03	2.08E-02	2.24E-04	8.98E-04	3.07E-03	1.23E-02	---	---	---	---	---	---	1.97	7.88
Storage Tanks	---	---	---	---	---	---	---	---	---	---	---	---	6.67E-02	2.46E-01	0.29	1.18
Heaters																
Fuel Skid Heaters	---	---	---	---	---	---	---	---	3.53E-04	1.55E-03	---	---	---	---	---	---
Fugitive Emissions																
Sludge and Wetcake Disposal	3.94E-04	1.73E-03	2.27E-04	9.96E-04	1.10E-05	4.83E-05	1.38E-04	6.06E-04	---	---	---	---	---	---	0.071	0.31
Bulk Transfer Points	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Fugitive Dust Emissions	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Fuel Skid Pig Venting	5.37E-03	1.40E-04	1.51E-02	3.92E-04	3.22E-03	8.37E-05	2.79E-03	7.25E-05	---	---	1.53E-01	3.99E-03	---	---	---	---
Facility PTE =	**0.13**	**0.12**	**0.052**	**0.056**	**0.013**	**0.0081**	**0.044**	**0.042**	**0.044**	**0.16**	**1.37**	**3.93**	**0.067**	**0.25**	**3.53**	**14.43**

*Ammonia is not a HAP but is included in the speciated table

Emergency Generator Emission Calculations

Company:	**Antero Treatment LLC**
Facility Name:	**Antero Clearwater Facility**
Facility Location:	**Doddridge County, WV**
Source Description:	**Emergency Generator**
Emission Unit ID:	**GEN-1**

Source Information - Per Engine

Engine Make/Model	Mitsubishi S16R-Y2PTAW2-1	
Generator Make/Model	Kohler 2000REOZMD	
Generator Rating	2,000	kWe
Horsepower at Rated kW	2,923	bhp
Fuel Consumption	160.1	gallons/hr
Heating Value[1]	21.94	MMBtu/hr
Density of Fuel	7.10	lb/gal
Fuel Heating Value	19,300	Btu/lb
Operating Hours[2]	500	hrs/yr

Notes:

1) Calculated

2) Generator will be used for emergency purposes only following the hourly limitation in NSPS Quad I for testing and maintenance of 100 hours/year. Other hours are for emergency use.

3) Generator will only be used for safe shut down of the facility during a power outage and not for normal operation.

Potential Emissions per Generator

Pollutant	Emission Factor[4]		Estimated Emissions			Source of Emissions Factors
	(lb/MMBtu)	(g/bhp-hr)	(lb/hr)	(lb/yr)	(tpy)	
NOx	---	4.0	25.78	---	6.44	EPA Certification data
CO	---	2.6	16.83	---	4.21	EPA Tier 2 Nonroad Diesel Engine Emission Factor per Quad I
VOC	---	0.42	2.69	---	0.67	EPA Certification data for Total Hydrocarbons
SO_2	1.52E-03	---	0.033	---	0.0083	AP-42, Chapter 3.4, Table 3.4-1; 15 ppm sulfur
PM_{10}	---	0.15	0.96	---	0.24	EPA Tier 2 Nonroad Diesel Engine Emission Factor per Quad I
$PM_{2.5}$	---	0.15	0.96	---	0.24	EPA Tier 2 Nonroad Diesel Engine Emission Factor per Quad I
Acetaldehyde	2.52E-05	---	5.53E-04	0.276	1.38E-04	AP-42, Chapter 3.4, Table 3.4-3
Acrolein	7.88E-06	---	1.73E-04	0.086	4.32E-05	AP-42, Chapter 3.4, Table 3.4-3
Benzene	7.76E-04	---	1.70E-02	8.51	4.26E-03	AP-42, Chapter 3.4, Table 3.4-3
Formaldehyde	7.89E-05	---	1.73E-03	0.87	4.33E-04	AP-42, Chapter 3.4, Table 3.4-3
Toluene	2.81E-04	---	6.16E-03	3.08	1.54E-03	AP-42, Chapter 3.4, Table 3.4-3
Xylenes	1.93E-04	---	4.23E-03	2.12	1.06E-03	AP-42, Chapter 3.4, Table 3.4-3
Total HAPS			0.030	14.94	0.0075	

Pollutant	Emission Factor	Estimated Emissions			Source of Emissions Factors
	(kg/MMBtu)	(lb/hr)		(tpy)	
CO_2	73.96	3,586	---	896.5	40 CFR Part 98, Subpart C, Table C-1
CH_4	0.003	0.15	---	0.0364	40 CFR Part 98, Subpart C, Table C-2
N_2O	0.0006	0.029	---	0.0073	40 CFR Part 98, Subpart C, Table C-2
CO_2e	---	3,598	---	899.5	40 CFR Part 98, Subpart A, Table A-1

4) CO and PM emissions factors are per the 40 CFR Part 60 Subpart IIII limits for an emergency engine of this size. The Tested Certification limits included on the spec sheet are within these limits.

The NOx and VOC emission factors are the tested certification limits as the total of NOx and HC fall within the 40 CFR Part 60 Subpart IIII limits.

Fire Water Pump Engine

Company:	**Antero Treatment LLC**
Facility Name:	**Antero Clearwater Facility**
Facility Location:	**Doddridge County, WV**
Source Description:	**Fire Water Pump Engine**
Emission Unit ID:	**ENG-2**

Source Information - Per Engine

Engine Make/Model	John Deere 4045HFC28E	
Fire Water Pump Model	Clarke JU4H-UFADR0	
Displacement	4.5	Liter
Horsepower	136	bhp
Fuel Consumption	6.9	gallons/hr
Heating Value[1]	0.94	MMBtu/hr
Density of Fuel	7.10	lb/gal
Fuel Heating Value	19,300	Btu/lb
Operating Hours[2]	500	hrs/yr

Notes:

1) Calculated

2) Fire pump engine will be used for emergency purposes only with 500 hours/year allotted for testing and maintenance.

3) Engine pump will be used to provide fire water from the fire loop to the cooling tower only in case of an emergency.

Potential Emissions per Engine

Pollutant	Emission Factor		Estimated Emissions			Source of Emissions Factors
	(lb/MMBtu)	(g/bhp-hr)	(lb/hr)	(lb/yr)	(tpy)	
NOx	---	2.85	0.85	---	0.21	40CFR Part 60 Subpart IIII, Table 4 minus VOC emission factor
CO	---	3.70	1.11	---	0.28	40CFR Part 60 Subpart IIII, Table 4
VOC	---	0.15	0.045	---	0.011	EPA Certificate Data
SO_2	2.90E-01	---	0.27	---	0.069	AP-42, Chapter 3.3-1
PM_{10}	---	0.22	0.066	---	0.016	40CFR Part 60 Subpart IIII, Table 4
$PM_{2.5}$	---	0.22	0.066	---	0.016	40CFR Part 60 Subpart IIII, Table 4
Acetaldehyde	7.67E-04	---	7.25E-04	0.36	1.81E-04	AP-42, Chapter 3.3-2
Acrolein	9.25E-05	---	8.74E-05	0.044	2.19E-05	AP-42, Chapter 3.3-2
Benzene	9.33E-04	---	8.82E-04	0.44	2.20E-04	AP-42, Chapter 3.3-2
Formaldehyde	1.18E-03	---	1.12E-03	0.56	2.79E-04	AP-42, Chapter 3.3-2
Toluene	4.09E-04	---	3.86E-04	0.19	9.66E-05	AP-42, Chapter 3.3-2
Xylenes	2.85E-04	---	2.69E-04	0.13	6.73E-05	AP-42, Chapter 3.3-2
Total HAPS			0.0035	1.73	0.00087	

Pollutant	Emission Factor	Estimated Emissions			Source of Emissions Factors
	(kg/MMBtu)	(lb/hr)		(tpy)	
CO_2	73.96	154.4	---	38.61	40 CFR Part 98, Subpart C, Table C-1
CH_4	0.003	0.0063	---	0.0016	40 CFR Part 98, Subpart C, Table C-2
N_2O	0.0006	0.0013	---	0.00031	40 CFR Part 98, Subpart C, Table C-2
CO_2e	---	155.0	---	38.75	40 CFR Part 98, Subpart A, Table A-1

Natural Gas Fired Boiler Emissions

Company:	**Antero Treatment LLC**
Facility Name:	**Antero Clearwater Facility**
Location:	**Doddridge County, WV**
Source Description:	**Steam Boilers A and B**
Emission Unit IDs:	**H-2185A and H-2185B**

Source Information

Source Description:	Boilers	
Hours of Operation	8,760	hr/yr
Design Heat Rate per Boiler	275.3	MMBtu/hr
Fuel Use Factor	0.89	
Number of Boilers	2	
Fuel Heat Value	1,200	Btu/scf
Fuel Use for both Boilers	3,589.2	MMscf/yr
Fuel Use for both Boilers	0.46	MMscf/hr

Fuel Heat Value based on natural gas in the area of the Facility

Hourly fuel use is based on the maximum fuel for full operation of both boilers. Annual fuel use is based on an 89% fuel use limit for both boilers in total.

Potential Emissions for both Boilers [1]

Pollutant	Emission Factor (lb/MMBtu)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
NO_X	0.036	20.05	78.42	Manufacturer Spec Sheet (converted from ppmw)
CO	0.037	20.34	79.57	Manufacturer Spec Sheet (converted from ppmw)
VOC	0.004	2.20	8.61	Manufacturer Spec Sheet
PM_{10}	0.010	5.51	21.54	Manufacturer Spec Sheet
$PM_{2.5}$	0.010	5.51	21.54	Manufacturer Spec Sheet
Pollutant	**Emission Factor (lb/MMscf)**	**Emissions (lb/hr)**	**Emissions (tpy)**	**Emission Factor Source**
SO_2	0.6	0.32	1.27	AP-42 Ch. 1.4 Table 1.4-2
Lead	0.0005	0.00027	0.0011	AP-42 Ch. 1.4 Table 1.4-2
Pollutant	**Emission Factor (lb/MMscf)**	**Emissions (lb/hr)**	**Emissions (tpy)**	**Emission Factor Source**
Benzene	2.10E-03	0.0011	0.0044	AP-42 Ch. 1.4 Table 1.4-3
Dichlorobenzene	1.20E-03	0.00065	0.0025	AP-42 Ch. 1.4 Table 1.4-3
Formaldehyde	7.50E-02	0.040	0.16	AP-42 Ch. 1.4 Table 1.4-3
n-Hexane	1.80E+00	0.97	3.80	AP-42 Ch. 1.4 Table 1.4-3
Naphthalene	6.10E-04	0.00033	0.0013	AP-42 Ch. 1.4 Table 1.4-3
Toluene	3.40E-03	0.0018	0.0072	AP-42 Ch. 1.4 Table 1.4-3
Other HAPs	8.82E-05	0.000048	0.00019	AP-42 Ch. 1.4 Table 1.4-3-sum of minor HAPs
Total HAPs	1.88E+00	1.02	3.97	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	64,565	252,525	40 CFR Part 98, Subpart C, Table C-1
Methane	0.001	1.22	4.76	40 CFR Part 98, Subpart C, Table C-2
Nitrous Oxide	0.0001	0.12	0.48	40 CFR Part 98, Subpart C, Table C-2
CO_2e	----	64,631	252,786	40 CFR Part 98, Subpart A, Table A-1

Notes

1. In actual operations, one boiler may operate more than the other. Fuel usage is total for both boilers and may or may not be not be used equally between both boilers, however total boiler emissions and fuel usage will not be exceeded regardless of how the fuel is used in actual operations.

Thermal Oxidizer Combustion Emissions

Company:	**Antero Treatment LLC**
Facility Name:	**Antero Clearwater Facility**
Facility Location:	**Doddridge County, WV**
Source Description:	**Thermal Oxidizer for Waste Gas Header**
Emission Unit ID:	**U-1080**

Combustion Emissions

Thermal Oxidizer Rating[1] :	11.00	MMBtu/hr
Gas Heating Value[2]:	1,200	Btu/scf
Hours of Operation:	8,760	hr/yr

Pollutant	Emission Factor (lb/MMBtu)	Emissions[3] (lbs/hr)	Emissions[3] (tons/yr)
Particulate Matter ($PM/PM_{10}/PM_{2.5}$)	N/A - Smokeless Design		
Sulfur Dioxide (SO_2)	N/A - Combusted Gas has no Sulfur		
Nitrogen Oxides (NO_x)	----	1.08	4.73
Carbon Monoxide (CO)	----	0.93	4.07

[1] Maximum heat input is used to calculate emissions, so as to be conservative.

[2] Methane with a heating value of 1200 Btu/hr will be added to the thermal oxidizer to assist in combustion.

[3] Emissions from manufacturer data.

NOx Emissions from Combusting Ammonia

The thermal oxidizer is designed such that the vented waste gas goes through multiple stages of combustion allowing streams heavy in nitrogen (i.e. from ammonia) to convert to molecular nitrogen rather than NOx thus there are no extra emissions of NOx from ammonia combustion.

Pollutant	Emissions (lbs/hr)	Emissions (tons/yr)
Nitrogen Oxides (NO_x)	0.00	0.00

Pilot Emissions

Pilot Heating Value:	1,200	Btu/scf
Hours of Operation:	8,760	hr/yr
Total Pilot Natural Gas Usage [6]:	1.50E-05	MMscf/hr

Pollutant	Emission Factor (lb/MMscf)[4]	Emissions (lbs/hr)	Emissions (tons/yr)
Particulate Matter ($PM/PM_{10}/PM_{2.5}$)	7.6	1.34E-04	5.87E-04
Nitrogen Oxides (NO_x)	100	1.76E-03	7.73E-03
Sulfur Dioxide (SO_2)	0.6	1.06E-05	4.64E-05
Carbon Monoxide (CO)	84	1.48E-03	6.49E-03
Volatile Organic Compounds (VOC)	5.5	9.71E-05	4.25E-04
Benzene	2.10E-03	3.71E-08	1.62E-07
Toluene	3.40E-03	6.00E-08	2.63E-07
Formaldehyde	7.50E-02	1.32E-06	5.80E-06
n-Hexane	1.80E+00	3.18E-05	1.39E-04
Total HAPs[4,5]	1.88	3.32E-05	1.45E-04

[4] Emission Factors from AP-42 Tables 1.4-1, 1.4-2, 1.4-3, and 1.4-4 (7/98).

[5] Sum of Emissions Factors published for pollutants classified as "HAPS" under AP-42 Table 1.4-3.

[6] Typical pilot gas usage

Total Thermal Oxidizer Emissions

Pollutant	Total Potential Emission Rate (lbs/hr)	Total Potential Emission Rate (tons/year)
Particulate Matter ($PM/PM_{10}/PM_{2.5}$)	1.34E-04	5.87E-04
Nitrogen Oxides (NO_x)	1.08	4.74
Sulfur Dioxide (SO_2)	1.06E-05	4.64E-05
Carbon Monoxide (CO)	0.93	4.08
Volatile Organic Compounds (VOC)	9.71E-05	4.25E-04
Total HAPs	3.32E-05	1.45E-04

Greenhouse Gas Emissions

Pollutant	Emission Factor (kg/MMBtu)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
Carbon Dioxide	53.06	1,292.0	5,659.0	40 CFR Part 98, Subpart C, Table C-1
Methane	0.001	0.024	0.11	40 CFR Part 98, Subpart C, Table C-2
Nitrous Oxide	0.0001	0.0024	0.011	40 CFR Part 98, Subpart C, Table C-2
CO_2e	----	1,293.3	5,664.8	40 CFR Part 98, Subpart A, Table A-1

Emergency Flare Combustion Emissions

Company:	**Antero Treatment LLC**
Facility Name:	**Antero Clearwater Facility**
Facility Location:	**Doddridge County, WV**
Source Description:	**Emergency Gas Blanket Flare**
Emission Unit ID:	**U-1090**

Combustion Emissions - Maintenance Use

Flare Rating[1] :	2.20	MMBtu/hr
Gas Heating Value[2]:	1,200	Btu/scf
Hours of Operation[1]:	336	hr/yr

Pollutant	Emission Factor[3] (lb/MMBtu)	Emissions (lbs/hr)	Emissions (tons/yr)
Particulate Matter ($PM/PM_{10}/PM_{2.5}$)	N/A - Smokeless Design		
Sulfur Dioxide (SO_2)	N/A - Combusted Gas has no Sulfur		
Nitrogen Oxides (NO_x)	0.068	0.15	0.025
Carbon Monoxide (CO)	0.31	0.68	0.11
Volatile Organic Compounds (VOC)	0.57	1.25	0.21

[1] Flare will be used for 336 hours per year of annual maintenance during shutdown for gas blanket bleed system. Bleed system is rated at 2.2 MMBtu/hr.

[2] Typical heating value of gas at facility

[3] Emission Factors from Table 13.5-1 and 13.5-2 of AP-42 Section 13.5 (April 2015)

Pilot Emissions - Continuous Use

Pilot Heating Value:	1,200	Btu/scf
Hours of Operation[6]:	8,760	hr/yr
Total Pilot Natural Gas Usage [6]:	6.20E-05	MMscf/hr

Pollutant	Emission Factor (lb/MMscf)[4]	Emissions (lbs/hr)	Emissions (tons/yr)
Particulate Matter ($PM/PM_{10}/PM_{2.5}$)	7.6	5.54E-04	2.43E-03
Nitrogen Oxides (NO_x)	100	7.29E-03	3.19E-02
Sulfur Dioxide (SO_2)	0.6	4.38E-05	1.92E-04
Carbon Monoxide (CO)	84	6.13E-03	2.68E-02
Volatile Organic Compounds (VOC)	5.5	4.01E-04	1.76E-03
Benzene	2.10E-03	1.53E-07	6.71E-07
Toluene	3.40E-03	2.48E-07	1.09E-06
Formaldehyde	7.50E-02	5.47E-06	2.40E-05
n-Hexane	1.80E+00	1.31E-04	5.75E-04
Total HAPs[4,5]	1.88	1.37E-04	6.01E-04

[4] Emission Factors from AP-42 Tables 1.4-1, 1.4-2, 1.4-3, and 1.4-4 (7/98).

[5] Sum of Emissions Factors published for pollutants classified as "HAPS" under AP-42 Table 1.4-3.

[6] Pilot gas usage from manufacturer specification. Assumed the pilot would be used continuously.

Total Flare Emissions

Pollutant	Total Potential Emission Rate (lbs/hr)	Total Potential Emission Rate (tons/year)
Particulate Matter ($PM/PM_{10}/PM_{2.5}$)	5.54E-04	2.43E-03
Nitrogen Oxides (NO_x)	0.16	0.057
Sulfur Dioxide (SO_2)	4.38E-05	1.92E-04
Carbon Monoxide (CO)	0.69	0.14
Volatile Organic Compounds (VOC)	1.25	0.21
Total HAPs	1.37E-04	6.01E-04

Greenhouse Gas Emissions

Pollutant	Emission Factor (kg/MMBtu)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
Carbon Dioxide	53.06	266.7	81.55	40 CFR Part 98, Subpart C, Table C-1
Methane	0.001	0.0050	0.0015	40 CFR Part 98, Subpart C, Table C-2
Nitrous Oxide	0.0001	0.00050	0.00015	40 CFR Part 98, Subpart C, Table C-2
CO_2e	----	18.6	81.64	40 CFR Part 98, Subpart A, Table A-1

Truck Unloading Emissions

Company:	**Antero Treatment LLC**
Facility Name:	**Antero Clearwater Facility**
Facility Location:	**Doddridge County, WV**
Source Description:	**Unloading Influent Water from Trucks**
Emission Unit ID:	**P-1051**

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) = L_L (lbs VOC/1000 gal) * 42 gal/bbl * 365 days/year * production (bbl/day)

UNCONTROLLED

Source	S[1]	P (psia)[2]	M[3]	T (ºF)[4]	L_L (lb/1000 gal)	Unloading (bbl/day)	VOC (tpy)	Benzene (tpy)	Toluene (tpy)	E-benzene (tpy)	Xylenes (tpy)	n-Hexane (tpy)	CO_2e (tpy)
Influent Water	0.6	0.37	22.56	66.6	0.12	60,000	54.04	0.26	0.021	0.014	0.064	0.00016	47,820.03

Source	S[1]	P (psia)[2]	M[3]	T (ºF)[4]	L_L (lb/1000 gal)	Unloading (bbl/hr)	VOC (lb/hr)	Benzene (lb/hr)	Toluene (lb/hr)	E-benzene (lb/hr)	Xylenes (lb/hr)	n-Hexane (lb/hr)	CO_2e (lb/hr)
Influent Water	0.6	0.37	22.56	66.6	0.12	12,000	59.22	0.29	0.022	0.015	0.070	0.00017	52,405.52

CONTROLLED

Source	S[1]	P (psia)[2]	M[3]	T (ºF)[4]	L_L (lb/1000 gal)	Unloading (bbl/day)	VOC (tpy)	Benzene (tpy)	Toluene (tpy)	E-benzene (tpy)	Xylenes (tpy)	n-Hexane (tpy)	CO_2e (tpy)
Influent Water	0.6	0.37	22.56	66.6	0.12	60,000	16.86	0.082	0.0064	0.0042	0.020	0.000048	15,015.49

Source	S[1]	P (psia)[2]	M[3]	T (ºF)[4]	L_L (lb/1000 gal)	Unloading (bbl/hr)	VOC (lb/hr)	Benzene (lb/hr)	Toluene (lb/hr)	E-benzene (lb/hr)	Xylenes (lb/hr)	n-Hexane (lb/hr)	CO_2e (lb/hr)
Influent Water	0.6	0.37	22.56	66.6	0.12	12,000	18.59	0.091	0.0071	0.0047	0.022	0.000053	16,455.33

Notes:

1. Saturation factor from AP-42, Table 5.2-1 (Submerged loading: dedicated normal service).
2. Vapor pressure is referenced from ProMax runs for produced water from wells in the area of the facility.
3. Molecular weight of the vapor is referenced from ProMax runs for produced water from wells in the area of the facility. A 20% buffer was added to account for variability in the produced water.
4. Temperature based on the temperature used in the ProMax runs corresponding to the vapor pressure.
5. HAPs and CO2e calculated using the relative weight percentages of the corresponding ProMax runs.
6. Short term loading assumes the maximum rate of 8400 gallons per minute when all 16 bays are used.
7. Influent water is unloaded into TK-1055A/B. This tank is controlled by the thermal oxidizer at 98%. Assume 70% of the unloading vapors are captured and controlled for a total of 68.6% control efficiency.
8. Although the influent water can be a mix of produced water and water from drilling and completion activities, it was assumed for the calculation that the influent water will be 100% produced water as that has a higher percentage of VOCs than flowback water.

Truck Loading Emissions

Company:	**Antero Treatment LLC**
Facility Name:	**Antero Clearwater Facility**
Facility Location:	**Doddridge County, WV**
Source Description:	**Loading Oil from TK-1065**
Emission Unit ID:	**OILLOAD**

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)

UNCONTROLLED

Source	S[1]	P (psia)[2]	M[3]	T (ºF)[4]	L_L (lb/1000 gal)	Loading (bbl/day)	VOC (tpy)	Benzene (tpy)	Toluene (tpy)	E-benzene (tpy)	Xylenes (tpy)	n-Hexane (tpy)	CO_2e (tpy)
Oil from TK-1065	0.6	3.10	50.00	65.0	2.21	515	8.72	0.0037	0.0060	0.0024	0.0055	0.13	1.80

Source	S[1]	P (psia)[2]	M[3]	T (ºF)[4]	L_L (lb/1000 gal)	Loading[5] (bbl/hr)	VOC (lb/hr)	Benzene (lb/hr)	Toluene (lb/hr)	E-benzene (lb/hr)	Xylenes (lb/hr)	n-Hexane (lb/hr)	CO_2e (lb/hr)
Oil from TK-1065	0.6	3.10	50.00	65.0	2.21	180	16.70	0.0071	0.012	0.0047	0.010	0.25	3.44

Notes:

1. Saturation factor from AP-42, Table 5.2-1 (Submerged loading: dedicated normal service).
2. Vapor pressure is referenced from AP-42 Table 7.1-2 for Crude Oil and 65 deg F.
3. Molecular weight of the vapor is referenced from AP-42 Table 7.1-2 for Crude Oil.
4. Temperature based referenced from average temperature in the area and oil temperature.
5. Short term loading assumes one truck per hour with an 180 bbl truck.
6. HAPs and CO_2e calculated using relative weight % from an average oil vapor analysis from the area surrounding the facility.

Emissions From Pressurized Truck Loading Operations

Company:	**Antero Treatment LLC**
Facility Name:	**Antero Clearwater Facility**
Facility Location:	**Doddridge County, WV**
Source Description:	**Pressurized Truck Loading from the Gunbarrel**
Emission Unit ID:	**LD-GB**

A pressurized vapor recovery system will be utilized for truck loading. Potential emissions result from the equalization of the loading rack connection to atmospheric pressure after the loading operation is completed.

Barrels per day Loaded	500	bbl/day	
Truck Capacity	120	bbl/truck	(5000 gallons)
Trucks per day	5	trucks/day	

Truck Loading Connection Configuration

Load Line Connection Diameter =	0.25	ft		
Load Line Length between Valves =	1.0	ft		
Connection Volume =	0.049	ft^3	Per truck	
Liquid Density =	41.25	lb/ft^3		
Liquid Mass Flow =	2.02	lb/hr	Assume one truck per hour	
Liquid Mass Flow =	10.12	lb/day		
Liquid Mass Flow =	1.85	ton/year		
VOC Weight Fraction of Liquid =	0.95			
VOC Liquid Mass Flow =	**1.75**	**ton/year**	**1.92**	**lb/hr**
Methane Weight Fraction =	0.0052			
CO2 Weight Fraction =	0.0002			
CO2e Mass Flow =	**0.24**	**ton/year**	**0.26**	**lb/hr**

Notes:
1. The load line will be 3 inches in diameter and the vapor return line will be 2 inches in diameter. The larger diameter is used.
2. The total length of the line may be as much as 10 feet; however, because the valves shut off almost instantaneously, the length that may contain any residual vapor is at most 1 foot.
3. Liquid density and weight fractions from attached aspentech simulation for Material Stream 14. Material Stream 14 is not speciated for individual HAPs.

Cooling Tower Emissions

Company:	**Antero Treatment LLC**
Facility Name:	**Antero Clearwater Facility**
Location:	**Doddridge County, WV**
Source Description:	**Cooling Tower Drift Loss**
Emission Unit ID:	**CT-2335**

Circulation Rate: 34,500 gpm TDS: 5,450 ppm Drift Loss: 0.001 %
Operating Hours: 8,760 hrs/yr

Emission Source	Circulation rate (gal/hr)	Circulating Water TDS content (ppm)	Liquid Drift Loss (%)	Water Density (lbs/gal)	Operating hours (hrs/yr)	PM10 (lb/hr)	PM10 (ton/yr)
Cooling Tower	2,070,000	5,450	0.001	8.34	8,760	0.94	4.12

Notes:
1. Circulation rate and drift loss based on design data.
2. Circulating water TDS from data on expected influent water streams.
3. Design data shows an evaporation rate of 472 gpm, however there are no volatile compounds in the water for evaproation emissions.
4. Emissions calculated using AP-42 Chapter 13.4 guidance. "Conservatively high PM-10 emissions can be obtained by multiplying the total drift factor by TDS and assume that upon evaporation all are PM-10".

Circulation Water Quality (based on 10 COC)

	Units	Average Concentration
Cations:		
Calcium	mg/L as Ca	< 250
Magnesium	mg/L as Mg	< 0.2
Sodium	mg/L	< 1,269
Potassium	mg/L	< 0.5
Barium	mg/L	< 0.5
Strontium	mg/L	< 0.5
Total Iron	mg/L	< 0.1
Ammonium	mg/L	< 37.5
Manganese	mg/L	< 0.1
Lithium	mg/L	< 0.5
Anions:		
Bicarbonate	mg/L	< 1,460
Carbonate	mg/L	< 3.1
Hydroxide	mg/L	< 0.1
Sulfate	mg/L	< 10
Bromide	mg/L	< 0.2
Chloride	mg/L	< 950
Nitrate	mg/L	< 1,328

	Units	Average Concentration
Other Constituents:		
pH	S.U.	7.5 – 8.5
Water Temperature	deg F	80 - 90
Silica	mg/L	< 0.5
Total Dissolved Solids (calculated)	mg/L	< 5,450
Total Alkalinity	mg/L as $CaCO_3$	< 1,205
Total Suspended Solids	mg/L	< 25
Free Oil & Grease (> 20 µm)	mg/L	< 0.5

Waste Gas Header Emission Sources

Company:	**Antero Treatment LLC**	
Facility Name:	**Antero Clearwater Facility**	
Facility Location:	**Doddridge County, WV**	
Source Description:	**Tanks going to the Waste Gas Header**	

Uncontrolled Emissions

Pollutant	TK-1055A		TK-1060A/B		TK-1070		TK-1105A/B		TK-1055B		TK-1115		TK-2010		TK-2015	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
VOCs	33.38	52.14	8.25	7.72	8.62	9.32	1.05	4.39	15.37	53.85	2.19	7.66	14.71	53.33	2.29	8.13
Ammonia	6.18	23.54	0.24	0.22	0.25	0.26	0.34	1.43	5.63	22.92	0.057	0.20	4.03	17.11	0.058	0.21
Benzene	0.062	0.12	0.019	0.017	0.020	0.023	0.0084	0.034	0.036	0.12	0.0045	0.016	0.025	0.094	0.0046	0.016
Ethylbenzene	0.0024	0.0061	0.00025	0.00023	0.00028	0.00039	0.00018	0.00074	0.0016	0.0062	0.000058	0.00022	0.0012	0.0047	0.000061	0.00022
Toluene	0.070	0.15	0.011	0.010	0.012	0.014	0.0063	0.027	0.042	0.16	0.0026	0.0095	0.029	0.12	0.0027	0.010
Xylene	0.010	0.036	0.0028	0.0026	0.0030	0.0037	0.00026	0.0011	0.0089	0.037	0.00065	0.0025	0.0064	0.028	0.00069	0.0026
Manganese	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Selenium	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
TOTAL HAPs	0.14	0.32	0.033	0.030	0.035	0.040	0.015	0.063	0.088	0.32	0.0078	0.028	0.062	0.25	0.0081	0.028
Carbon Dioxide	15.76	26.62	59.34	53.81	52.64	53.60	2.62	10.84	5.29	18.49	9.44	33.48	2.81	10.85	6.92	25.45

Pollutant	TK-2040		TK-1065		TK-1120		TK-2020		TK-2140		E-2076		TOTALS	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
VOCs	2.78	10.30	0.91	2.18	1.13	4.14	3.84	13.80	38.80	169.94	86.90	380.62	220.21	777.53
Ammonia	0.071	0.27	----	----	0.34	1.33	1.47	5.67	5.37	23.52	33.60	147.17	57.63	243.84
Benzene	0.0060	0.022	----	----	0.0081	0.024	0.025	0.073	----	----	----	----	0.22	0.57
Ethylbenzene	0.00011	0.00041	----	----	0.00019	0.00070	0.00074	0.0027	----	----	----	----	0.0071	0.023
Toluene	0.0036	0.014	----	----	0.0067	0.023	0.024	0.081	----	----	----	----	0.21	0.62
Xylene	0.0010	0.0039	----	----	0.00030	0.0012	0.0014	0.0058	----	----	----	----	0.035	0.12
Manganese	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Selenium	----	----	----	----	----	----	----	----	----	----	----	----	----	----
TOTAL HAPs	0.011	0.040	----	----	0.015	0.049	0.051	0.16	----	----	----	----	0.47	1.33
Carbon Dioxide	6.95	26.45	----	----	2.36	5.60	3.44	8.84	----	----	----	----	167.57	274.04

Waste Gas Header Emission Sources

Company:	**Antero Treatment LLC**	
Facility Name:	**Antero Clearwater Facility**	
Facility Location:	**Doddridge County, WV**	
Source Description:	**Tanks going to the Waste Gas Header**	

Controlled Emissions

Pollutant	TK-1055A		TK-1060A/B		TK-1070		TK-1105A/B		TK-1055B		TK-1115		TK-2010		TK-2015	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
VOCs	0.67	1.04	0.17	0.15	0.17	0.19	0.021	0.088	0.31	1.08	0.044	0.15	0.29	1.07	0.046	0.16
Ammonia	0.12	0.47	0.0048	0.0043	0.0050	0.0053	0.0068	0.029	0.11	0.46	0.0011	0.0041	0.081	0.34	0.0012	0.0041
Benzene	1.2E-03	2.5E-03	3.8E-04	3.5E-04	4.0E-04	4.5E-04	1.7E-04	6.8E-04	7.2E-04	2.5E-03	9.0E-05	3.2E-04	5.0E-04	1.9E-03	9.2E-05	3.2E-04
Ethylbenzene	4.8E-05	1.2E-04	4.9E-06	4.5E-06	5.7E-06	7.9E-06	3.5E-06	1.5E-05	3.3E-05	1.2E-04	1.2E-06	4.3E-06	2.3E-05	9.4E-05	1.2E-06	4.4E-06
Toluene	1.4E-03	3.1E-03	2.3E-04	2.1E-04	2.4E-04	2.8E-04	1.3E-04	5.4E-04	8.4E-04	3.1E-03	5.1E-05	1.9E-04	5.9E-04	2.4E-03	5.4E-05	1.9E-04
Xylene	2.0E-04	7.3E-04	5.5E-05	5.1E-05	6.0E-05	7.4E-05	5.2E-06	2.3E-05	1.8E-04	7.4E-04	1.3E-05	5.0E-05	1.3E-04	5.5E-04	1.4E-05	5.1E-05
Manganese	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Selenium	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
TOTAL HAPs	0.0029	0.0064	0.00067	0.00061	0.00071	0.00081	0.00030	0.0013	0.0018	0.0065	0.00016	0.00056	0.0012	0.0049	0.00016	0.00057
Carbon Dioxide	15.76	26.62	59.34	53.81	52.64	53.60	2.62	10.84	5.29	18.49	9.44	33.48	2.81	10.85	6.92	25.45

Pollutant	TK-2040		TK-1065		TK-1120		TK-2020		TK-2140		E-2076		TOTALS	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
VOCs	0.056	0.21	0.018	0.044	0.023	0.083	0.077	0.28	0.78	3.40	1.74	7.61	4.40	15.55
Ammonia	0.0014	0.0053	----	----	0.0069	0.027	0.029	0.11	0.11	0.47	0.67	2.94	1.15	4.88
Benzene	1.2E-04	4.4E-04	----	----	1.6E-04	4.7E-04	5.0E-04	1.5E-03	----	----	----	----	4.38E-03	1.13E-02
Ethylbenzene	2.1E-06	8.3E-06	----	----	3.8E-06	1.4E-05	1.5E-05	5.4E-05	----	----	----	----	1.42E-04	4.52E-04
Toluene	7.2E-05	2.8E-04	----	----	1.3E-04	4.6E-04	4.7E-04	1.6E-03	----	----	----	----	4.20E-03	1.24E-02
Xylene	2.0E-05	7.9E-05	----	----	5.9E-06	2.4E-05	2.7E-05	1.2E-04	----	----	----	----	7.06E-04	2.48E-03
Manganese	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Selenium	----	----	----	----	----	----	----	----	----	----	----	----	----	----
TOTAL HAPs	0.00021	0.00080	----	----	0.00030	0.0010	0.0010	0.0032	----	----	----	----	0.0094	0.027
Carbon Dioxide	6.95	26.45	----	----	2.36	5.60	3.44	8.84	----	----	----	----	167.57	274.04

Notes:

1. Waste Gas Header is controlled by a thermal oxidizer with a control efficiency of at least 98 %
2. EPA's WATER9 program was used to calculate the emissions of all the emission points shown except for TK-1065, E-2076, and TK-2140. TK-1065 was assumed all crude to be conservative and emissions were calculated using TANKS 4.09d. E-2076 emissions were from Material Balance Stream 225. TK-2140 emissions were calculated using Stream 263.
3. Emissions from TK-1055A/B and TK-2010 are likely less than shown. WATER9 does not allow for covered clarifiers so more emissions are likely generated in the model due to air flow over the tanks.
4. Influent stream into TK-1055A/B is Material Balance Stream 102. Pound per hour emissions are calculated using peak flow and annual emissions use the average flow.
5. Metal HAPs are shown for completeness but stay in solution so there are no air emissions.
6. Only those compounds above the detection limit are shown as otherwise emissions are not quantifiable.
7. TK-1130 has been removed from the thermal oxidizer stream and is now connected to a carbon canister

Carbon Canister Emission Source

Company:	**Antero Treatment LLC**
Facility Name:	**Antero Clearwater Facility**
Facility Location:	**Doddridge County, WV**
Source Description:	**Tank going to the Carbon Canister**

Uncontrolled Emissions

Pollutant	TK-1130	
	(lb/hr)	(tpy)
VOCs	0.43	1.67
Ammonia	0.044	0.19
Benzene	0.0018	0.0072
Ethylbenzene	5.43E-24	2.30E-23
Toluene	9.49E-24	3.91E-23
Xylene	5.93E-25	2.59E-24
Manganese	----	----
Selenium	----	----
TOTAL HAPs	0.0018	0.0072
Carbon Dioxide	0.11	0.36

Controlled Emissions

Pollutant	TK-1130	
	(lb/hr)	(tpy)
VOCs	0.0086	0.033
Ammonia	0.044	0.19
Benzene	3.7E-05	1.4E-04
Ethylbenzene	1.1E-25	4.6E-25
Toluene	1.9E-25	7.8E-25
Xylene	1.2E-26	5.2E-26
Manganese	----	----
Selenium	----	----
TOTAL HAPs	0.000037	0.00014
Carbon Dioxide	0.11	0.36

Notes:

1. TK-1130 off-gas is captured by a carbon canister with a capture efficiency of at least 98 %
   Manufacturer estimates a 99% capture efficiency for total hydrocarbons inluding VOCs, but capture efficiency is reduced to 98% to account for times when the activated carbon is being replaced.
2. EPA's WATER9 program was used to calculate the emissions from TK-1130.
3. Metal HAPs are shown for completeness but stay in solution so there are no air emissions.
4. Only those compounds above the detection limit are shown as otherwise emissions are not quantifiable.

Post Treatment System Tanks

Company:	**Antero Treatment LLC**	
Facility Name:	**Antero Clearwater Facility**	
Facility Location:	**Doddridge County, WV**	
Source Description:	**Post Treatment System Tanks**	
Emission Unit ID:	**TK-2500, TK-2550, TK-2555, CF-2510, TK-2520, and TK-2515**	

	TK-2500 [1,2,3,4,5]					TK-2550 and TK-2555 [1,6,7]					CF-2510 [1,3,8]				
	2034833	L/hr Peak	1860242	L/hr Average		2044577	L/hr Peak	1858789	L/hr Average		515346	L/hr Peak	468558	L/hr Average	
	In	Out	Delta	Emissions [4,5]		In	Out	Delta	Emissions		In	Out	Delta	Emissions	
	mg/L	mg/L	mg/L	(lb/hr)	(tpy)	mg/L	mg/L	mg/L	(lb/hr)	(tpy)	mg/L	mg/L	mg/L	(lb/hr)	(tpy)
VOCs as oil	6.41	1.13	5.28	1.18	4.74	1.13	1.13	0.0	0.00	0.00	1.13	1.13	0.0	0.00	0.00
Ammonia	24.90	3.00	21.90	1.96	7.87	3.00	3.00	0.0	0.00	0.00	3.00	3.00	0.0	0.00	0.00
Benzene	0.017	0.003	0.01	0.0031	0.013	0.003	0.003	0.0	0.00	0.00	0.003	0.003	0.0	0.00	0.00
3&4 Methylbenzene	0.005	0.001	0.004	0.00090	0.0036	0.001	0.001	0.0	0.00	0.00	0.001	0.001	0.0	0.00	0.00
Cumene	0.0005	0.0	0.0005	0.00011	0.00044	----	----	----	----	----	----	----	----	----	----
Ethylbenzene	0.0010	0.0	0.0010	0.00022	0.00090	----	----	----	----	----	----	----	----	----	----
Phenol	0.0005	0.00	0.0005	0.00011	0.00044	----	----	----	----	----	----	----	----	----	----
Toluene	0.03	0.005	0.02	0.0049	0.020	0.01	0.01	0.0	0.00	0.00	0.005	0.005	0.0	0.00	0.00
Xylene	0.016	0.003	0.01	0.0029	0.012	0.003	0.003	0.0	0.00	0.00	0.0030	0.0030	0.0	0.00	0.00
TOTAL HAPs	0.067	0.012	0.05	0.012	0.049	0.012	0.012	0.0	0.00	0.00	0.012	0.012	0.0	0.00	0.00
Carbon Dioxide	8.40	32.00	-23.60	----	----	32.00	5.30	26.70	120.35	479.24	5.00	5.30	-0.30	----	----

Post Treatment System Tanks

Company:	**Antero Treatment LLC**	
Facility Name:	**Antero Clearwater Facility**	
Facility Location:	**Doddridge County, WV**	
Source Description:	**Post Treatment System Tanks**	
Emission Unit ID:	**TK-2500, TK-2550, TK-2555, CF-2510, TK-2520, and TK-2515**	

	TK-2515 [9]		TK-2520 [9]	
	Emissions		Emissions	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)
VOCs as oil	0.77	3.10	0.015	0.064
Ammonia	0.0014	0.0057	0.00089	0.0039
Benzene	1.2E-04	5.0E-04	2.1E-05	9.1E-05
3&4 Methylbenzene	7.5E-09	3.0E-08	3.8E-09	1.7E-08
Cumene	----	----	----	----
Ethylbenzene	----	----	----	----
Phenol	----	----	----	----
Toluene	2.4E-04	9.6E-04	3.0E-05	1.3E-04
Xylene	1.6E-04	6.2E-04	1.6E-06	7.2E-06
TOTAL HAPs	0.00052	0.0021	0.00005	0.00023
Carbon Dioxide	0.95	3.81	0.027	0.12

Notes

1. Due to the nature of the processes for the Post Treatment tanks, emissions will be calculated by mass balance based on Material Balance Stream data. In and out concentrations shown are based on material balance in the liquid phase and it is assumed the difference in concentration is due to volatilization unless denoted otherwise by the process.
2. Influent Streams to TK-2500 are 298, 402, and 405 and the sum of the streams is shown above.
3. Negative delta concentrations in the liquid phase in this case means added to the system.
4. Due to the nature of the process, the volatile components in TK-2500 are expected to adsorb onto the biosolids that are formed or otherwise consumed in the process based on experience with the process from the design firm. Its is expected that 95% of the organics will be adsorbed or consumed.
5. It is assumed most all of the ammonia (98%) will be reduced in TK-2500 as explained in Attachment G.
6. The rest of the process train (TK-2550 to CF-2510) only has changes regarding air emissions in CO2.
7. Influent Stream to TK-2550 and TK-2555 is 403 and is shown above.
8. Influent Stream to CF-2510 is 406 and is shown above.
9. Influent Streams to TK-2520 and TK-2515 are 407 and 408. Emissions are calculated from these tanks by WATER9 as there was not enough data on the effluent streams to perform material balance.

Atmospheric Storage Tank Working and Breathing Emissions

Company:	**Antero Treatment LLC**	
Facility Name:	**Antero Clearwater Facility**	
Facility Location:	**Doddridge County, WV**	
Source Description:	**Atmospheric Storage Tanks**	
Emission Unit IDs:	**TK-2120 and TK-4115**	

TANK DESCRIPTION	Peak Flow (gph)	Avg Flow (gph)	VOCs		Methanol		Ammonia	
			(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
Process Distillate Level Tank (TK-2120)	74,580	68,400	-----	-----	-----	-----	0.29	1.18
Methanol Bulk Storage Tank (TK-4115)	85.6	31.3	0.067	0.25	0.067	0.25	-----	-----
TOTAL			**0.067**	**0.25**	**0.067**	**0.25**	**0.29**	**1.18**

Notes:

1. EPA Tanks 4.0.9d used to calculate standing, working, and breathing emissions.
2. Pounds per hour emissions calculated using the peak flow rate from the Material Balance Sheet and tons per year emissions calculated using the average flow rate from the Material Balance Sheet.
3. Process Distillate Level Tank uses Material Balance streams 226, 251, 261, and 271. Only stream 226 contained ammonia so the concentration was adjusted for total flow.
4. Methanol is both a HAP and VOC.

Sludge and Salt Disposal Emissions

Company:	**Antero Treatment LLC**	
Facility Name:	**Antero Clearwater Facility**	
Facility Location:	**Doddridge County, WV**	
Source Description:	**Sludge and Wetcake Disposal Emissions**	
Emission Unit ID:	**DISP1, DISP2, and DISP3**	

	Stage 1 Sludge Disposal			Stage 2 Sludge Disposal			Salt Disposal					
	DISP3			DISP1			DISP2 - 4A Salt			DISP2 - 4B Salt		
	1,136	L/hr Average		7,949	L/hr Average		69,412	lb/hr Average		107,624	lb/hr Average	
	In	Emissions[1,3,4]		In	Emissions[2,3,4]		In	Emissions[5]		In	Emissions[5]	
	mg/L	(lb/hr)	(tpy)	mg/L	(lb/hr)	(tpy)	ppmw	(lb/hr)	(tpy)	ppmw	(lb/hr)	(tpy)
VOCs	280	0.070	0.31	2,580	4.52	19.80	0.10	0.0051	0.022	0.50	0.059	0.26
Ammonia	151	0.038	0.17	132	0.033	0.14	----	----	----	----	----	----
Benzene	1.00	2.5E-04	1.1E-03	0.575	1.4E-04	6.3E-04	----	----	----	----	----	----
Ethylbenzene	0.00	0.0E+00	0.0E+00	0.044	1.1E-05	4.8E-05	----	----	----	----	----	----
Toluene	0.00	0.0E+00	0.0E+00	0.908	2.3E-04	1.0E-03	----	----	----	----	----	----
Xylene	0.00	0.0E+00	0.0E+00	0.553	1.4E-04	6.1E-04	----	----	----	----	----	----
TOTAL HAPs	1.00	0.00025	0.0011	2.08	0.00052	0.0023	----	----	----	----	----	----
Carbon Dioxide [3]	29	0.0073	0.032	0.002	5.01E-07	2.19E-06	----	----	----	----	----	----

Notes

1. Influent Stream for the Stage 1 dewatered sludge is 118.
2. Influent Stream for the Stage 2 dewatered sludge is 126.
3. DISP1 and DISP3 transferred to appropriate disposal containers to be taken to a landfill. Based on short term on-site storage from Section 9 of EPA-453/R-94-080A Air Emissions Models for Waste and Wastewater, the fraction volatilized to the air is estimated to be less than 10%.
4. Although Streams 118 and 126 have solids present, both DISP1 and DISP3 are wet processes so none of the particulates and associated HAPs bound to the particulates are expected to be released into the air. DISP1 has approximately 30-35% wet solids and DISP3 has approximately 60-75% wet solids. Additionally, DISP1 is via a covered disposal process and DISP3 disposal process is in a building.
5. Assumes 100% of the VOCs present in the salt are volatilized at the Antero Clearwater Facility.

Process Feeder System Particulate Matter Emissions

Company:	**Antero Treatment LLC**
Facility Name:	**Antero Clearwater Facility**
Facility Location:	**Doddridge County, WV**

Feed Rates into the Water Treatment System

DrySodium Sulfate - Max Process Rate:	120	lb/hr
Dry Sodium Sulfate - Avg Process Rate:	49.5	lb/hr
Dry Lime Feeder System A - Max Process Rate:	600	lb/hr
Dry Lime Feeder System A - Avg Process Rate:	250	lb/hr
Dry Lime Feeder System B - Max Process Rate:	600	lb/hr
Dry Lime Feeder System B - Avg Process Rate:	250	lb/hr
Dry Sodium Bicarbonate Feeder System - Max Process Rate:	25	lb/hr
Dry Sodium Bicarbonate Feeder System - Avg Process Rate:	11.7	lb/hr
Dry Calcium Carbonate Feeder System - Max Process Rate:	380	lb/hr
Dry Calcium Carbonate Feeder System - Avg Process Rate:	230	lb/hr

Emissions Multiplier Ratio

lb PM2.5/ton	1.30E-05	Table 11.19.2-2 (controlled)
lb PM10/ton	4.60E-05	Table 11.19.2-2 (controlled)
lb PM/ton	1.40E-04	Table 11.19.2-2 (controlled)

Sodium Sulfate Feeder System

Source ID	Emission Source	Emission Factor		PM		PM10[3]		PM2.5[4]		Emission Factor Source
				(lb/hr)[1]	(ton/yr)[2]	(lb/hr)[1]	(ton/yr)[2]	(lb/hr)[1]	(ton/yr)[2]	
TK-4036	Sodium Sulfate Silo[5]	5.2	lb/ton product	0.31	0.56	0.10	0.19	0.029	0.05	AP-42 Table 8.12-3 for Sodium Carbonate
U-4037	Sodium Sulfate Bin Discharger5	5.2	lb/ton product	0.31	0.56	0.10	0.19	0.029	0.05	AP-42 Table 8.12-3 for Sodium Carbonate
U-4038	Sodium Sulfate Bin Feeder5	5.2	lb/ton product	0.31	0.56	0.10	0.19	0.029	0.05	AP-42 Table 8.12-3 for Sodium Carbonate
	System Total Max Hourly Emissions:			**0.94**	lb/hr	**0.31**	lb/hr	**0.087**	lb/hr	
	System Total Average Annual Emissions:			**1.69**	ton/yr	**0.56**	ton/yr	**0.16**	ton/yr	

1) The hourly emissions (lb/hr) are determined using the max hourly production rate for the system.

2) The annual emissions (ton/yr) are determined using the average hourly production rate for the system.

3) Emission factors for PM10 are not provided in AP-42 Table 8.12-3. Therefore, the PM10 emissions are based on AP-42 11.19.2 Crushed Stone and Pulverized Mineral Processing and the particule size multiplier ratio PM10/PM of 4.6E-05/1.4E-04, shown in AP-42, Table 11.19.2-2.

4) Emission factors for PM2.5 are not provided in AP-42 Table 8.12-3. Therefore, the PM2.5 emissions are based on AP-42 11.19.2 Crushed Stone and Pulverized Mineral Processing and the particule size multiplier ratio PM2.5/PM10 of 1.3E-05/4.6E-05, shown in AP-42, Table 11.19.2-2.

5) Emission calculations for each source assume that the process feed rate is equal to the system production rates. Additionally, it is assumed that each emission source accounts for a single drop point.

Process Feeder System Particulate Matter Emissions

Company:	**Antero Treatment LLC**
Facility Name:	**Antero Clearwater Facility**
Facility Location:	**Doddridge County, WV**

Bulk Lime Feeder System A

Source ID	Emission Source	Emission Factor		PM		PM10[3]		PM2.5[4]		Emission Factor Source
				(lb/hr)[1]	(ton/yr)[2]	(lb/hr)[1]	(ton/yr)[2]	(lb/hr)[1]	(ton/yr)[2]	
TK-4046A	Lime Silo A[5]	2.2	lb/ton product	0.66	1.20	0.22	0.40	0.061	0.11	AP-42 Table 11.17-4 for Lime Processing
U-4047A	Lime Bin Discharger A[5]	2.2	lb/ton product	0.66	1.20	0.22	0.40	0.061	0.11	AP-42 Table 11.17-4 for Lime Processing
U-4048A	Lime Bin Feeder A[5]	2.2	lb/ton product	0.66	1.20	0.22	0.40	0.061	0.11	AP-42 Table 11.17-4 for Lime Processing
	System Total Max Hourly Emissions:			**1.98**	lb/hr	**0.65**	lb/hr	**0.18**	lb/hr	
	System Total Average Annual Emissions:			**3.61**	ton/yr	**1.19**	ton/yr	**0.34**	ton/yr	

1) The hourly emissions (lb/hr) are determined using the max hourly production rate for the system.

2) The annual emissions (ton/yr) are determined using the average hourly production rate for the system.

3) Emission factors for PM10 are not provided in AP-42 Table 11.17-4. Therefore, the PM10 emissions are based on AP-42 11.19.2 Crushed Stone and Pulverized Mineral Processing and the particule size multiplier ratio PM10/PM of 4.6E-05/1.4E-04, shown in AP-42, Table 11.19.2-2.

4) Emission factors for PM2.5 are not provided in AP-42 Table 11.17-4. Therefore, the PM2.5 emissions are based on AP-42 11.19.2 Crushed Stone and Pulverized Mineral Processing and the particule size multiplier ratio PM2.5/PM10 of 1.3E-05/4.6E-05, shown in AP-42, Table 11.19.2-2.

5) Emission calculations for each source assume that the process feed rate is equal to the system production rates. Additionally, it is assumed that each emission source accounts for a single drop point.

Bulk Lime Feeder System B

Source ID	Emission Source	Emission Factor		PM		PM10[3]		PM2.5[4]		Emission Factor Source
				(lb/hr)[1]	(ton/yr)[2]	(lb/hr)[1]	(ton/yr)[2]	(lb/hr)[1]	(ton/yr)[2]	
TK-4046B	Lime Silo B[5]	2.2	lb/ton product	0.66	1.20	0.22	0.40	0.061	0.11	AP-42 Table 11.17-4 for Lime Processing
U-4047B	Lime Bin Discharger B[5]	2.2	lb/ton product	0.66	1.20	0.22	0.40	0.061	0.11	AP-42 Table 11.17-4 for Lime Processing
U-4048B	Lime Bin Feeder B[5]	2.2	lb/ton product	0.66	1.20	0.22	0.40	0.061	0.11	AP-42 Table 11.17-4 for Lime Processing
	System Total Max Hourly Emissions:			**1.98**	lb/hr	**0.65**	lb/hr	**0.18**	lb/hr	
	System Total Average Annual Emissions:			**3.61**	ton/yr	**1.19**	ton/yr	**0.34**	ton/yr	

1) The hourly emissions (lb/hr) are determined using the max hourly production rate for the system.

2) The annual emissions (ton/yr) are determined using the average hourly production rate for the system.

3) Emission factors for PM10 are not provided in AP-42 Table 11.17-4. Therefore, the PM10 emissions are based on AP-42 11.19.2 Crushed Stone and Pulverized Mineral Processing and the particule size multiplier ratio PM10/PM of 4.6E-05/1.4E-04, shown in AP-42, Table 11.19.2-2.

4) Emission factors for PM2.5 are not provided in AP-42 Table 11.17-4. Therefore, the PM2.5 emissions are based on AP-42 11.19.2 Crushed Stone and Pulverized Mineral Processing and the particule size multiplier ratio PM2.5/PM10 of 1.3E-05/4.6E-05, shown in AP-42, Table 11.19.2-2.

5) Emission calculations for each source assume that the process feed rate is equal to the system production rates. Additionally, it is assumed that each emission source accounts for a single drop point.

Process Feeder System Particulate Matter Emissions

Company:	**Antero Treatment LLC**
Facility Name:	**Antero Clearwater Facility**
Facility Location:	**Doddridge County, WV**

Sodium Bicarbonate Feeder System

Source ID	Emission Source	Emission Factor		PM		PM10[3]		PM2.5[4]		Emission Factor Source
				(lb/hr)[1]	(ton/yr)[2]	(lb/hr)[1]	(ton/yr)[2]	(lb/hr)[1]	(ton/yr)[2]	
TK-4012	Sodium Bicarbonate Silo[5]	5.2	lb/ton product	0.065	0.13	0.021	0.044	0.0060	0.012	AP-42 Table 8.12-3 for Sodium Carbonate
U-4012	Sodium Bicarbonate Bin Discharger[5]	5.2	lb/ton product	0.065	0.13	0.021	0.044	0.0060	0.012	AP-42 Table 8.12-3 for Sodium Carbonate
U-4013	Sodium Bicarbonate Volumentric Feeder[5]	5.2	lb/ton product	0.065	0.13	0.021	0.044	0.0060	0.012	AP-42 Table 8.12-3 for Sodium Carbonate
	System Total Max Hourly Emissions:			**0.20**	lb/hr	**0.064**	lb/hr	**0.018**	lb/hr	
	System Total Average Annual Emissions:			**0.40**	ton/yr	**0.13**	ton/yr	**0.037**	ton/yr	

1) The hourly emissions (lb/hr) are determined using the max hourly production rate for the system.

2) The annual emissions (ton/yr) are determined using the average hourly production rate for the system.

3) Emission factors for PM10 are not provided in AP-42 Table 8.12-3. Therefore, the PM10 emissions are based on AP-42 11.19.2 Crushed Stone and Pulverized Mineral Processing and the particule size multiplier ratio PM10/PM of 4.6E-05/1.4E-04, shown in AP-42, Table 11.19.2-2.

4) Emission factors for PM2.5 are not provided in AP-42 Table 8.12-3. Therefore, the PM2.5 emissions are based on AP-42 11.19.2 Crushed Stone and Pulverized Mineral Processing and the particule size multiplier ratio PM2.5/PM10 of 1.3E-05/4.6E-05, shown in AP-42, Table 11.19.2-2.

5) Emission calculations for each source assume that the process feed rate is equal to the system production rates. Additionally, it is assumed that each emission source accounts for a single drop point.

Calcium Carbonate Feeder System

Source ID	Emission Source	Emission Factor		PM		PM10[3]		PM2.5[4]		Emission Factor Source
				(lb/hr)[1]	(ton/yr)[2]	(lb/hr)[1]	(ton/yr)[2]	(lb/hr)[1]	(ton/yr)[2]	
TK-4301	Calcium Carbonate Silo[5]	5.2	lb/ton product	0.99	2.62	0.32	0.86	0.092	0.24	AP-42 Table 8.12-3 for Sodium Carbonate
U-4302	Calcium Carbonate Bin Discharger[5]	5.2	lb/ton product	0.99	2.62	0.32	0.86	0.092	0.24	AP-42 Table 8.12-3 for Sodium Carbonate
U-4303	Calcium Carbonate Volumentric Feeder[5]	5.2	lb/ton product	0.99	2.62	0.32	0.86	0.092	0.24	AP-42 Table 8.12-3 for Sodium Carbonate
	System Total Max Hourly Emissions:			**2.96**	lb/hr	**0.97**	lb/hr	**0.28**	lb/hr	
	System Total Average Annual Emissions:			**7.86**	ton/yr	**2.58**	ton/yr	**0.73**	ton/yr	

1) The hourly emissions (lb/hr) are determined using the max hourly production rate for the system.

2) The annual emissions (ton/yr) are determined using the average hourly production rate for the system.

3) Emission factors for PM10 are not provided in AP-42 Table 8.12-3. Therefore, the PM10 emissions are based on AP-42 11.19.2 Crushed Stone and Pulverized Mineral Processing and the particule size multiplier ratio PM10/PM of 4.6E-05/1.4E-04, shown in AP-42, Table 11.19.2-2.

4) Emission factors for PM2.5 are not provided in AP-42 Table 8.12-3. Therefore, the PM2.5 emissions are based on AP-42 11.19.2 Crushed Stone and Pulverized Mineral Processing and the particule size multiplier ratio PM2.5/PM10 of 1.3E-05/4.6E-05, shown in AP-42, Table 11.19.2-2.

5) Emission calculations for each source assume that the process feed rate is equal to the system production rates. Additionally, it is assumed that each emission source accounts for a single drop point.

Natural Gas Fueled Fuel Conditioning Skid Heater Emissions

Company:	**Antero Treatment LLC**
Facility Name:	**Antero Clearwater Facility**
Location:	**Doddridge County, WV**
Source Description:	**Fuel Conditioning Heater**

Source Information

Emission Unit ID:	HTFUEL1 and HTFUEL2	
Source Description:	Fuel Conditioning Heaters	
Hours of Operation	8,760	hr/yr
Design Heat Rate	2.40	MMBtu/hr
Number of Heaters	2	
Fuel Heat Value	1,020	Btu/scf
Fuel Use- all heaters	41.22	MMscf/yr

Emission Calculations for all Heaters

Pollutant	Emission Factor (lb/MMscf)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
NO_X	100	0.47	2.06	AP-42 Ch. 1.4 Table 1.4-1
CO	84	0.40	1.73	AP-42 Ch. 1.4 Table 1.4-1
VOC	5.5	0.026	0.11	AP-42 Ch. 1.4 Table 1.4-2
$PM_{10}/PM_{2.5}$	7.6	0.036	0.16	AP-42 Ch. 1.4 Table 1.4-2
SO_2	0.6	0.0028	0.012	AP-42 Ch. 1.4 Table 1.4-2
Formaldehyde	0.075	0.00035	0.0015	AP-42 Ch. 1.4 Table 1.4-3
Total HAPs (including HCHO)[1]	1.9	0.0089	0.039	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	281.43	1,232.7	40 CFR Part 98, Subpart C, Table C-1
Methane	0.001	0.0053	0.023	40 CFR Part 98, Subpart C, Table C-2
Nitrous Oxide	0.0001	0.00053	0.0023	40 CFR Part 98, Subpart C, Table C-2
CO_2e	----	281.72	1,233.9	40 CFR Part 98, Subpart A, Table A-1

1. Only those HAP pollutants above detection thresholds were included.

Sample Calculations:

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

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

Fugitive Emissions From Venting Episodes

Company:	**Antero Treatment LLC**
Facility Name:	**Antero Clearwater Facility**
Facility Location:	**Doddridge County, WV**
Source Description:	**Fugitive Emissions-Venting Episodes**

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[3]**	**VOC Emissions (ton/yr)**
Pigging Venting (VENT1)	52	767	19.17	1.01	0.19	0.20
Total Emissions (tons/yr)						**0.20**

HAPs Venting Emissions										
Type of Event[1]	**Benzene Weight Fraction[3]**	**Benzene Emissions (tpy)**	**Toluene Weight Fraction[3]**	**Toluene Emissions (tpy)**	**Ethylbenzene Weight Fraction[3]**	**Ethylbenzene Emissions (tpy)**	**Xylene Weight Fraction[3]**	**Xylene Emissions (tpy)**	**n-Hexane Weight Fraction[3]**	**n-Hexane Emissions (tpy)**
Pigging Venting (VENT1)	1.39E-04	1.40E-04	3.89E-04	3.92E-04	8.31E-05	8.37E-05	7.20E-05	7.25E-05	3.96E-03	3.99E-03
Total Emissions (tons/yr)		**1.40E-04**		**3.92E-04**		**8.37E-05**		**7.25E-05**		**3.99E-03**

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[3]**	**CO_2 Weight Fraction[3]**	**CH_4 Emissions (ton/yr)**	**CO_2 Emissions (ton/yr)**	**CO_2e Emissions (tpy)**
Pigging Venting (VENT1)	52	767	19.17	0.73	0.0056	0.74	0.0056	18.47
Total Emissions (tons/yr)						**0.74**	**0.0056**	**18.47**

1) Estimated number of events from engineering based on other facilities

2) Amount vented is based on the 10.25 cubic foot cylinder adjusted from standard conditions to 1100 psia expected operating condition

3) Weight Fraction is from a gas analysis that will be typical for the facility

Fugitive Dust Emissions

Company:	**Antero Treatment LLC**
Facility Name:	**Antero Clearwater Facility**
Facility Location:	**Doddridge County, WV**
Source Description:	**Fugitive Dust from Travel on the Facility Roads**
Emission Unit ID:	**PROAD**

Vehicles	Truck Weight[1]	Trips per year	Trips per day[2]	Distance per round trip (truck in and out)[3]		VMT per year
	tons			feet	miles	miles
Influent Water Trucks	40	219,000	600	4,400	0.83	182,500
Oil Trucks	40	1,095	3	4,400	0.83	913
Chemical Delivery Trucks	40	1,825	5	5,600	1.06	1,936
Sludge/Salt Trucks	60	27,375	75	2,000	0.38	10,369
Worker Vehicles	2	3,650	10	5,600	1.06	3,871

Equation Parameter	Value
Eext, annual size-specific emission factor for PM_{10} & $PM_{2.5}$ (paved roads) extrapolated for natural mitigation	**see table below**
k, Particle size multiplier for particle size range (PM_{10}), (lb/VMT) (Source: AP-42 Table 13.2.1-1)	**0.0022**
k, Particle size multiplier for particle size range ($PM_{2.5}$), (lb/VMT) (Source: AP-42 Table 13.2.2-2)	**0.00054**
sL, surface material silt content, (g/m^2) (Source: AP-42 Table 13.2.1-2)[4]	**0.6**
W, mean weight (tons) of the vehicles traveling the road	**41.62**
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 13.2.1-2.	**150**

Annual:

$$E_{ext} = [\ k\ (sL)^{0.91} \times (W)^{1.02}\ ]\ (1 - P/4N)$$

Hourly:

$$E = k\ (sL)^{0.91} \times (W)^{1.02}$$

Source of Equations: AP-42 Section 13.2.1

PM_{10} Emissions

Emission Factor	Vehicle miles traveled		PM_{10} Emissions	
(lb/VMT)	(VMT/hr)	(VMT/yr)	(lb/hr)	(tons/yr)
0.062	23	-----	1.41	-----
0.056	-----	199,589	-----	5.55

$PM_{2.5}$ Emissions

Emission Factor	Vehicle miles traveled		PM_{10} Emissions	
(lb/VMT)	(VMT/hr)	(VMT/yr)	(lb/hr)	(tons/yr)
0.015	23	-----	0.35	-----
0.014	-----	199,589	-----	1.36

Table Notes:

1. Truck weights are assumed to be empty on one leg and loaded on the other.
2. Influent trucks are based on 100 bbl trucks at 60,000 bbl/day. Chemical trucks are based on at most 24,000 gallons of chemicals per day needed at the facility in 5,000 gallon trucks. Sludge and salt disposal trucks are based on expected number of trucks. Worker vehicles are based on 2 shifts per day with a maximum of 5 workers per shift. Oil trucks are based on 447 bbl/day of oil loaded out with 180 bbl trucks.
3. Distance per round trip is based on the proposed site layout and the various truck bays.
4. The silt loading value of 0.6 g/m^2 is for public roads. Although the facility is industrial, the facility will not be a source of particlate matter generation as would a mining facility, so the public road silt loading was deemed appropriate.

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 Clearwater Facility, including federal and state regulatory requirements.

1. Summary of Key Operational Throughput Limits

a. Maximum liquids loaded: 21,900,000 barrels per year (919,800,000 gallons per year).

b. Maximum fuel use for both boilers is 3589.2 MMscf/year.

c. Maximum oil loaded out: 188,048 barrels per year (7,898,016 gallons per year).

2. Operational Requirements

a. Generator engine will meet Tier II emission standards and will be fueled by diesel only. Fire water pump engine will be fueled by diesel only.

b. Boilers will be fueled by natural gas only at a heater rating no more than 275.3 MMBtu/hr.

c. No fuel-burning unit of any kind will have opacity greater than 10 percent based on a six minute block average observation.

d. Boilers will meet applicable requirements of 40 CFR Part 60 Subpart Db.

e. The thermal oxidizer capacity will not exceed 11.0 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.

f. The thermal oxidizer will be operated per manufacturer instructions.

g. Waste gas header storage tanks potential emissions shall be routed to the thermal oxidizer with destruction efficiency greater than 98 percent at all times.

h. The Stage 1 Filtrate Tank will be routed to the Carbon Canister at all times.

i. The Carbon Canister will be operated per manufacturer instructions and the granular activated carbon replaced when necessary.

j. Liquid loadout trucks will use the submerged-fill method.

k. Facility roads and driveways will be gravel until they can be paved.

3. Monitoring

a. Hours of operation for the emergency engine and fire water pump will be monitored; including emergency, maintenance and testing, and non-emergency hours.

b. An initial Method 22 observation will be conducted of the thermal oxidizer for a minimum of 2 hours.

c. Monthly Method 22 observations will be conducted of the thermal oxidizer for a minimum of 10 minutes each.

d. Monthly olfactory, visual, and auditory inspections will be conducted of the tanks closed vent and control system (thermal oxidizer) for leaks or defects that could result in emissions. Leaks will be repaired as soon as practicable (no later than 5 days for first attempt).

e. The presence of thermal oxidizer flame will be continuously monitored.

f. The daily and rolling twelve-month average amount of liquids unloaded and loaded will be monitored.

g. The daily and rolling twelve-month average amount of sludge disposed of will be monitored.

h. The daily and rolling twelve-month average amount of salt disposed of will be monitored.

i. Hours of operation of the granular activated carbon will be monitored.

4. Recordkeeping

a. Records will be kept in company records (on or off-site) for a minimum of 5 years.

b. Records will be kept of inspections, observations, preventive maintenance, malfunctions, and shutdowns of all onsite equipment.

c. Records will be kept of the date, time, and duration of each time that a thermal oxidizer flame is not present at the thermal oxidizer as well as startup, shutdown, and malfunctions of the thermal oxidizer.

d. Records will be kept of generator engine and fire water pump maintenance and run time.

e. Records will be kept of the fuel combusted in the boilers including the sulfur content, the actual run time of each boiler, and all opacity inspections.

f. The daily and rolling twelve-month average amount of liquids unloaded and loaded will be recorded.

g. The daily and rolling twelve-month average amount of sludge disposed of will be recorded.

h. The daily and rolling twelve-month average amount of salt disposed of will be recorded.

i. Hours of operation of the granular activated carbon will be recorded.

5. Notifications and Reports

a. Notify WVDAQ within 30 calendar days of commencement of construction.

b. Notify WVDAQ within 30 calendar days of startup.

c. Upon startup, file a Certificate to Operate (CTO) application and pay fees to WVDAQ for the period from startup to the following June 30 and then annually renew the CTO and pay fees. Maintain CTO on-site.

d. For stack testing, file protocol at least 30 days prior to test and notify WVDAQ and EPA of the test at least 15 days prior to test. Report results within 60 days of test.

e. If operations are suspended for 60 days or more, notify WVDAQ within 2 weeks after the 60th day.

Attachment P.
Public Notice

AIR QUALITY PERMIT NOTICE
Notice of Class II Administrative Update – Antero Clearwater Facility

Notice is given that Antero Treatment LLC has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a Class II Administrative Update to a 45CSR13 Construction Permit for a water treatment facility located south of US-50 near Greenwood, in Doddridge County, West Virginia. The latitude and longitude coordinates are: 39.26923N, 80.89309W.

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

Pollutant	Emission Rate (tons per year)
Nitrogen Oxides (NOx)	0.0
Carbon Monoxide (CO)	0.0
Volatile Organic Compounds (VOCs)	1.75
Particulate Matter less than 10 µm (PM_{10})	0.0
Particulate Matter less than 2.5 µm ($PM_{2.5}$)	0.0
Sulfur Dioxide (SO_2)	0.0
Total Hazardous Air Pollutants (HAPs)	0.0
Carbon Dioxide Equivalent (CO_2e)	0.24

Startup of operation for the updates is planned to begin on or about September 1, 2017, with construction already started for the currently permitted equipment. Written comments will be received by the West Virginia Department of Environmental Protection, Division of Air Quality, 601 57th Street, SE, Charleston, WV 25304, for at least 30 calendar days from the date of publication of this notice.

Any questions regarding this permit application should be directed to the DAQ at (304) 926-0499, extension 1250, during normal business hours.

Dated this the 28th day of February 2017.

By: Antero Resources Corporation
Barry Schatz
Senior Environmental and 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: June 13, 2016

ATTN.: Director

Corporation's / other business entity's Federal Employer I.D. Number 30-0882879

The undersigned hereby files with the West Virginia Department of Environmental Protection, Division of Air Quality, a permit application and hereby certifies that the said name is a trade name which is used in the conduct of an incorporated business or other business entity.

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

(1) Barry Schatz (is/are) the authorized representative(s) and in that capacity may represent the interest of the corporation or the business entity and may obligate and legally bind the corporation or the business entity.

(2) The corporation or the business entity is authorized to do business in the State of West Virginia.

(3) If the corporation or the business entity changes its authorized representative(s), the corporation or the business entity shall notify the Director of the West Virginia Department of Environmental Protection, Division of Air Quality, immediately upon such change.

Al Schopp, Regional Senior Vice President and Chief Administrative Officer

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 Treatment LLC
Name of Corporation or business entity