KLEINFELDER
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September 26, 2016

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 Air Permit Modification Application, R13-3260

Mr. Williams,

On behalf of Antero Treatment LLC, please find attached the 45CSR13 Air Permit Modification Application 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 R13-3260.

Proposed modifications to the Facility include the following:

- Modification of the emergency generator model and change to true emergency status per NSPS IIII;
- Modification to the operation of the boilers to take an 89% fuel limitation from maximum and change the status of the Facility to a synthetic minor;
- Modification to the thermal oxidizer heat rating and operation;
- Modification of operations in the thermal portion of the facility resulting in emission changes to a few tanks and the salt disposal;
- Addition of a fire water pump engine;
- Addition of an emergency flare for the gas blanket stream;
- Addition of tanks and a change to the Pre-treatment operations at the Facility;
- Addition and removal of some of the chemical tanks (insignificant emissions);
- Addition of a calcium carbonate stream; and
- Addition of an offsite fuel conditioning skid that will support the Facility.

Attachment N contains a complete table of all the equipment that has been added, removed, or modified whether or not it is an emission source.

Enclosed is the original hard copy application plus two copies on CDs, including the permit application form and the required attachments. Per 45CSR22, a $2,000 application fee is also enclosed, which covers the base 45CSR13 $1,000 application fee, and an additional $1,000 for NSPS requirements.

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

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

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
Air Quality Specialist

Enclosures: Antero Clearwater Facility Air Permit Modification Application

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

Antero Treatment LLC

Antero Clearwater Facility

NSR Permit Modification Application
West Virginia Department of Environmental Protection
Division of Air Quality
45CSR13 – R13-3260

Doddridge County, West Virginia

September 2016

Prepared by:

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

DEN16O45199

Table of Contents

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):
R13-3260

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:
Pre-treatment process change and addition of new tanks in the pre-treatment area. Addition of fire water pump engine. Addition of fuel conditioning skid. Addition of emergency gas blanket flare. Both removal and addition of chemical storage tanks. Modification to the emergency generator and thermal oxidizer rating and models. Addition of a synthetic minor fuel limit for the boilers.

14A. Provide the date of anticipated installation or change: December 2016 – 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: March 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: Boilers, Emergency Generator, Fire water pump engine, material transfer point, venting, process tanks, heaters

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 : Thermal Oxidizer

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

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

31. **Monitoring, Recordkeeping, Reporting and Testing Plans.** Attach proposed monitoring, recordkeeping, reporting and testing plans in order to demonstrate compliance with the proposed emissions limits and operating parameters in this permit application. Provide this information as **Attachment O.**

➢ Please be aware that all permits must be practically enforceable whether or not the applicant chooses to propose such measures. Additionally, the DAQ may not be able to accept all measures proposed by the applicant. If none of these plans are proposed by the applicant, DAQ will develop such plans and include them in the permit.

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

33**. Business Confidentiality Claims.** Does this application include confidential information (per 45CSR31)?

☐ **YES** ☒ **NO**

➢ If **YES,** identify each segment of information on each page that is submitted as confidential and provide justification for each segment claimed confidential, including the criteria under 45CSR§31-4.1, and in accordance with the DAQ's ***"Precautionary Notice – Claims of Confidentiality"*** guidance found in the ***General Instructions*** as **Attachment Q.**

Section III. Certification of Information

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

☒ Authority of Corporation or Other Business Entity	☐ Authority of Partnership
☐ Authority of Governmental Agency	☐ Authority of Limited Partnership

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

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

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

Certification of Truth, Accuracy, and Completeness

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

Compliance Certification

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

SIGNATURE _____ (Please use blue ink) DATE: 8/25/16 (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

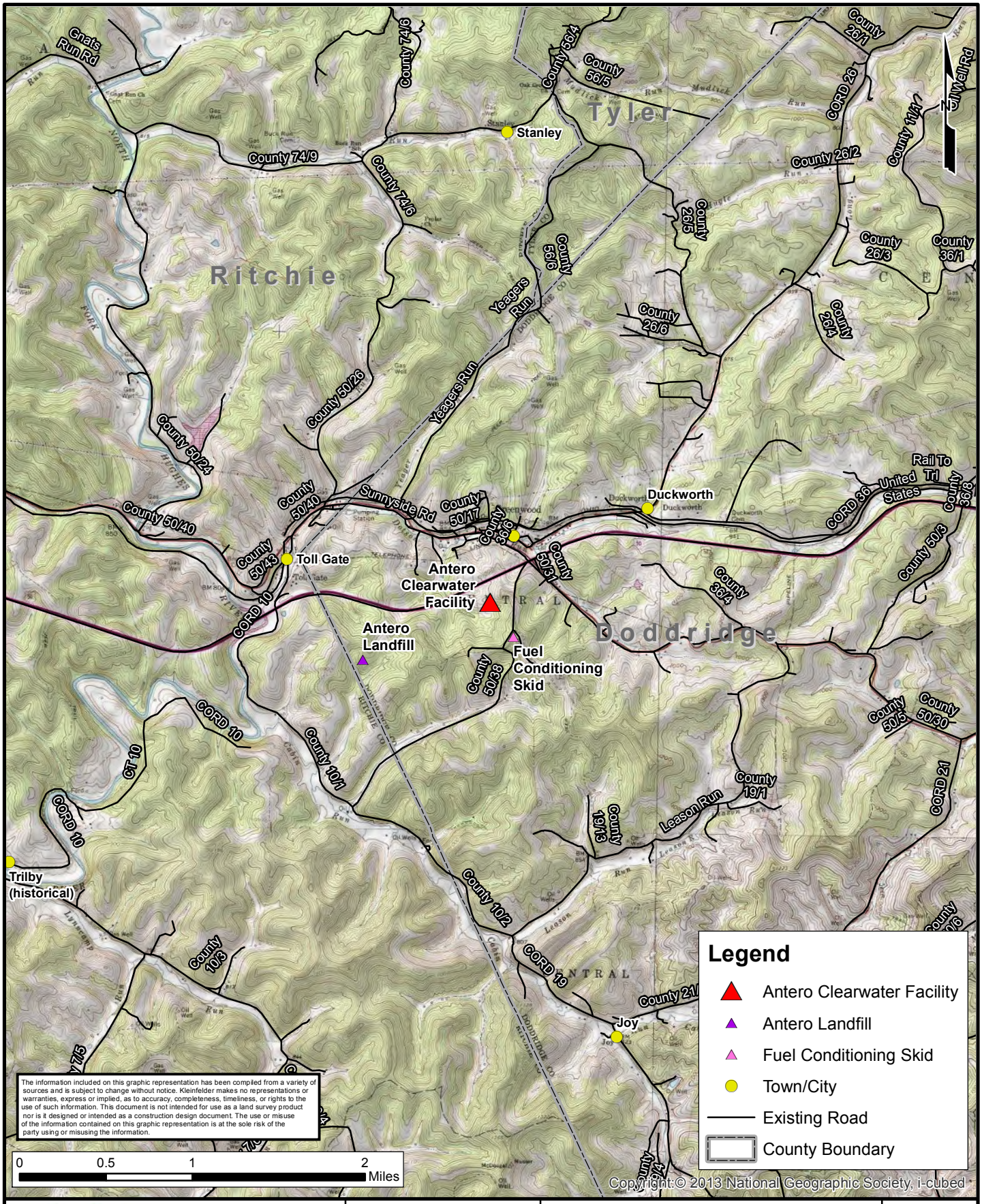
KLEINFELDER
Bright People. Right Solutions.
www.kleinfelder.com

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 a modified 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 R13-3260 is also occurring. Installation of the proposed equipment is scheduled to be installed in December 2016. Facility operations are scheduled to begin on or around March 2017.

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)		

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*

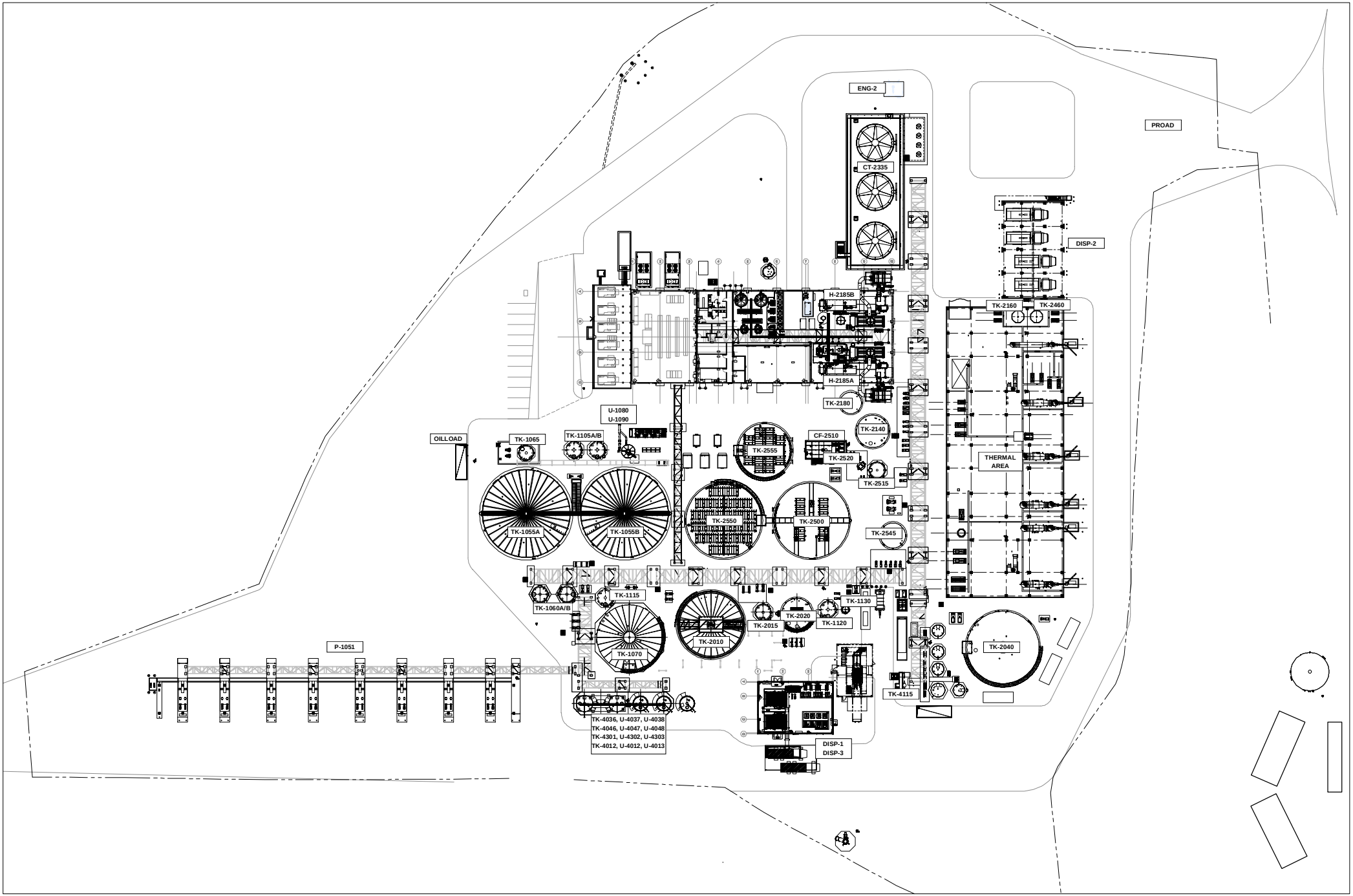
XII. *45CSR33 – Acid Rain Provisions and Permits*

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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OILLOAD
TK-1065
TK-1105A/B
TK-2555
CF-2510
TK-2520
THERMAL AREA
TK-2515
TK-1055A
TK-1055B
TK-2550
TK-2500
TK-2545
TK-1115
TK-1130
TK-1060A/B
TK-2020
TK-2015
TK-1120
TK-2010
TK-2040
P-1051
TK-1070
TK-4115
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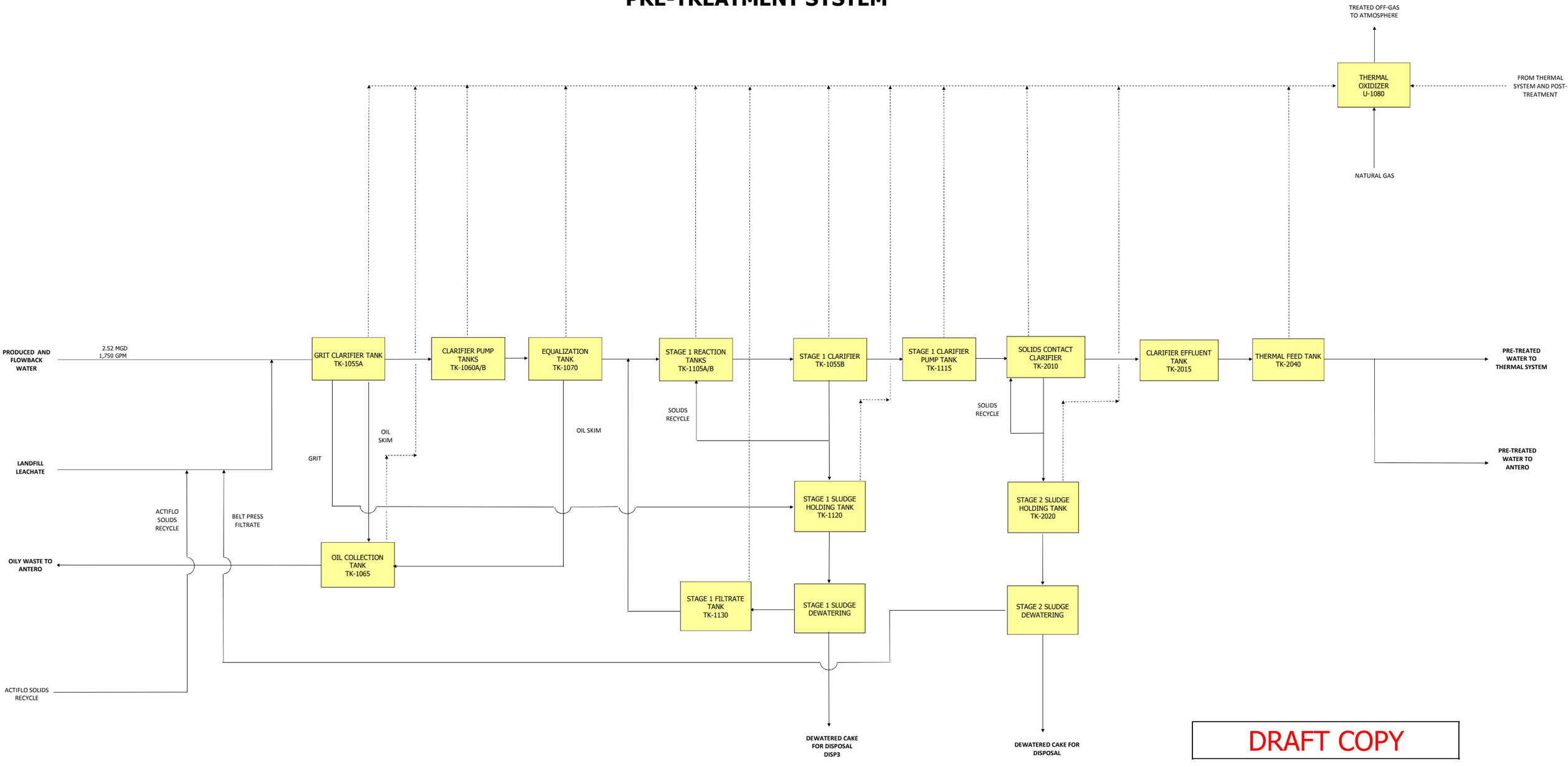
TK-4046, U-4047, U-4048
TK-4301, U-4302, U-4303
TK-4012, U-4012, U-4013
DISP-1
DISP-3

Attachment F.
Process Flow Diagram

PRE-TREATMENT SYSTEM



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B	11/9/15	HLK	BAB	CDB			
A	8/10/15	HLK	BAB	CDB			

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ANTERO CLEARWATER FACILITY

LINE DRAWING
PAGE 1 OF 3

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

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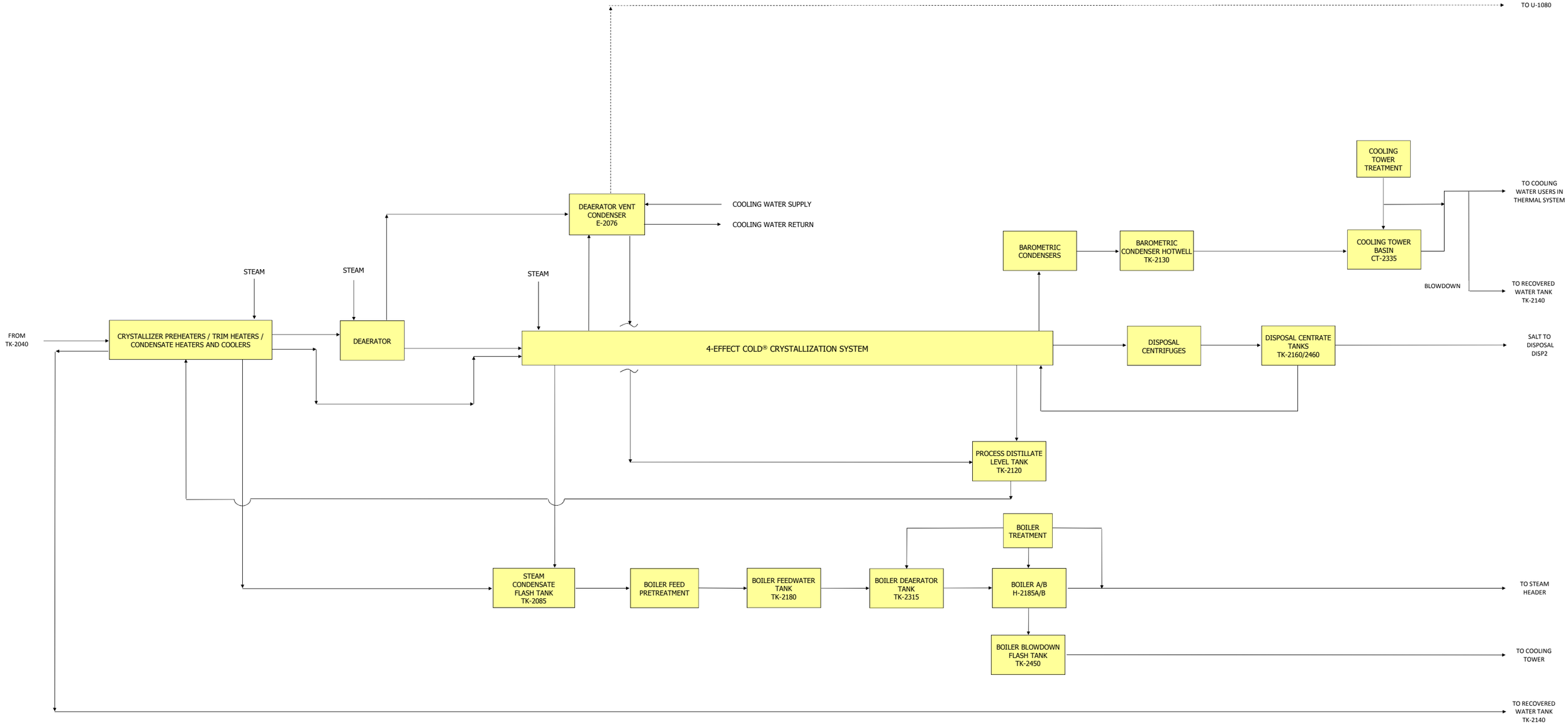

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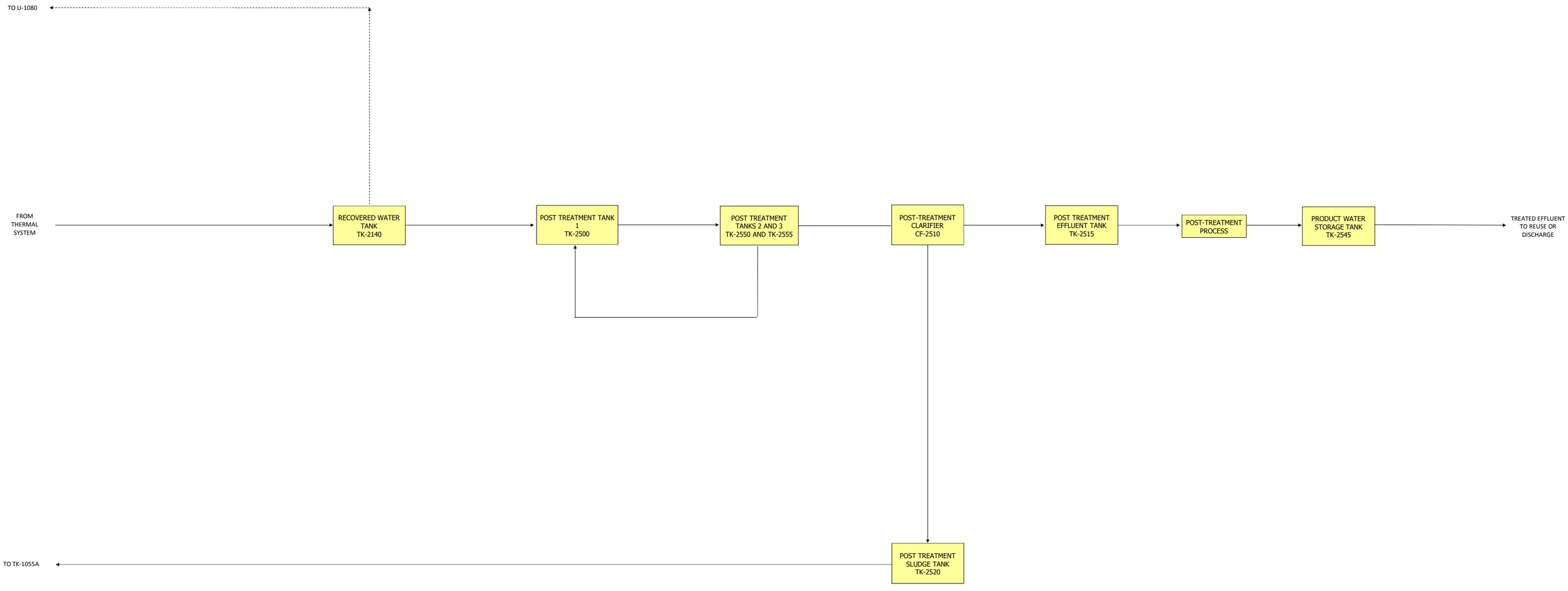
LINE DRAWING
PAGE 2 OF 3

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

POST-TREATMENT SYSTEM



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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).

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.

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: Some of the MSDS included in this attachment are representative and may not reflect the selected chemical supplier as the exact suppliers may not be known at this time.

SAFETY DATA SHEET

Material Name: Produced Water **US GHS**

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

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

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

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

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

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

* * * Section 2 – HAZARDS IDENTIFICATION * * *

GHS Classification:

Eye Irritant – Category 2A.

GHS LABEL ELEMENTS
Symbol(s)

Signal Word

Warning

Hazard Statements

Causes serious eye irritation

Precautionary Statements

Prevention

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

Response

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

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

If EYE irritation persists, get medical advice / attention.

Storage
Store in a secure area.

Disposal
Dispose of contents/containers in accordance with regulations.

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

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

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

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

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

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

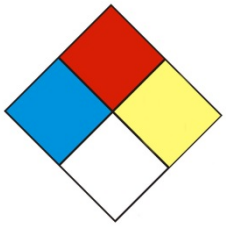
First Aid: Ingestion (Swallowing)
First aid is not required, normally. If spontaneous vomiting occurs, lean the victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. If symptoms develop, seek medical attention.

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

Most important symptoms and effects

None known or anticipated.

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



NFPA 704 Hazard Class

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

General Fire Hazards

No fire hazards are expected.

General Fire Hazards

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

Extinguishing Media

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

Unsuitable Extinguishing Media

None

Fire Fighting Equipment / Instructions

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

Hazardous Combustion Products

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

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

Recovery and Neutralization

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

Materials and Methods for Clean-Up

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

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

Emergency Measures

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

Personal Precautions and Protective Equipment

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

Environmental Precautions

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

Prevention of Secondary Hazards

None

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

Handling Procedures

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

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

Storage Procedures

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

Incompatibilities

Keep away from excessive heat to prevent rupture of container.

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

Component Exposure Limits

Water (7732-18-5)

ACGIH: Not listed

Sodium Chloride (7647-14-5)

ACGIH: Not listed

Engineering Measures

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

Personal Protective Equipment: Respiratory

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

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

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

Personal Protective Equipment: Skin and Hands

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

Personal Protective Equipment: Eyes

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

Hygiene Measures

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

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

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

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

Chemical Stability

This is a stable material.

Hazardous Reaction Potential

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

Conditions to Avoid

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

Hazardous Decomposition Products

Not anticipated under normal conditions of use.

Hazardous Polymerization

Not known to occur.

* * * Section 11 – TOXICOLOGICAL INFORMATION * * *

Acute Toxicity

A: General Product Information

Unlikely to be harmful.

B. Component Analysis – D50/LC50

Water (7732-18-5)

Oral LD50 Rat 90 g/kg

Sodium Chloride (7647-14-5)

Oral LD50 Rat 3 g/kg

Potential Health Effects: Skin Corrosion Property / Stimulativeness

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

Potential Health Effects: Eye Critical Damage / Stimulativeness

Contact with eyes may cause moderate irritation.

Potential Health Effects: Ingestion

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

Potential Health Effects: Inhalation

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

Generative Cell Mutagenicity

Not expected to cause genetic effects.

Carcinogenicity

General Product Information

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

Reproductive Toxicity

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

Specified Target Organ General Toxicity: Single Exposure

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

Specified Target Organ General Toxicity: Repeated Exposure

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

Aspiration Respiratory Organs Hazard

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

* * * Section 12 – ECOLOGICAL INFORMATION * * *

Ecotoxicity

A: General Product Information

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

Persistence / Degradability

No information available

Bioaccumulation

No information available

Mobility in Soil

No information available

* * * Section 13 – DISPOSAL CONSIDERATIONS * * *

Waste Disposal Instructions

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

Disposal of Contaminated Containers or Packaging

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

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

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

* * * Section 14 – TRANSPORTATION INFORMATION * * *

DOT Information

Shipping Description: Not Regulated

UN #: Not Regulated

* * * Section 15 – REGULATORY INFORMATION * * *

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

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

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

State Regulations

Component Analysis

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

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

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

U.S. Export control classification Number: EAR99.

* * * Section 16 – OTHER INFORMATION * * *

NFPA® Hazard Rating

Health	1
Fire	0
Reactivity	0

HMIS® Hazard Rating

Health	1	Slight
Fire	0	Minimal
Physical	0	Minimal

Key/Legend

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

Literature References

None

Other Information

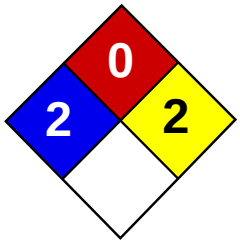
The information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those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

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

Date of Preparation: January 28, 2014

Date of Last Revision: March 4, 2014

End of Sheet



Health	2
Fire	0
Reactivity	1
Personal Protection	C

Material Safety Data Sheet
Calcium chloride, Anhydrous MSDS

Section 1: Chemical Product and Company Identification

Product Name: Calcium chloride, Anhydrous

Catalog Codes: SLC5011, SLC2221, SLC4012, SLC4798, SLC1006

CAS#: 10043-52-4

RTECS: EV9800000

TSCA: TSCA 8(b) inventory: Calcium chloride, Anhydrous

CI#: Not available.

Synonym:

Chemical Name: Calcium Chloride, Anhydrous

Chemical Formula: CaCl2

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Calcium chloride, Anhydrous	10043-52-4	100

Toxicological Data on Ingredients: Calcium chloride, Anhydrous: ORAL (LD50): Acute: 1000 mg/kg [Rat]. 1940 mg/kg [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to heart, cardiovascular system. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Furan-2-peroxycarboxylic acid + calcium chloride causes explosion at room temperature.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Do not ingest. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as moisture.

Storage:
Hygroscopic. Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 30°C (86°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Synthetic apron. Gloves (impervious).

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Boots. Gloves. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Crystalline solid.)

Odor: Odorless.

Taste: Saline.

Molecular Weight: 110.99 g/mole

Color: Colorless. White. Off-white.

pH (1% soln/water): 9 [Basic.]

Boiling Point: 1670°C (3038°F)

Melting Point: 772°C (1421.6°F)

Critical Temperature: Not available.

Specific Gravity: 2.15 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, acetone.

Solubility:
Easily soluble in cold water, hot water, acetone. Freely soluble in alcohol. Soluble in Acetic Acid.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, moisture.

Incompatibility with various substances: Reactive with moisture.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Hygroscopic. Reacts violently (violent boiling) with water, generating heat. Forms flammable gases and evolves hydrogen when reacted with zinc. Solutions attack some metals. Generates heat and violent polymerization occurs when mixed with methyl vinyl ether. Bromine trifluoride reacts violently with and attacks calcium chloride.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 1000 mg/kg [Rat].

Chronic Effects on Humans:
MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. May cause damage to the following organs: heart, cardiovascular system.

Other Toxic Effects on Humans:
Hazardous in case of skin contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Dose: LDL [Rabbit] - Route: Oral; Dose: 1384 mg/kg

Special Remarks on Chronic Effects on Humans:
May affect genetic material based on animal data. May cause cancer (tumorigenic) based on animal data.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: May cause severe irritation and possible burns, especially if skin is wet. Contact with dry skin causes mild irritation. Contact of solid with moist/wet skin or skin contact with strong solutions may cause marked irritation or possible burns. Eyes: May cause severe irritation, possible transient corneal injury, and possible eye burns. Inhalation: May cause severe irritation of the upper respiratory tract with pain, inflammation and possible burns. Ingestion: May cause severe gastrointestinal (digestive) tract irritation with nausea, vomiting and possible burns. May affect cardiovascular system (cardiac disturbances, slow heart beat), behavior (seizures), metabolism, blood, and brain, respiration (rapid respiration). Chronic Potential Health Effects: effects may be delayed.

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 100 mg/l 96 hours [Fish].

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations: TSCA 8(b) inventory: Calcium chloride, Anhydrous

Other Regulations: EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R36- Irritating to eyes. S2- Keep out of the reach of children. S22- Do not breathe dust. S24- Avoid contact with skin.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 1

Personal Protection: C

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 0

Reactivity: 2

Specific hazard:

Protective Equipment:
Gloves (impervious). Synthetic apron. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 04:31 PM

Last Updated: 05/21/2013 12:00 PM

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BOC GASES

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: CARBON DIOXIDE, GAS

1. Chemical Product and Company Identification

BOC Gases,
Division of
The BOC Group, Inc.
575 Mountain Avenue
Murray Hill, NJ 07974

TELEPHONE NUMBER: (908) 464-8100
24-HOUR EMERGENCY TELEPHONE NUMBER:
CHEMTREC (800) 424-9300

BOC Gases
Division of
BOC Canada Limited
5975 Falbourne Street, Unit 2
Mississauga, Ontario L5R 3W6

TELEPHONE NUMBER: (905) 501-1700
24-HOUR EMERGENCY TELEPHONE NUMBER:
(905) 501-0802
EMERGENCY RESPONSE PLAN NO: 20101

PRODUCT NAME: CARBON DIOXIDE, GAS
CHEMICAL NAME: Carbon Dioxide
COMMON NAMES/SYNONYMS: Carbonic Anhydride
TDG (Canada) CLASSIFICATION: 2.2
WHMIS CLASSIFICATION: A

PREPARED BY: Loss Control (908)464-8100/(905)501-1700
PREPARATION DATE: 6/1/95
REVIEW DATES: 6/7/96

2. Composition, Information on Ingredients

INGREDIENT	% VOLUME	PEL-OSHA[1]	TLV-ACGIH[2]	LD_{50} or LC_{50} Route/Species
Carbon Dioxide FORMULA: CO_2 CAS: 124-38-9 RTECS #: FF6400000	99.8 TO 99.999	5000 ppm TWA	5000 ppm TWA 30,000 ppm STEL	Not Available

[1] As stated in 29 CFR 1910, Subpart Z (revised July 1, 1993)

[2] As stated in the ACGIH 1994-95 Threshold Limit Values for Chemical Substances and Physical Agents

3. Hazards Identification

EMERGENCY OVERVIEW

Oxygen levels below 19.5% may cause asphyxia. Carbon dioxide exposure can cause nausea and respiratory problems. High concentrations may cause vasodilation leading to circulatory collapse.

ROUTE OF ENTRY:

Skin Contact	Skin Absorption	Eye Contact	Inhalation	Ingestion
Yes	No	Yes	Yes	Yes

HEALTH EFFECTS:

Exposure Limits	Irritant	Sensitization
Yes	No	No
Teratogen	Reproductive Hazard	Mutagen
No	No	No
Synergistic Effects None reported		

Carcinogenicity: -- NTP: No IARC: No OSHA: No

EYE EFFECTS:
No adverse effects anticipated.

SKIN EFFECTS:
No adverse effects anticipated.

INGESTION EFFECTS:
No adverse effects anticipated.

INHALATION EFFECTS:
Carbon dioxide is the most powerful cerebral vasodilator known. Inhaling large concentrations causes rapid circulatory insufficiency leading to coma and death. Asphyxiation is likely to occur before the effects of carbon dioxide overexposure. Chronic, harmful effects are not known from repeated inhalation of low concentrations. Low concentrations of carbon dioxide cause increased respiration and headache.

Effects of oxygen deficiency resulting from simple asphyxiants may include: rapid breathing, diminished mental alertness, impaired muscular coordination, faulty judgement, depression of all sensations, emotional instability, and fatigue. As asphyxiation progresses, nausea, vomiting, prostration, and loss of consciousness may result, eventually leading to convulsions, coma, and death.

Oxygen deficiency during pregnancy has produced developmental abnormalities in humans and experimental animals.

NFPA HAZARD CODES	**HMIS HAZARD CODES**	**RATINGS SYSTEM**
Health: 1	Health: 1	0 = No Hazard
Flammability: 0	Flammability: 0	1 = Slight Hazard
Reactivity: 0	Reactivity: 0	2 = Moderate Hazard
		3 = Serious Hazard
		4 = Severe Hazard

4. First Aid Measures

EYES:
Never introduce oil or ointment into the eyes without medical advice! If pain is present, refer the victim to an ophthalmologist for further treatment and follow up.

SKIN:
No adverse effects anticipated.

INGESTION:
Not anticipated.

INHALATION:
PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO CARBON DIOXIDE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS. Conscious persons should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. Unconscious persons should be moved to an uncontaminated area, given mouth-to-mouth resuscitation and supplemental oxygen. Further treatment should be symptomatic and supportive.

5. Fire Fighting Measures

Conditions of Flammability: Nonflammable		
Flash point: None	Method: Not Applicable	Autoignition Temperature: None
LEL(%): None	UEL(%): None	
Hazardous combustion products: None		
Sensitivity to mechanical shock: None		
Sensitivity to static discharge: None		

FIRE AND EXPLOSION HAZARDS:
None. Nonflammable

6. Accidental Release Measures

Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with inert gas prior to attempting repairs. If leak is in container or container valve, contact the appropriate emergency telephone number listed in Section 1 or call your closest BOC location.

7. Handling and Storage

Electrical Classification:
Non-Hazardous

Dry carbon dioxide can be handled in most common structural materials. Moist carbon dioxide is generally corrosive by its formation of carbonic acid. For applications with moist Carbon Dioxide, 316, 309 and 310 stainless steels may be used as well as Hastelloy ® A, B, & C, and Monel ®. Ferrous Nickel alloys are slightly susceptible to corrosion. At normal temperatures carbon dioxide is compatible with most plastics and elastomers.

Use only in well-ventilated areas. Carbon dioxide vapor is heavier than air and will accumulate in low areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<3000 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the system.

Protect cylinders from physical damage. Store in cool, dry, well-ventilated area away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 125°F (52°C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders being stored for excessive periods of time.

For additional storage recommendations, consult Compressed Gas Association's Pamphlet P-1.

Never carry a compressed gas cylinder or a container of a gas in cryogenic liquid form in an enclosed space such as a car trunk, van or station wagon. A leak can result in a fire, explosion, asphyxiation or a toxic exposure.

Maximum use for potable water 100 mg/l.

8. Exposure Controls, Personal Protection

EXPOSURE LIMITS[1]:

INGREDIENT	% VOLUME	PEL-OSHA[2]	TLV-ACGIH[3]	LD_{50} or LC_{50} Route/Species
Carbon Dioxide FORMULA: CO_2 CAS: 124-38-9 RTECS #: FF6400000	99.8 TO 99.999	5000 ppm TWA	5000 ppm TWA 30,000 ppm STEL	Not Available

[1] Refer to individual state of provincial regulations, as applicable, for limits which may be more stringent than those listed here.
[2] As stated in 29 CFR 1910, Subpart Z (revised July 1, 1993)
[3] As stated in the ACGIH 1994-1995 Threshold Limit Values for Chemical Substances and Physical Agents.

IDLH (Carbon Dioxide): 50,000 ppm

ENGINEERING CONTROLS:
Use local exhaust to prevent accumulation of high concentrations so as to reduce the oxygen level in the air to less than 19.5% and the carbon dioxide concentration below the exposure limit.

EYE/FACE PROTECTION:
Safety goggles or glasses as appropriate for the job.

SKIN PROTECTION:
Protective gloves of any material appropriate for the job.

RESPIRATORY PROTECTION:

Positive pressure air line with full-face mask and escape bottle or self-contained breathing apparatus should be available for emergency use.

OTHER/GENERAL PROTECTION:
Safety shoes.

9. Physical and Chemical Properties

PARAMETER	VALUE	UNITS
Physical state (gas, liquid, solid)	: Gas	
Vapor pressure at 70 ^{o}F	: 856	psia
Vapor density at 70 ^{o}F, 1 atm (Air = 1)	: 1.53	
Evaporation point	: Not Available	
Boiling point (CO2 Sublimes)	: -109.3	^{o}F
	: -78.5	^{o}C
Freezing point	: -69.8	^{o}F
	: -56.6	^{o}C
pH	: Not Available	
Specific gravity	: Not Available	
Oil/water partition coefficient	: Not Available	
Solubility (H20)	: Very soluble	
Odor threshold	: Not Applicable	
Odor and appearance	: A colorless, odorless gas.	

10. Stability and Reactivity

STABILITY:
Stable

INCOMPATIBLE MATERIALS:
Certain reactive metals, hydrides, moist cesium monoxide, or lithium acetylene carbide diammino may ignite. Passing carbon dioxide over a mixture of sodium peroxide and aluminum or magnesium may explode.

HAZARDOUS DECOMPOSITION PRODUCTS:
Carbon monoxide and oxygen when heated above 3092 ^{o}F (1700^{o}C). Carbonic acid is formed in the presence of moisture.

HAZARDOUS POLYMERIZATION:
Will not occur.

11. Toxicological Information

REPRODUCTIVE:
Oxygen deficiency during pregnancy has produced developmental abnormalities in humans and experimental animals.

Exposure of female rats to 60,000 ppm carbon dioxide for 24 hours has produced toxic effects to the embryo and fetus in pregnant rats. Toxic effects to the reproductive system have been observed in other mammalian species at similar concentrations.

OTHER:

Carbon dioxide is the most powerful cerebral vasodilator known. Inhaling large concentrations causes rapid circulatory insufficiency leading to coma and death. Chronic, harmful effects are not known from repeated inhalation of low (3 to 5 molar %) concentrations.

12. Ecological Information

No data given.

13. Disposal Considerations

Do not attempt to dispose of residual waste or unused quantities. Return in the shipping container PROPERLY LABELED, WITH ANY VALVE OUTLET PLUGS OR CAPS SECURED AND VALVE PROTECTION CAP IN PLACE to BOC Gases or authorized distributor for proper disposal.

14. Transport Information

PARAMETER	United States DOT	Canada TDG
PROPER SHIPPING NAME:	Carbon Dioxide	Carbon Dioxide
HAZARD CLASS:	2.2	2.2
IDENTIFICATION NUMBER:	UN 1013	UN 1013
SHIPPING LABEL:	NONFLAMMABLE GAS	NONFLAMMABLE GAS

15. Regulatory Information

SARA TITLE III NOTIFICATIONS AND INFORMATION

SARA TITLE III HAZARD CLASSES:
Acute Health Hazard
Sudden Release of Pressure Hazard

16. Other Information

Compressed gas cylinders shall not be refilled without the express written permission of the owner. Shipment of a compressed gas cylinder which has not been filled by the owner or with his/her (written) consent is a violation of transportation regulations.

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES:
Although reasonable care has been taken in the preparation of this document, we extend no warranties and make no representations as to the accuracy or completeness of the information contained herein, and assume no responsibility regarding the suitability of this information for the user's intended purposes or for the consequences of its use. Each individual should make a determination as to the suitability of the information for their particular purpose(s).

MATERIAL SAFETY DATA SHEET

Bayer MaterialScience

Bayer MaterialScience LLC
Product Safety & Regulatory Affairs
100 Bayer Road
Pittsburgh, PA 15205-9741
USA

TRANSPORTATION EMERGENCY

CALL CHEMTREC:	(800) 424-9300
INTERNATIONAL:	(703) 527-3887

NON-TRANSPORTATION

Emergency Phone:	Call Chemtrec
Information Phone:	(800) 662-2927

1. Product and Company Identification

Product Name:	CAUSTIC SODA SOLUTION (50%)
Material Number:	5452627
CAS-No.:	1310-73-2

2. Hazards Identification

Emergency Overview

Danger Color: Clear, Opaque **Form:** liquid **Odor:** Odorless.
Water runoff from fire fighting may be corrosive. Irritating gases/fumes may be given off during burning or thermal decomposition. Contact with metals liberates flammable gas. Reacts violently with water. Causes respiratory tract burns. Causes skin burns. May be harmful if absorbed through skin. Causes eye burns. Causes digestive tract burns. Harmful if swallowed.

Potential Health Effects

Primary Routes of Entry:	Skin Contact, Eye Contact, Ingestion, Inhalation
Medical Conditions Aggravated by Exposure:	Skin disorders, Respiratory disorders, Eye disorders

HUMAN EFFECTS AND SYMPTOMS OF OVEREXPOSURE

Inhalation
Acute Inhalation
For Component: Sodium hydroxide
Corrosive with symptoms of coughing, burning, ulceration, and pain.

Skin
Acute Skin
For Component: Sodium hydroxide
Corrosive with symptoms of reddening, itching, swelling, burning and possible permanent damage.

Eye
Acute Eye
For Component: Sodium hydroxide

Corrosive with symptoms of reddening, tearing, swelling, burning and possible permanent damage.

Ingestion
Acute Ingestion
For Component: Sodium hydroxide
Harmful if swallowed. Corrosive to the digestive tract with symptoms of burning and ulceration.

General Effects of Exposure
Chronic Effects of Exposure
For Product: CAUSTIC SODA SOLUTION (50%)
Repeated or prolonged overexposure may cause effects as noted under acute health effects.

Carcinogenicity:

No carcinogenic substances as defined by IARC, NTP and/or OSHA

3. Composition/Information on Ingredients

Hazardous components

Weight percent	Components	CAS-No.
45 - 55%	Sodium hydroxide	1310-73-2

4. First aid measures

Eye contact
In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Use fingers to ensure that eyelids are separated and that the eye is being irrigated. Call a physician immediately.

Skin contact
Wash off immediately with plenty of water for at least 15 minutes. Immediately remove contaminated clothing and shoes. Call a physician immediately. Wash clothing and shoes before reuse.

Inhalation
If inhaled, remove to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration using a pocket mask type resuscitator. Call a physician immediately.

Ingestion
Do not induce vomiting. If conscious, give 2 glasses of water. Get immediate medical attention. Never give anything by mouth to an unconscious person.

5. Firefighting measures

Suitable extinguishing media: Carbon dioxide (CO2), Foam, Dry chemical

Special Fire Fighting Procedures
Firefighters should be equipped with self-contained breathing apparatus to protect against potentially toxic and irritating fumes.

Unusual Fire/Explosion Hazards
Water runoff from fire fighting may be corrosive. Toxic and irritating gases/fumes may be given off during burning or thermal decomposition. Contact with metals liberates flammable gas.

6. Accidental release measures

Spill and Leak Procedures
Cleanup personnel must use appropriate personal protective equipment. Cover spill with inert material (e. g., dry sand or earth) and collect for proper disposal. Do not allow spilled material or wash water to enter sewers, surface waters, or groundwater systems. Decontaminant/Neutralizer: Dilute hydrochloric acid solution. Wash spill area with water. Collect wash water for approved disposal.

7. Handling and storage

Storage period
Not Applicable

Handling/Storage Precautions
Do not breathe vapours or spray mist. Do not get on skin or clothing. Do not get in eyes. Do not taste or swallow. Use only with adequate ventilation/personal protection. Wash thoroughly after handling. Keep container closed when not in use.

Further Info on Storage Conditions
Material can be stored safely at ambient temperatures. Do not expose to direct sunlight. Protect from freezing. This product is corrosive to metal(s). Product can react with water.

8. Exposure controls/personal protection

Sodium hydroxide (1310-73-2)
US. ACGIH Threshold Limit Values
Ceiling Limit Value: 2 mg/m3
US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)
PEL: 2 mg/m3

Industrial Hygiene/Ventilation Measures
General dilution and local exhaust as necessary to control airborne vapors, mists, dusts and thermal decomposition products below appropriate airborne concentration standards/guidelines.

Respiratory protection
In case of insufficient ventilation, wear suitable respiratory equipment.

Hand protection
Permeation resistant gloves.

Eye protection
Chemical resistant goggles must be worn., Chemical safety goggles in combination with a full face shield if a splash hazard exists.

Skin and body protection

Permeation resistant clothing and foot protection.

Additional Protective Measures
Employees should wash their hands and face before eating, drinking, or using tobacco products. Educate and train employees in the safe use and handling of this product. Emergency showers and eye wash stations should be available.

9. Physical and chemical properties

Form:	liquid
Color:	Clear, Opaque
Odor:	Odorless
pH:	14
Melting Point:	12 °C (53.6 °F)
Boiling point/boiling range:	140 °C (284 °F) @ 1,013 hPa
Flash point:	Not Applicable
Vapour pressure:	13 mmHg @ 15.56 °C (60.01 °F)
Density:	1.54 g/cm³ @ 15 °C (59 °F) (DIN 51757) 1.52 g/cm³ @ 20 °C (68 °F) (DIN 51757) 1.505 g/cm³ @ 50 °C (122 °F) (DIN 51757)
Specific Gravity:	1.53 @ 15.56 °C (60.01 °F)
Solubility in Water:	Soluble
Viscosity, dynamic:	79 mPa.s @ 20 °C (68 °F)

10. Stability and reactivity

Hazardous Reactions
Hazardous polymerisation does not occur.

Hazardous polymerisation does not occur.

Stability
Stable

Stable

Materials to avoid
Combustible material, Acids, Halogenated compounds, Halogens, Metals, Oxidizing agents, Peroxides, Organic nitro compounds

Oxidizing agents

Conditions to avoid
Avoid contact with moisture / water. Do not expose to direct sunlight. Protect from freezing.

Heat, flames and sparks.

Hazardous decomposition products
By Fire and Thermal Decomposition: Sodium oxides, other potentially toxic fumes
Other decomposition products Hydrogen;
By Fire and Thermal Decomposition: Phenol; Carbon monoxide, Carbon oxides, other potentially toxic fumes

11. Toxicological information

Toxicity Data for CAUSTIC SODA SOLUTION (50%)
Toxicity Data for Sodium hydroxide
Acute oral toxicity
LD50: 140 - 340 mg/kg (Rat)

Acute dermal toxicity
LD50: 1,350 mg/kg (rabbit)

Skin irritation
Human, Corrosive

Eye irritation
Human, severe irritant

Sensitisation
Skin sensitisation:: negative (Human experience, Patch Test)

Mutagenicity
Genetic Toxicity in Vitro:
Ames: negative (Salmonella typhimurium)
Positive and negative results were seen in various in vitro studies.
Genetic Toxicity in Vivo:
Micronucleus Assay: (mouse, Male/Female, intraperitoneal)
negative

12. Ecological information

Ecological Data for CAUSTIC SODA SOLUTION (50%)
Ecological Data for Sodium hydroxide
Acute and Prolonged Toxicity to Fish
LC50: 45.4 mg/L (50 %, pH 8) (Rainbow (Donaldson)Trout (Oncorhynchus mykiss), 96 h)

Acute Toxicity to Aquatic Invertebrates
LC100: 156 mg/L (pH 9.1 - 9.5) (Water flea (Daphnia magna))

Toxicity to Aquatic Plants
The freshwater algae are destroyed at a pH of >8.5.

13. Disposal considerations

Waste Disposal Method
Waste disposal should be in accordance with existing federal, state and local environmental control laws.

Empty Container Precautions
Recondition or dispose of empty container in accordance with governmental regulations. Do not reuse empty container without proper cleaning. Label precautions also apply to this container when empty.

14. Transport information

Land transport (DOT)
Proper shipping name: Sodium hydroxide solution
Hazard Class or Division: 8
UN/NA Number: UN1824
Packaging group: II
Hazard Label(s): Corrosive

RSPA/DOT Regulated Components:
Sodium hydroxide

Reportable Quantity: 907 kg (2000 lb)

Sea transport (IMDG)
Proper shipping name: SODIUM HYDROXIDE SOLUTION
Hazard Class or Division: 8
UN number: UN1824
Packaging group: II
Hazard Label(s): CORROSIVE

Air transport (ICAO/IATA)
Proper shipping name: Sodium hydroxide solution
Hazard Class or Division: 8
UN number: UN1824
Packaging group: II
Hazard Label(s): CORROSIVE

Additional Transportation Information
Pollution category: Y - Ship type: 3

15. Regulatory information

United States Federal Regulations

OSHA Hazcom Standard Rating: Hazardous

US. Toxic Substances Control Act: Listed on the TSCA Inventory.

US. EPA CERCLA Hazardous Substances (40 CFR 302):
Components
Sodium hydroxide Reportable quantity: 1000 lbs

SARA Section 311/312 Hazard Categories:
Acute Health Hazard, Reactivity Hazard, Chronic Health Hazard

US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 302 Extremely Hazardous Substance (40 CFR 355, Appendix A):
Components
None

US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 313 Toxic Chemicals (40 CFR 372.65) - Supplier Notification Required:
Components
None

US. EPA Resource Conservation and Recovery Act (RCRA) Composite List of Hazardous Wastes and Appendix VIII Hazardous Constituents (40 CFR 261)
Under RCRA, it is the responsibility of the person who generates a solid waste, as defined in 40 CFR 261.2, to determine if that waste is a hazardous waste., In its purchased form, this product meets the criteria of corrosivity under 40 CFR 261.22(a), and, when discarded in that form, should be managed as a hazardous waste.

State Right-To-Know Information

The following chemicals are specifically listed by individual states; other product specific health and safety data in other sections of the MSDS may also be applicable for state requirements. For details on your regulatory requirements you should contact the appropriate agency in your state.

Massachusetts, New Jersey or Pennsylvania Right to Know Substance Lists:

Weight percent	Components	CAS-No.
>=1%	Water	7732-18-5
45 - 55%	Sodium hydroxide	1310-73-2

New Jersey Environmental Hazardous Substances List and/or New Jersey RTK Special Hazardous Substances Lists:

Weight percent	Components	CAS-No.
45 - 55%	Sodium hydroxide	1310-73-2

California Prop. 65:

To the best of our knowledge, this product does not contain any of the listed chemicals, which the state of California has found to cause cancer, birth defects or other reproductive harm.

16. Other information

NFPA 704M Rating

Health	3
Flammability	0
Reactivity	2
Other	

0=Insignificant 1=Slight 2=Moderate 3=High 4=Extreme

HMIS Rating

Health	3*
Flammability	0
Physical Hazard	2

0=Minimal 1=Slight 2=Moderate 3=Serious 4=Severe
* = Chronic Health Hazard

The method of hazard communication for Bayer MaterialScience LLC is comprised of Product Labels and Material Safety Data Sheets. HMIS and NFPA ratings are provided by Bayer MaterialScience LLC as a customer service.

Contact person: Product Safety Department

Telephone:	(412) 777-2835
MSDS Number:	112000014025
Version Date:	07/20/2014
Report version:	2.10

This information is furnished without warranty, express or implied. This information is believed to be accurate to the best knowledge of Bayer MaterialScience LLC. The information in this MSDS relates only to the specific material designated herein. Bayer MaterialScience LLC assumes no legal responsibility for use of or reliance upon the information in this MSDS.

Changes since the last version are highlighted in the margin. This version replaces all previous versions.

SAFETY DATA SHEET

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

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

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

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

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

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

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

* * * Section 2 – HAZARDS IDENTIFICATION * * *

GHS Classification:

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

GHS LABEL ELEMENTS

Symbol(s)

Signal Word

Danger

Hazard Statements

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

Precautionary Statements

Prevention

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

Response

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

Storage

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

Disposal

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

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

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

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

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

First Aid: Eyes

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

First Aid: Skin

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

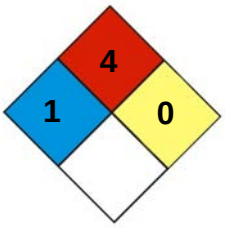
First Aid: Ingestion (swallowing)

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

First Aid: Inhalation (breathing)

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

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



NFPA 704 Hazard Class

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

General Fire Hazards

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

Hazardous Combustion Products

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

Extinguishing Media

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

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

Unsuitable Extinguishing Media

None

Fire Fighting Equipment / Instructions

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

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

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

Recovery and Neutralization

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

Materials and Methods for Clean-Up

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

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

Emergency Measures

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

Personal Precautions and Protective Equipment

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

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

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

Environmental Precautions

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

Prevention of Secondary Hazards

None

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

Handling Procedures

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

Storage Procedures

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

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

Incompatibilities

Keep away from strong oxidizers, ignition sources and heat.

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

Component Exposure Limits

Octanes (111-65-9)

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

Heptanes (142-82-5)

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

n-Hexane (110-54-3)

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

n-Pentane (109-66-0)

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

n-Butane (106-97-8)

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

Propane (74-98-6)

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

Ethane (74-84-0)

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

Benzene (71-43-2)

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

Toluene (108-88-3)

ACGIH: 20 ppm TWA (listed under Toluene)

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

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

Engineering Measures

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

Personal Protective Equipment: Respiratory

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

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

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

Personal Protective Equipment: Hands

Gloves constructed of nitrile or neoprene are recommended.

Personal Protective Equipment: Eyes

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

Personal Protective Equipment: Skin and Body

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

Hygiene Measures

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

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

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

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

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

Chemical Stability

This is a stable material.

Hazardous Reaction Potential

Will not occur.

Conditions to Avoid

Keep away from ignition sources and high temperatures.

Hazardous Decomposition Products

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

* * * Section 11 – TOXICOLOGICAL INFORMATION * * *

Acute Toxicity

A: General Product Information

Harmful if swallowed.

B. Component Analysis – LD50/LC50

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

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

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

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

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

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

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

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

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

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

Potential Health Effects: Skin Corrosion Property / Stimulativeness

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

Potential Health Effects: Eye Critical Damage / Stimulativeness

Contact with eyes may cause moderate irritation.

Potential Health Effects: Ingestion (swallowing)

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

Potential Health Effects: Inhalation (breathing)

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

Respiratory Organs Sensitization / Skin Sensitization

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

Generative Cell Mutagenicity

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

Carcinogenicity

A: General Product Information

May cause cancer.

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

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

B: Component Carcinogenicity

Benzene (71-43-2)

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

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

Reproductive Toxicity

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

Specified Target Organ General Toxicity: Single Exposure

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

Specified Target Organ General Toxicity: Repeated Exposure

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

Aspiration Respiratory Organs Hazard

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

* * * Section 12 – ECOLOGICAL INFORMATION * * *

Ecotoxicity

A: General Product Information

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

B: Component Analysis – Ecotoxicity – Aquatic Toxicity

Benzene (71-43-2)

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

Natural Gas condensates (68919-39-1)

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

Persistence / Degradability

No information available

Bioaccumulation

No information available

Mobility in Soil

No information available

* * * Section 13 – DISPOSAL CONSIDERATIONS * * *

Waste Disposal Instructions

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

Disposal of Contaminated Containers or Packaging

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

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

* * * Section 14 – TRANSPORTATION INFORMATION * * *

DOT Information

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

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

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

Placard:

* * * Section 15 – REGULATORY INFORMATION * * *

Regulatory Information

Component Analysis

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

Benzene (71-43-2)

SARA 313: 0.1% de minimis concentration

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

SARA Section 311/312 – Hazard Classes

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

SARA SECTION 313 – SUPPLIER NOTIFICATION

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

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

Canadian Regulatory Information

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

European Union Regulatory Information

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

State Regulations

Component Analysis – State

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

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

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

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

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

Component Analysis – WHMIS IDL

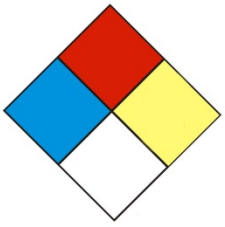
The following components are identified under the Canadian Hazardous Products Act Ingredient Disclosure List:

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

* * * Section 16 – OTHER INFORMATION * * *

NFPA® Hazard Rating

Health	1
Fire	4
Reactivity	0



HMIS® Hazard Rating

Health	1	Slight
Fire	4	Severe
Physical	0	Minimal
		* Chronic

Key/Legend

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

Literature References

None

Other Information

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

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

Date of Preparation: January 29, 2014

Date of Last Revision: March 4, 2014

End of Sheet

Canada Colors and Chemicals Limited

152 Kennedy Road South
Brampton, Ontario
Canada
L6W 3G4

General Inquiry Number: (905) 459-1232

Material Safety Data Sheet Attached

ParaFlow™ HE-1507A
Emulsion Breaker -Degreaser
Paraffin Treatment

Material Safety Data Sheet

Revision Date: October 15, 2014

1. IDENTIFICATION OF THE PRODUCT AND THE COMPANY

Ce produit est distribué par les
Produits Chimiques CCC ltée
Pour information appelez: (905) 459-1232
En cas d'urgence (24 heures) (416) 444-2112
Code de produit de CCC: 558261
Nom de produit de CCC: PARAFLOW HE-1507A

Product Name:	Demulsifier
Chemical Family:	
Supplier:	HALBOUTY ENERGY 5100 Westheimer, Suite 425 Houston, TX 77056 www.halboutyenergy.com
Telephone:	(713) 239-0336

Hazard Ratings:

Health = 1	0 = Least
Fire = 0	1 = Slight
Reactivity = 0	2 = Moderate
PPE = 1	4 = Extreme

2. HAZARDOUS INGREDIENTS

Product composition contains the following hazardous components reportable under OSHA Regulation CFR 1910.1200:

No Hazardous Compounds
Component
Proprietary blend of surfactants, water and aliphatic carboxylic acids
Contains less than 0.5% Sulfuric Acid.

3. HAZARDS IDENTIFICATION

Emergency Overview:	White to straw-colored liquid. Water solution.
Relevant Routes of Exposure:	Ingestion and skin absorption.
Signs and Symptoms of Overexposure:	General reddening and irritation to the skin and eyes.
Medical Conditions Generally Aggravated by Exposure:	None reported.
Potential Health Effects:	
Eyes:	May cause mild eye irritation
Skin:	May cause mild skin irritation
Ingestion:	
Inhalation:	May be mildly irritating to mucous membranes.
Chronic Health Effects:	
Cardinogenicity:	NTP: No IARC: No OSHA No ACGIH No Other: None

Emulsion Breaker-Degreaser

Medical Conditions Generally Aggravated By Exposure:	None reported.
Potential Health Effects:	
Eyes:	May cause mild eye irritation
Skin:	May cause mild skin irritation
Chronic Health Effects:	None
Carcinogenicity:	NTP: No IARC: No OSHA No ACGIH No Other: None

4. EMERGENCY & FIRST AID PROCEDURES

Eye Contact:	Flush with large volumes of water for at least 15 minutes. Get medical attention.
Skin Contact:	While removing clothing, wash with large volumes of soap and water for at least 15 minutes. If irritation develops, get medical attention.
Ingestion:	Give person 1 to 2 glasses of water. Get medical attention immediately.
Notes to Physicians and/or Protection for First-Aiders:	This product has low acute oral toxicity and is mildly irritating to the eyes and skin. Contains weak acid.

5. WIRE AND EXPLOSION HAZARD DATA

Flash Point:	Degree F: 100°c (212°F) Method Used: COC
Flammable Limits in Air:	None
Autoignition Temperature:	Not Applicable
Recommended Extinguishing Media:	All conventional media are suitable
Fire Fighting Instructions:	Wear a self-contained breathing apparatus and Protective clothing to prevent skin and eye contact in fire situations.
Unusual Fire/Explosion Hazards:	None
Flammability Classification:	
Known or Anticipated Hazardous Products of Combustion:	

6. ACCIDENTAL RELEASE MEASURES

Procedures if Material is Spilled or Released:	Contain spill. Wearing appropriate personal protective equipment, collect spill with the aid of an inert absorbent and place in suitable labeled containers for disposal.
Environmental Precautions:	Avoid releasing to the environment. Neutralized with sodium bicarbonate.

7. HANDLING AND STORAGE

Handling:	Use appropriate personal protection equipment. Avoid eye, skin and clothing contact. Do not breathe mist or vapor. Avoid repeated or prolonged contact. Use only in a well-ventilated area. Store and handle away from any product involved in food processing.
Storage:	Protect containers against damage.
Other Precautions:	Avoid contact of material with alkaline materials.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls:	Avoid the generation of airborne mist where possible when processing at high temperatures, local exhaust ventilation or personal protective equipment as indicated below may be necessary to control exposures.
Ventilation:	Use local ventilation to keep levels below established threshold values. Use mechanical ventilation for general area control.
Respiratory Protection:	Wear a NIOSH/MSHA approved organic cartridge respirator in high temperature applications, if misting or vapor occurs, or there is potential for airborne exposures to exceed established threshold values, and in emergency situations.
Skin Protection:	Impervious gloves. Clothing designed to minimize skin contact. Wear an apron or impervious clothing and rubber boots if splashing is expected.
Eye Protection:	Chemical safety goggles or full face shield.
Other Protective Equipment:	Wear an apron or impervious clothing and rubber boots if splashing is expected.
Hygenics:	Wash thoroughly after handling. Wash contaminated clothing before reuse.

9. PHYSICAL DATA

Appearance:	Dark
Odor:	Pine Oil
Boiling Point	100°c
pH:	L I to 1.3
Specific Gravity:	1.107 (9.24 lb/gal)
Physical State	Liquid
Reactivity in Water:	Not water reactive

10. STABILITY & REACTIVITY DATA

Stability:	Stable under normal conditions of handling and use.
Conditions to Avoid:	Excessive heat and fire.
Materials to Avoid:	Strong Alkali
Hazardous Decomposition Products:	Thermal decomposition may produce the following: Carbon monoxide and carbon dioxide.
Hazardous Polymerization:	Will occur

11. TOXICOLOGICAL INFORMATION

Non-Applicable -No known hazardous components

12. ECOLOGICAL INFORMATION

Non Applicable -No known hazardous components. Environmental Fate -Biodegradeable components.

13. TRANSPORTATION INFORMATION

DOT:	Not regulated
DOT Hazard Class:	N/A
DOT Packing Group:	N/A
UN Number:	N/A
DOT Label Required:	N/A
DOT Placard:	N/A

Not regulated to the Department of Transportation

14. DISPOSAL CONSIDERATION

Waste Disposal Method:	Dispose of waste in an approved chemical disposal facility in compliance with all current local, state and federal laws and regulations. If the product was supplied in a single use container, care should be taken to dispose of the container in a responsible manner and in accordance with applicable regulations.

Emulsion Breaker - Degreaser

15. REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS:	The components of this product are either on the TSCA Inventory or exempt (i.e. impurities, a polymer complying with the exemption rule at 40 CFR 7.23.250) from the inventory.
STATE REGULATIONS:	None known.
INTERNATIONAL REGULATIONS:	Canada: DSL UE: EINECS Australia: AICS Korea: ECL Japan: ENCS Philippines: PICCS Canadian WHMIS Hazard Class and Division = D.2.b.
SARA HAZARDS:	Acute: No Reactive: No Pressure: No Chronic: No Fire: No
ADDITIONAL INFORMATION:	The above regulatory information represents only selected regulations and is not meant to be a complete list.

15. **OTHER INFORMATION**

The information herein is presented in good faith and believed to be correct as of the date hereof. However, Halbouty Energy makes no representation as to the completeness and accuracy thereof. Users must make their own determination as to the suitability of the product for their purposes prior to use.

No representations or warranties, either expressed or implied, of merchantability, fitness for a particular purpose or any other nature with respect to the product or to the information herein is made. Halbouty Energy shall in no event be responsible for any damages of whatsoever nature directly or indirectly resulting from the publication or use of reliance upon information contained herein.

FOR FURTHER INFORMATION CONTACT:

Halbouty Energy
5100 Westheimer, Suite 425
Houston, TX 77056
Phone: (713) 239-0336
www.halboutyenergy.com

MSDS Date: August 12, 1998
Emergency Contact: 1-800-424-9300

SECTION I

PRODUCT NAME: Ferric Chloride Solution
SYNONYMS: Iron chloride solution
CHEMICAL NAME: Ferric chloride solution
CHEMICAL FAMILY: Inorganic salt
FORMULA: $FeCl_3$ solution

DOT SHIPPING INFORMATION: Ferric chloride solution, 8,
UN 2582, PG III RQ=1000 lbs.

SECTION II - HAZARDOUS INGREDIENTS

This material contains no ingredients which are known by Thatcher Company to be hazardous unless listed below.

HAZARDOUS MATERIAL	CAS NUMBER	w/w %	EXPOSURE LIMITS IN AIR
Ferric chloride	7705-08-0	----	TLV = 1 mg/m^3 (as Fe)

The specific identity of some ingredients may be withheld for confidential business purposes. However, all known potential health effects from exposure to these ingredients are being addressed.

SECTION III - PHYSICAL DATA

BOILING POINT (F): Unknown

SPECIFIC GRAVITY: 1.47 for 43%

VAPOR PRESSURE (mm Hg): Essentially water

% VOLATILE, BY VOLUME: Abt 60%

VAPOR DENSITY (air = 1): Essentially water

EVAPORATION RATE: Unknown

SOLUBILITY IN WATER: Complete

APPEARANCE AND ODOR: Dark brown liquid with a slightly muddy smell.

SECTION IV - FIRE AND EXPLOSION DATA

FLASH POINT:
Nonflammable

FLAMMABLE LIMITS:
Lel: N/A Uel: N/A

EXTINGUISHING MEDIA:
Use any.

SPECIAL FIRE-FIGHTING PROCEDURES:
None.

UNUSUAL FIRE AND EXPLOSION HAZARDS:
None.

SECTION V - REACTIVITY DATA

STABILITY:
Stable

HAZARDOUS POLYMERIZATION:
Will not occur.

CONDITIONS OR MATERIALS TO AVOID:
Very corrosive to all common metals.

HAZARDOUS DECOMPOSITION PRODUCTS:
None.

SECTION VI - HEALTH HAZARD DATA

NFPA HAZARDOUS RATING: Health = 2 Flammability = 0 Reactivity = 0

CARCINOGENIC LISTING:

NTP: No ingredients listed in this section.

IARC MONOGRAPHS: No ingredients listed in this section.

OSHA 29 CFR 1910: No ingredients listed in this section.

ENTRY ROUTES & EFFECTS OF OVEREXPOSURE:

Contact: Can cause irritation and burns to skin, eyes and mucous membranes.

Ingestion: Can be harmful if swallowed, causing burns and severe irritation to the gastrointestinal tract.

STATEMENT OF PRACTICAL TREATMENT:

Contact: Flush exposed area thoroughly with water. For eyes, flush with cool water for at least 15 minutes and get medical attention.

Ingestion: If conscious, give several glasses of water or milk. **Do not** induce vomiting. Call a physician at once!

SECTION VII - SPECIAL PRECAUTIONS

HANDLING AND STORAGE PRECAUTIONS:
Avoid contact with skin and eyes. Do not take internally.

STEPS TO BE TAKEN IF MATERIAL SPILLS OR LEAKS:
Wear proper safety equipment. For small spills, absorb with floor dry or other absorbent material, and sweep up into drums. Flush residue to sewer with large amounts of water. For larger spills, dike the liquid and scoop into drums. Clean up residue as explained above.

WASTE DISPOSAL METHOD:
Waste solution is an EPA characteristic hazardous waste due to corrosivity (D002). Dispose of at an EPA-approved hazardous waste disposal facility. Contact the local EPA for further information. Comply with all local, state and federal regulations.

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION:
None required.

VENTILATION:
Normal room ventilation sufficient.

EYE PROTECTION:
Chemical goggles.

SKIN PROTECTION:
Rubber gloves.

OTHER PROTECTIVE EQUIPMENT:
Rubber boots and other protective clothing as required to prevent contact with skin and eyes.

ACGIH = American Conference of Governmental Industrial Hygienists
CL = Ceiling Level
IARC = International Agency for Research on Cancer: Monographs
OSHA = Occupational Safety and Health Administration
N/A = Not Applicable
NTP = National Toxicology Program: Annual Report on Carcinogens
PEL = Permissible Exposure Level (OSHA)
TLV = Threshold Limit Value (ACGIH)
TWA = Time Weighted Average over 8 Hours
STEL = Short Term Exposure Limit (ACGIH)
ND = Not Determined

MISSISSIPPI LIME COMPANY – MATERIAL SAFETY DATA SHEET
OSHA HAZARD COMMUNICATION

PRODUCT IDENTIFICATION	CHEMICAL ABSTRACT	DATE REVISED
Calcium Hydroxide "Hydrated Lime"	**CAS 1305-62-0**	**01/01/2010** Previous Versions Obsolete

Product Line: MicroCal – HF, HFT20, HM, HS; PetroCal – HF, HM, HS; Standard Hydrated Lime; Standard Hydrated - Lime, CG, SBP (Flow Treated) , SP,; Liquid Calcium Hydroxide (LCH); MP Liquid Calcium Hydroxide (MPLCH); VitaCal – H, LCH; Architectural Lime Putty

Section I

MANUFACTURER		HMIS RATING
Mississippi Lime Company 16147 US Highway 61 Ste Genevieve, MO 63670 Website Mississippilime.com	24 Hour Emergency Contact Number: (800) 437-5463 Telephone Number for Information: (800) 437-5463	**Health - 2** **Flammability - 0** **Physical Hazards - 0** **Protective Equip - E**
	Signature of Preparer J.S. Castleberry	

Section II – Hazardous Ingredients / Identity Information

Specific Chemical Identity; Common Names	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (Optional)
Calcium Hydroxide; Slaked Lime; Hydrated Lime	5 mg/m^3	5 mg/m^3		
Crystalline Silica (Quartz)	0.1 mg/m^3	0.05 mg/m^3	Respirable	Variable <0.10-0.2%

Calcium Hydroxide is not listed on the NTP, IARC, or OSHA lists of carcinogens. Calcium hydroxide produced with quicklime manufactured by coal fired kilns may contain crystalline silica >0.1%. Crystalline silica is listed by IARC and NTP but not by OSHA. In 1997, IARC determined that "crystalline silica inhaled in the form or quartz or crystobalite from occupational sources is carcinogenic to humans (Group 1). OSHA requires that products containing >0.1% of a known carcinogen must be labeled. NTP states that "silica, crystalline (respirable)" may reasonably be anticipated to be a carcinogen (1991). Mississippi Lime Company recommends using personal protection equipment when handling this product.

Section III – Physical / Chemical Characteristics

Boiling Point (Calcium Oxide)	5162 ^oF	Specific Gravity (H_2O) = 1)	2.2
Vapor Pressure (mm Hg)	NA	Melting Point – Loses CO^2	1076 ^oF
Vapor Density (Air = 1)	NA	Evaporation Rate	NA
Solubility in Water	0.185 % @ 0 ^oC; 0.077 % @ 100 ^oC		
Appearance and Color	Odorless; White as a dry powder, wet slurry, or paste		

Section IV – Fire and Explosion Hazard Data

Flash Point	NA	Flammable Limits – NA
Extinguishing Method	NA	
Special Fire Fighting Procedures	NA	
Unusual Fire and Explosion Hazards	NA	

PRODUCT IDENTIFICATION	CHEMICAL ABSTRACT	DATE REVISED
Calcium Hydroxide "Hydrated Lime"	**CAS No. 1305-62-0**	**1/01/2010**

Section V – Reactivity Data

Stability	Stable	Conditions to Avoid – NA
Incompatibility (Materials to Avoid)		Acids, Inter-halogens, Phosphorus (V) Oxide
Hazardous Decomposition or Byproducts		None
Hazardous Polymerization	Will Not Occur	Conditions to Avoid – NA

Section VI - Health Hazard Data

Route(s) of Entry	Inhalation? YES	Absorption Through Skin? YES	Ingestion (swallowing)? - YES
Health Hazards	Acute	Prolonged contact may irritate or burn skin - especially in the presence of moisture. Inhalation of dust may irritate mucous membranes or respiratory passages. Direct eye contact may cause permanent damage.	
	Chronic	Long term exposure can cause irritation	

Carcinogenicity	NTP?	IARC Monographs?	OSHA Regulated?
Calcium Hydroxide	NO	NO	NO
Crystalline Silica	YES	YES	YES

Signs and Symptoms of Exposure	Irritation of eyes, respiratory tract, or red "sun burn" like skin.
Medical Conditions Generally Aggravated by Exposure	Respiratory disease, skin condition.
Emergency and First Aid Procedures	Provide fresh air. Wash off dust with soap and water. Drink plenty of water if swallowed. Flush eyes with water immediately and contact physician.

Section VII – Precautions for Safe Handling

Steps to Be Taken in Case Material is Released or Spilled	Normal clean-up procedures. Care should be taken to avoid causing dust to become airborne. Vacuum cleaning systems are recommended.
Waste Disposal Method	Dispose of product in accordance with Federal, State and Local regulations. **See Section IX Guidance**
Precautions to Be Taken in Handling	Store away from water and acids.
Other Precautions	

Section VIII – Control Measures

Respiratory Protection - Dust filter masks are recommended for personal comfort and/or protection		
Ventilation	Local Exhaust – To maintain TLV's and PEL's Mechanical – To maintain TLV's and PEL's	Special – None Other – None
Protective Gloves – Cloth/leather gloves when handling dry product –rubber gloves if wet or damp		
Eye Protection – ALWAYS wear shielded glasses and/or fitted goggles around product to reduce eye injury. Wearing of contact lenses may impede first aid.		
Other Protective Clothing – Wear long sleeve shirts and pants to minimize skin contact with product.		
Work / Hygienic Practices – Maintain dust exposure limits below TLV's and PEL's. Whenever necessary wear respiratory protection. Air blowers are effective for dedusting skin and clothing.		

PRODUCT IDENTIFICATION	CHEMICAL ABSTRACT	DATE REVISED
Calcium Hydroxide "Hydrated Lime"	**CAS No. 1305-62-0**	**1/01/2010**

Section IX – Regulatory Compliance Guidance

CONEG	Materials used to manufacture bags containing products are CONEG compliant.
CWA	Product contains alkaline material potentially toxic to aquatic life if concentration is elevated for extended periods of time. Minimize contact with storm water runoff.
DOT	Product is not regulated by U.S. Dept of Transportation
EPA	Waste derived from unused products is not subject to RCRA. Waste is acceptable at most landfills as a "special waste" but can often be beneficially reused for other purposes.
SPILL	Whenever possible, contain and sweep up spillage in dry form rather than flushing with water. Fire may occur in containers if damp product is placed in direct contact with combustible materials.
TSCA	Product is listed on Toxic Substance Control Act, Canada DSL and all other International Inventories
Prop65	Subject to California Proposition 65 warning labeling requirements due to presence of trace metals and crystalline silica above instrument detection levels.
NAFTA	Product qualifies under HS Tariff No 2522.20 or 2825.90 as 100% US Origin, Preference Criteria A. Annual certification is provided upon direct request.
REACH	Product has been pre-registered under **05-2116 374 587-30-0000** EINECS # **215-137-3**

SAFETY DATA SHEET

1. Identification

Product identifier **Hydrex 1317**

Other means of identification None.

Recommended use Boiler Water Oxygen Scavenger

Recommended restrictions PROFESSIONAL USE ONLY

Manufacturer/Importer/Supplier/Distributor information

Manufacturer

Supplier Veolia Water Technologies, Inc

Address 913 Industrial Park Drive
Vandalia, Ohio
45377

Contact Person Hydrex Product Manager

Telephone +1-937-890-4075

Fax +1-937-890-5495

e-mail hydrex.msds@veolia.com

Global Emergency Contact +1-760-476-3962 (Code: 333239)

2. Hazard(s) identification

Physical hazards Not classified.

Health hazards Skin corrosion/irritation Category 2

Serious eye damage/eye irritation Category 2

Environmental hazards Not classified.

OSHA defined hazards Not classified.

Label elements

Signal word Warning

Hazard statement Causes skin irritation. Causes serious eye irritation.

Precautionary statement

Prevention Wear protective gloves. Wear eye/face protection.

Response If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If skin irritation occurs: Get medical advice/attention. If eye irritation persists: Get medical advice/attention. Take off contaminated clothing and wash before reuse.

Storage Store away from incompatible materials.

Disposal Dispose of waste and residues in accordance with local authority requirements.

Hazard(s) not otherwise classified (HNOC) None known.

Supplemental information None.

3. Composition/information on ingredients

Mixtures

Chemical name	Common name and synonyms	CAS number	%
Potassium hydroxide		1310-58-3	0.1 - 1
Other components below reportable levels			90 - 100

*Designates that a specific chemical identity and/or percentage of composition has been withheld as a trade secret.

4. First-aid measures

Inhalation If breathing is difficult, remove to fresh air and keep at rest in a position comfortable for breathing. Call a physician if symptoms develop or persist.

Skin contact	Remove contaminated clothing. Rinse skin with water/shower. If skin irritation occurs: Get medical advice/attention. Wash contaminated clothing before reuse.
Eye contact	Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if irritation develops and persists.
Ingestion	Rinse mouth. If ingestion of a large amount does occur, call a poison control center immediately.
Most important symptoms/effects, acute and delayed	Severe eye irritation. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Skin irritation. May cause redness and pain.
Indication of immediate medical attention and special treatment needed	Provide general supportive measures and treat symptomatically. Keep victim under observation. Symptoms may be delayed.
General information	Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire-fighting measures

Suitable extinguishing media	Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2).
Unsuitable extinguishing media	Do not use water jet as an extinguisher, as this will spread the fire.
Specific hazards arising from the chemical	During fire, gases hazardous to health may be formed.
Special protective equipment and precautions for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Fire fighting equipment/instructions	Move containers from fire area if you can do so without risk.
Specific methods	Use standard firefighting procedures and consider the hazards of other involved materials.
General fire hazards	No unusual fire or explosion hazards noted.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Wear appropriate protective equipment and clothing during clean-up. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ensure adequate ventilation. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.
Methods and materials for containment and cleaning up	Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Cover with plastic sheet to prevent spreading. Absorb in vermiculite, dry sand or earth and place into containers. Following product recovery, flush area with water. Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination. Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.
Environmental precautions	Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling	Avoid contact with eyes, skin, and clothing. Avoid prolonged exposure. Provide adequate ventilation. Wear appropriate personal protective equipment. Observe good industrial hygiene practices.
Conditions for safe storage, including any incompatibilities	Store in original tightly closed container. Store away from incompatible materials (see Section 10 of the SDS).

8. Exposure controls/personal protection

Occupational exposure limits

US. ACGIH Threshold Limit Values

Components	Type	Value
Potassium hydroxide (CAS 1310-58-3)	Ceiling	2 mg/m3

US. NIOSH: Pocket Guide to Chemical Hazards

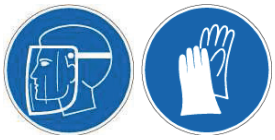
Components	Type	Value
Potassium hydroxide (CAS 1310-58-3)	TWA	2 mg/m3

Biological limit values	No biological exposure limits noted for the ingredient(s).

Appropriate engineering controls	Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Eye wash facilities and emergency shower must be available when handling this product.

Individual protection measures, such as personal protective equipment

Eye/face protection	Wear safety glasses with side shields (or goggles) and a face shield. Chemical goggles and face shield are recommended.
Skin protection	
Hand protection	Chemical resistant gloves.
Other	Wear appropriate chemical resistant clothing. Chemical resistant gloves.
Respiratory protection	In case of insufficient ventilation, wear suitable respiratory equipment.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.



General hygiene considerations	Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance	Clear.
Physical state	Liquid.
Form	Liquid.
Color	Colorless to Pale yellow
Odor	Sulfur dioxide.
pH	7.4 - 7.6
Melting point/freezing point	< 32 °F (< 0 °C)
Initial boiling point and boiling range	> 212 °F (> 100 °C)
Flash point	Not available.
Evaporation rate	Not available.
Flammability (solid, gas)	Not available.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	Not available.
Flammability limit - upper (%)	Not available.
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	Not available.
Vapor density	Not available.
Solubility(ies)	
Solubility (water)	Not available.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	Not available.
Other information	
Density	1.20 g/cm³
Specific gravity	1.2 - 1.25

10. Stability and reactivity

Reactivity The product is stable and non-reactive under normal conditions of use, storage and transport.

Chemical stability Material is stable under normal conditions.

Possibility of hazardous reactions No dangerous reaction known under conditions of normal use.

Conditions to avoid Contact with incompatible materials.

Incompatible materials Strong oxidizing agents.

Hazardous decomposition products Carbon oxides. Sulfur oxides.

11. Toxicological information

Information on likely routes of exposure

Inhalation Prolonged inhalation may be harmful.

Skin contact Causes skin irritation.

Eye contact Causes serious eye irritation.

Ingestion Expected to be a low ingestion hazard.

Symptoms related to the physical, chemical and toxicological characteristics Severe eye irritation. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Skin irritation. May cause redness and pain.

Information on toxicological effects

Acute toxicity

Product	Species	Test Results
Hydrex 1317		
Acute		
Oral		
LD50	Rat	>= 5000 mg/kg Calculated

* Estimates for product may be based on additional component data not shown.

Skin corrosion/irritation Causes skin irritation.

Serious eye damage/eye irritation Causes serious eye irritation.

Respiratory or skin sensitization

Respiratory sensitization Not a respiratory sensitizer.

Skin sensitization This product is not expected to cause skin sensitization.

Germ cell mutagenicity No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.

Carcinogenicity This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Reproductive toxicity This product is not expected to cause reproductive or developmental effects.

Specific target organ toxicity - single exposure Not classified.

Specific target organ toxicity - repeated exposure Not classified.

Aspiration hazard Not an aspiration hazard.

Chronic effects Prolonged inhalation may be harmful.

12. Ecological information

Ecotoxicity The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Product		Species	Test Results
Hydrex 1317			
Aquatic			
Acute			
Crustacea	EC50	Daphnia	1200 mg/l, 48 hours Calculated

Product		Species	Test Results
Fish	LC50	Fish	>= 1200 mg/l, 96 hours calculated

* Estimates for product may be based on additional component data not shown.

Persistence and degradability No data is available on the degradability of this product.

Bioaccumulative potential

Mobility in soil No data available.

Other adverse effects No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Dispose of contents/container in accordance with local/regional/national/international regulations.

Local disposal regulations Dispose in accordance with all applicable regulations.

Hazardous waste code The waste code should be assigned in discussion between the user, the producer and the waste disposal company.

Waste from residues / unused products Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).

Contaminated packaging Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not established.

15. Regulatory information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
All components are on the U.S. EPA TSCA Inventory List.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

Potassium hydroxide (CAS 1310-58-3) Listed.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories Immediate Hazard - Yes
Delayed Hazard - No
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical Yes

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA) Not regulated.

US state regulations

US. California Controlled Substances. CA Department of Justice (California Health and Safety Code Section 11100)

Not listed.

US. Massachusetts RTK - Substance List

Potassium hydroxide (CAS 1310-58-3)

US. New Jersey Worker and Community Right-to-Know Act

Potassium hydroxide (CAS 1310-58-3)

US. Pennsylvania Worker and Community Right-to-Know Law

Potassium hydroxide (CAS 1310-58-3)

US. Rhode Island RTK

Potassium hydroxide (CAS 1310-58-3)

US. California Proposition 65

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date 06-02-2015

Version # 01

NFPA ratings Health: 2
Flammability: 0
Instability: 0

NFPA ratings

Disclaimer Test MFG Default cannot anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use. The information in the sheet was written based on the best knowledge and experience currently available. Veolia Water Technologies is not able to anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use and or non respect of Veolia Water Technologies' requirement.

Revision Information	Product and Company Identification: Alternate Trade Names Hazard(s) identification: Hazard statement Hazard(s) identification: Storage Toxicological Information: Toxicological Data Ecological Information: Ecotoxicity

SAFETY DATA SHEET

1. Identification

Product identifier **Hydrex 1425**

Other means of identification None.

Recommended use Boiler Water Treatment

Recommended restrictions PROFESSIONAL USE ONLY

Manufacturer/Importer/Supplier/Distributor information

Manufacturer

Supplier Veolia Water Technologies, Inc

Address 913 Industrial Park Drive
Vandalia, Ohio
45377

Contact Person Hydrex Product Manager

Telephone +1-937-890-4075

Fax +1-937-890-5495

e-mail hydrex.msds@veolia.com

Global Emergency Contact +1-760-476-3962 (Code: 333239)

2. Hazard(s) identification

Physical hazards Not classified.

Health hazards Skin corrosion/irritation Category 2

Serious eye damage/eye irritation Category 2

Environmental hazards Not classified.

OSHA defined hazards Not classified.

Label elements

Signal word Warning

Hazard statement Causes skin irritation. Causes serious eye irritation.

Precautionary statement

Prevention Wear protective gloves. Wear eye/face protection.

Response If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If skin irritation occurs: Get medical advice/attention. If eye irritation persists: Get medical advice/attention. Take off contaminated clothing and wash before reuse.

Storage Store away from incompatible materials.

Disposal Dispose of waste and residues in accordance with local authority requirements.

Hazard(s) not otherwise classified (HNOC) None known.

Supplemental information None.

3. Composition/information on ingredients

Mixtures

Chemical name	Common name and synonyms	CAS number	%
Potassium hydroxide		1310-58-3	0.1 - 1
Other components below reportable levels			90 - 100

#: This substance has workplace exposure limit(s).
vPvB: very persistent and very bioaccumulative substance.
PBT: persistent, bioaccumulative and toxic substance.
*Designates that a specific chemical identity and/or percentage of composition has been withheld as a trade secret.

Composition comments The full text for all R-phrases is displayed in Section 16 of the SDS.

4. First-aid measures

Inhalation	Move to fresh air. Call a physician if symptoms develop or persist.
Skin contact	Remove contaminated clothing. Wash with plenty of soap and water. If skin irritation occurs: Get medical advice/attention. Wash contaminated clothing before reuse.
Eye contact	Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if irritation develops and persists.
Ingestion	Rinse mouth. Get medical attention if symptoms occur.
Most important symptoms/effects, acute and delayed	Severe eye irritation. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Skin irritation. May cause redness and pain.
Indication of immediate medical attention and special treatment needed	Provide general supportive measures and treat symptomatically. Keep victim under observation. Symptoms may be delayed.
General information	Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire-fighting measures

Suitable extinguishing media	Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2).
Unsuitable extinguishing media	Do not use water jet as an extinguisher, as this will spread the fire.
Specific hazards arising from the chemical	During fire, gases hazardous to health may be formed.
Special protective equipment and precautions for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Fire fighting equipment/instructions	Move containers from fire area if you can do so without risk.
Specific methods	Use standard firefighting procedures and consider the hazards of other involved materials.
General fire hazards	No unusual fire or explosion hazards noted.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Wear appropriate protective equipment and clothing during clean-up. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ensure adequate ventilation. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.
Methods and materials for containment and cleaning up	Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Cover with plastic sheet to prevent spreading. Absorb in vermiculite, dry sand or earth and place into containers. Following product recovery, flush area with water. Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination. Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.
Environmental precautions	Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling	Avoid contact with eyes, skin, and clothing. Avoid prolonged exposure. Provide adequate ventilation. Wear appropriate personal protective equipment. Observe good industrial hygiene practices.
Conditions for safe storage, including any incompatibilities	Store in original tightly closed container. Store away from incompatible materials (see Section 10 of the SDS).

8. Exposure controls/personal protection

Occupational exposure limits

US. ACGIH Threshold Limit Values

Components	Type	Value
Potassium hydroxide (CAS 1310-58-3)	Ceiling	2 mg/m3

US. NIOSH: Pocket Guide to Chemical Hazards

Components	Type	Value
Potassium hydroxide (CAS 1310-58-3)	TWA	2 mg/m3

Biological limit values No biological exposure limits noted for the ingredient(s).

Exposure guidelines No exposure standards allocated.

Appropriate engineering controls Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. General ventilation normally adequate. Eye wash facilities and emergency shower must be available when handling this product. Provide adequate general and local exhaust ventilation.

Individual protection measures, such as personal protective equipment

Eye/face protection Wear eye/face protection. Wear safety glasses with side shields (or goggles). Wear chemical protective equipment that is specifically recommended by the manufacturer.

Skin protection

Hand protection Chemical resistant gloves.

Other Wear appropriate chemical resistant clothing. Chemical resistant gloves.

Respiratory protection No personal respiratory protective equipment normally required. In case of insufficient ventilation, wear suitable respiratory equipment. Avoid forming spray/aerosol mists.

Thermal hazards Wear appropriate thermal protective clothing, when necessary.

General hygiene considerations Avoid contact with eyes. Avoid contact with skin. Keep away from food and drink. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance Clear to Hazy

Physical state Liquid.

Form Liquid Liquid.

Color Colorless to Light amber

Odor Not significant.

pH 8 - 10

Melting point/freezing point < 32 °F (< 0 °C)

Initial boiling point and boiling range 212 °F (100 °C)

Flash point Not available.

Evaporation rate Not available.

Flammability (solid, gas) Not available.

Upper/lower flammability or explosive limits

Flammability limit - lower (%) Not available.

Flammability limit - upper (%) Not available.

Explosive limit - lower (%) Not available.

Explosive limit - upper (%) Not available.

Vapor pressure Not available.

Vapor density Not available.

Solubility(ies)

Solubility (water) Not available.

Partition coefficient (n-octanol/water) Not available.

Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	Not available.
Other information	
Specific gravity	1.17 - 1.2

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	Hazardous polymerization does not occur.
Conditions to avoid	Heat, flames and sparks. Contact with incompatible materials.
Incompatible materials	Strong oxidizing agents.
Hazardous decomposition products	No dangerous reaction known under conditions of normal use. Carbon oxides. Phosphorus compounds.

11. Toxicological information

Information on likely routes of exposure

Inhalation	Prolonged inhalation may be harmful.
Skin contact	Causes skin irritation.
Eye contact	Causes serious eye irritation.
Ingestion	Expected to be a low ingestion hazard.
Symptoms related to the physical, chemical and toxicological characteristics	Severe eye irritation. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Skin irritation. May cause redness and pain.

Information on toxicological effects

Acute toxicity

Product	Species	Test Results
Hydrex 1425		
Acute		
Dermal		
LC50	Rabbit	>= 93000 mg/kg Calculated
LD50	Rat	246 g/kg calculated
Oral		
LD50	Rat	27300 mg/kg Calculated

* Estimates for product may be based on additional component data not shown.

Skin corrosion/irritation	Causes skin irritation.
Serious eye damage/eye irritation	Causes serious eye irritation.
Respiratory or skin sensitization	
Respiratory sensitization	Not a respiratory sensitizer.
Skin sensitization	This product is not expected to cause skin sensitization.
Germ cell mutagenicity	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Reproductive toxicity	This product is not expected to cause reproductive or developmental effects.
Specific target organ toxicity - single exposure	Not classified.
Specific target organ toxicity - repeated exposure	Not classified.
Aspiration hazard	Not an aspiration hazard.
Chronic effects	Prolonged inhalation may be harmful.

12. Ecological information

Ecotoxicity The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Product		Species	Test Results
Hydrex 1425			
Aquatic			
Crustacea	EC50	Daphnia	5705.8823 mg/l, 48 hours estimated
	LC50	Daphnia	>= 1700 mg/l, 24 Hours calculated
Fish	LC50	Fish	8000 mg/l, 96 hours calculated

* Estimates for product may be based on additional component data not shown.

Persistence and degradability No data is available on the degradability of this product.

Bioaccumulative potential No data available.

Mobility in soil No data available.

Other adverse effects No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Dispose of contents/container in accordance with local/regional/national/international regulations.

Local disposal regulations Dispose in accordance with all applicable regulations.

Hazardous waste code The waste code should be assigned in discussion between the user, the producer and the waste disposal company.

Waste from residues / unused products Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).

Contaminated packaging Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

- **UN number** UN3266
- **UN proper shipping name** Corrosive liquid, basic, inorganic, n.o.s. (Potassium hydroxide)
- **Transport hazard class(es)**
  - **Class** 8
  - **Subsidiary risk** -
  - **Label(s)** 8
- **Packing group** III
- **Special precautions for user** Read safety instructions, SDS and emergency procedures before handling.
- **Special provisions** IB3, T7, TP1, TP28
- **Packaging exceptions** 154
- **Packaging non bulk** 203
- **Packaging bulk** 241

IATA

- **UN number** UN3266
- **UN proper shipping name** Corrosive liquid, basic, inorganic, n.o.s. (Potassium hydroxide)
- **Transport hazard class(es)**
  - **Class** 8
  - **Subsidiary risk** -
- **Packing group** III
- **Environmental hazards** No.
- **ERG Code** 8L
- **Special precautions for user** Read safety instructions, SDS and emergency procedures before handling.
- **Other information**
  - **Passenger and cargo aircraft** Allowed.
  - **Cargo aircraft only** Allowed.

IMDG

UN number	UN3266
UN proper shipping name	CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S. (Potassium hydroxide)
Transport hazard class(es)	
Class	8
Subsidiary risk	-
Packing group	III
Environmental hazards	
Marine pollutant	No.
EmS	F-A, S-B
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not established.

DOT

IATA; IMDG

15. Regulatory information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
One or more components are not listed on TSCA.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

Potassium hydroxide (CAS 1310-58-3) Listed.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories Immediate Hazard - Yes
Delayed Hazard - No
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical Yes

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA) Not regulated.

US state regulations

US. California Controlled Substances. CA Department of Justice (California Health and Safety Code Section 11100)

Not listed.

US. Massachusetts RTK - Substance List

Potassium hydroxide (CAS 1310-58-3)

US. New Jersey Worker and Community Right-to-Know Act

Potassium hydroxide (CAS 1310-58-3)

US. Pennsylvania Worker and Community Right-to-Know Law

Potassium hydroxide (CAS 1310-58-3)

US. Rhode Island RTK

Potassium hydroxide (CAS 1310-58-3)

US. California Proposition 65

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	No
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	No
New Zealand	New Zealand Inventory	No
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	No
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	No

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date 06-02-2015

Version # 01

NFPA ratings Health: 2
Flammability: 0
Instability: 0

NFPA ratings

Disclaimer	Test MFG Default cannot anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use. The information in the sheet was written based on the best knowledge and experience currently available. Veolia Water Technologies is not able to anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use and or non respect of Veolia Water Technologies' requirement.
Revision Information	Product and Company Identification: Alternate Trade Names Hazard(s) identification: Hazard statement Hazard(s) identification: Storage Hazard(s) identification: GHS Signal Words Hazard(s) identification: GHS Symbols

SAFETY DATA SHEET

1. Identification

Product identifier	**Hydrex 1565**
Other means of identification	None.
Recommended use	Boiler Water Treatment
Recommended restrictions	PROFESSIONAL USE ONLY

Manufacturer/Importer/Supplier/Distributor information

Manufacturer

Supplier	Veolia Water Technologies, Inc
Address	913 Industrial Park Drive Vandalia, Ohio 45377
Contact Person	Hydrex Product Manager
Telephone	+1-937-890-4075
Fax	+1-937-890-5495
e-mail	hydrex.msds@veolia.com
Global Emergency Contact	+1-760-476-3962 (Code: 333239)

2. Hazard(s) identification

Physical hazards	Corrosive to metals	Category 1
Health hazards	Acute toxicity, oral	Category 4
	Skin corrosion/irritation	Category 1
	Serious eye damage/eye irritation	Category 1
Environmental hazards	Hazardous to the aquatic environment, acute hazard	Category 3
	Hazardous to the aquatic environment, long-term hazard	Category 3
OSHA defined hazards	Not classified.	

Label elements

Signal word	Danger
Hazard statement	May be corrosive to metals. Harmful if swallowed. Causes severe skin burns and eye damage. Causes serious eye damage. Harmful to aquatic life. Harmful to aquatic life with long lasting effects.

Precautionary statement

Prevention	Avoid forming spray/aerosol mists. Keep only in original container. Do not breathe mist or vapor. Do not eat, drink or smoke when using this product. Avoid release to the environment. Wear protective gloves/protective clothing/eye protection/face protection.
Response	If swallowed: Rinse mouth. Do NOT induce vomiting. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. If inhaled: Remove person to fresh air and keep comfortable for breathing. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/physician. Wash contaminated clothing before reuse. Absorb spillage to prevent material damage.
Storage	Store in cool place. Store locked up. Protect from sunlight.
Disposal	Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

Hazard(s) not otherwise classified (HNOC)	None known.
Supplemental information	None.

3. Composition/information on ingredients

Mixtures

Chemical name	Common name and synonyms	CAS number	%
Sodium Hydroxide		1310-73-2	40 - 60
Other components below reportable levels			40 - 60

*Designates that a specific chemical identity and/or percentage of composition has been withheld as a trade secret.

4. First-aid measures

Inhalation
Move to fresh air. Call a physician if symptoms develop or persist.

Skin contact
Take off immediately all contaminated clothing. Rinse skin with water/shower. Call a physician or poison control center immediately. Chemical burns must be treated by a physician. Wash contaminated clothing before reuse.

Eye contact
Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Call a physician or poison control center immediately.

Ingestion
Call a physician or poison control center immediately. Rinse mouth. Do not induce vomiting. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.

Most important symptoms/effects, acute and delayed
Burning pain and severe corrosive skin damage. Causes serious eye damage. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Permanent eye damage including blindness could result.

Indication of immediate medical attention and special treatment needed
Provide general supportive measures and treat symptomatically. Chemical burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital. Keep victim warm. Keep victim under observation. Symptoms may be delayed.

General information
Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance.

5. Fire-fighting measures

Suitable extinguishing media
Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2).

Unsuitable extinguishing media
Not available.

Specific hazards arising from the chemical
During fire, gases hazardous to health may be formed.

Special protective equipment and precautions for firefighters
Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

Fire fighting equipment/instructions
Move containers from fire area if you can do so without risk.

Specific methods
Use standard firefighting procedures and consider the hazards of other involved materials.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures
Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Wear appropriate protective equipment and clothing during clean-up. Do not breathe mist or vapor. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ensure adequate ventilation. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.

Methods and materials for containment and cleaning up
Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Absorb spillage to prevent material damage. Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Prevent entry into waterways, sewer, basements or confined areas. Following product recovery, flush area with water.

Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination.

Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.

Environmental precautions
Avoid release to the environment. Prevent further leakage or spillage if safe to do so. Avoid discharge into drains, water courses or onto the ground. Inform appropriate managerial or supervisory personnel of all environmental releases.

7. Handling and storage

Precautions for safe handling

Avoid forming spray/aerosol mists. Do not breathe mist or vapor. Do not get in eyes, on skin, or on clothing. Avoid prolonged exposure. Do not taste or swallow. When using, do not eat, drink or smoke. Provide adequate ventilation. Wear appropriate personal protective equipment. Wash hands thoroughly after handling. Avoid release to the environment. Observe good industrial hygiene practices.

Conditions for safe storage, including any incompatibilities

Store in a cool, dry place out of direct sunlight. Store in corrosive resistant container with a resistant inner liner. Keep only in the original container. Store away from incompatible materials (see Section 10 of the SDS).

8. Exposure controls/personal protection

Occupational exposure limits

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Components	Type	Value
Sodium Hydroxide (CAS 1310-73-2)	PEL	2 mg/m3

US. ACGIH Threshold Limit Values

Components	Type	Value
Sodium Hydroxide (CAS 1310-73-2)	Ceiling	2 mg/m3

US. NIOSH: Pocket Guide to Chemical Hazards

Components	Type	Value
Sodium Hydroxide (CAS 1310-73-2)	Ceiling	2 mg/m3

Biological limit values

No biological exposure limits noted for the ingredient(s).

Appropriate engineering controls

Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Eye wash facilities and emergency shower must be available when handling this product.

Individual protection measures, such as personal protective equipment

Eye/face protection

Wear safety glasses with side shields (or goggles) and a face shield. Chemical goggles and face shield are recommended.

Skin protection

Hand protection

Chemical resistant gloves.

Other

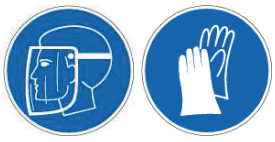
Wear appropriate chemical resistant clothing. Chemical resistant gloves.

Respiratory protection

In case of insufficient ventilation, wear suitable respiratory equipment. Avoid forming spray/aerosol mists.

Thermal hazards

Wear appropriate thermal protective clothing, when necessary.



General hygiene considerations

Keep away from food and drink. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance

Clear.

Physical state

Liquid.

Form

Liquid.

Color

Colorless.

Odor

Odorless.

pH

13.5 - 13.8

Melting point/freezing point

< 39.92 °F (< 4.4 °C)

Initial boiling point and boiling range

293 °F (145 °C)

Flash point

Not available.

Evaporation rate	Not available.
Flammability (solid, gas)	Not available.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	Not available.
Flammability limit - upper (%)	Not available.
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	6.33 mm Hg (40 °C)
Vapor density	Not available.
Solubility(ies)	
Solubility (water)	Not available.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	Not available.
Other information	
Density	1.53 g/cm3
Percent volatile	0.5 %
Specific gravity	1.52 - 1.54
pH of 1% Solution	13

10. Stability and reactivity

Reactivity	Reacts violently with strong acids. This product may react with oxidizing agents. May be corrosive to metals.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	Hazardous polymerization does not occur.
Conditions to avoid	Do not mix with other chemicals. Contact with incompatible materials.
Incompatible materials	Strong acids. Acids. Strong oxidizing agents. Oxidizing agents. Metals.
Hazardous decomposition products	No dangerous reaction known under conditions of normal use. No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure

Inhalation	May cause irritation to the respiratory system. Prolonged inhalation may be harmful.
Skin contact	Causes severe skin burns.
Eye contact	Causes serious eye damage.
Ingestion	Causes digestive tract burns. Harmful if swallowed.
Symptoms related to the physical, chemical and toxicological characteristics	Burning pain and severe corrosive skin damage. Causes serious eye damage. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Permanent eye damage including blindness could result.

Information on toxicological effects

Acute toxicity Harmful if swallowed.

Product	Species	Test Results
Hydrex 1565		
Acute		
Oral		
LD50	Rat	> 700 mg/kg

* Estimates for product may be based on additional component data not shown.

Skin corrosion/irritation Causes severe skin burns and eye damage.

Serious eye damage/eye irritation	Causes serious eye damage.
Respiratory or skin sensitization	
Respiratory sensitization	Not a respiratory sensitizer.
Skin sensitization	This product is not expected to cause skin sensitization.
Germ cell mutagenicity	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Reproductive toxicity	This product is not expected to cause reproductive or developmental effects.
Specific target organ toxicity - single exposure	Not classified.
Specific target organ toxicity - repeated exposure	Not classified.
Aspiration hazard	Not an aspiration hazard.
Chronic effects	Prolonged inhalation may be harmful.

12. Ecological information

Ecotoxicity	Harmful to aquatic life with long lasting effects.
Persistence and degradability	No data is available on the degradability of this product.
Bioaccumulative potential	No data available.
Mobility in soil	No data available.
Other adverse effects	No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions	Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. Dispose of contents/container in accordance with local/regional/national/international regulations.
Local disposal regulations	Dispose in accordance with all applicable regulations.
Hazardous waste code	D002: Waste Corrosive material [pH <=2 or =>12.5, or corrosive to steel] The waste code should be assigned in discussion between the user, the producer and the waste disposal company.
Waste from residues / unused products	Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).
Contaminated packaging	Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

UN number	UN1824
UN proper shipping name	Sodium hydroxide solution
Transport hazard class(es)	
Class	8
Subsidiary risk	-
Label(s)	8
Packing group	II
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.
Special provisions	B2, IB2, N34, T7, TP2
Packaging exceptions	154
Packaging non bulk	202
Packaging bulk	242

IATA

UN number	UN1824
UN proper shipping name	Sodium hydroxide solution

Transport hazard class(es)

Class	8
Subsidiary risk	-
Packing group	II
Environmental hazards	No.
ERG Code	8L
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.
Other information	
Passenger and cargo aircraft	Allowed.
Cargo aircraft only	Allowed.

IMDG

UN number	UN1824
UN proper shipping name	SODIUM HYDROXIDE SOLUTION
Transport hazard class(es)	
Class	8
Subsidiary risk	-
Packing group	II
Environmental hazards	
Marine pollutant	No.
EmS	F-A, S-B
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not established.

DOT

IATA; IMDG

15. Regulatory information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
All components are on the U.S. EPA TSCA Inventory List.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

Sodium Hydroxide (CAS 1310-73-2) Listed.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories
Immediate Hazard - Yes
Delayed Hazard - No
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical
Yes

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Clean Water Act (CWA) Section 112(r) (40 CFR 68.130)
Hazardous substance

Safe Drinking Water Act (SDWA)
Not regulated.

US state regulations

US. California Controlled Substances. CA Department of Justice (California Health and Safety Code Section 11100)

Not listed.

US. Massachusetts RTK - Substance List

Sodium Hydroxide (CAS 1310-73-2)

US. New Jersey Worker and Community Right-to-Know Act

Sodium Hydroxide (CAS 1310-73-2)

US. Pennsylvania Worker and Community Right-to-Know Law

Sodium Hydroxide (CAS 1310-73-2)

US. Rhode Island RTK

Sodium Hydroxide (CAS 1310-73-2)

US. California Proposition 65

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date 05-19-2015

Version # 01

NFPA ratings	Health: 3 Flammability: 0 Instability: 0
NFPA ratings	
Disclaimer	Veolia Water Technologies is not able to anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use and or non respect of Veolia Water Technologies' requirement.
Revision Information	Product and Company Identification: Alternate Trade Names Toxicological Information: Toxicological Data Toxicological information: Ingestion

SAFETY DATA SHEET

1. Identification

Product identifier	**Hydrex 1605**
Other means of identification	None.
Recommended use	Boiler Water Treatment
Recommended restrictions	PROFESSIONAL USE ONLY

Manufacturer/Importer/Supplier/Distributor information

Manufacturer

Supplier	Veolia Water Technologies, Inc
Address	913 Industrial Park Drive Vandalia, Ohio 45377
Contact Person	Hydrex Product Manager
Telephone	+1-937-890-4075
Fax	+1-937-890-5495
e-mail	hydrex.msds@veolia.com
Global Emergency Contact	+1-760-476-3962 (Code: 333239)

2. Hazard(s) identification

Physical hazards	Flammable liquids	Category 4
	Corrosive to metals	Category 1
Health hazards	Acute toxicity, oral	Category 4
	Acute toxicity, dermal	Category 4
	Acute toxicity, inhalation	Category 4
	Skin corrosion/irritation	Category 1
	Serious eye damage/eye irritation	Category 1
	Reproductive toxicity (fertility)	Category 2
	Specific target organ toxicity, single exposure	Category 3 respiratory tract irritation
	Specific target organ toxicity, repeated exposure	Category 1
Environmental hazards	Hazardous to the aquatic environment, acute hazard	Category 2
	Hazardous to the aquatic environment, long-term hazard	Category 2
OSHA defined hazards	Not classified.	

Label elements

Signal word	Danger
Hazard statement	Combustible liquid. May be corrosive to metals. Harmful if swallowed. Harmful in contact with skin. Causes severe skin burns and eye damage. Causes serious eye damage. Harmful if inhaled. May cause respiratory irritation. Suspected of damaging fertility. Causes damage to organs through prolonged or repeated exposure. Toxic to aquatic life. Toxic to aquatic life with long lasting effects.
Precautionary statement	
Prevention	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Avoid forming spray/aerosol mists. Keep only in original container. Do not breathe mist or vapor. Do not eat, drink or smoke when using this product. Use only outdoors or in a well-ventilated area. Avoid release to the environment. Wear protective gloves/protective clothing/eye protection/face protection.

Response	If swallowed: Rinse mouth. Do NOT induce vomiting. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. If inhaled: Remove person to fresh air and keep comfortable for breathing. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Take off contaminated clothing and wash before reuse. Absorb spillage to prevent material damage.
Storage	Store in cool place. Store in a well-ventilated place. Keep container tightly closed. Store in a well-ventilated place. Keep cool. Store locked up. Protect from sunlight.
Disposal	Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.
Hazard(s) not otherwise classified (HNOC)	None known.
Supplemental information	None.

3. Composition/information on ingredients

Mixtures

Chemical name	Common name and synonyms	CAS number	%
Morpholine		110-91-8	20 - 40
Cyclohexylamine		108-91-8	10 - 20
Diethylaminoethanol (DEAE or DEEA)		100-37-8	10 - 20
Other components below reportable levels			40 - 60

*Designates that a specific chemical identity and/or percentage of composition has been withheld as a trade secret.

4. First-aid measures

Inhalation	Remove victim to fresh air and keep at rest in a position comfortable for breathing. Oxygen or artificial respiration if needed. Call a POISON CENTER or doctor/physician if you feel unwell.
Skin contact	Take off immediately all contaminated clothing. Rinse skin with water/shower. Call a physician or poison control center immediately. Chemical burns must be treated by a physician. Wash contaminated clothing before reuse.
Eye contact	Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Call a physician or poison control center immediately.
Ingestion	Call a physician or poison control center immediately. Rinse mouth. Do not induce vomiting. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.
Most important symptoms/effects, acute and delayed	Burning pain and severe corrosive skin damage. Nausea. Causes serious eye damage. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Permanent eye damage including blindness could result. May cause respiratory irritation. Prolonged exposure may cause chronic effects.
Indication of immediate medical attention and special treatment needed	Provide general supportive measures and treat symptomatically. Chemical burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital. Keep victim warm. Keep victim under observation. Symptoms may be delayed.
General information	IF exposed or concerned: Get medical advice/attention. If you feel unwell, seek medical advice (show the label where possible). Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance.

5. Fire-fighting measures

Suitable extinguishing media	Alcohol resistant foam. Water fog. Dry chemical powder. Carbon dioxide (CO2).
Unsuitable extinguishing media	Not available.
Specific hazards arising from the chemical	The product is combustible, and heating may generate vapors which may form explosive vapor/air mixtures.
Special protective equipment and precautions for firefighters	Not available.
Fire fighting equipment/instructions	In case of fire and/or explosion do not breathe fumes.
General fire hazards	Combustible liquid.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Wear appropriate protective equipment and clothing during clean-up. Do not breathe mist or vapor. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ensure adequate ventilation. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.

Methods and materials for containment and cleaning up

Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Keep combustibles (wood, paper, oil, etc.) away from spilled material.

Large Spills: Stop the flow of material, if this is without risk. Use water spray to reduce vapors or divert vapor cloud drift. Dike the spilled material, where this is possible. Absorb spillage to prevent material damage. Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Prevent entry into waterways, sewer, basements or confined areas. Following product recovery, flush area with water.

Small Spills: Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination.

Never return spills to original containers for re-use.

Environmental precautions

Avoid release to the environment. Inform appropriate managerial or supervisory personnel of all environmental releases.

7. Handling and storage

Precautions for safe handling

Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Avoid forming spray/aerosol mists. Keep away from open flames, hot surfaces and sources of ignition. Do not breathe mist or vapor. Do not get in eyes, on skin, or on clothing. Do not taste or swallow. When using, do not eat, drink or smoke. Pregnant or breastfeeding women must not handle this product. Should be handled in closed systems, if possible. Use only outdoors or in a well-ventilated area. Wear appropriate personal protective equipment. Wash hands thoroughly after handling. Avoid release to the environment. Wash contaminated clothing before reuse. Observe good industrial hygiene practices.

Conditions for safe storage, including any incompatibilities

Keep away from heat, sparks and open flame. Store in a cool, dry place out of direct sunlight. Store in corrosive resistant container with a resistant inner liner. Keep only in the original container. Store in a well-ventilated place. Keep in an area equipped with sprinklers. Store away from incompatible materials (see Section 10 of the SDS).

8. Exposure controls/personal protection

Occupational exposure limits

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Components	Type	Value
Diethylaminoethanol (DEAE or DEEA) (CAS 100-37-8)	PEL	50 mg/m3 10 ppm
Morpholine (CAS 110-91-8)	PEL	70 mg/m3 20 ppm

US. ACGIH Threshold Limit Values

Components	Type	Value
Cyclohexylamine (CAS 108-91-8)	TWA	10 ppm
Diethylaminoethanol (DEAE or DEEA) (CAS 100-37-8)	TWA	2 ppm
Morpholine (CAS 110-91-8)	TWA	20 ppm

US. NIOSH: Pocket Guide to Chemical Hazards

Components	Type	Value
Cyclohexylamine (CAS 108-91-8)	TWA	40 mg/m3 10 ppm
Diethylaminoethanol (DEAE or DEEA) (CAS 100-37-8)	TWA	50 mg/m3 10 ppm
Morpholine (CAS 110-91-8)	STEL	105 mg/m3 30 ppm

US. NIOSH: Pocket Guide to Chemical Hazards Components	Type	Value
	TWA	70 mg/m3 20 ppm

Biological limit values No biological exposure limits noted for the ingredient(s).

Exposure guidelines

US - Tennessee OELs: Skin designation

Diethylaminoethanol (DEAE or DEEA) (CAS 100-37-8)	Can be absorbed through the skin.
Morpholine (CAS 110-91-8)	Can be absorbed through the skin.

US ACGIH Threshold Limit Values: Skin designation

Diethylaminoethanol (DEAE or DEEA) (CAS 100-37-8)	Can be absorbed through the skin.
Morpholine (CAS 110-91-8)	Can be absorbed through the skin.

US. California Code of Regulations, Title 8, Section 5155. Airborne Contaminants

2-(diethylamino)ethanol (CAS 100-37-8)	Can be absorbed through the skin.
CYCLOHEXYLAMINE (CAS 108-91-8)	Can be absorbed through the skin.
MORPHOLINE; TETRAHYDRO-4H-1, 4-OXAZINE (CAS 110-91-8)	Can be absorbed through the skin.

US. Minnesota Hazardous Substances List (Minn. Rules 5206.0400).

Diethylaminoethanol (DEAE or DEEA) (CAS 100-37-8)	Skin designation applies.
Morpholine (CAS 110-91-8)	Skin designation applies.

US. NIOSH: Pocket Guide to Chemical Hazards

Diethylaminoethanol (DEAE or DEEA) (CAS 100-37-8)	Can be absorbed through the skin.
Morpholine (CAS 110-91-8)	Can be absorbed through the skin.

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Diethylaminoethanol (DEAE or DEEA) (CAS 100-37-8)	Can be absorbed through the skin.
Morpholine (CAS 110-91-8)	Can be absorbed through the skin.

Appropriate engineering controls Eye wash facilities and emergency shower must be available when handling this product.

Individual protection measures, such as personal protective equipment

Eye/face protection Wear safety glasses with side shields (or goggles) and a face shield. Chemical goggles and face shield are recommended.

Skin protection

Hand protection Chemical resistant gloves.

Other Wear suitable protective clothing. Chemical resistant gloves.

Respiratory protection If engineering controls do not maintain airborne concentrations below recommended exposure limits (where applicable) or to an acceptable level (in countries where exposure limits have not been established), an approved respirator must be worn. Avoid forming spray/aerosol mists.

Thermal hazards Wear appropriate thermal protective clothing, when necessary.

General hygiene considerations When using, do not eat, drink or smoke. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance Clear.

Physical state Liquid.

Form Liquid.

Color Colorless

Odor Strong. Amine-like.

pH 11.8

Melting point/freezing point < 32 °F (< 0 °C)

Initial boiling point and boiling range > 253.4 °F (> 123 °C)

Flash point 145.0 °F (62.8 °C)

Evaporation rate Not available.

Flammability (solid, gas) Not available.

Upper/lower flammability or explosive limits

Flammability limit - lower (%) Not available.

Flammability limit - upper (%)	Not available.
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	Not available.
Vapor density	Not available.
Solubility(ies)	
Solubility (water)	Not available.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	Not available.
Other information	
Density	0.98 - 1.00 g/cm3
Flammability class	Combustible IIIA
Percent volatile	45 % estimated
Specific gravity	0.96 - 1
VOC (Weight %)	45 %

10. Stability and reactivity

Reactivity	Reacts violently with strong acids. This product may react with oxidizing agents. May be corrosive to metals.
Chemical stability	Risk of ignition. Material is stable under normal conditions.
Possibility of hazardous reactions	No dangerous reaction known under conditions of normal use. Hazardous polymerization does not occur.
Conditions to avoid	Avoid heat, sparks, open flames and other ignition sources. Do not mix with other chemicals. Contact with incompatible materials.
Incompatible materials	Strong acids. Acids. Strong oxidizing agents. Oxidizing agents. Metals. Aluminum.
Hazardous decomposition products	Carbon oxides. Nitrogen oxides (NOx).

11. Toxicological information

Information on likely routes of exposure

Inhalation	Harmful if inhaled. May cause damage to organs through prolonged or repeated exposure by inhalation.
Skin contact	Causes severe skin burns. Harmful in contact with skin.
Eye contact	Causes serious eye damage.
Ingestion	Causes digestive tract burns. Harmful if swallowed.
Symptoms related to the physical, chemical and toxicological characteristics	Burning pain and severe corrosive skin damage. Nausea. Causes serious eye damage. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Permanent eye damage including blindness could result. May cause respiratory irritation.

Information on toxicological effects

Acute toxicity	Harmful if inhaled. Harmful in contact with skin. Harmful if swallowed. May cause respiratory irritation.

Product	**Species**	**Test Results**
Hydrex 1605		
Acute		
Dermal		
LD50	Rabbit	>= 1500 mg/kg Calculated
Inhalation		
LC50	Rat	>= 30 mg/l/4h Calculated

Product	Species	Test Results
Oral		
LD50	Rat	>= 900 mg/kg Calculated

* Estimates for product may be based on additional component data not shown.

Skin corrosion/irritation Causes severe skin burns and eye damage.

Serious eye damage/eye irritation Causes serious eye damage.

Respiratory or skin sensitization

Respiratory sensitization Not available.

Skin sensitization Not available.

Germ cell mutagenicity Not available.

Carcinogenicity This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

IARC Monographs. Overall Evaluation of Carcinogenicity

Morpholine (CAS 110-91-8) 3 Not classifiable as to carcinogenicity to humans.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Reproductive toxicity Suspected of damaging fertility.

Specific target organ toxicity - single exposure May cause respiratory irritation.

Specific target organ toxicity - repeated exposure Causes damage to organs through prolonged or repeated exposure.

Aspiration hazard Not available.

Chronic effects Causes damage to organs through prolonged or repeated exposure.

12. Ecological information

Ecotoxicity Toxic to aquatic life with long lasting effects.

Product		Species	Test Results
Hydrex 1605			
Aquatic			
Acute			
Crustacea	EC50	Daphnia	404.3333 mg/l, 48 hours estimated
			>= 170 mg/l, 24 hours calculated
Fish	LC50	Fish	>= 600 mg/l, 96 hours calculated

* Estimates for product may be based on additional component data not shown.

Persistence and degradability Not available.

Bioaccumulative potential Not available.

Mobility in soil Not available.

Other adverse effects Not available.

13. Disposal considerations

Disposal instructions Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container.

Local disposal regulations Dispose in accordance with all applicable regulations.

Hazardous waste code D002: Waste Corrosive material [pH <=2 or =>12.5, or corrosive to steel]
The waste code should be assigned in discussion between the user, the producer and the waste disposal company.

Waste from residues / unused products Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).

Contaminated packaging Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

UN number	UN2734
UN proper shipping name	Amines, liquid, corrosive, flammable, n.o.s. (Morpholine, Cyclohexylamine)
Transport hazard class(es)	
Class	8
Subsidiary risk	3
Label(s)	8, 3
Packing group	II
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.
Special provisions	IB2, T11, TP2, TP27
Packaging exceptions	None
Packaging non bulk	202
Packaging bulk	243
Reportable Quantity (Lbs)	333

IATA

UN number	UN2734
UN proper shipping name	Amines, liquid, corrosive, flammable, n.o.s. (Morpholine, Cyclohexylamine)
Transport hazard class(es)	
Class	8
Subsidiary risk	3
Packing group	II
Environmental hazards	No.
ERG Code	8F
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.
Other information	
Passenger and cargo aircraft	Allowed.
Cargo aircraft only	Allowed.

IMDG

UN number	UN2734
UN proper shipping name	AMINES, LIQUID, CORROSIVE, FLAMMABLE, N.O.S. (Morpholine, Cyclohexylamine)
Transport hazard class(es)	
Class	8
Subsidiary risk	3
Packing group	II
Environmental hazards	
Marine pollutant	No.
EmS	F-E, S-C
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not available.

DOT

IATA; IMDG

15. Regulatory information

US federal regulations

This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
All components are on the U.S. EPA TSCA Inventory List.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

Cyclohexylamine (CAS 108-91-8)	Listed.
Morpholine (CAS 110-91-8)	Listed.

US EPCRA Section 304 Extremely Haz. Subs. & CERCLA Haz. Subs.: Section 304 EHS reportable quantity

Cyclohexylamine (CAS 108-91-8)	10000 LBS

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

Immediate Hazard - Yes
Delayed Hazard - Yes
Fire Hazard - Yes
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Chemical name	CAS number	Reportable quantity	Threshold planning quantity	Threshold planning quantity, lower value	Threshold planning quantity, upper value
Cyclohexylamine	108-91-8	10000	10000 lbs		

SARA 311/312 Hazardous chemical

Yes

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Cyclohexylamine (CAS 108-91-8)

Safe Drinking Water Act (SDWA)

Not regulated.

US state regulations

US. California Controlled Substances. CA Department of Justice (California Health and Safety Code Section 11100)

Morpholine (CAS 110-91-8)

US. Massachusetts RTK - Substance List

Cyclohexylamine (CAS 108-91-8)
Diethylaminoethanol (DEAE or DEEA) (CAS 100-37-8)
Morpholine (CAS 110-91-8)

US. New Jersey Worker and Community Right-to-Know Act

Cyclohexylamine (CAS 108-91-8)
Diethylaminoethanol (DEAE or DEEA) (CAS 100-37-8)
Morpholine (CAS 110-91-8)

US. Pennsylvania Worker and Community Right-to-Know Law

Cyclohexylamine (CAS 108-91-8)
Diethylaminoethanol (DEAE or DEEA) (CAS 100-37-8)

Morpholine (CAS 110-91-8)

US. Rhode Island RTK

Cyclohexylamine (CAS 108-91-8)

US. California Proposition 65

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date 06-01-2015

Version # 01

NFPA ratings Health: 3
Flammability: 2
Instability: 0

NFPA ratings

Disclaimer Veolia Water Technologies is not able to anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use and or non respect of Veolia Water Technologies' requirement.

Revision Information Product and Company Identification: Alternate Trade Names
Physical & Chemical Properties: Multiple Properties
Toxicological Information: Toxicological Data
Ecological Information: Ecotoxicity

SAFETY DATA SHEET

1. Identification

Product identifier **Hydrex 2233**

Other means of identification None.

Recommended use Cooling Water Treatment

Recommended restrictions PROFESSIONAL USE ONLY

Manufacturer/Importer/Supplier/Distributor information

Manufacturer

Supplier Veolia Water Technologies, Inc

Address 913 Industrial Park Drive
Vandalia, Ohio
45377

Contact Person Hydrex Product Manager

Telephone +1-937-890-4075

Fax +1-937-890-5495

e-mail hydrex.msds@veolia.com

Global Emergency Contact +1-760-476-3962 (Code: 333239)

2. Hazard(s) identification

Physical hazards	Corrosive to metals	Category 1
Health hazards	Skin corrosion/irritation	Category 1
	Serious eye damage/eye irritation	Category 1

Environmental hazards Not classified.

OSHA defined hazards Not classified.

Label elements

Signal word Danger

Hazard statement May be corrosive to metals. Causes severe skin burns and eye damage. Causes serious eye damage.

Precautionary statement

Prevention Avoid forming spray/aerosol mists. Keep only in original container. Do not breathe mist or vapor. Wear protective gloves/protective clothing/eye protection/face protection.

Response If swallowed: Rinse mouth. Do NOT induce vomiting. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. If inhaled: Remove person to fresh air and keep comfortable for breathing. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/physician. Specific treatment (see this label). Wash contaminated clothing before reuse. Absorb spillage to prevent material damage.

Storage Store in cool place. Store locked up. Protect from sunlight.

Disposal Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

Hazard(s) not otherwise classified (HNOC) None known.

Supplemental information None.

3. Composition/information on ingredients

Mixtures

Chemical name	Common name and synonyms	CAS number	%
Acrylic copolymer		40623-75-4	10 - 20

Chemical name	Common name and synonyms	CAS number	%
2-phosphonobutane-1,2,4-tricarboxylic acid		37971-36-1	2.5 - 10
Phosphoric Acid		7664-38-2	2.5 - 10
Zinc chloride		7646-85-7	2.5 - 10
1-hydroxy ethylidene-1,1-diphosphonic acid		2809-21-4	1 - 2.5
Other components below reportable levels			60 - 80

*Designates that a specific chemical identity and/or percentage of composition has been withheld as a trade secret.

4. First-aid measures

Inhalation
Move to fresh air. Call a physician if symptoms develop or persist.

Skin contact
Take off immediately all contaminated clothing. Rinse skin with water/shower. Call a physician or poison control center immediately. Chemical burns must be treated by a physician. Wash contaminated clothing before reuse.

Eye contact
Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Call a physician or poison control center immediately.

Ingestion
Call a physician or poison control center immediately. Rinse mouth. Do not induce vomiting. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.

Most important symptoms/effects, acute and delayed
Burning pain and severe corrosive skin damage. Causes serious eye damage. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Permanent eye damage including blindness could result.

Indication of immediate medical attention and special treatment needed
Provide general supportive measures and treat symptomatically. Chemical burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital. Keep victim under observation. Symptoms may be delayed.

General information
Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire-fighting measures

Suitable extinguishing media
Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2).

Unsuitable extinguishing media
Not available.

Specific hazards arising from the chemical
During fire, gases hazardous to health may be formed.

Special protective equipment and precautions for firefighters
Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

Fire fighting equipment/instructions
Move containers from fire area if you can do so without risk.

Specific methods
Use standard firefighting procedures and consider the hazards of other involved materials.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures
Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Wear appropriate protective equipment and clothing during clean-up. Do not breathe mist or vapor. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ensure adequate ventilation. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.

Methods and materials for containment and cleaning up
Should not be released into the environment.

Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Absorb spillage to prevent material damage. Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Prevent entry into waterways, sewer, basements or confined areas. Following product recovery, flush area with water.

Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination.

Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not contaminate water. Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling

Avoid forming spray/aerosol mists. Do not breathe mist or vapor. Do not get in eyes, on skin, or on clothing. Avoid prolonged exposure. Provide adequate ventilation. Wear appropriate personal protective equipment. Observe good industrial hygiene practices.

Conditions for safe storage, including any incompatibilities

Store in a cool, dry place out of direct sunlight. Store in corrosive resistant container with a resistant inner liner. Keep only in the original container. Store away from incompatible materials (see Section 10 of the SDS).

8. Exposure controls/personal protection

Occupational exposure limits

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Components	Type	Value	Form
Phosphoric Acid (CAS 7664-38-2)	PEL	1 mg/m3	
Zinc chloride (CAS 7646-85-7)	PEL	1 mg/m3	Fume.

US. ACGIH Threshold Limit Values

Components	Type	Value	Form
Phosphoric Acid (CAS 7664-38-2)	STEL	3 mg/m3	
	TWA	1 mg/m3	
Zinc chloride (CAS 7646-85-7)	STEL	2 mg/m3	Fume.
	TWA	1 mg/m3	Fume.

US. NIOSH: Pocket Guide to Chemical Hazards

Components	Type	Value	Form
Phosphoric Acid (CAS 7664-38-2)	STEL	3 mg/m3	
	TWA	1 mg/m3	
Zinc chloride (CAS 7646-85-7)	STEL	2 mg/m3	Fume.
	TWA	1 mg/m3	Fume.

US. Workplace Environmental Exposure Level (WEEL) Guides

Components	Type	Value	Form
2-phosphonobutane-1,2,4-tricarboxylic acid (CAS 37971-36-1)	TWA	10 mg/m3	Aerosol.

Biological limit values

No biological exposure limits noted for the ingredient(s).

Appropriate engineering controls

Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Eye wash facilities and emergency shower must be available when handling this product.

Individual protection measures, such as personal protective equipment

Eye/face protection

Wear safety glasses with side shields (or goggles) and a face shield. Chemical goggles and face shield are recommended.

Skin protection

Hand protection

Chemical resistant gloves.

Other

Wear appropriate chemical resistant clothing. Chemical resistant gloves.

Respiratory protection

In case of insufficient ventilation, wear suitable respiratory equipment. Avoid forming spray/aerosol mists.

Thermal hazards

Wear appropriate thermal protective clothing, when necessary.

General hygiene considerations

Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance	Clear.
Physical state	Liquid.
Form	Liquid.
Color	Colorless to Pale yellow
Odor	Slight Characteristic.
pH	1 - 1.8
Melting point/freezing point	< 32 °F (< 0 °C)
Initial boiling point and boiling range	> 212 °F (> 100 °C)
Flash point	Not available.
Evaporation rate	Not available.
Flammability (solid, gas)	Not available.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	Not available.
Flammability limit - upper (%)	Not available.
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	Not available.
Vapor density	Not available.
Solubility(ies)	
Solubility (water)	Not available.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	Not available.
Other information	
Density	1.12 - 1.15 g/cm3
Specific gravity	1.12 - 1.15

10. Stability and reactivity

Reactivity	Reacts violently with strong alkaline substances. This product may react with reducing agents. May be corrosive to metals.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	No dangerous reaction known under conditions of normal use. Hazardous polymerization does not occur.
Conditions to avoid	Do not mix with other chemicals. Contact with incompatible materials.
Incompatible materials	Bases. Strong oxidizing agents. Reducing agents. Metals.
Hazardous decomposition products	Hydrogen cyanide (hydrocyanic acid). Carbon oxides. Phosphorus compounds. Sulfur oxides.

11. Toxicological information

Information on likely routes of exposure

Inhalation	May cause irritation to the respiratory system. Prolonged inhalation may be harmful.
Skin contact	Causes severe skin burns.
Eye contact	Causes serious eye damage.
Ingestion	Causes digestive tract burns.
Symptoms related to the physical, chemical and toxicological characteristics	Burning pain and severe corrosive skin damage. Causes serious eye damage. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Permanent eye damage including blindness could result.

Information on toxicological effects

Acute toxicity

Product	Species	Test Results
Hydrex 2233		
Acute		
Dermal		
LD50	Rabbit	>= 15000 mg/kg calculated
Oral		
LD50	Rat	>= 3400 mg/kg calculated

* Estimates for product may be based on additional component data not shown.

Skin corrosion/irritation Causes severe skin burns and eye damage.

Serious eye damage/eye irritation Causes serious eye damage.

Respiratory or skin sensitization

Respiratory sensitization Not a respiratory sensitizer.

Skin sensitization This product is not expected to cause skin sensitization.

Germ cell mutagenicity No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.

Carcinogenicity This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Reproductive toxicity This product is not expected to cause reproductive or developmental effects.

Specific target organ toxicity - single exposure Not classified.

Specific target organ toxicity - repeated exposure Not classified.

Aspiration hazard Not an aspiration hazard.

Chronic effects Prolonged inhalation may be harmful.

12. Ecological information

Ecotoxicity Because of the low pH of this product, it would be expected to produce significant ecotoxicity upon exposure to aquatic organisms and aquatic systems.

Product		Species	Test Results
Hydrex 2233			
Aquatic			
Acute			
Crustacea	EC50	Daphnia	>= 70 mg/l, 48 hours calculated
Fish	LC50	Fish	>= 220 mg/l, 96 hours calculated

* Estimates for product may be based on additional component data not shown.

Persistence and degradability No data is available on the degradability of this product.

Bioaccumulative potential

Mobility in soil No data available.

Other adverse effects No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Do not allow this material to drain into sewers/water supplies. Dispose of contents/container in accordance with local/regional/national/international regulations.

Local disposal regulations Dispose in accordance with all applicable regulations.

Hazardous waste code D002: Waste Corrosive material [pH <=2 or =>12.5, or corrosive to steel]
The waste code should be assigned in discussion between the user, the producer and the waste disposal company.

Waste from residues / unused products Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).

Contaminated packaging	Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

UN number	UN3264
UN proper shipping name	Corrosive liquid, acidic, inorganic, n.o.s. (Phosphoric Acid, Zinc Chloride)
Transport hazard class(es)	
Class	8
Subsidiary risk	-
Label(s)	8
Packing group	II
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.
Special provisions	B2, IB2, T11, TP2, TP27
Packaging exceptions	154
Packaging non bulk	202
Packaging bulk	242

IATA

UN number	UN3264
UN proper shipping name	Corrosive liquid, acidic, inorganic, n.o.s. (Phosphoric Acid, Zinc Chloride)
Transport hazard class(es)	
Class	8
Subsidiary risk	-
Packing group	II
Environmental hazards	No.
ERG Code	8L
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.
Other information	
Passenger and cargo aircraft	Allowed.
Cargo aircraft only	Allowed.

IMDG

UN number	UN3264
UN proper shipping name	CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S. (Phosphoric Acid, Zinc Chloride)
Transport hazard class(es)	
Class	8
Subsidiary risk	-
Packing group	II
Environmental hazards	
Marine pollutant	No.
EmS	F-A, S-B
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not established.

DOT

IATA; IMDG

15. Regulatory information

US federal regulations

This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
One or more components are not listed on TSCA.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

Phosphoric Acid (CAS 7664-38-2)	Listed.
Zinc chloride (CAS 7646-85-7)	Listed.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

Immediate Hazard - Yes
Delayed Hazard - No
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical

Yes

SARA 313 (TRI reporting)

Chemical name	CAS number	% by wt.
Zinc chloride	7646-85-7	2.5 - 10

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA)

Not regulated.

US state regulations

US. California Controlled Substances. CA Department of Justice (California Health and Safety Code Section 11100)

Not listed.

US. Massachusetts RTK - Substance List

Phosphoric Acid (CAS 7664-38-2)
Zinc chloride (CAS 7646-85-7)

US. New Jersey Worker and Community Right-to-Know Act

Phosphoric Acid (CAS 7664-38-2)
Zinc chloride (CAS 7646-85-7)

US. Pennsylvania Worker and Community Right-to-Know Law

Phosphoric Acid (CAS 7664-38-2)
Zinc chloride (CAS 7646-85-7)

US. Rhode Island RTK

Phosphoric Acid (CAS 7664-38-2)
Zinc chloride (CAS 7646-85-7)

US. California Proposition 65

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	No
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	No
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	No

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date 05-12-2015

Revision date 07-09-2015

Version # 02

NFPA ratings Health: 3
Flammability: 0
Instability: 0

NFPA ratings

Disclaimer Veolia Water Technologies is not able to anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use and or non respect of Veolia Water Technologies' requirement.

Revision Information Physical & Chemical Properties: Multiple Properties
Toxicological Information: Toxicological Data
Ecological Information: Ecotoxicity

SAFETY DATA SHEET

1. Identification

Product identifier **Hydrex 2252**

Other means of identification None.

Recommended use Cooling Water Treatment

Recommended restrictions INDUSTRIAL USE ONLY.

Manufacturer/Importer/Supplier/Distributor information

Manufacturer

Supplier Veolia Water Technologies, Inc

Address 913 Industrial Park Drive
Vandalia, Ohio
45377

Contact Person Hydrex Product Manager

Telephone +1-937-890-4075

Fax +1-937-890-5495

e-mail hydrex.msds@veolia.com

Global Emergency Contact +1-760-476-3962 (Code: 333239)

2. Hazard(s) identification

Physical hazards Not classified.

Health hazards Serious eye damage/eye irritation Category 2

Environmental hazards Not classified.

OSHA defined hazards Not classified.

No hazards resulting from the material as supplied.

Label elements

Signal word Warning

Hazard statement May be harmful in contact with skin. Causes serious eye irritation.

Precautionary statement

Prevention Not applicable.

Response If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If exposed or concerned: Get medical advice/attention.

Storage Store in accordance with local/regional/national/international regulation.

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

Hazard(s) not otherwise classified (HNOC) None known.

Supplemental information None.

3. Composition/information on ingredients

Mixtures

The manufacturer lists no ingredients as hazardous according to OSHA 29 CFR 1910.1200.

Chemical name	Common name and synonyms	CAS number	%
Amide Hydrolysate		Trade Secret	10 - 20
Other components below reportable levels			80 - 90

*Designates that a specific chemical identity and/or percentage of composition has been withheld as a trade secret.

4. First-aid measures

Inhalation If breathing is difficult, remove to fresh air and keep at rest in a position comfortable for breathing. Move to fresh air. Call a physician if symptoms develop or persist.

Skin contact	Rinse skin with water/shower. Call a POISON CENTER or doctor/physician if you feel unwell. Get medical attention if irritation develops and persists.
Eye contact	Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if irritation develops and persists.
Ingestion	Rinse mouth. Call a POISON CENTER or doctor/physician if you feel unwell.
Most important symptoms/effects, acute and delayed	Severe eye irritation. Symptoms may include stinging, tearing, redness, swelling, and blurred vision.
Indication of immediate medical attention and special treatment needed	Provide general supportive measures and treat symptomatically. Keep victim under observation. Symptoms may be delayed.
General information	If you feel unwell, seek medical advice (show the label where possible). Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance.

5. Fire-fighting measures

Suitable extinguishing media	Dry chemical, CO2, sand, earth, water spray or regular foam.
Unsuitable extinguishing media	Do not use water jet as an extinguisher, as this will spread the fire.
Specific hazards arising from the chemical	During fire, gases hazardous to health may be formed.
Special protective equipment and precautions for firefighters	Wear suitable protective equipment.
Fire fighting equipment/instructions	Move containers from fire area if you can do so without risk.
Specific methods	Use standard firefighting procedures and consider the hazards of other involved materials.
General fire hazards	No unusual fire or explosion hazards noted. This product is not flammable.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Keep out of low areas. Wear appropriate protective equipment and clothing during clean-up. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ensure adequate ventilation. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.
Methods and materials for containment and cleaning up	Following product recovery, flush area with water. Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.
Environmental precautions	Do not contaminate water. Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling	DO NOT handle, store or open near an open flame, sources of heat or sources of ignition. Protect material from direct sunlight. Avoid contact with eyes. Do not use in areas without adequate ventilation. Wear appropriate personal protective equipment. Wash thoroughly after handling. Avoid release to the environment. Observe good industrial hygiene practices. Use care in handling/storage. Handle an open container with care.
Conditions for safe storage, including any incompatibilities	CAUTION Keep away from heat, sparks and open flame. Store in original tightly closed container. Keep container tightly closed. Keep out of the reach of children. Use care in handling/storage. Store away from incompatible materials (see Section 10 of the SDS). Store in accordance with local/regional/national/international regulation.

8. Exposure controls/personal protection

Occupational exposure limits	No exposure limits noted for ingredient(s).
Biological limit values	No biological exposure limits noted for the ingredient(s).
Exposure guidelines	No exposure standards allocated.
Appropriate engineering controls	Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Ensure adequate ventilation, especially in confined areas. Provide eyewash station. Provide adequate general and local exhaust ventilation.

Individual protection measures, such as personal protective equipment

Eye/face protection	Wear eye/face protection. Wear safety glasses with side shields (or goggles) and a face shield. Chemical goggles and face shield are recommended. Avoid contact with eyes.

Skin protection

Hand protection	Use suitable protective gloves if risk of skin contact. Chemical resistant gloves.
Other	Wear suitable protective clothing. Chemical resistant gloves. Plastic or rubber gloves, apron and boots.
Respiratory protection	No personal respiratory protective equipment normally required. In case of insufficient ventilation, wear suitable respiratory equipment.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.

General hygiene considerations	Avoid contact with eyes. Avoid contact with skin. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance	Liquid
Physical state	Liquid.
Form	Liquid.
Color	Dark brown to Off-white
Odor	Vinegar-like.
pH	6
Melting point/freezing point	32 °F (0 °C)
Initial boiling point and boiling range	> 250 °F (> 121.11 °C)
Flash point	Not available.
Evaporation rate	Not available.
Flammability (solid, gas)	Not available.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	Not available.
Flammability limit - upper (%)	Not available.
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	23.7 mm Hg @ 25 °C
Vapor density	2.25
Solubility(ies)	
Solubility (water)	Not available.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	Not available.
Other information	
Density	0.85 g/cm3 estimated
Specific gravity	1

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	No dangerous reaction known under conditions of normal use.
Conditions to avoid	Heat, flames and sparks. Contact with incompatible materials. None under normal conditions.
Incompatible materials	Strong oxidizing agents.

Hazardous decomposition products No dangerous reaction known under conditions of normal use. No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure

Inhalation Not classified.

Skin contact May be harmful in contact with skin.

Eye contact Causes serious eye irritation.

Ingestion Not classified.

Symptoms related to the physical, chemical and toxicological characteristics Severe eye irritation. Symptoms may include stinging, tearing, redness, swelling, and blurred vision.

Information on toxicological effects

Acute toxicity May be harmful in contact with skin.

Product	Species	Test Results
Hydrex 2252		
Acute		
Dermal		
LD50	Rabbit	> 2000 mg/kg
Oral		
LD50	Rat	> 5000 mg/kg

* Estimates for product may be based on additional component data not shown.

Skin corrosion/irritation Classification not possible.

Serious eye damage/eye irritation Causes serious eye irritation.

Respiratory or skin sensitization

Respiratory sensitization Classification not possible.

Skin sensitization Classification not possible.

Germ cell mutagenicity No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic. Classification not possible.

Carcinogenicity This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA. Not classifiable as to carcinogenicity to humans.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Reproductive toxicity Classification not possible.

Specific target organ toxicity - single exposure Classification not possible.

Specific target organ toxicity - repeated exposure Classification not possible.

Aspiration hazard Classification not possible.

Further information This product has no known adverse effect on human health.

12. Ecological information

Ecotoxicity Expected to be harmful to aquatic organisms.

Product		Species	Test Results
Hydrex 2252			
Aquatic			
Crustacea	LC50	Daphnia	10 mg/l, 48 hr
Fish	LC50	Fathead minnow (Pimephales promelas)	25.3 mg/l, 48 hr
		Rainbow Trout	71.5 mg/l, 48 hr

* Estimates for product may be based on additional component data not shown.

Persistence and degradability No data is available on the degradability of this product.

Bioaccumulative potential No data available.

Mobility in soil No data available.

Other adverse effects	No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions	Contract with a disposal operator licensed by the Law on Disposal and Cleaning. This material and its container must be disposed of as hazardous waste. Must be incinerated in a suitable incineration plant holding a permit delivered by the competent authorities. Do not allow this material to drain into sewers/water supplies. Dispose of contents/container in accordance with local/regional/national/international regulations. Dispose of contents/container (in accordance with related regulations). When your own wastewater treatment plant is not available, collect entire waste and then charge to a licensed industrial waste management professional with manifests for industrial waste.
Local disposal regulations	Dispose in accordance with all applicable regulations.
Hazardous waste code	The waste code should be assigned in discussion between the user, the producer and the waste disposal company.
Waste from residues / unused products	Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).
Contaminated packaging	Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	Not established.

15. Regulatory information

US federal regulations

CERCLA/SARA Hazardous Substances - Not applicable.
This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
One or more components are not listed on TSCA.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

Not listed.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

Immediate Hazard - Yes
Delayed Hazard - No
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical	Yes

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA) Not regulated.

US state regulations This product does not contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.

US. California Controlled Substances. CA Department of Justice (California Health and Safety Code Section 11100)

Not listed.

US. Massachusetts RTK - Substance List

Not regulated.

US. New Jersey Worker and Community Right-to-Know Act

Not listed.

US. Pennsylvania Worker and Community Right-to-Know Law

Not listed.

US. Rhode Island RTK

Not regulated.

US. California Proposition 65

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	No
Canada	Domestic Substances List (DSL)	No
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	No
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	No
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	No
New Zealand	New Zealand Inventory	No
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	No
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	No

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date 06-03-2015

Version # 01

Further information HMIS® is a registered trade and service mark of the NPCA.

NFPA ratings Health: 2
Flammability: 0
Instability: 0

NFPA ratings

References	ACGIH ACGIH Documentation of the Threshold Limit Values and Biological Exposure Indices EPA: AQUIRE database HSDB® - Hazardous Substances Data Bank IARC Monographs. Overall Evaluation of Carcinogenicity National Toxicology Program (NTP) Report on Carcinogens NLM: Hazardous Substances Data Base US. IARC Monographs on Occupational Exposures to Chemical Agents Korea. Toxic Chemical Control Law (TCCL), Existing Chemicals Inventory (KECI) Korea. Toxic Chemical Control Law (TCCL), pre-1997 List Korea. Toxic Chemicals (TCCL Article 10) Korea. Toxic Release Inventory (TRI) Chemicals (TCCL Article 14) Taiwan. Dangerous Materials (Rules on Hazard Communication of Dangerous Materials and Toxic Materials) Taiwan. Industrial Precursor Chemicals (Categories and Regulations Governing Inspection and Declaration of Industrial Precursor Chemicals, MOEA Decree No. 87, as amended) Taiwan. OELs. (Standards on Workplace Atmosphere of Dangerous and Hazardous Materials) Taiwan. Toxic Chemical Substances (TCS) (List of Toxic Chemical Substances announced by the Environmental Protection Administration) Taiwan. Toxic Materials (Rules on Hazard Communication of Dangerous Materials and Toxic Materials) Japan Society for Occupational Health, Recommendation of Occupational Exposure Limits JIS Z 7250: 2005 Safety data sheet for chemical products-Part 1:Content and order of sections JCIA GHS Guideline, October 2008
Disclaimer	Veolia Water Technologies is not able to anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use and or non respect of Veolia Water Technologies' requirement.
Revision Information	Product and Company Identification: Alternate Trade Names

SAFETY DATA SHEET

1. Identification

Product identifier	**Hydrex 3523**
Other means of identification	None.
Recommended use	Potable Water Flocculant
Recommended restrictions	PROFESSIONAL USE ONLY

Manufacturer/Importer/Supplier/Distributor information

Manufacturer

Supplier	Veolia Water Technologies, Inc
Address	913 Industrial Park Drive Vandalia, Ohio 45377
Contact Person	Hydrex Product Manager
Telephone	+1-937-890-4075
Fax	+1-937-890-5495
e-mail	hydrex.msds@veolia.com
Global Emergency Contact	+1-760-476-3962 (Code: 333239)

2. Hazard(s) identification

Physical hazards	Not classified.
Health hazards	Not classified.
Environmental hazards	Not classified.
OSHA defined hazards	Not classified.

Label elements

Hazard symbol	None.
Signal word	None.
Hazard statement	The mixture does not meet the criteria for classification.

Precautionary statement

Prevention	Observe good industrial hygiene practices.
Response	Wash hands after handling.
Storage	Store in cool place. Protect from sunlight. Store away from incompatible materials.
Disposal	Dispose of waste and residues in accordance with local authority requirements. Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

Hazard(s) not otherwise classified (HNOC)	None known.
Supplemental information	None.

3. Composition/information on ingredients

Mixtures

The manufacturer lists no ingredients as hazardous according to OSHA 29 CFR 1910.1200.

*Designates that a specific chemical identity and/or percentage of composition has been withheld as a trade secret.

Composition comments	Anionic hydro-soluble polymer

4. First-aid measures

Inhalation	Move to fresh air. Call a physician if symptoms develop or persist.
Skin contact	Do not peel polymer from the skin.
Eye contact	Do not rub eyes. Flush eyes with water as a precaution. Get medical attention if irritation develops and persists.
Ingestion	Rinse mouth. If ingestion of a large amount does occur, call a poison control center immediately. Get medical attention if symptoms occur.

Most important symptoms/effects, acute and delayed	Dusts may irritate the respiratory tract, skin and eyes.
Indication of immediate medical attention and special treatment needed	Treat symptomatically.
General information	If you feel unwell, seek medical advice (show the label where possible). Show this safety data sheet to the doctor in attendance.

5. Fire-fighting measures

Suitable extinguishing media	Dry chemical, CO2, water spray or alcohol resistant foam.
Unsuitable extinguishing media	Not available.
Specific hazards arising from the chemical	Material can be slippery when wet. During fire, gases hazardous to health may be formed.
Special protective equipment and precautions for firefighters	Wear suitable protective equipment.
Fire fighting equipment/instructions	Move containers from fire area if you can do so without risk. Use water spray to cool unopened containers.
Specific methods	Use standard firefighting procedures and consider the hazards of other involved materials.
General fire hazards	No unusual fire or explosion hazards noted. This product is not flammable.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. Wear appropriate protective equipment and clothing during clean-up. Use a NIOSH/MSHA approved respirator if there is a risk of exposure to dust/fume at levels exceeding the exposure limits. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS. Slippery when wet.
Methods and materials for containment and cleaning up	Stop the flow of material, if this is without risk. Collect dust using a vacuum cleaner equipped with HEPA filter. Large Spillages: Shovel the material into waste container. Avoid the generation of dusts during clean-up. Following product recovery, flush area with water. Small Spills: Sweep up or vacuum up spillage and collect in suitable container for disposal. For waste disposal, see section 13 of the SDS.
Environmental precautions	Do not contaminate water. Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling	Minimize dust generation and accumulation. Provide appropriate exhaust ventilation at places where dust is formed. Material can be slippery when wet. Static electricity and formation of sparks must be prevented. Avoid release to the environment. Practice good housekeeping. Handle an open container with care.
Conditions for safe storage, including any incompatibilities	Prevent electrostatic charge build-up by using common bonding and grounding techniques. To maintain product quality, do not store in heat or direct sunlight. Store in original tightly closed container. Store in a well-ventilated place. Use care in handling/storage. Store away from incompatible materials (see Section 10 of the SDS).

8. Exposure controls/personal protection

Occupational exposure limits	No exposure limits noted for ingredient(s).
Biological limit values	No biological exposure limits noted for the ingredient(s).
Exposure guidelines	No exposure standards allocated.
Appropriate engineering controls	If material is ground, cut, or used in any operation which may generate dusts, use appropriate local exhaust ventilation to keep exposures below the recommended exposure limits.

Individual protection measures, such as personal protective equipment

Eye/face protection	Wear safety glasses with side shields (or goggles).
Skin protection	
Hand protection	Chemical resistant gloves.
Other	Normal work clothing (long sleeved shirts and long pants) is recommended. Chemical resistant gloves.
Respiratory protection	Use a NIOSH/MSHA approved respirator if there is a risk of exposure to dust/fume at levels exceeding the exposure limits.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.

General hygiene considerations	Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance	Powder.
Physical state	Solid.
Form	Powder.
Color	White.
Odor	Odorless.
pH	Not available.
Melting point/freezing point	Not applicable.
Initial boiling point and boiling range	Not applicable.
Flash point	Not applicable.
Evaporation rate	Not available.
Flammability (solid, gas)	Not available.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	Not available.
Flammability limit - upper (%)	Not available.
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	Not applicable.
Vapor density	Not available.
Solubility(ies)	
Solubility (water)	Not available.
Partition coefficient (n-octanol/water)	-2
Auto-ignition temperature	Not applicable.
Decomposition temperature	Not available.
Viscosity	Not available.
Other information	
Density	0.60 - 0.90 g/cm³
Dust explosion properties	
Kst	0 bar.m/s
St class	0
Minimum ignition energy (MIE) - dust layer	0.003 mJ
pH in aqueous solution	5 - 9 (5 g/l)
Shelf life	24 months
Specific gravity	0.6 - 0.9

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	No dangerous reaction known under conditions of normal use.
Conditions to avoid	Contact with incompatible materials.

Incompatible materials	Strong oxidizing agents.
Hazardous decomposition products	No dangerous reaction known under conditions of normal use. At thermal decomposition temperatures, carbon monoxide and carbon dioxide. Nitrogen oxides (NOx). Hydrogen cyanide (hydrocyanic acid).

11. Toxicological information

Information on likely routes of exposure

Inhalation	Dust may irritate respiratory system.
Skin contact	Dust or powder may irritate the skin.
Eye contact	Dust may irritate the eyes.
Ingestion	Not classified.
Symptoms related to the physical, chemical and toxicological characteristics	Dusts may irritate the respiratory tract, skin and eyes.

Information on toxicological effects

Acute toxicity

Product	Species	Test Results
Hydrex 3523		
Acute		
Oral		
LD50	Rat	> 5000 mg/kg
Chronic		
Oral		
Presumed Non-Toxic	Dog	12 months Non-Toxic
	Rat	2 years Non-Toxic

* Estimates for product may be based on additional component data not shown.

Skin corrosion/irritation	Classification not possible.
Serious eye damage/eye irritation	Classification not possible.

Respiratory or skin sensitization

Respiratory sensitization	Classification not possible.
Skin sensitization	Classification not possible.
Germ cell mutagenicity	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA. Not classifiable as to carcinogenicity to humans.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Reproductive toxicity	Classification not possible.
Specific target organ toxicity - single exposure	Classification not possible.
Specific target organ toxicity - repeated exposure	Classification not possible.
Aspiration hazard	Classification not possible.
Chronic effects	Not expected to be hazardous by WHMIS criteria.
Further information	This product has no known adverse effect on human health.

12. Ecological information

Ecotoxicity Contains a substance which causes risk of hazardous effects to the environment. Not expected to be harmful to aquatic organisms.

Product		Species	Test Results
Hydrex 3523			
Aquatic			
Algae	LC50	Algae	> 100 mg/l, 72 hours
Crustacea	LC50	Daphnia	> 100 mg/l, 48 hours

Product		Species	Test Results
Fish	LC50	Rainbow Trout	> 100 mg/l, 96 hours

* Estimates for product may be based on additional component data not shown.

Persistence and degradability Not inherently biodegradable.

Bioaccumulative potential

Partition coefficient n-octanol / water (log Kow)

1
-2

Mobility in soil No data available.

Other adverse effects No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Do not allow this material to drain into sewers/water supplies. Dispose of contents/container in accordance with local/regional/national/international regulations. Dispose of contents/container (in accordance with related regulations). When your own wastewater treatment plant is not available, collect entire waste and then charge to a licensed industrial waste management professional with manifests for industrial waste.

Local disposal regulations Dispose in accordance with all applicable regulations.

Hazardous waste code The waste code should be assigned in discussion between the user, the producer and the waste disposal company.

Waste from residues / unused products Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions). Not applicable.

Contaminated packaging Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not applicable.

15. Regulatory information

US federal regulations This product is not known to be a "Hazardous Chemical" as defined by the OSHA Hazarc Communication Standard, 29 CFR 1910.1200.
All components are on the U.S. EPA TSCA Inventory List.

CERCLA/SARA Hazardous Substances - Not applicable.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

Not listed.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories
Immediate Hazard - No
Delayed Hazard - No
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical No

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA) Not regulated.

US state regulations This product does not contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.

US. California Controlled Substances. CA Department of Justice (California Health and Safety Code Section 11100)

Not listed.

US. Massachusetts RTK - Substance List

Not regulated.

US. New Jersey Worker and Community Right-to-Know Act

Not listed.

US. Pennsylvania Worker and Community Right-to-Know Law

Not listed.

US. Rhode Island RTK

Not regulated.

US. California Proposition 65

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	No
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date 12-08-2015

Version # 01

Further information HMIS® is a registered trade and service mark of the NPCA.

NFPA ratings Health: 0
Flammability: 0
Instability: 0

NFPA ratings

References

ACGIH
ACGIH Documentation of the Threshold Limit Values and Biological Exposure Indices
EPA: AQUIRE database
HSDB® - Hazardous Substances Data Bank
IARC Monographs. Overall Evaluation of Carcinogenicity
National Toxicology Program (NTP) Report on Carcinogens
NLM: Hazardous Substances Data Base
US. IARC Monographs on Occupational Exposures to Chemical Agents
Korea. Accidental Release Prevention Substances (Presidential Decree of Toxic Chemical Control Law, Executive Order No. 19203)
Korea. Dangerous Substances Threshold Quantity (Presidential Decree of Dangerous Substances Safety Management Act No. 18406, Schedule 1)
Korea. Harmful Substances Prohibited from Manufacturing (Presidential Decree on the Industrial Safety and Health Act (No. 13053), Article 29)
Korea. Harmful Substances Requiring Permission for Manufacture or Use (Presidential Decree on the Industrial Safety and Health Act (No. 13053), Article 30)
Korea. Non-Toxic Chemicals List (National Institute of Environment Research (NIER) Public Notice No. 1997-10, as amended)
Korea. Observational Chemicals (Ministerial Decree of TCCL Article 6)
Korea. OELs. Regulation for Permitted Concentration of Hazardous Substances (Ministry of Labor (MOL) Public Notice No. 1986-45, as amended)
Korea. Prohibited Chemical Substances (TCCL Article 11)
Korea. Regulated volatile organic compounds (VOCs) (MOE Notice No. 2001-36, March 8, 2001, as amended)
Korea. Restricted Chemical Substances (TCCL Article 11)
Korea. Toxic Chemical Control Law (TCCL), Existing Chemicals Inventory (KECI)
Korea. Toxic Chemical Control Law (TCCL), pre-1997 List
Korea. Toxic Chemicals (TCCL Article 10)
Korea. Toxic Release Inventory (TRI) Chemicals (TCCL Article 14)
Taiwan. Dangerous Materials (Rules on Hazard Communication of Dangerous Materials and Toxic Materials)
Taiwan. Industrial Precursor Chemicals (Categories and Regulations Governing Inspection and Declaration of Industrial Precursor Chemicals, MOEA Decree No. 87, as amended)
Taiwan. OELs. (Standards on Workplace Atmosphere of Dangerous and Hazardous Materials)
Taiwan. Toxic Chemical Substances (TCS) (List of Toxic Chemical Substances announced by the Environmental Protection Administration)
Taiwan. Toxic Materials (Rules on Hazard Communication of Dangerous Materials and Toxic Materials)
Japan Society for Occupational Health, Recommendation of Occupational Exposure Limits
JIS Z 7250: 2005 Safety data sheet for chemical products-Part 1:Content and order of sections
JCIA GHS Guideline, October 2008

Disclaimer

Veolia Water Technologies is not able to anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use and or non respect of Veolia Water Technologies' requirement.

Revision Information

Product and Company Identification: Product Review
Physical & Chemical Properties: Multiple Properties
HazReg Data: North America

SAFETY DATA SHEET

1. Identification

Product identifier **Hydrex 6501**

Other means of identification None.

Recommended use Wastewater Treatment

Recommended restrictions PROFESSIONAL USE ONLY

Manufacturer/Importer/Supplier/Distributor information

Manufacturer

Supplier Veolia Water Technologies, Inc

Address 913 Industrial Park Drive
Vandalia, Ohio
45377

Contact Person Hydrex Product Manager

Telephone +1-937-890-4075

Fax +1-937-890-5495

e-mail hydrex.msds@veolia.com

Global Emergency Contact +1-760-476-3962 (Code: 333239)

2. Hazard(s) identification

Physical hazards Not classified.

Health hazards Not classified.

Environmental hazards Not classified.

OSHA defined hazards Not classified.

Label elements

Hazard symbol None.

Signal word None.

Hazard statement The mixture does not meet the criteria for classification.

Precautionary statement

Prevention Avoid forming spray/aerosol mists. Observe good industrial hygiene practices.

Response Wash hands after handling.

Storage Store in cool place. Protect from sunlight. Store away from incompatible materials.

Disposal Dispose of waste and residues in accordance with local authority requirements. Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

Hazard(s) not otherwise classified (HNOC) None known.

Supplemental information None.

3. Composition/information on ingredients

Mixtures

Chemical name	Common name and synonyms	CAS number	%
Distillates, (petroleum), Hydrotreated Light		64742-47-8	20 - 40
Fatty alcohol alkoxylate		Mixture	2.5 - 10
Other components below reportable levels			60 - 80

*Designates that a specific chemical identity and/or percentage of composition has been withheld as a trade secret.

4. First-aid measures

Inhalation Move to fresh air. Call a physician if symptoms develop or persist.

Skin contact Wash off with soap and water. Get medical attention if irritation develops and persists.

Eye contact Rinse with water. Get medical attention if irritation develops and persists.

Ingestion	Rinse mouth. Do not induce vomiting without advice from poison control center. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.
Most important symptoms/effects, acute and delayed	Diarrhea. Headache. Nausea, vomiting. Irritation of eyes and mucous membranes. Irritation of nose and throat. Skin irritation.
Indication of immediate medical attention and special treatment needed	Treat symptomatically.
General information	Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire-fighting measures

Suitable extinguishing media	Alcohol resistant foam. Water fog. Dry chemical powder. Dry chemicals. Carbon dioxide (CO2).
Unsuitable extinguishing media	Not available.
Specific hazards arising from the chemical	Material can be slippery when wet. During fire, gases hazardous to health may be formed.
Special protective equipment and precautions for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Fire fighting equipment/instructions	Cool containers exposed to heat with water spray and remove container, if no risk is involved.
Specific methods	Use standard firefighting procedures and consider the hazards of other involved materials.
General fire hazards	No unusual fire or explosion hazards noted.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. For personal protection, see section 8 of the SDS. Slippery when wet.
Methods and materials for containment and cleaning up	This product is miscible in water. Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Absorb in vermiculite, dry sand or earth and place into containers. Following product recovery, flush area with water. Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination. Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.
Environmental precautions	Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling	Avoid forming spray/aerosol mists. Material can be slippery when wet. Avoid prolonged or repeated contact with skin. Avoid prolonged exposure. Use only in well-ventilated areas.
Conditions for safe storage, including any incompatibilities	Keep away from heat and sources of ignition. Store in original tightly closed container. Store away from incompatible materials (see Section 10 of the SDS).

8. Exposure controls/personal protection

Occupational exposure limits

US. NIOSH: Pocket Guide to Chemical Hazards

Components	Type	Value
Distillates, (petroleum), Hydrotreated Light (CAS 64742-47-8)	TWA	100 mg/m3

Biological limit values	No biological exposure limits noted for the ingredient(s).
Appropriate engineering controls	Not available.

Individual protection measures, such as personal protective equipment

Eye/face protection	Wear safety glasses with side shields (or goggles) and a face shield. Chemical goggles and face shield are recommended.
Skin protection	
Hand protection	Chemical resistant gloves.

Other	Chemical resistant gloves.
Respiratory protection	In case of insufficient ventilation, wear suitable respiratory equipment. Avoid forming spray/aerosol mists.
Thermal hazards	Not available.

General hygiene considerations	Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance	Viscous
Physical state	Liquid.
Form	Liquid.
Color	Milky
Odor	Aliphatic.
pH	Not available.
Melting point/freezing point	Not applicable. / < 41 °F (< 5 °C)
Initial boiling point and boiling range	Not available.
Flash point	Not applicable.
Evaporation rate	Not available.
Flammability (solid, gas)	Not available.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	Not available.
Flammability limit - upper (%)	Not available.
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	2.3 kPa @ 20°C
Vapor density	Not available.
Solubility(ies)	
Solubility (water)	Not available.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	1200 cP
Other information	
Density	1.05 g/cm³
pH in aqueous solution	5 - 8
Specific gravity	1 - 1.1

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	Not available.
Conditions to avoid	Contact with incompatible materials. None under normal conditions.
Incompatible materials	Strong oxidizing agents. Oxidizing agents.
Hazardous decomposition products	No dangerous reaction known under conditions of normal use. At thermal decomposition temperatures, carbon monoxide and carbon dioxide and Hydrogen chloride. Nitrogen oxides (NOx).

11. Toxicological information

Information on likely routes of exposure

Inhalation	Prolonged inhalation may be harmful.
Skin contact	No adverse effects due to skin contact are expected.
Eye contact	Direct contact with eyes may cause temporary irritation.
Ingestion	Expected to be a low ingestion hazard.
Symptoms related to the physical, chemical and toxicological characteristics	Diarrhea. Headache. Nausea, vomiting. Irritation of eyes and mucous membranes. Irritation of nose and throat. Skin irritation.

Information on toxicological effects

Acute toxicity

Product	Species	Test Results
Hydrex 6501		
Acute		
Inhalation		
LC50	Rat	19804 mg/m3, 4 hours estimated
Oral		
AT_LD50	Rat	10000 mg/kg estimated
LD50	Rat	> 5000 mg/kg

* Estimates for product may be based on additional component data not shown.

Skin corrosion/irritation	Prolonged skin contact may cause temporary irritation.
Serious eye damage/eye irritation	Direct contact with eyes may cause temporary irritation.

Respiratory or skin sensitization

Respiratory sensitization	Not a respiratory sensitizer.
Skin sensitization	This product is not expected to cause skin sensitization.
Germ cell mutagenicity	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Reproductive toxicity	This product is not expected to cause reproductive or developmental effects.
Specific target organ toxicity - single exposure	Not classified.
Specific target organ toxicity - repeated exposure	Not classified.
Aspiration hazard	Not an aspiration hazard.
Chronic effects	Prolonged inhalation may be harmful.
Further information	This product has no known adverse effect on human health.

12. Ecological information

Ecotoxicity The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Product		Species	Test Results
Hydrex 6501			
Aquatic			
Algae	IC50	Algae	> 100 mg/l, 72 hours
Crustacea	LC50	Daphnia	> 100 mg/l, 48 hours
Fish	LC50	Danio (Danio)	> 100 mg/l, 96 hours

* Estimates for product may be based on additional component data not shown.

Persistence and degradability	No data is available on the degradability of this product.
Bioaccumulative potential	
Mobility in soil	No data available.

Other adverse effects No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions Collect and reclaim or dispose in sealed containers at licensed waste disposal site.

Local disposal regulations Dispose in accordance with all applicable regulations.

Hazardous waste code The waste code should be assigned in discussion between the user, the producer and the waste disposal company.

Waste from residues / unused products Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).

Contaminated packaging Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not established.

15. Regulatory information

US federal regulations All components are on the U.S. EPA TSCA Inventory List.
This product is not known to be a "Hazardous Chemical" as defined by the OSHA Hazarc Communication Standard, 29 CFR 1910.1200.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

Not listed.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories
Immediate Hazard - No
Delayed Hazard - No
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical No

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA) Not regulated.

US state regulations WARNING: This product contains a chemical known to the State of California to cause cancer: Residual acrylamide.

US. California Controlled Substances. CA Department of Justice (California Health and Safety Code Section 11100)

Not listed.

US. Massachusetts RTK - Substance List

Distillates, (petroleum), Hydrotreated Light (CAS 64742-47-8)

US. New Jersey Worker and Community Right-to-Know Act

Distillates, (petroleum), Hydrotreated Light (CAS 64742-47-8)

US. Pennsylvania Worker and Community Right-to-Know Law

Distillates, (petroleum), Hydrotreated Light (CAS 64742-47-8)

US. Rhode Island RTK

Not regulated.

US. California Proposition 65

WARNING: This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	No
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date 05-28-2015

Version # 01

NFPA ratings Health: 2
Flammability: 0
Instability: 0

NFPA ratings

Disclaimer Veolia Water Technologies is not able to anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use and or non respect of Veolia Water Technologies' requirement.

Revision Information Product and Company Identification: Product Review
Composition / Information on Ingredients: Disclosure Overrides
Physical & Chemical Properties: Multiple Properties
Regulatory Information: United States
HazReg Data: North America
GHS: Classification

SAFETY DATA SHEET

1. Identification

Product identifier **Hydrex 6509**

Other means of identification None.

Recommended use Wastewater Flocculant

Recommended restrictions PROFESSIONAL USE ONLY

Manufacturer/Importer/Supplier/Distributor information

Manufacturer

Supplier Veolia Water Technologies, Inc

Address 913 Industrial Park Drive
Vandalia, Ohio
45377

Contact Person Hydrex Product Manager

Telephone +1-937-890-4075

Fax +1-937-890-5495

e-mail hydrex.msds@veolia.com

Global Emergency Contact +1-760-476-3962 (Code: 333239)

2. Hazard(s) identification

Physical hazards Not classified.

Health hazards

Acute toxicity, inhalation	Category 4
Serious eye damage/eye irritation	Category 2B
Specific target organ toxicity, single exposure	Category 3 narcotic effects

Environmental hazards Not classified.

OSHA defined hazards Not classified.

Label elements

Signal word Warning

Hazard statement Causes eye irritation. Harmful if inhaled. May cause drowsiness or dizziness.

Precautionary statement

Prevention Avoid forming spray/aerosol mists. Avoid breathing mist or vapor. Wash hands thoroughly after handling. Use only outdoors or in a well-ventilated area.

Response If inhaled: Remove person to fresh air and keep comfortable for breathing. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Call a poison center/doctor/paramedic/ if you feel unwell. If eye irritation persists: Get medical advice/attention.

Storage Store in cool place. Store in a well-ventilated place. Keep container tightly closed. Store locked up. Protect from sunlight.

Disposal Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

Hazard(s) not otherwise classified (HNOC) None known.

Supplemental information 4% of the mixture consists of component(s) of unknown acute inhalation toxicity.

3. Composition/information on ingredients

Mixtures

Chemical name	Common name and synonyms	CAS number	%
Distillates, (petroleum), Hydrotreated Light		64742-47-8	20 - 40

Chemical name	Common name and synonyms	CAS number	%
ALCOHOLS, (C=12-14)-SECONDARY, ETHOXYLATED		84133-50-6	1 - 2.5
ALCOHOLS, C10-16, ETHOXYLATED		68002-97-1	1 - 2.5
Other components below reportable levels			60 - 80

*Designates that a specific chemical identity and/or percentage of composition has been withheld as a trade secret.

4. First-aid measures

Inhalation Remove victim to fresh air and keep at rest in a position comfortable for breathing. Oxygen or artificial respiration if needed. Call a POISON CENTER or doctor/physician if you feel unwell.

Skin contact Wash off with soap and water. Get medical attention if irritation develops and persists.

Eye contact Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if irritation develops and persists.

Ingestion Rinse mouth. Do not induce vomiting without advice from poison control center. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs. Get medical attention if symptoms occur.

Most important symptoms/effects, acute and delayed May cause drowsiness and dizziness. Headache. Nausea, vomiting. Irritation of eyes. Exposed individuals may experience eye tearing, redness, and discomfort.

Indication of immediate medical attention and special treatment needed Provide general supportive measures and treat symptomatically. Keep victim warm. Keep victim under observation. Symptoms may be delayed.

General information Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire-fighting measures

Suitable extinguishing media Powder. Alcohol resistant foam. Dry chemicals. Carbon dioxide (CO2).

Unsuitable extinguishing media Not available.

Specific hazards arising from the chemical Material can be slippery when wet. During fire, gases hazardous to health may be formed.

Special protective equipment and precautions for firefighters Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

Fire fighting equipment/instructions Cool containers exposed to heat with water spray and remove container, if no risk is involved.

Specific methods Use standard firefighting procedures and consider the hazards of other involved materials.

General fire hazards No unusual fire or explosion hazards noted.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Wear appropriate protective equipment and clothing during clean-up. Avoid inhalation of vapors and spray mists. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ensure adequate ventilation. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS. Slippery when wet.

Methods and materials for containment and cleaning up Large Spills: Stop the flow of material, if this is without risk. Use water spray to reduce vapors or divert vapor cloud drift. Dike the spilled material, where this is possible. Absorb in vermiculite, dry sand or earth and place into containers. Following product recovery, flush area with water.

Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination.

Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.

Environmental precautions Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling Avoid forming spray/aerosol mists. Material can be slippery when wet. Avoid inhalation of vapors and spray mists. Avoid contact with eyes. Avoid prolonged or repeated contact with skin. Avoid prolonged exposure. Use only outdoors or in a well-ventilated area. Wear appropriate personal protective equipment. Observe good industrial hygiene practices.

Conditions for safe storage, including any incompatibilities Keep away from heat and sources of ignition. Store in original tightly closed container. Store in a well-ventilated place. Store away from incompatible materials (see Section 10 of the SDS).

8. Exposure controls/personal protection

Occupational exposure limits

US. NIOSH: Pocket Guide to Chemical Hazards

Components	Type	Value
Distillates, (petroleum), Hydrotreated Light (CAS 64742-47-8)	TWA	100 mg/m3

Biological limit values No biological exposure limits noted for the ingredient(s).

Appropriate engineering controls Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Provide eyewash station.

Individual protection measures, such as personal protective equipment

Eye/face protection Wear safety glasses with side shields (or goggles) and a face shield. Chemical goggles and face shield are recommended.

Skin protection

Hand protection Chemical resistant gloves.

Other Wear suitable protective clothing. Chemical resistant gloves.

Respiratory protection In case of insufficient ventilation, wear suitable respiratory equipment. Avoid forming spray/aerosol mists.

Thermal hazards Wear appropriate thermal protective clothing, when necessary.

General hygiene considerations Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance Opaque Milky.

Physical state Liquid.

Form Liquid.

Color White.

Odor Hydrocarbon-like.

pH 7 - 9

Melting point/freezing point < -0.4 °F (< -18 °C)

Initial boiling point and boiling range 212 - 500 °F (100 - 260 °C)

Flash point > 201.2 °F (> 94.0 °C)

Evaporation rate < 1

Flammability (solid, gas) Not applicable.

Upper/lower flammability or explosive limits

Flammability limit - lower (%) Not available.

Flammability limit - upper (%) Not available.

Explosive limit - lower (%) Not available.

Explosive limit - upper (%) Not available.

Vapor pressure 0 hPa

Vapor density Not available.

Solubility(ies)

Solubility (water)	Not available.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	Not available.

Other information

Density	1.05 g/cm3
Percent volatile	50 - 60
Specific gravity	1.05

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	No dangerous reaction known under conditions of normal use.
Conditions to avoid	Heat, flames and sparks. Avoid temperatures exceeding the flash point. Contact with incompatible materials.
Incompatible materials	Strong oxidizing agents.
Hazardous decomposition products	No dangerous reaction known under conditions of normal use. Nitrogen compounds. Carbon oxides.

11. Toxicological information

Information on likely routes of exposure

Inhalation	Harmful if inhaled. May cause drowsiness and dizziness. Headache. Nausea, vomiting.
Skin contact	No adverse effects due to skin contact are expected.
Eye contact	Causes eye irritation.
Ingestion	Expected to be a low ingestion hazard.
Symptoms related to the physical, chemical and toxicological characteristics	Headache. May cause drowsiness and dizziness. Nausea, vomiting. Irritation of eyes. Exposed individuals may experience eye tearing, redness, and discomfort.

Information on toxicological effects

Acute toxicity Harmful if inhaled. Narcotic effects.

Product	Species	Test Results
Hydrex 6509		
Acute		
Dermal		
LD50	Rabbit	> 2000 mg/kg
Inhalation		
LC50	Rat	> 20 mg/l/4h
Oral		
LD50	Rat	> 5000 mg/kg

* Estimates for product may be based on additional component data not shown.

Skin corrosion/irritation	Prolonged skin contact may cause temporary irritation.
Serious eye damage/eye irritation	Causes eye irritation.

Respiratory or skin sensitization

Respiratory sensitization	Not a respiratory sensitizer.
Skin sensitization	This product is not expected to cause skin sensitization.
Germ cell mutagenicity	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Reproductive toxicity This product is not expected to cause reproductive or developmental effects.

Specific target organ toxicity - single exposure	May cause drowsiness and dizziness.
Specific target organ toxicity - repeated exposure	Not classified.
Aspiration hazard	Not an aspiration hazard.
Chronic effects	Prolonged inhalation may be harmful.

12. Ecological information

Ecotoxicity The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Product		Species	Test Results
Hydrex 6509			
Aquatic			
Algae	IC50	Green algae (Chlamydomonas variabilis)	> 100 mg/l, 72 hours
Crustacea	EC50	Daphnia	> 100 mg/l, 48 hours
Fish	LC50	Zebra danio (Danio rerio)	> 100 mg/l, 96 hours

* Estimates for product may be based on additional component data not shown.

Persistence and degradability	No data is available on the degradability of this product.
Bioaccumulative potential	
Mobility in soil	No data available.
Other adverse effects	No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions	Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Dispose of contents/container in accordance with local/regional/national/international regulations.
Local disposal regulations	Dispose in accordance with all applicable regulations.
Hazardous waste code	The waste code should be assigned in discussion between the user, the producer and the waste disposal company.
Waste from residues / unused products	Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).
Contaminated packaging	Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not established.

15. Regulatory information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

Not listed.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories
Immediate Hazard - Yes
Delayed Hazard - No
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical Yes

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA) Not regulated.

US state regulations

US. California Controlled Substances. CA Department of Justice (California Health and Safety Code Section 11100)

Not listed.

US. Massachusetts RTK - Substance List

Distillates, (petroleum), Hydrotreated Light (CAS 64742-47-8)

US. New Jersey Worker and Community Right-to-Know Act

Distillates, (petroleum), Hydrotreated Light (CAS 64742-47-8)

US. Pennsylvania Worker and Community Right-to-Know Law

Distillates, (petroleum), Hydrotreated Light (CAS 64742-47-8)

US. Rhode Island RTK

Not regulated.

US. California Proposition 65

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	No
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date 07-29-2015

Version # 01

NFPA ratings
Health: 2
Flammability: 1
Instability: 0

Hydrex

MATERIAL SAFETY DATA SHEET

1. Product and Company Identification

Material name	**Hydrex 2982**
Version #	02
Issue date	02-23-2012
Revision date	09-27-2012
Supersedes date	02-23-2012
CAS #	Mixture
Product use	Cooling water treatment
Manufacturer	
Supplier	I. Kruger
Address	401 Harrison Oaks Blvd. Suite 100 Cary, NC 27513
Contact Person	Hydrex Product Manager
Telephone	888-578-4378
Fax	919-677-0082
e-mail	krugerinchydrex@veoliawater.com
Global Emergency Contact	1-760-476-3962 (Code:333239)

2. Hazards identification

Emergency overview	Health injuries are not known or expected under normal use.
OSHA regulatory status	This product is considered not hazardous under 29 CFR 1910.1200 (Hazard Communication).
Potential health effects	
Routes of exposure	Not applicable.
Eyes	Health injuries are not known or expected under normal use.
Skin	Health injuries are not known or expected under normal use.
Inhalation	Health injuries are not known or expected under normal use.
Ingestion	Health injuries are not known or expected under normal use.
Potential environmental effects	May cause long-term adverse effects in the environment.

3. Composition / Information on Ingredients

The manufacturer lists no ingredients as hazardous according to OSHA 29 CFR 1910.1200.

4. First Aid Measures

First aid procedures	
Eye contact	Rinse with water. Get medical attention if irritation develops and persists.
Skin contact	Rinse skin with water/shower. Get medical attention if irritation develops and persists.
Inhalation	If breathing is difficult, remove to fresh air and keep at rest in a position comfortable for breathing. Call a physician if symptoms develop or persist.
Ingestion	Rinse mouth. If ingestion of a large amount does occur, call a poison control center immediately.
General advice	If you feel unwell, seek medical advice (show the label where possible).

5. Fire Fighting Measures

Flammable properties	The product is not flammable. No unusual fire or explosion hazards noted.

Extinguishing media

Suitable extinguishing media	Water fog. Dry chemical, CO2, sand, earth, water spray or regular foam.
Fire fighting equipment/instructions	Not available.

6. Accidental Release Measures

Personal precautions	Keep unnecessary personnel away. Local authorities should be advised if significant spillages cannot be contained.
Environmental precautions	Prevent further leakage or spillage if safe to do so. Do not contaminate water.
Methods for containment	Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible.
Methods for cleaning up	Should not be released into the environment. Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Absorb in vermiculite, dry sand or earth and place into containers. Following product recovery, flush area with water. Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination. Never return spills in original containers for re-use. For waste disposal, see section 13 of the MSDS.

7. Handling and Storage

Handling	Avoid release to the environment. Handle and open container with care. Handle an open container with care.
Storage	Use care in handling/storage.

8. Exposure Controls / Personal Protection

Personal protective equipment

Skin protection	Normal work clothing (long sleeved shirts and long pants) is recommended.
Respiratory protection	No personal respiratory protective equipment normally required.
General hygiene considerations	Handle in accordance with good industrial hygiene and safety practice.

9. Physical & Chemical Properties

Physical state	Liquid.
Form	Liquid.
Color	Opaque. White.
Odor	Slight
pH	6.7 - 7.3
Boiling point	212 °F (100 °C)
Melting point/Freezing point	32 °F (0 °C)
Solubility (water)	Complete
Other data	
Density	0.95 - 1.05 g/cm3

10. Chemical Stability & Reactivity Information

Chemical stability	Material is stable under normal conditions.
Conditions to avoid	None under normal conditions.
Incompatible materials	Not available.
Hazardous decomposition products	No hazardous decomposition products are known.

11. Toxicological Information

Carcinogenicity This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

Further information This product has no known adverse effect on human health.

12. Ecological Information

Ecotoxicological data

Product		Species	Test Results
Hydrex 2982 (Mixture)			
Fish	LC50	Fish	>= 900 mg/l, 96 hours, calculated

* Estimates for product may be based on additional component data not shown.

Ecotoxicity Contains a substance which causes risk of hazardous effects to the environment.

Environmental effects An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Persistence and degradability Not available.

13. Disposal Considerations

Disposal instructions Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Do not allow this material to drain into sewers/water supplies. This product, in its present state, when discarded or disposed of, is not a hazardous waste according to Federal regulations (40 CFR 261.4 (b)(4)). Under RCRA, it is the responsibility of the user of the product to determine, at the time of disposal, whether the product meets RCRA criteria for hazardous waste. Dispose in accordance with all applicable regulations.

Waste from residues / unused products Not applicable.

Contaminated packaging Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport Information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

15. Regulatory Information

US federal regulations This product is not known to be a "Hazardous Chemical" as defined by the OSHA Hazarc Communication Standard, 29 CFR 1910.1200.
CERCLA/SARA Hazardous Substances - Not applicable.

Drug Enforcement Administration (DEA). List 2, Essential Chemicals (21 CFR 1310.02(b) and 1310.04(f)(2)

Not regulated.

DEA Essential Chemical Code Number

Not regulated.

Drug Enforcement Administration (DEA). List 1 & 2 Exempt Chemical Mixtures (21 CFR 1310.12(c))

Not regulated.

DEA Exempt Chemical Mixtures Code Number

Not regulated.

CERCLA (Superfund) reportable quantity

None

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories	Immediate Hazard - No Delayed Hazard - No Fire Hazard - No Pressure Hazard - No Reactivity Hazard - No
Section 302 extremely hazardous substance	No
Section 311 hazardous chemical	No

Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	No
Canada	Domestic Substances List (DSL)	No
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	No
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	No
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	No

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

State regulations This product does not contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.

16. Other Information

Further information HMIS® is a registered trade and service mark of the NPCA.

HMIS® ratings
Health: 1
Flammability: 0
Physical hazard: 0

NFPA ratings
Health: 1
Flammability: 0
Instability: 0

Disclaimer The information in the sheet was written based on the best knowledge and experience currently available. Veolia Water Solutions & Technologies is not able to anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use and or non respect of Veolia Water Solutions & Technologies' requirement.

This data sheet contains changes from the previous version in section(s):
Product and Company Identification: Product Review
Handling and Storage: Handling
Physical & Chemical Properties: Multiple Properties
Physical & Chemical Properties: Color
Physical & Chemical Properties: Form
Physical & Chemical Properties: Odor

NFPA ratings

Disclaimer

Veolia Water Technologies is not able to anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use and or non respect of Veolia Water Technologies' requirement.

Revision Information

Product and Company Identification: Product Review
Composition / Information on Ingredients: Disclosure Overrides
Toxicological Information: Toxicological Data
Regulatory Information: United States
GHS: Classification

Univar USA Inc Material Safety Data Sheet

MSDS No:	62614
Version No:	005 2006-09-06
Order No:	

Univar USA Inc., 17425 NE Union Hill Rd., Redmond WA 98052
(425) 889 3400

Emergency Assistance

For emergency assistance involving chemicals call
Chemtrec - (800) 424-9300

The Version Date and Number for this MSDS is : 09/06/2006 - #005

PRODUCT NAME: HYDROGEN PEROXIDE, 50% (ALL GRADES)

MSDS NUMBER: 62614

DATE ISSUED: 08/09/2006

SUPERSEDES: 10/12/2004

ISSUED BY: 008782

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Material Safety Data Sheet

Distributor:
UNIVAR USA, INC.
17425 NE Union Hill Road
Redmond WA 98052
425-889-3400

Product Name HYDROGEN PEROXIDE, 50% (ALL GRADES)
Product Synonym(s)

Chemical Family Peroxide
Chemical Formula H202
Chemical Name Hydrogen Peroxide Solution, 50%
EPA Reg Num
Product Use

2 COMPOSITION / INFORMATION ON INGREDIENTS

Ingredient Name	CAS RegistryNumber	Typical %	OSHA
Hydrogen peroxide	7722-84-1	50%	Y
Water	7732-18-5	50%	N

The substance(s) marked with a "Y" in the OSHA column, are identified as hazardous chemicals according to the criteria of the OSHA Hazard Communication Standard (29 CFR 1910.1200)

This material is classified as hazardous under Federal OSHA regulation.

The components of this product are all on the TSCA Inventory list.

3 HAZARDS IDENTIFICATION

Emergency Overview

Annotation:
water white liquid with slightly sharp odor.
DANGER!
CAUSES EYE BURNS. MAY CAUSE BLINDNESS.
CAUSES SKIN BURNS.
CAUSES RESPIRATORY TRACT BURNS.
HARMFUL IF SWALLOWED.
STRONG OXIDIZER.
CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE OR EXPLOSIVE DECOMPOSITION.

Potential Health Effects

Inhalation and skin contact are expected to be the primary routes of occupational exposure to this material. Based on single exposure animal tests, it is considered to be moderately toxic if swallowed, practically non-toxic if absorbed through skin, slightly toxic if inhaled, and corrosive to eyes and skin. Inhalation of high concentrations of vapor or mist may cause severe irritation of the eyes, nose and upper respiratory tract with cough, chest discomfort and, in severe cases, pulmonary edema (accumulation of fluid in the lungs). Skin contact with concentrated liquid for a short period of time may cause a temporary whitening or bleaching of the skin. Prolonged or repeated contact with skin may cause severe irritation or burns characterized by a tingling sensation, redness, swelling and possible destruction of the dermis with ulceration. If swallowed, this material may cause irritation, burns or perforation of the gastrointestinal tract including the stomach and intestines. Symptoms of injury may include nausea, vomiting, diarrhea, abdominal pain, bleeding or tissue ulceration.

4 FIRST AID MEASURES

IF IN EYES, immediately flush with plenty of water for at least 15 minutes. Get medical attention.

IF ON SKIN, immediately flush with plenty of water. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Destroy contaminated shoes.

IF SWALLOWED, do NOT induce vomiting. Give water to drink. Get medical attention immediately. NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON.

IF INHALED, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

5 FIRE FIGHTING MEASURES

Fire and Explosive Properties

Auto-Ignition Temperature	NA	
Flash Point	None	Flash Point Method
Flammable Limits- Upper	NA	
Lower	NA	

Extinguishing Media
Use water spray, water fog.

Fire Fighting Instructions
Fire fighters and others who may be exposed to products of combustion should wear full fire fighting turn out gear (full Bunker Gear) and self-contained breathing apparatus (pressure demand NIOSH approved or equivalent). Fire fighting equipment should be thoroughly decontaminated after use.

Fire and Explosion Hazards
Solutions above 65% are especially hazardous as they do not contain enough water to remove the heat of decomposition by evaporation. Avoid breathing fumes from fire exposed material.

6 ACCIDENTAL RELEASE MEASURES

In Case of Spill or Leak
Stop the leak, if possible. Ventilate the space involved. Flush with plenty of water. Combustible materials exposed to hydrogen peroxide should be rinsed immediately with large amounts of water to ensure that all the hydrogen peroxide is removed. Residual hydrogen peroxide which is allowed to dry on organic materials such as paper, fabrics, cotton, leather, wood, or other combustibles can cause the material to ignite and result in a fire. Consult a regulatory specialist to determine appropriate state or local reporting requirements, for assistance in waste characterization and/or hazardous waste disposal and other requirements listed in pertinent environmental permits.

7 HANDLING AND STORAGE

Handling
Do not get in eyes, on skin or on clothing. Do not breathe mist. Do not taste or swallow. Wash thoroughly after handling. Use only with adequate ventilation. Avoid contamination. Keep container closed.

Storage
Store separate from acids, alkalies, reducing agents, combustibles.

8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering Controls
Investigate engineering techniques to reduce exposures below airborne exposure limits. Provide ventilation if necessary to control exposure levels below airborne exposure limits (see below). If practical, use local mechanical exhaust ventilation at sources of air contamination such as open process equipment. Consult ACGIH ventilation manual or NFPA Standard 91 for design of exhaust systems.

Eye / Face Protection
Where there is potential for eye contact, wear a face shield, chemical goggles, and have eye flushing equipment immediately available.

Annotation:

Skin Protection

Neoprene, Polyvinyl chloride, Butyl rubber Gloves should be worn when handling this material. Wear chemical goggles, a face shield, and chemical resistant clothing such as a rubber apron when splashing may occur. Rinse immediately if skin is contaminated. Remove contaminated clothing promptly and wash before reuse. Clean protective equipment before reuse. Provide a safety shower at any location where skin contact can occur. Wash skin thoroughly after handling.

Respiratory Protection

Avoid breathing vapor or mist. When airborne exposure limits are exceeded (see below), use NIOSH approved respiratory protection equipment appropriate to the material and/or its components. Consult respirator manufacturer to determine appropriate type equipment for given application. Observe respirator use limitations specified by NIOSH or the manufacturer. For emergency and other conditions where exposure limit may be significantly exceeded, use an approved full face positive-pressure, self-contained breathing apparatus or positive-pressure airline with auxiliary self-contained air supply. Respiratory protection programs must comply with 29 CFR ' 1910.134.

Other Protective Equipment

Rubber boots with neoprene or pvc soles. Do NOT wear leather boots. Note: As the water content of hydrogen peroxide evaporates, cotton, rayon, and wool fibers are particularly subject to spontaneous combustion. Where there is significant risk of sudden splash or spray, it is advised that an apron or rubber suit be worn. Any contaminated clothing, including gloves, shoes, aprons, coveralls, etc., should be removed immediately and thoroughly flushed with water to eliminate any traces of hydrogen peroxide before cleaning and reuse.

Airborne Exposure Guidelines for Ingredients

Exposure Limit	Value
Hydrogen peroxide	
ACGIH TWA-	ppm 1.4 mg/m3
OSHA TWA PEL-	ppm 1.4 mg/m3

-Only those components with exposure limits are printed in this section.
-Skin contact limits designated with a "Y" above have skin contact effect. Air sampling alone is insufficient to accurately quantitate exposure. Measures to prevent significant cutaneous absorption may be required.
-ACGIH Sensitizer designator with a value of "Y" above means that exposure to this material may cause allergic reactions. -WEEL-AIHA Sensitizer designator with a value of "Y" above means that exposure to this material may cause allergic skin reactions.

9 PHYSICAL AND CHEMICAL PROPERTIES

Appearance/Odor	Water white liquid with slightly sharp odor.
pH	NE

Specific Gravity	1.196 @ 20 C
Vapor Pressure	18.3 @ 20 C
Vapor Density	1.0
Melting Point	NE
Freezing Point	-52 C (-62 F)
Boiling Point	114 C (237 F)
Solubility In Water	Complete
Percent Volatile	100%
Molecular Weight	34.01

10 STABILITY AND REACTIVITY

Stability
This material is chemically stable under normal and anticipated storage and handling conditions.

Incompatibility
Material decomposes with the potential to produce a rupture of unvented closed containers. Contact with metals, metal ions, organics, wood, dust, shavings, dry vegetables may cause decomposition.

Hazardous Decomposition Products
This material decomposes if contaminated, causing fire and possible explosions. Oxygen can be liberated at temperatures above ambient.

11 TOXICOLOGICAL INFORMATION

Toxicological Information

Data on this material and/or its components are summarized below. Hydrogen Peroxide
Single exposure (acute) studies indicate that this material is moderately toxic if swallowed (rat LD50 805 mg/kg; 70% solution), practically non-toxic if absorbed through skin (rabbit LD50 >6,500 mg/kg; 70% solution), slightly toxic if inhaled (no mortality in rats at 170 mg/m3 for 4 hours), and corrosive to rabbit eyes and skin. No skin allergy was observed in guinea pigs following repeated exposure. Solutions are commonly used for disinfecting wounds, bleaching hair or as a mouth wash and generally do not show adverse skin reactions. Accidental ingestion by children has resulted in death from lung edema, stomach erosions and gas distention and burns to the throat and esophagus. Eye and throat irritation and bleaching of hair have been reported by workers exposed to this material in the atmosphere.

Several studies have been conducted by administering material in the drinking water of mice and rats. The primary findings were irritation of the gastric mucous. Repeated inhalation exposure of rats and mice caused nasal irritation without notable adverse effects on the lining of the upper respiratory system. Repeated inhalation exposure of dogs resulted in upper respiratory tract irritation and emphysematous changes in the lungs. Generally, long-term oral dosing caused no adverse effects other than erosion of the stomach lining from direct application of the test material. Several studies have

Annotation:
shown an increase in gastrointestinal tract tumors in mice and rats following long-term exposure in the drinking water. Concentrations less than 1% do not promote gastrointestinal tumors. The U.S. Federal Drug Administration has concluded that there is insufficient evidence of carcinogenicity and the International Agency for Research on Cancer (IARC) has concluded that this chemical is not classifiable as to its carcinogenicity to humans (Group 3). Genetic changes were observed in tests using bacteria and animal cells, but not in animals.

12 ECOLOGICAL INFORMATION

Ecotoxicological Information
Data on this material and/or its components are summarized below.
Hydrogen Peroxide
This material is highly toxic to marine algae (LC50 0.85 mg/L), moderately toxic to Daphnia magna (EC50 7.7 mg/L) and Daphnia pulex (LC50 2.4 mg/L). It is slightly toxic to coho salmon (LC50 10 mg/L), channel catfish (LC50 37.4 mg/L), golden orfe (LC50 35 mg/L), fathead minnow (LC50 16.4 mg/L), snail (LC50 17.7 mg/L) and bacteria (EC50 30 mg/L).

Chemical Fate Information
No data are available.

13 DISPOSAL CONSIDERATIONS

Waste Disposal
Consult with environmental engineer or professional to determine if neutralization is appropriate and for handling procedures for residual materials. Note: Chemical additions to, processing of, or otherwise altering this material may make this waste management information incomplete, inaccurate, or otherwise inappropriate. Furthermore, state and local waste disposal requirements may be more restrictive or otherwise different from federal laws and regulations.

14 TRANSPORT INFORMATION

DOT Name	Hydrogen Peroxide, Aqueous Solution,
DOT Technical Name	
DOT Hazard Class	5.1
UN Number	UN 2014
DOT Packing Group	PG II
RQ	
DOT Special Information	Subsidiary (8) Non-Bulk packages must have Class 5.1 and Class 8 labels. Bulk packages require Class 5.1 Oxidizer placards.

15 REGULATORY INFORMATION

Hazard Categories Under Criteria of SARA Title III Rules (40 CFR Part 370)

Immediate (Acute) Health	Y	Fire	Y

Annotation:

Delayed (Chronic) Health	N	Reactive	Y
		Sudden Release of Pressure	N

The components of this product are all on the TSCA Inventory list.

Ingredient Related Regulatory Information:

SARA Reportable Quantities	CERCLA RQ	SARA TPQ
Hydrogen peroxide	NE	1000 LBS
Water	NE	

SARA Title III, Section 302
This product does contain chemical(s), as indicated below, currently on the Extremely Hazardous Substance List, Section 302, SARA Title Ill. See Section 2 for further details regarding concentrations and registry numbers.
Hydrogen peroxide

Massachusetts Right to Know
This product does contain the following chemicals(s), as indicated below, currently on the Massachusetts Right to Know Substance List.
Hydrogen peroxide

New Jersey Right to Know
This product does contain the following chemical(s), as indicated below, currently on the New Jersey Right-to-Know Substances List.
Hydrogen peroxide

Pennsylvania Environmental Hazard
This product does contain the following chemical(s), as indicated below, currently on the Pennsylvania Environmental Hazard List.
Hydrogen peroxide

Pennsylvania Right to Know
This product does contain the following chemical(s), as indicated below, currently on the Pennsylvania Hazardous Substance List.
Hydrogen peroxide

16 OTHER INFORMATION

Key
NE= Not Established NA= Not Applicable (R) = Registered Trademark

Univar USA Inc Material Safety Data Sheet

For Additional Information contact MSDS Coordinator during business hours, Pacific time: (425) 889-3400

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This information relates only to the product designated herein, and does not relate to its use in combination with any other material or in any other process

Safety Data Sheet

Limestone

Revision date:
June 24, 2015

1. Identification

Product Name: Limestone

Synonyms:

#1 Grit,
#3 Grit Coated,
#3 Grit,
#57 Washed Stone,
#57,
#8's Limestone,
100 mesh,
100x0,
12mx50m,
12x50,
16 m x 100 m,
16x100,
16x140M,
16x200,
20x0,
20x200,
21AA,
23A,
2A Sub Base,
3" X 6",
5x9M,
60x0,
62/200,
6AA,
75-200,
78/200,
80/325,
85-200,
8mx20m,
8x20,
90/325,
90-325,
95-150M,
Ag Lime,
Agg #57 Stone,
Agg 75,
Agg OGB Select Material Stone,
Aggregate Limestone,
Agricultural Stone-Large,
Agricultural Stone-Small,
B-10,
Blast Furnace Stone,
BOF Stone,
Calcite #1,
Calcite 467,
Calcite 57/2B,
Calcite 8/1B,
Calcite,
Calcitic Aglime Dry,
Calcitic Aglime,
Camadil 76-325,
Camadil 99-325,
CM 11,
Commercial Aggregates,
Commercial Stone,
Concrete Stone,
Feed Grade Calcium Bulk,
Feed grade HiCal,
FGD Limestone,
FGD Stone,
G Chemical,
GFP 101,
GFP 101WO,
GFP 102 ,
GFP 135,
GFP 200C,
GFP 250,
GFP 250C,
GFP 3,
GFP 325,
GFP 60C,
GFP270C,
GFP7,
GPS 20,
GPS 325,
Grade B,
Grade F,
Granular A,
Granular M,
Ground Limestone,
Guideline Field Marker,
H1,
H2,
H3,
Hi Cal Blast Furnace Stone,
Hi Cal Fluxing Stone,
Hi Cal Large Sand,
Hi Cal Min. Filler 62/200-BK,
Hi Cal Min. Filler 75/200-BK,
Hi Cal Sinter Flux Stone,
Hi Cal Stone,
Hi Calcium Blast Furnace Flux,
High Calcium Limestone
HL-3,
Intermediate Aggregate,
Large Fraction,
Lut 95-150m,
Manufactured Sand 3-32,
Manufactured Sand,
MI-22A,
MI-23A,
MI-25A,
MI-31A,
MI-6AA,
MI-6AAA,
Mine Safety Dust,
Minn. Class 5s,
OGB,
OH-57,
OH-67,
OH-8,
OHIO #4,
OHIO 57's,
OHIO 8's,
PCC Limestone,
Pellet Flux,
Pelletized Limestone,
Port Inld Screenings,
Premiacal - Grade F,
Premiacal 16,
Premiacal 20,
Premiacal 22,
Premiacal 28,
Premiacal 29,
Premiacal,
Pro Pulverized,
Pro Select,
Pulverized calcium carbonate,
Pulverized Limestone,
Rock Dust 101 (White),
ROM Stone,
ROMF,
Rotary E2,
Sewer Stone,
Sinter Stone,
Soil Doctor,
TMG Hi Cal 325,
Tri-County 8 Mesh Fertilizer Filler,
Tuff Shell HiCal,
VDOT Rockfill,
W-10,
York CA Chips,

Recommended Uses: Mineral filler, Manufacture of lime and lime related products, and aggregate

Manufacturer: Carmeuse Lime & Stone

US Office
11 Stanwix Street, 21st Floor
Pittsburgh, PA 15222
Phone: (412) 995-5500
Fax: (412) 995-5594

Canadian Office
PO Box 190
Ingersoll, ON N5C 3K5
Phone: (519) 423-6283
Fax: (519) 423-6545

Emergency Contact: Infotrac: (800) 535-5053 (24 hrs a day, 7 days a week)

2. Hazards Identification

GHS classification

Physical Hazards

None

Health Hazards

Skin irritation	Category 3
Eye irritation	Category 2B
Carcinogenicity	Category 1A
Specific Target Organ Toxicity – Repeated Exposure	Category 1

GHS Label Elements:

Signal Word: Danger

Hazard Statements:
Causes mild skin irritation
Causes eye irritation
May cause cancer through inhalation
Causes damage to lungs through prolonged or repeated exposure by inhalation

Precautionary Statements:
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Do not breathe dust.
Wash thoroughly after handling.
Use personal protective equipment as required
Do not eat, smoke or drink when using this product

Pictograms:

3. Composition

Chemical name	% by weight	CAS#
Calcium carbonate	90+	1317-65-3
Magnesium carbonate	< 5	546-93-0
Silica-crystalline quartz	0.1 - 2	14808-60-7

4. First Aid Measures

Eyes: Flush victim's eyes thoroughly with large quantities of water, including under eye lids. Get medical attention if irritation persists.

Skin: Remove dusty clothing. Wash skin thoroughly with soap and water. Launder clothing before re-use. Get medical attention if irritation persists.

Ingestion: Get medical attention if a large amount is swallowed.

Inhalation: Remove victim to fresh air. If symptoms persist or breathing is difficult, get medical attention.

Most Important Symptoms: Eye and respiratory irritation due to exposure to dust.

Immediate medical attention / special treatment? No immediate medical attention anticipated.

5. Fire Fighting Measures

Suitable (and unsuitable) fire extinguishing media: Use extinguishing media appropriate for surrounding conditions.

Specific hazards arising from the product Decomposes at 950 ^{o}C to produce calcium oxide and magnesium oxide.

Special protective equipment and precautions for fire fighters Dust that becomes wet may cause surfaces to be extremely slippery and cause a slip hazard.

6. Accidental Release Measures

Personal precautions, protective equipment, emergency procedures:

Avoid eye and skin contact. Avoid generating airborne dust. Wear appropriate clothing to prevent skin contact. Wearing of standard SCBA should be adequate to protect against inhalation of dust.

Methods and materials for containment and clean up:

Utilize cleanup methods that minimize generating dust: vacuum. Avoid dry sweeping. Water may be used to control dust, but wet dust can be very slippery and result in a slip hazard. Residue on surfaces may be removed with water or vinegar.

7. Handling & Storage

Safe Handling: Avoid skin and eye contact. Avoid generating airborne dust. An eye wash station should be readily available when this product is handled.

Safe Storage: Store in dry, well ventilated areas, away from incompatible materials.

8. Exposure Controls/Personal Protection

Occupational Exposure Limits

	OSHA PEL (mg/m^3)	ACGIH TLV (mg/m^3)	Ont. Reg. 833 TWAEV (mg/m^3)
Calcium carbonate	15 5 (respirable)	10	10
Magnesium carbonate	15 5 (respirable)	10	10
silica - crystalline quartz	30 / (% silica +2) (total) 10 / (% silica +2) (respirable)	0.025 (respirable)	0.1

Engineering Controls: Use with adequate general or local exhaust ventilation and to maintain exposure below occupational exposure limits.

Individual Protection Measures (Personal Protective Equipment):

Specific Eye / Face Protection: In windy conditions, or if work activity generates elevated airborne dust levels, dust proof or chemical goggles are recommended.

Specific Skin Protection: When prolonged skin contact is likely to occur, wear appropriate clothing and gloves.

Specific Respiratory Protection: If exposure limits are exceeded, an approved particulate respirator, or supplied air respirator, appropriate for the airborne concentrations, should be used. Selection and use of the respiratory protective equipment must be in accordance with applicable regulations and good industrial hygiene practices.

9. Physical & Chemical Properties

Appearance: Solid, white or grey powder or stone

Odor: Odorless

Odor threshold: Not Applicable

pH: 9.4 in saturated water solution at 25 ^{o}C (77 ^{o}F)

Melting Point/Freezing Point: 950 ^{o}C (1742 ^{o}F)

Boiling Point and range: 2850 ^{o}C (5162 ^{o}F)

Flash Point: Not Applicable

Evaporation Rate: Not Applicable

Flammability: Not Available

Upper/lower flammability or explosive limits Not Applicable

Vapor pressure/density: Non Volatile

Relative density:	2.7
Solubility:	Slightly soluble in water: 0.013 g/L at 18 °C
Partition coefficient: n-octanol/water	Not Applicable
Auto-ignition temperature:	Not Available
Decomposition temperature:	950 °C (1742 °F)
Viscosity:	Not Applicable

10. Stability & Reactivity

Reactivity:	Not normally reactive.
Chemical stability:	Stable under normal storage and handling conditions.
Possibility of Hazardous Reactions:	Reacts with acids to form calcium salts while generating heat.
Conditions to avoid:	Vicinity of incompatible materials.
Incompatibility:	Incompatible with acids (reaction generates carbon dioxide gas and heat); reactive fluoridated, brominated or phosphorous compounds; aluminum (may form hydrogen gas), ammonium salts, mercury, hydrogen, magnesium, reactive powdered metals; organic acid anhydrides; nitro-organic compounds; interhalogenated compounds
Hazardous decomposition products:	Calcium oxide and carbon dioxide

11. Toxicological Information

Likely routes of exposure & symptoms:

Eyes:	Exposure to pulverized dust may cause irritation
Skin:	Exposure to pulverized dust may cause dryness and irritation
Ingestion:	No adverse effects expected for normal, incidental ingestion. If a large amount is swallowed, may cause gastrointestinal irritation, discomfort and blockage.
Inhalation:	Exposure to pulverized dust may cause irritation in nose, throat and lungs

Chronic health effects:	This product contains trace amounts of crystalline silica. Prolonged or repeated inhalation of respirable crystalline silica can cause silicosis, as serious lung disease.
Respiratory or skin sensitization:	This material is not known to cause sensitization
Germ cell mutagenicity:	No data available.

Carcinogenicity:	This product is not listed as carcinogenic by OSHA, IARC, NTP, ACGIH, or the EU Directives. This product may contain trace amounts of crystalline silica quartz which is listed by IARC as “Carcinogenic to Humans” (Group 1) and “Known to be a Human Carcinogen" by NTP.
Reproductive toxicity:	No Data Available.
Numerical Measures of Toxicity	Crystalline Silica: Oral Rate LD_{50} > 22,500 mg/kg

12. Ecological Information

Because of the elevated pH of this product, it might be expected to produce some ecotoxicity upon exposure to certain aquatic organisms and aquatic systems in high concentrations
This material shows no bioaccumulation effect or food chain concentration toxicity.

13. Disposal Considerations

Dispose of contents in accordance with federal, state, provincial and local regulations.

14. Transport Information

This product is not classified as a hazardous material under US DOT or Canadian TDG regulations.

15. Regulatory Information

CERCLA Hazardous Substances	Not listed
SARA Toxic Chemical (40 CFR 372.65)	Not listed
SARA Section 302 Extremely Hazardous Substances (40 CFR 355)	Not listed
SARA 311/312	Not listed
SARA Section 313 Toxic Chemicals reporting requirements	none
Threshold planning quantity (TPQ)	Not listed
RCRA Hazardous Waste Classification (40 CFR 261)	Not Classified
EPA Toxic Substances Control Act (TSCA) Status	All of the components of this product are listed on the TSCA
California Proposition 65	Airborne crystalline silica particulates of respirable size are known to the State of California to cause cancer.
NFPA ratings	Health: 1 Fire: 0 Reactivity: 0
HMIS Ratings	Health: 1 Fire: 0 Reactivity: 0 Personal protection: A
OSHA Specifically regulated substance (29 CFR 1910)	Not listed
OSHA Air contaminant (29 CFR 1910.1000, Table Z-1, Z-1-A)	Listed

MSHA	Not listed
Canada DSL	Listed
Canadian WHMIS Classification	D2A, Materials Causing other toxic effects.

Canada CPR This product has been classified in accordance with the hazard criteria of the Controlled Products Regulation of Canada and this SDS contains all the required information.

16. Other Information

List of GHS Hazard Statements:
H316: Causes mild skin irritation
H320: Causes eye irritation
H350: May cause cancer by inhalation
H372: Causes damage to lungs through prolonged or repeated exposure by inhalation.

List of GHS Precautionary Statements:
P201: Obtain special instructions before use.
P202: Do not handle until all safety precautions have been read and understood.
P260: Do not breathe dust.
P264: Wash hands thoroughly after handling.
P270: Do not eat, drink or smoke when using this product.
P281: Use personal protective equipment as required

Abbreviations

CERCLA	Comprehensive Environmental Response, Compensation and Liability Act	RCRA	Resource Conservation and Recovery Act
SARA	Superfund Amendments and Reauthorization Act	IARC	International Agency for Research on Cancer
NTP	National Toxicology Program		

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SAFETY DATA SHEET

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

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

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

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

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

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

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

* * * Section 2 – HAZARDS IDENTIFICATION * * *

GHS Classification:

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

GHS LABEL ELEMENTS

Symbol(s)

Signal Word

Danger

Hazard Statements

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

Precautionary Statements

Prevention

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

Response

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

Storage

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

Disposal

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

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

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

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

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

First Aid: Eyes

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

First Aid: Skin

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

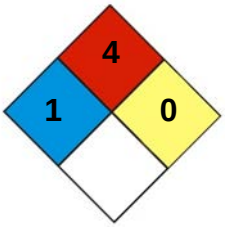
First Aid: Ingestion

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

First Aid: Inhalation

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

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



NFPA 704 Hazard Class

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

General Fire Hazards

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

Hazardous Combustion Products

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

Extinguishing Media

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

Unsuitable Extinguishing Media

None.

Fire Fighting Equipment / Instructions

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

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

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

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

Recovery and Neutralization

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

Materials and Methods for Clean-Up

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

Emergency Measures

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

Personal Precautions and Protective Equipment

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

Environmental Precautions

Do not flush gas vapors toward sewer or drainage systems.

Prevention of Secondary Hazards

None.

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

Handling Procedures

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

Storage Procedures

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

Incompatibilities

Keep away from strong oxidizers, ignition sources and heat.

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

Component Exposure Limits

Methane (74-82-8)

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

Ethane (74-84-0)

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

Propane (74-98-6)

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

Butane (106-97-8)

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

Pentanes (109-66-0)

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

Hexanes (110-54-3)

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

Nitrogen (7727-37-9)

Simple Asphyxiant

Carbon Dioxide (124-38-9)

ACGIH: 5000 ppm TWA (listed under Carbon Dioxide)

Oxygen (7782-44-7)

N/A – Necessary for life

Engineering Measures

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

Personal Protective Equipment: Respiratory

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

Personal Protective Equipment: Hands

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

Personal Protective Equipment: Eyes

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

Personal Protective Equipment: Skin and Body

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

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

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

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

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

Chemical Stability

This is a stable material.

Hazardous Reaction Potential

Will not occur.

Conditions to Avoid

Keep away from strong oxidizers, ignition sources and heat.

Hazardous Decomposition Products

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

* * * Section 11 – TOXICOLOGICAL INFORMATION * * *

Acute Toxicity

A: General Product Information

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

B. Component Analysis – LD50/LC50

Methane (74-82-8)

Inhalation LC50 Mouse 326 g/m3 2h

Ethane (74-84-0)

Inhalation LC50 Rat 658 mg/l 4h

Propane (74-98-6)

Inhalation LC50 Rat 658 mg/l 4h

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

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

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

Nitrogen (7727-37-9)
Simple Asphyxiant

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

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

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

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

Carcinogenicity

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

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

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

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

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

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

* * * Section 12 – ECOLOGICAL INFORMATION * * *

Ecotoxicity

A: General Product Information

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

B: Component Analysis – Ecotoxicity – Aquatic Toxicity

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

Persistance / Degradability

No information available.

Bioaccumulation

No information available.

Mobility in Soil

No information available.

* * * Section 13 – DISPOSAL CONSIDERATIONS * * *

Waste Disposal Instructions

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

Disposal of Contaminated Containers or Packaging

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

* * * Section 14 – TRANSPORTATION INFORMATION * * *

DOT Information

Shipping Name: Natural Gas, Compressed

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

Placard:

* * * Section 15 – REGULATORY INFORMATION * * *

Regulatory Information

Component Analysis

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

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

SARA Section 311/312 – Hazard Classes

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

SARA Section 313 – Supplier Notification

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

State Regulations

Component Analysis – State

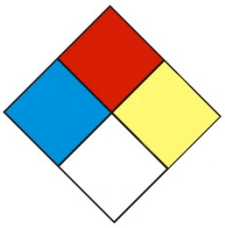
The following components appear on one or more of the following state hazardous substances lists:

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

* * * Section 16 – OTHER INFORMATION * * *

NFPA® Hazard Rating

Health	1
Fire	4
Reactivity	0



HMIS® Hazard Rating

Health	1	Moderate
Fire	4	Severe
Physical	0	Minimal
		* Chronic

Key/Legend

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

Literature References

None

Other Information

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

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

Date of Preparation: January 30, 2014

Date of Last Revision: March 4, 2014

End of Sheet

Terra Nitrogen Corporation
Terra Centre – 600 Fourth Street
Sioux City, Iowa 51101

Material Safety Data Sheet

Methanol

MSDS Number 2016 (Revised April 1, 2001) 8 Pages

1. CHEMICAL PRODUCT and EMERGENCY TELEPHONE CONTACT

Product Name:.....Methanol
Chemical Family:.....Aliphatic Alcohol
Synonyms:.....Carbinol, Columbian Spirits, Methyl Alcohol, Pyroligneous Spirits, Wood Alcohol, Methylol, Wood Naphtha, Wood Spirits, Manhattan Spirits, Pyroxylic Spirits, Colonial Spirits, Methyl Hydroxide, Monohydroxymethane
Formula:.....CH_3OH

EMERGENCY TELEPHONE NUMBER
CHEMTREC:.....800-424-9300

2. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient Name/CAS Number	Concentration	Exposure Limits
Methanol #67-56-1	99-100%	200 ppm TWA 250 ppm STEL 6000 ppm IDLH (1 ppm = 1.33 mg/m^3)

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Methanol is a colorless volatile liquid with a faintly sweet pungent odor similar to ethyl alcohol. The substance is fully soluble in water. Vapors of methanol are slightly heavier than air and may travel some distance to a source of ignition and flash back. Accumulations of vapors in confined spaces such as buildings or sewers may explode if ignited. There is potential for containers of liquid to rupture violently if exposed to fire or excessive heat for sufficient time duration. Methanol is listed as a "Poison-Class B". It is harmful if swallowed or absorbed through the skin. Ingestion of as little as one ounce can cause irreversible injury to the nervous system, blindness, or death. It cannot be made non-poisonous. Causes eye and respiratory system irritation and may cause skin irritation. Avoid liquid, mist, or vapor contact. Vapor inhalation or liquid penetration of the skin can cause central nervous system depression.

POTENTIAL HEALTH EFFECTS

Primary Routes of Entry: Inhalation, skin contact/absorption, eye contact, and ingestion.
General Acute Exposure: Liquid, mist, or vapors can cause eye, skin, and respiratory tract irritation and Central Nervous System (CNS) depression.

Inhalation:
Acute Exposure: Short-term exposure to high concentrations of methanol may cause CNS depression. Symptoms may include headache, weakness, drowsiness, lightheadedness, nausea, difficult breathing, drunkenness, eye irritation, blurred vision, blindness, loss of consciousness, vertigo, fatigue, convulsions, and possibly death, depending on exposure. Victims may improve and then get worse again up to 30 hours later.

Skin:
Acute Contact: Upon prolonged or repeated contact, absorption through the skin may occur and produce toxic effects similar to those resulting from inhalation exposure. Repeated or prolonged skin contact may cause drying, cracking, and inflammation of the skin due to the defatting action of the product.

Eye:
Acute Contact: Eye irritation may occur upon short-term exposure, including a burning sensation, tearing, redness, or swelling. Upon direct contact with liquid, conjunctivitis and corneal burns may occur. The primary toxic effect of methanol is exerted upon the nervous system, particularly the optic nerves and possibly the retina. The condition can progress to permanent blindness.

Ingestion:
Ingestion may cause serious poisoning with effects similar to those of inhalation and absorption through the skin. Toxic effects are more common after ingestion. Death from as little as one ounce has been reported.

Neurologic:
Acute Exposure: Central Nervous System (CNS) depression may occur upon exposure.

Summary of Chronic Exposure:
Methanol is slowly eliminated from the body; hence repeated exposures may result in toxic levels in the blood and tissues. Due to its slow elimination, methanol should be regarded as a cumulative poison. Though single exposures to fumes may cause no harmful effect, daily exposure may result in the accumulation of sufficient methanol in the body to cause illness.

Note to the Physician: Coma resulting from massive exposures may last as long as 2-4 days. In the body, products formed by its oxidation are formaldehyde and formic acid.

Carcinogenicity:
NTP:.....Not Listed
IARC:.....Not Listed
OSHA.....Not Regulated

Medical Conditions Aggravated by Exposure: Personnel with pre-existing CNS disease, skin disorders, impaired liver or kidney function, GI tract disorders or chronic respiratory diseases should avoid exposure.

4. FIRST AID MEASURES

First Aid for Eyes: Immediately flush eyes with copious amounts of tepid water for at least 15 minutes. The patient should be seen in a health care facility and referral to an ophthalmologist considered.

First Aid for Skin: Immediately flush exposed area with copious amounts of tepid water for at least 15 minutes while removing contaminated clothing and shoes, followed by washing area thoroughly with soap and water. The patient should be seen in a health care facility if irritation or pain persists or if symptoms of toxicity develop. Wash contaminated clothing and shoes before reuse.

First Aid for Inhalation: Move patient to fresh air and keep warm and at rest. Monitor for respiratory distress. If difficulty in breathing develops or if breathing has stopped, administer artificial respiration and seek medical attention. If trained to do so administer supplemental oxygen with assisted ventilation as required. *Caution*: Administration of mouth-to-mouth resuscitation may expose the first aid provider to chemical within the victim's lungs or vomit.

First Aid for Ingestion: If patient is conscious, immediately give two glasses of water and induce vomiting. Do not make an unconscious person vomit. Get medical attention immediately. **NOTE**: NIOSH suggests that vomiting be induced only if immediate medical attention in not available.

Note to Physician: Provide standard methanol ingestion treatment. To prepare the antidote, make a solution using 100 ml of 100-proof ethyl alcohol (grain alcohol) in 2000 ml of water and give 1.5 ml per kg of body weight, or 100 ml for an average adult. Following this, at 2-hour intervals for 4 days, give the antidote (0.5-1.0 ml per kg of body weight, orally or intravenously to reduce the metabolism of the methanol and to allow time for its excretion). Blood ethanol levels should be 1.0-1.5 mg/L.

5. FIRE FIGHTING MEASURES

Flash Point: .....52^{o} F, closed cup
Lower Flammable Limit: .....6.0 % Volume in Air
Upper Flammable Limit:.....36.5 % Volume in Air
Autoignition Temperature:.....725^{o} F, 385^{o} C

General Information: Methanol is extremely flammable! This material releases vapors at or below ambient temperatures. When mixed with air this substance can burn in the open or explode in confined space conditions. Methanol vapors are heavier than air and may travel long distances along the ground before reaching a point of ignition and flashing back. Methanol-water mixtures containing as little as 21% methanol by volume (25% by weight) are also flammable liquids. Methanol fires may not be visible to the naked eye during daylight.

Extinguishing Media:
Water may be ineffective but may be used to dilute spills to nonflammable mixtures.

Small Fire:.....Dry chemical, CO_2, water spray or alcohol-resistant foam
Large Fire:.....Water spray, fog or alcohol-resistant foam

Special Fire Fighting Procedures:

a. Move container from fire area if you can do it without risk.
b. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks due to exploding potential when tanks are involved in a fire.
c. Dike fire control water for later disposal, do not scatter the material.
d. Do not use straight streams due to spreading of methanol.
e. Positive pressure self-contained breathing apparatus (SCBA) should be used when there is a potential for inhalation of vapors and/or fumes.
f. Structural fire fighter's protective clothing is recommended for fire situations ONLY; it is not effective in spill situations.

Fire involving Tanks or Rail Car/Trailer Loads

a. Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
b. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
c. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.
d. Isolate area for 1/2 mile in all directions.

6. ACCIDENTAL RELEASE MEASURES

Spill or Leak Measures: Stop leak if you can do it without risk. Keep unnecessary people away and deny entry. Isolate spill or leak area immediately for at least 330 to 660 feet in all directions. Stay upwind, out of low areas, and ventilate closed spaces before entering. Eliminate all ignition sources. Do not touch or walk through spilled material. Prevent entry of product into waterways, sewers, basements, or confined spaces. A vapor suppressing foam may be used to reduce vapors. All equipment used when handling the product must be grounded and/or spark resistant. Water spray may reduce vapors but may not prevent ignition in closed spaces. Fully encapsulating, vapor protective clothing should be worn for spills and leaks with no fire.

Determining Spill Size: Generally, a small spill is one that involves a single, small package (i.e. up to a 55 gallon drum), small cylinder, or a small (non-continuing) leak from a large container.

Small Spill:

a. Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal.
b. Use clean non-sparking tools to collect absorbed material.

Large Spill:

a. Dike far ahead of liquid spill for later disposal.
b. Follow local emergency protocol for handling.
c. Water spray may reduce vapor; but may not prevent ignition in closed spaces.

7. HANDLING AND STORAGE

Handling and storage for methanol should follow the standards listed below. Other standards or regulations may apply which are not listed.

a. National Electrical Code; Hazard Classification for Methanol is Class I, Div. 1 or 2, Group D.
b. NFPA No. 30, "Flammable and Combustible Liquids Code".

Handling Precautions: Use proper personal protective equipment when working with or around methanol. See Section 8.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

Respiratory Protection Requirements:

<200 ppm:	No protection required.
200 to 250 ppm:	Protection required if the daily TWA is exceeded, a fresh air supplied system must be used if protection is needed.
>250 ppm:	A fresh air supply system must be used (i.e. positive pressure self contained breathing apparatus)

Skin Protection Requirements: Equipment should prevent repeated or prolonged skin contact with the product. This may include rubber boots, resistant gloves, and other impervious and resistant clothing. Compatible materials may include butyl rubber, natural rubber, neoprene, nitrile rubber, viton and others. Review the equipment manufacture's compatibility data.

Eye Protection Requirements: Use chemical (indirectly vented) goggles when there is a potential for contact with product, including vapor. A full-face shield may be worn over goggles for additional protection, but not as a substitute for goggles.

Other Protective Equipment: Safety shower and eyewash fountain should be provided in the methanol handling area. Proper fire extinguishment equipment must be kept in the handling area.

Engineering Controls: Adequate ventilation to keep methanol concentrations below applicable standards when possible.

NOTE: See Section 2 for regulatory exposure guidelines.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical Form: .....Liquid
Color: .....Colorless
Odor: .....Faintly sweet pungent odor like ethyl alcohol
Boiling Point:.....148^{o} F at atmospheric pressure
Melting point:.....-144^{o} F
pH:.....7.2
Solubility:.....100%
Specific Gravity: .....0.792 (@ 68^{o} F)
Vapor Density:.....1.11 (@ 60^{o} F)
Vapor Pressure:.....1.86 psia (@ 68^{o} F)
% Volatile by Volume: 100
Molecular Weight:.....32.04
Density:.....6.63 lb. per gallon (@ 60^{o} F)
Critical Temperature:.....464^{o} F
Critical Pressure:.....1142 psia

10. REACTIVITY

Stability:.....This is a stable material.
Hazardous Polymerization:.....Will not occur.

Decomposition:
Excessive heating and/or incomplete combustion will generate carbon monoxide, formaldehyde, and possibly unburned methanol.

Incompatibilities:

a. Methanol has an explosive reaction with chloroform + sodium methoxide and diethyl zinc (see note following).

b. Methanol has a violent reaction with alkyl aluminum salts, acetyl bromide, chloroform + sodium hydroxide, cyanuric chloride, nitric acid, etc. (See note following)

c. Incompatible with beryllium dihydride, metals (potassium, magnesium, etc.), oxidants (barium, perchorate, bromine, chlorine, etc.), etc. (see note following)

d. Dangerous; can react vigorously with oxidizing materials. (See note following)

NOTE: The incompatibilities above is a partial list taken from two books by Sax & Lewis: "Dangerous Properties of Industrial Materials", 9th. ed., 1995 and "Hawley's Condensed Chemical Dictionary", 11th. ed. 1987, both published by Van Nostrand Reinhold Company, New York. It is recommend that if additional information is needed, refer to these and other published information.

11. TOXICOLOGICAL INFORMATION

LDLo	Human:	143 mg/kg; Eye, Pul, GIT
LD_{50}	Mouse:	7300 mg/kg
LC_{50}	Rat:	64,000 ppm / 4 hours
LC_{50}	Goldfish:	250 ppm / 11hours

12. ECOLOGICAL INFORMATION

a. Methanol is harmful to aquatic life in low concentrations and may be hazardous if it enters water intakes.
b. Local health and wildlife authorities, as well as operators of water intakes in the vicinity, should be notified of water releases.
c. Biological Oxygen Demand: 0.6 to 1.12 lb./lb. in 5 days

13. DISPOSAL CONSIDERATIONS

Waste must be disposed of in accordance with federal, state, and local environmental control regulations. Waste methanol in concentrations equal to or greater than 24 % by weight meets the definition of an ignitable hazardous waste. Product grade methanol, when disposed, is a listed hazardous waste.

For large spills, maximize product recovery for reuse or recycling. Free liquid may be collected using explosion-proof pumps. For small spills, take up with sand or other non-combustible absorbent. Use registered transporters to move contaminated product/soil/water in D.O.T. approved containers. Dispose of materials at a licensed facility permitted to handle RCRA "Hazardous Wastes". Incineration is the recommended disposal method. Burn concentrated liquid in systems compatible with water-soluble waste. Biodegradation may be used on dilute aqueous waste. Assure emissions and effluents comply with applicable laws.

14. TRANSPORTATION INFORMATION

D.O.T. Shipping Name:	Methanol
D.O.T. Hazard Class:	Flammable Liquid, Class 3
U.N. / N.A. Number:	1230
D.O.T. Placard:	Flammable Liquid, Class 3, color: red
OSHA Label Required:	Yes
RQ (Reportable Quantity):	5000 pounds or approx. 755 gallons
STCC Number:	4909230

15. REGULATORY INFORMATION

OSHA: This product is considered a hazardous material under criteria of the Federal OSHA Hazard Communication Standard 29 CFR 1910.1200.

SARA TITLE III:

a. EHS (Extremely Hazardous Substances) List: Not Listed
Note: Chemicals on the original list that do not meet the toxicity criteria but because of their high production volume and recognized toxicity are considered chemicals of concern ("other chemicals").
b. RQ (Reportable Quantity): Not Listed
c. TPQ (Threshold Planning Quantity): Not Listed
d. Section 313: "Specific Toxic Chemical Listings" - 40 CFR Part 372 Methanol is subject to the reporting requirements of Section 313 and 40 CFR Part 372. Terra Nitrogen is required by 40 CFR 372.45 to notify certain customers as to which of its mixture or trade name products contain those chemicals. The purpose of that notification is to ensure that facilities that may be subject to reporting requirements of Section 313 and that use products of unknown formulation will have knowledge that they are receiving products that contain chemicals subject to those reporting requirements.

CERCLA Hazardous Substances List:

a. RQ (Reportable Quantity): 5000 pounds or approx. 755 gallons
b. Regulation: "Designation, Reportable Quantities, Notification" - 40 CFR 302

TSCA Inventory:

Listed (RTECS)

16. OTHER INFORMATION

Nov. 5, 1996: The MSDS was rewritten to comply with ANSI Standard Z400.1-1993.

Feb. 16, 1999: Revised to make minor typographical and editorial changes.

April 1, 2001: Revised to change the mailing address of Terra Nitrogen Corporation and to make minor editorial changes.

The information and recommendations herein are taken from data contained in independent, industry-recognized references including but not limited to NIOSH, OSHA, NFPA, D.O.T. ERG, MEDITEXT, HAZARDTEXT, CHRIS, and SAX's Dangerous Properties of Industrial Materials - ninth edition. Thus, Terra Nitrogen Corporation makes no guarantee, warranty or other representation concerning this substance, since conditions of its use are beyond the control of the company. Terra Nitrogen Corporation disclaims any liability for loss or damage incurred in connection with the use of this substance.

Innovative technologies and services for environmental professionals.

ENVIRONMENTAL BUSINESS SPECIALISTS, LLC

Safety Data Sheet
BOOST™ Wastewater Micronutrient Supplement

Section 1: Identification

1.1 PRODUCT IDENTIFIER:
Product Name: BOOST
Product Number: Not available
CAS Number: Not applicable
Synonyms: Micronutrient
Product Description: Wastewater Micronutrient Supplement
Product Type: Dry powder

1.2 RELEVANT IDENTIFIED USES OF THE SUBSTANCE/MIXTURE AND USES ADVISED AGAINST:
Product Uses: Wastewater Micronutrient

1.3 DETAILS OF THE SUPPLIER OF THE SAFETY DATA SHEET:
Environmental Business Specialists, LLC
1930 Surgi Drive
Mandeville, LA USA 70448
E-mail: info@ebsbiowizard.com
Website: www.ebsbiowizard.com

1.4 EMERGENCY TELEPHONE NUMBER/S:
Emergency Phone Number: (800) 424-9300 (CHEMTREC)
Company Phone Number: (985) 674-0660
Company Fax Number: (985) 674-3483

Section 2: Hazards Identification

2.1 CLASSIFICATION OF SUBSTANCE OR MIXTURE:
Acute Toxicity, Oral Category 4: Harmful if swallowed.
Acute Toxicity, Dermal Category 5: May be harmful if contacts skin.
Acute Toxicity, Inhalation Category 5: May be harmful if inhaled.

2.2 LABEL ELEMENTS:
Signal Word: Warning.
Hazard Pictograms:

Hazard Statements: May cause slight irritation to eyes, skin, respiratory system, and digestive tract.
Precautionary Statement:
Prevention: Wear protective gloves. Wear eye and face protection.
Response: IF INGESTED, give large quantities of water to dilute. Consult a physician promptly. IF ON SKIN OR CLOTHING, immediately flush skin with water. If irritation persists, seek medical attention. IF IN EYES, immediately flush eyes thoroughly with water for at least 15 minutes. If irritation persists, seek medical attention.
Storage: Keep out of extreme temperatures. Avoid strong acids and alkali compounds. Avoid oxides of carbon and nitrogen.
Disposal: Disposal is subject to federal, state, and local regulations.

2.3 OTHER HAZARDS:
Other Hazards That Do Not Result in Classification: Not applicable.

Section 3: Composition/Information on Ingredients

3.1 Buffering agents: 50%
Bran carrier and growth media: 50%
Contains no hazardous components as listed in 29 CFR 1900.1000 or other pertinent sections of OSHA regulations.

Compound	Percentage	CAS No.
Sodium sesquicarbonate	40-60%	533-96-0-2

Section 4: First Aid Measures

4.1 DESCRIPTION OF FIRST AID MEASURES:
Eye Contact: Immediately flush eyes with plenty of water for at least 15 minutes. Examine and treat by medical personnel.
Skin Contact: Remove contaminated clothing and footwear. Wash material off the skin with plenty of soap and water. Wash clothing and footwear before reuse.
Inhalation: Remove victim to fresh air.
Ingestion: May lead to nausea or diarrhea. Drink water to dilute. Call poison control center. Induce vomiting only if advised by physician or poison control center.

4.2 MOST IMPORTANT SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED:
Potential Acute Health Effects
Eye Contact: Slight irritation.
Skin Contact: Skin irritation.
Inhalation: Slight hazard.
Ingestion: Material is slightly toxic.
Over-Exposure Signs/Symptoms
Eye Contact: Adverse symptoms may include the following: pain or irritation, watering, redness.
Skin Contact: Adverse symptoms may include the following: irritation, redness.
Inhalation: Not considered an inhalation hazard.
Ingestion: Adverse symptoms may include the following: nausea, diarrhea, and diuresis.

4.3 INDICATION OF ANY IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED:
Notes to Physician: Treat symptoms. Contact poison control center immediately if large quantities have been ingested.
Specific Treatments: No specific treatment.

Section 5: Firefighting Measures

5.1 EXTINGUISHING MEDIA:
Suitable Extinguishing Media: No special requirements; water and foam are suitable.
Unsuitable Extinguishing Media: All acceptable.

5.2 SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OR MIXTURE:
Hazards from the Substance or Mixture: No hazards exist.
Hazardous Combustion Products: None known.

5.3 ADVICE FOR FIREFIGHTERS:
Special Precautions for Firefighters: In event of fire, wear a NIOSH-approved self-contained breathing apparatus. Use water spray to keep containers cool.
Special Protective Equipment for Firefighters: NIOSH-approved self-contained breathing apparatus and protective clothing should be worn in fighting fires involving chemicals.

Section 6: Accidental Release Measures

6.1 PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT, AND EMERGENCY PROCEDURES:
For Non-Emergency Personnel: Wear approved respirator for nuisance dust during cleanup.
For Emergency Responders: Refer to section 5.3 for specialized equipment.

6.2 ENVIRONMENTAL PRECAUTIONS:
No special precautions.

6.3 METHODS AND MATERIALS FOR CONTAINMENT AND CLEANING UP:
Small Spills: For small spills, flush to waste treatment sewer (product is biodegradeable).
Large Spills: For large spills, contain and collect for reuse.
Accidental: In case of accident or road spill notify CHEMTREC (800-424-9300).

Section 7: Handling and Storage

7.1 PRECAUTIONS FOR SAFE HANDLING:
Protective Measures: Prevent skin and eye contact.
Advice on General Occupational Hygiene: Wash hands thoroughly with soap and water after use.

7.2 CONDITIONS FOR SAFE STORAGE, INCLUDING INCOMPATIBILITIES:
Keep Out of Reach of Children.

7.3 SPECIFIC END USE(S):
Recommendations: Not available.
Industrial Sector-Specific Solutions: Not available.

Section 8: Exposure Controls/Personal Protection

8.1 CONTROL PARAMETERS:
Occupational Exposure Limits: Minimize exposure in accordance with good hygiene practice.

8.2 EXPOSURE CONTROLS:
Appropriate Engineering Controls: None known.
Individual Protection Measures
Hygiene Measures: Minimize exposure in accordance with good hygiene practice.
Eye/Face Protection: None required.
Skin Protection
Hand Protection: None required.
Body Protection: None required.
Respiratory Protection: None required as product is contained in water soluble bags.

Section 9: Physical and Chemical Properties

9.1 **Physical State:** Powder
Color: Straw
Odor: Musty
Odor Threshold: Not available.
pH (typical): 6.0 to 9.0 @ 1% in water
Melting Point/Freezing Point: Not available.
Boiling Point: Not available.
Flash Point: Non-flammable.
Evaporation Rate: Not applicable.
Flammable Limits: Not applicable.
Burning Time: Not available.
Burning Rate: Not available.
Upper/Lower Flammability/Explosive Limits: Not available.
Vapor Pressure: Not available.
Vapor Density: Not available.
Density (lb/gal): Not available.
Solubility (ies): Dispersible in water
Partition Coefficient: n- octanol/water: Not available.
Auto-Ignition Temperature: Not available.
Decomposition Temperature: Not available.
Viscosity: Not available.
Specific Gravity (@ 60^{O}F): 0.6 to 0.7 grams/cc

Section 10: Stability and Reactivity

10.1 **REACTIVITY:** No specific reactivity data available for product or product ingredients.

10.2 **CHEMICAL STABILITY:** Stable during normal use and storage.

10.3 **POSSIBILITY OF HAZARDOUS REACTIONS:** Will not occur.

10.4 **CONDITIONS TO AVOID:** Avoid extreme temperatures.

10.5 **INCOMPATIBLE MATERIALS:** Strong acids or alkali compounds may inactivate cultures. Incompatible with aluminum powder, fluorine, and molten lithium.

10.6 **HAZARDOUS DECOMPOSITION PRODUCTS:** Oxides of carbon and nitrogen. Can release large amounts of carbon dioxide gas.

Section 11: Toxicology Information

11.1 **INFORMATION ON TOXICOLOGICAL EFFECTS:**

Acute Toxicity:

Product/Ingredient Name	Result	Species	Dose	Exposure
BOOST	N/A	N/A	N/A	N/A

Irritation/Corrosion:

Product/Ingredient Name	Result	Species	Dose	Exposure
BOOST	N/A	N/A	N/A	N/A

Sensitizer: Not available.
Mutagenicity: None known.
Carcinogenicity: Not available.
Reproductive Toxicity: Not available.
Teratogenicity: Not available.
Specific Target Organ Toxicity (Single Exposure): Not available.
Specific Target Organ Toxicity (Repeated Exposure): Not available.
Aspiration: Not available.

INFORMATION ON TOXICOLOGICAL EFFECTS: CONT'D

Likely Routes of Exposure: Routes of entry include oral, dermal, and inhalation.

Potential Acute Health Effects

Inhalation: May cause allergic response in susceptible or hypersensitive individuals upon repeated or prolonged exposure.

Ingestion: May lead to nausea or diarrhea. Relative to other materials, this product is rarely toxic by ingestion. Irritation of the mouth, pharynx, esophagus and stomach may develop following ingestion.

Skin Contact: May cause slight irritation if prolonged exposure or if individual has a history of dermal allergic reaction.

Eye Contact: May cause irritation.

Symptoms Related to Physical, Chemical, and Toxicological Characteristics

Inhalation: Adverse symptoms may include nausea, vomiting, or headache.

Ingestion: Adverse symptoms may include nausea, vomiting, headache, diarrhea, or diuresis.

Skin Contact: No specific data.

Eye Contact: Adverse symptoms may include pain, irritation, watering, or redness.

Delayed/Immediate Effects and Chronic Effects From Short and Long-Term Exposure

Short-term Exposure: Not available.

Long-term Exposure: Not available.

Potential Chronic Health Effects: Not available.

Section 12: Ecological Information

12.1 Toxicity: No toxicity studies have been conducted on this product.

12.2 Persistence and Degradability: Not available.

12.3 Bioaccumulative Potential: Not available.

12.4 Mobility in Soil: Not available.

12.5 Results of PBT and vPvB Assessment: Not available.

12.6 Other Adverse Effects: Proper use and disposal should not cause a significant environmental impact. Slightly toxic to non-toxic based on the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) acute toxicity ratings.

Section 13: Disposal Considerations

13.1 Product

Methods of Disposal: Disposal of this product or product residues must be in accordance with all local, state, and federal regulations.

13.2 Packaging

Methods of Disposal: Rinse thoroughly and dispose according to local, state, and federal regulations.

Section 14: Transportation Information

D.O.T Proper Shipping Name: Chemicals not otherwise indexed [NOI], non-hazardous.
Hazard Class: Not applicable.

Section 15: Regulatory Information

OSHA: This product is not known to be a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200

TSCA: All intentional ingredients are listed on the TSCA inventory.

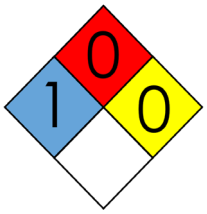
SARA: **Compound**	**CAS No.**	**311**	**312**	**313**
Sodium sesquicarbonate	533-96-0-2	YES	YES	NO

CERCLA Reportable Quantity: Not applicable.

State of California, Proposition 65: No components of these products are listed under state of California Proposition 65 to cause cancer and birth defects or other reproductive harm.

Section 16: Other Information

NFPA 704: National Fire Protection Association



0 = minimal hazard, 1 = slight hazard, 2 = moderate hazard,
3 = severe hazard, 4 = extreme hazard

This product is a non-pressure, non-hazardous, non-flammable, non-regulated, safe-handling dry product.

N/A = Not Available/Not Applicable

Issue Date: 6/1/2014
Expiration Date: 6/1/2017

Material Safety Data Sheet

Revision Issued: 1/31/2013	Supersedes: 10/23/2009	First Issued: 4/11/1996

Section I – Product and Company Identification

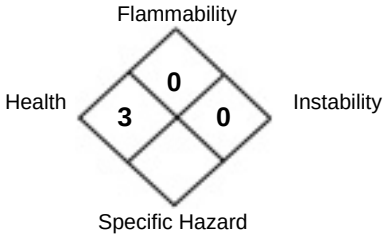
Product Name: **Phosphoric Acid 85-90% Food Grade**

PotashCorp MSDS No.: 88
ERG No.: 154

1101 Skokie Blvd., Northbrook, IL 60062
Phone (800) 241-6908 / (847) 849-4200

Suite 500, 122 – 1st Avenue South
Saskatoon, Saskatchewan Canada S7K7G3
Phone (800) 667-0403 from Canada
(800) 667-3930 from USA

Emergencies (800) 424-9300 (CHEMTREC)
Web Site www.potashcorp.com
Health Emergencies, Contact Your Local Poison Center



NFPA Code

Common Name: Phosphoric Acid	**Formula:** H_3PO_4	**Synonym:** DCMA, DCMA85, FG85, FG85LS, LAA, LAALS	**Uses:** Food Grade, Industrial

Section II – Composition / Information On Ingredients

Chemical Name	CAS No.	Exposure Limits								% by Weight
		OSHA PEL		TLV – TWA		STEL		CEIL		
		mg/m³	ppm	mg/m³	ppm	mg/m³	ppm	mg/m³	ppm	
Phosphoric Acid	7664-38-2	1		1		3				85-90

Section III – Hazard Identification

Potential Acute Health Effects:			
Eyes and Skin:	Contact causes eye irritation, may cause burns or blindness. Substance is corrosive. May cause severe burns and ulceration.		
Inhalation:	Inhalation can cause irritation or corrosive burns to the upper respiratory system, including nose, mouth, and throat. Lung irritation, pulmonary edema, and chemical pneumonitis can also occur.		
Ingestion:	Ingestion causes irritation and can cause corrosive burns to mouth, throat and stomach resulting in hemorrhaging and permanent damage. Can be fatal if swallowed.		
Potential Chronic Health Effects:	Long-term exposure may cause upper respiratory disease and irritation of the skin.		
CARCINOGENICITY LISTS	**IARC Monograph:** No	**NTP:** No	**OSHA:** No

Section IV – First Aid Measures

Eyes:	Immediately flush eyes (holding eyelids apart) with plenty of water for at least 15 minutes. Get medical attention.
Skin:	Immediately flush skin with plenty of water while removing contaminated clothing. Get medical attention if irritation develops or persists.
Ingestion:	Do not induce vomiting. Drink large amounts of water (or milk if available) to dilute the acid. Get medical attention immediately.
Inhalation:	Remove to fresh air. If breathing has stopped, give artificial respiration with the aid of a pocket mask equipped with a one way valve or other proper respiratory medical device. If breathing with difficulty, give oxygen. Observe for possible delayed reaction.

Section V – Fire Fighting Measures			
Flash Point:	Non-flammable	**Autoignition Temperature:**	Not Applicable
Lower Explosive Limit:	Not Applicable	**Upper Explosive Limit:**	Not Applicable
Unusual Fire and Explosion Hazards:	Phosphoric Acid is not flammable however the following hazards can occur when exposed to extreme heat: release of phosphorus oxides and/or phosphine from thermal decomposition and hydrogen from reaction with metals.		
Extinguishing Media:	Phosphoric acid is not flammable; use most appropriate agent to extinguish surrounding material.		
Special Firefighting Procedures and Equipment:	Keep personnel removed from and upwind of fire. Wear full fire-fighting turn-out gear (full Bunker gear) and respiratory protection (SCBA). Cool containers containing phosphoric acid with water spray to prevent rupture.		

Section VI – Accidental Release Measures	
Small Spill:	Neutralize acid spill with alkali such as soda ash, sodium bicarbonate, limestone or lime. Absorb material with an inert material such as sand, vermiculite, diatomaceous earth or other absorbent material and place in chemical waste container to be disposed at an appropriate waste disposal facility according to current applicable laws and regulations and product characteristics at time of disposal. Adequate ventilation is required for soda ash due to the release of carbon dioxide gas. No smoking in spill area.
Large Spill:	Contain spill with dikes and transfer the material to appropriate containers for reclamation or disposal. Absorb remaining spill with an inert material such as sand, vermiculite or other absorbent material and place in chemical waste container to be disposed at an appropriate waste disposal facility according to current applicable laws and regulations and product characteristics at time of disposal. Neutralize residue with alkali such as soda ash, sodium bicarbonate, limestone or lime. Adequate ventilation is required for soda ash due to the release of carbon dioxide gas. No smoking in spill area.
Release Notes:	If spill could potentially enter any waterway, including intermittent dry creeks, contact the local authorities. If in the U.S., contact the US COAST GUARD NATIONAL RESPONSE CENTER toll free number 800-424-8802. In case of accident or road spill notify: CHEMTREC IN USA at 800-424-9300; CANUTEC in Canada at 613-996-6666 CHEMTREC in other countries at (International code)+1-703-527-3887.
Comments:	See Section XIII for disposal information and Section XV for regulatory requirements. Large and small spills may have a broad definition depending on the user's handling system. Therefore, the spill category must be defined at the point of release by technically qualified personnel.

Section VII – Handling and Storage	
Ventilation:	Use with adequate ventilation.
Handling:	Use appropriate personal protective equipment as specified in Section VIII. Avoid contact with skin and eyes. Avoid inhalation and ingestion.
Storage:	Store in unopened container in cool, well ventilated area, away from potential sources of heat and fire. Keep away from combustible materials, strong bases and metals. Large storage tanks should be bermed and electrically grounded. Avoid using unprotected steel containers.

Section VIII – Exposure Controls/ Personal Protection	
Engineering Controls:	Good ventilation should be sufficient to control airborne levels.
Personal Protection:	
Eye Protection:	Wear chemical splash goggles and face shield (ANSI Z87.1 or approved equivalent) when eye and face contact is possible due to splashing or spraying of material.
Protective Clothing:	Where contact is likely, wear chemical-resistant gloves, a chemical suit, rubber boots and chemical safety goggles plus a face shield.
Respiratory Protection:	Wear NIOSH approved respiratory protective equipment when vapor or mists may exceed applicable concentration limits.
Other Protective Clothing or Equipment:	Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower.

Section IX – Physical and Chemical Properties

Appearance/Color/Odor:	Clear, colorless liquid with no odor	**Boiling Point:**	158ºC (85% H_3PO_4)
Melting Point/Range:	21.1ºC (85% H_3PO_4)	**Boiling Point Range:**	135-158ºC (75-85% H_3PO_4)
Solubility in Water:	750-850 g/L (high solubility)(75-85% H_3PO_4)	**Vapor Pressure (mmHg):**	2-1 mm Hg @ 25ºC (low volatility))
Specific Gravity:	1.7 @ 25ºC/15.5ºC	**Molecular Weight:**	98
Vapor Density:	3.4 (air = 1)	**% Volatiles:**	Not Applicable
Bulk Density:	14 lbs/gal	**Evaporation Rate:**	Not Applicable
pH:	1-1.5 at 1-10 g/L	**Freezing Point:**	21.1ºC (85% H_3PO_4)
Viscosity:	47-72 cp @ 20ºC, 23-33 cp @ 40ºC	**Density:**	1.68-1.74 g/mL @ 25^{O}C

Section X – Stability and Reactivity

Stability:	This product is hygroscopic, but is stable under normal conditions of storage, handling and use.
Hazardous Polymerization:	Will not occur
Conditions to Avoid:	High temperatures
Materials to Avoid (Incompatibles):	Bases, aluminum, copper, mild steel, brass and bronze
Hazardous Decomposition Products:	Phosphorus oxides and/or phosphine from thermal decomposition and hydrogen gas from reaction with metals.

Section XI – Toxicological Information

Significant Routes of Exposure:	Eyes, Skin, Respiratory System, Digestive Tract	
Toxicity to Animals:	**Acute Oral Toxicity:**	(Rat) LD_{50} = 1,530 mg/kg bw.
	Acute Inhalation Toxicity:	(Guinea pig, mouse, rat, rabbit) 1-hr: LC_{50} = 61 – 1,689 mg/m^3 P_2O_5. .
	Acute Toxicity: Other Routes:	No data available
	Acute Dermal Toxicity:	(Rabbit) 24–hr: LD_{50} (85-75% H_3PO_4) = >1,260 – >3,160 mg/kg bw.
	Repeated Dose Toxicity:	No data available
	Eye & Skin Irritation/Corrosion:	Eye: (Rabbit) OECD Guideline 405: Not irritating at 17% solution but severe irritation at higher concentrations. Skin: (Rabbit) 24-hr: Highly irritating to corrosive.
Special Remarks on Toxicity to Animals:	**Developmental Toxicity/Teratogenicity:**	No data available
	Bacterial Genetic Toxicity In-Vitro: Gene Mutation:	(S. *typhimurium*) Bacterial reverse mutation assay: Negative
	Non-Bacterial Genetic Toxicity In-Vitro: Chromosomal Aberration:	(Sea urchin) Embryo and sperm assays: Aberrations caused at pH 6.5.
	Toxicity to Reproduction:	(Rat) One-generation: 375 mg/kg bw did not affect offspring growth in rats.
	Carcinogenicity:	No data available
Other Effects on Humans:	Inhalation: 10,000 mg/m^3 is immediately dangerous to life (IDLH). Dermal contact: May irritate eyes and skin.	
Special Remarks on Chronic Effects on Humans	No data available	
Special Remarks on Other Effects on Humans:	No data available	

Section XII – Ecological Information

Ecotoxicity	**EPA Ecological Toxicity rating :**	High
	Acute Toxicity to Fish:	(L. *macrochirus* (bluegill sunfish)) 96-hr static: LC_{50} = pH 3.0–3.5.
	Chronic Toxicity to Fish:	Mosquito fish: LC_{50} = 138 mg/L; 96 hours
	Acute Toxicity to Aquatic Invertebrates:	(*Daphnia magna*) 12-hr static: EC_{50} = pH 4.6; (*Daphnia pulex*) 12-hr static: EC_{50} = pH 4.1; (*Gammarus pulex*) 12-hr static: LC_{50} = pH 3.4.
	Chronic Toxicity to Aquatic Invertebrates:	No data available
	Toxicity to Aquatic Plants:	Dangerous to aquatic plants at high concentrations.
	Toxicity to Bacteria:	(Activated sludge): EC_{50} = pH 2.55.
	Toxicity to Soil Dwelling Organisms:	No data available
	Toxicity to Terrestrial Plants:	(Peas, beans, beets, rapeseed and weeds) Sprayed with 15-20% solution of H_3PO_4: Foliage was destroyed on all plants.
Environmental Fate:	**Stability in Water:**	Ionic dissociation in water.
	Stability in Soil:	Dissolves some soil material (carbonates).
	Transport and Distribution:	Under acidic soil conditions, sparsely soluble phosphates tend to solubilize and may migrate to water.
Toxicity:	Inorganic phosphates have the potential to increase the growth of freshwater algae, whose eventual death will reduce the available oxygen for aquatic life.	
Degradation Products:	**Biodegradation:**	Under anaerobic conditions, microorganisms may degrade the product to phosphine.
	Photodegradation:	No data available

Section XIII – Disposal Considerations

Product Disposal:	Dispose of waste at an appropriate waste disposal facility according to applicable laws and regulations. Neutralize with lime or other base. Collect in appropriate containers. Dispose of at an appropriate waste disposal facility in accordance with current applicable laws and regulations and product characteristics at time of disposal.
General Comments:	None

Section XIV – Transportation Information

	USDOT	**TDG - Canada**
Proper Shipping Name:	Phosphoric Acid, Solution	Phosphoric Acid, Solution
Hazard Class:	8	8
Identification Number:	UN1805	UN1805
Packing Group (Technical Name):	III	III
Labeling / Placarding:	Corrosive	Corrosive
Authorized Packaging:	Rail: Class DOT 103, 104, 105, 109, 111, 112, 114, 115, or 120 tank car tanks; Class 106 or 110 multi-unit tank car tanks and AAR Class 203W, 206W, and 211W tank car tanks. Truck: DOT specification MC 300, MC 301, MC 302, MC 303, MC 304, MC 305, MC 306, MC 307, MC 310, MC 311, MC 312, MC 330, MC 331, DOT 406, DOT 407, and DOT 412 cargo tank motor vehicles.	
Notes:	TDG Note (Canada): If product exceeds the CERCLA Reportable Quantity, the notation “RQ” shall be added before or after the basic shipping description.	

Section XV – Regulatory Information

UNITED STATES: SARA Hazard Category:

This product has been reviewed according to the EPA Hazard Categories promulgated under Section 311 and 312 of the Superfund Amendment and reauthorization Act of 1986 (SARA title III) and is considered, under applicable definitions, to meet the following categories:

Fire:	No	Pressure Generating:	No	Reactivity:	No	Acute:	Yes	Chronic:	No

40 CFR Part 355 - Extremely Hazardous Substances:	None Applicable
40 CFR Part 370 - Hazardous Chemical Reporting:	Applicable
All intentional ingredients listed on the TSCA inventory.	

SARA Title III Information: This product contains the following substances subject to the reporting requirements of Title III (EPCRA) of the Superfund amendments and Reauthorization Act of 1986 and 40 CFR Part 372:

Chemical	CAS NO.	Percent by Weight	CERCLA RQ (lbs)	SARA (1986) Reporting		
				311	312	313
Phosphoric Acid	7664-38-2	85-90	5000	Yes	Yes	No

CERCLA/Superfund, 40 CFR Parts 117, 302: If this product contains components subject to substances designated as CERCLA reportable Quantity (RQ) Substances, it will be designated in the above table with the RQ value in pounds. If there is a release of RQ Substance to the environment, notification to the National Response Center, Washington D.C. (1-800-424-8802) is required.

CANADA:

WHMIS Hazard Symbol and Classification:	This product is WHMIS controlled. Category E
Ingredient Disclosure List:	This product does contain ingredient(s) on this list
Environmental Protection:	All intentional ingredients are listed on the DSL (Domestic Substance List).

EINECS#: (Phosphoric Acid) 231-633-2

California: Prop 65: This is not a chemical known to cause cancer, nor is it listed.

Section XVI – Other Information

NFPA Hazard Ratings:	Health: 3	Flammability: 0	Instability: 0	Special Hazards:
	0 = Insignificant	1 = Slight	2 = Moderate	3 = High 4 = Extreme

COMMENTS:	
Section(s) changed since last revision:	

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Material Safety Data Sheet

Material Name: Sodium Bicarbonate

ID: C1-184

* * * Section 1 - Chemical Product and Company Identification * * *

Part Number: Technical, Industrial, Conditioned, USP
Chemical Name: Sodium Bicarbonate
Product Use: For Commercial Use
Synonyms: Sodium hydrogen carbonate; sodium acid carbonate; carbonic acid monosodium salt; bicarbonate of soda; baking soda.
Supplier Information

Chem One Ltd.
8017 Pinemont Drive, Suite 100
Houston, Texas 77040-6519

Phone: (713) 896-9966
Fax: (713) 896-7540
Emergency # (800) 424-9300 or (703) 527-3887

General Comments: FOR COMMERCIAL USE ONLY; NOT TO BE USED AS A PESTICIDE.
NOTE: Emergency telephone numbers are to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure, or accident involving chemicals. All non-emergency questions should be directed to customer service.

* * * Section 2 - Composition / Information on Ingredients * * *

CAS #	Component	Percent
144-55-8	Sodium Bicarbonate	99-100

Component Information/Information on Non-Hazardous Components
This product is not considered hazardous under 29 CFR 1910.1200 (Hazard Communication).

* * * Section 3 - Hazards Identification * * *

Emergency Overview
Sodium Bicarbonate is an odorless solid, consisting of white granules or powder. Prolonged or repeated contact may cause irritation to the eyes, skin, and the respiratory system. When heated to decomposition it emits acrid smoke, fumes, and carbon dioxide. Firefighters should wear full protective equipment and clothing.

Hazard Statements
CAUTION! PROLONGED OR REPEATED CONTACT MAY CAUSE IRRITATION TO THE EYES, SKIN, AND RESPIRATORY SYSTEM. Avoid breathing dust. Do not get in eyes, on skin or on clothing. Keep container closed when not in use. Use with adequate ventilation. Wash thoroughly after handling.

Potential Health Effects: Eyes
Dusts can irritate the eyes.

Potential Health Effects: Skin
Prolonged or repeated skin contact with this product may cause mild irritation.

Potential Health Effects: Ingestion
Sodium Bicarbonate is of low oral toxicity; however, ingestion of large amounts of Sodium Bicarbonate can cause metabolic alkalosis. Symptoms of overexposure may include thirst, abdominal pain, gastroenteritis, and inflammation of the gastrointestinal tract. Distention or rupture of the gastrointestinal tract can occur, due to generation of carbon dioxide gas. Chronic ingestion of Sodium Bicarbonate in large quantity produces "rebound" in acid secretion and may also cause crystallization of phosphates in kidney leading to kidney stones. Chronic ingestion of Sodium Bicarbonate can lead to interference in the blood-clotting process.

Potential Health Effects: Inhalation
Dusts of this product can be irritating to the respiratory system. Symptoms may include coughing and choking. Chronic inhalation exposure may cause increase in mucosal flow in the nose and respiratory system airways. This symptom normally disappears after exposure ends.

HMIS Ratings: Health Hazard: 1 **Fire Hazard:** 0 **Physical Hazard:** 0
Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe * = Chronic hazard

* * * Section 4 - First Aid Measures * * *

First Aid: Eyes
Immediately flush eyes with plenty of water for 15 minutes. If irritation develops or persists, seek medical attention immediately.

First Aid: Skin
If irritation occurs, wash gently and thoroughly with water and non-abrasive soap. If irritation persists, seek medical attention.

First Aid: Ingestion
DO NOT INDUCE VOMITING, unless directed by medical personnel. Have victim rinse mouth thoroughly with water, if conscious. Never give anything by mouth to a victim who is unconscious or having convulsions. If vomiting occurs naturally, have victim lean forward to reduce risk of aspiration. Contact a physician or poison control center immediately.

* * * Section 4 - First Aid Measures (Continued) * * *

First Aid: Inhalation

Remove source of contamination or move victim to fresh air. Apply artificial respiration if victim is not breathing. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Administer oxygen if breathing is difficult. Get immediate medical attention.

First Aid: Notes to Physician

Provide general supportive measures and treat symptomatically.

* * * Section 5 - Fire Fighting Measures * * *

Flash Point: Not available
Method Used: Not available
Upper Flammable Limit (UEL): Not available
Lower Flammable Limit (LEL): Not available
Auto Ignition: Not available
Flammability Classification: Not available
Rate of Burning: Not available

General Fire Hazards

If extremely large quantities of Sodium Bicarbonate are involved in a fire, significant levels of carbon dioxide may be generated. Soda ash (sodium carbonate), another decomposition product resulting from heating above 200 deg F, is a respiratory, skin, and eye irritant.

Hazardous Combustion Products

When heated to decomposition Sodium Bicarbonate emits acrid smoke, fumes, and carbon dioxide and sodium oxides.

Extinguishing Media

Use methods for the surrounding fire and other materials involved in the fire. Use water spray, dry chemical, carbon dioxide or foam.

Fire Fighting Equipment/Instructions

Firefighters should wear full protective clothing including self contained breathing apparatus.

NFPA Ratings: Health: 1 **Fire:** 0 **Reactivity:** 0 **Other:**
Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

* * * Section 6 - Accidental Release Measures * * *

Containment Procedures

Stop the flow of material, if this can be done without risk. Contain the discharged material. If sweeping of a contaminated area is necessary use a dust suppressant agent, which does not react with product (see Section 10 for incompatibility information).

Clean-Up Procedures

Wear appropriate protective equipment and clothing during clean-up. Shovel the material into waste container. Thoroughly wash the area after a spill or leak clean-up. Prevent spill rinsate from contamination of storm drains, sewers, soil or groundwater.

Evacuation Procedures

Evacuate the area promptly and keep upwind of the spilled material. Isolate the spill area to prevent people from entering. Keep materials which burn away from spilled material. In case of large spills, follow all facility emergency response procedures.

Special Procedures

Remove soiled clothing and launder before reuse. Avoid all skin contact with the spilled material. Have emergency equipment readily available.

* * * Section 7 - Handling and Storage * * *

Handling Procedures

All employees who handle this material should be trained to handle it safely. Do not breathe dust. Avoid all contact with skin and eyes. Use this product only with adequate ventilation. Wash thoroughly after handling.

Storage Procedures

Keep container tightly closed when not in use. Store containers in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Material should be stored in secondary containers or in a diked area, as appropriate. Store containers away from incompatible chemicals (see Section 10, Stability and Reactivity). Storage areas should be made of fire-resistant materials. Post warning and “NO SMOKING” signs in storage and use areas, as appropriate. Use corrosion-resistant structural materials, lighting, and ventilation systems in the storage area. Floors should be sealed to prevent absorption of this material. Inspect all incoming containers before storage, to ensure containers are properly labeled and not damaged. Have appropriate extinguishing equipment in the storage area (i.e., sprinkler system, portable fire extinguishers).

* * * Section 7 - Handling and Storage (Continued) * * *

Storage Procedures (continued)

Sodium Bicarbonate tablets and effervescent tablets should be stored in tightly closed containers at a temperature less than 40 deg C, preferably between 15-30 deg C. Sodium Bicarbonate injection should be stored at a temperature less than 40 deg C, preferably between 15-30 deg C; freezing should be avoided. Empty containers may contain residual particulates; therefore, empty containers should be handled with care. Never store food, feed, or drinking water in containers which held this product. Keep this material away from food, drink and animal feed. Do not store this material in open or unlabeled containers. Limit quantity of material stored.

* * * Section 8 - Exposure Controls / Personal Protection * * *

Exposure Guidelines

A: General Product Information

No exposure guidelines have been established.

B: Component Exposure Limits

ACGIH, OSHA, and NIOSH have not developed exposure limits for any of this product's components.

The exposure limits given are for Particulates Not Otherwise Classified (PNOC).

OSHA: 15 mg/m^3 TWA (Total dust)
5 mg/m^3 TWA (Respirable fraction)
DFG MAKs 4 mg/m^3 TWA (Inhalable fraction)
1.5 mg/m^3 TWA (Respirable fraction)

Engineering Controls

Use mechanical ventilation such as dilution and local exhaust. Use a corrosion-resistant ventilation system and exhaust directly to the outside. Supply ample air replacement. Provide dust collectors with explosion vents.

PERSONAL PROTECTIVE EQUIPMENT

The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132). Please reference applicable regulations and standards for relevant details.

Personal Protective Equipment: Eyes/Face

Wear safety glasses with side shields or chemical goggles. If necessary, refer to U.S. OSHA 29 CFR 1910.133.

Personal Protective Equipment: Skin

Wear appropriate work gloves for type of operation. Rubber gloves are recommended. If necessary, refer to U.S. OSHA 29 CFR 1910.138.

Personal Protective Equipment: Respiratory

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask. If respiratory protection is needed, use only protection authorized in the U.S. Federal OSHA Standard (29 CFR 1910.134), applicable U.S. State regulations. Oxygen levels below 19.5% are considered IDLH by OSHA. In such atmospheres, use of a full-facepiece pressure/demand SCBA or a full facepiece, supplied air respirator with auxiliary self-contained air supply is required under OSHA's Respiratory Protection Standard (1910.134-1998).

Personal Protective Equipment: General

Have an eyewash fountain and safety shower available in the work area. Use good hygiene practices when handling this material including changing and laundering work clothing after use.

* * * Section 9 - Physical & Chemical Properties * * *

Physical Properties: Additional Information

The data provided in this section are to be used for product safety handling purposes. Please refer to Product Data Sheets, Certificates of Conformity or Certificates of Analysis for chemical and physical data for determinations of quality and for formulation purposes.

Appearance:	White, crystalline powder	**Odor:**	Odorless
Physical State:	Solid	**pH:**	8.3 (0.1 molar aq. soln @ 25 deg C); 8-9 (saturated soln)
Vapor Pressure:	Not applicable	**Vapor Density:**	Not applicable
Boiling Point:	Decomposes	**Freezing/Melting Point:**	50 deg C (122 deg F) [decomposes]
Solubility (H2O):	9.6 g/100g H_2O at 20 deg C	**Specific Gravity:**	2.16 @ 20 deg C
Other Solubilities:	Insoluble in alcohol	**Particle Size:**	Not available
Bulk Density:	56-62.5 lb/ft3	**Molecular Weight:**	84.01
		Chemical Formula:	NaHCO3

* * * Section 10 - Chemical Stability & Reactivity Information * * *

Chemical Stability

Stable in dry air at room temperature. In moist air, Sodium Bicarbonate slowly decomposes generating carbon dioxide.

Chemical Stability: Conditions to Avoid

Heat and moisture and exposure to incompatibly chemicals.

Incompatibility

Avoid contact with oxidizing agents and strong acids. Contact with monoammonium phosphate, especially in the presence of water, may cause pressure to build due to the generation of ammonia and carbon dioxide gas; moisture will accelerate this reaction. Sodium potassium alloy can result in a violent reaction with certain extinguishing agents, such as Sodium Bicarbonate. Mixtures of Sodium Bicarbonate with 2-furaldehyde can spontaneously ignite, upon exposure to air. Sodium Bicarbonate is incompatible with dopamine hydrochloride, pentazocine lactate, many alkalodial salts, aspirin and bismuth salicylate.

Hazardous Decomposition

When heated to decomposition Sodium Bicarbonate emits acrid smoke, fumes, and carbon dioxide and sodium oxides. Decomposition in water also generates carbon dioxide.

Hazardous Polymerization

Will not occur.

* * * Section 11 - Toxicological Information * * *

Acute and Chronic Toxicity

A: General Product Information

Dusts can irritate the eyes. Prolonged or repeated skin contact with this product may cause mild irritation. Sodium Bicarbonate is of low oral toxicity; however, ingestion of large amounts of Sodium Bicarbonate can cause metabolic alkalosis. Sever alkalosis may be characterized by hyperirritability and tetany. In rare cases, cerebral edema can occur. Renal failure could occur in severe cases. Other human systemic effects include urine retention, changes in potassium levels, expansion of extracellular fluid volume, nausea and vomiting. Symptoms of overexposure may include thirst, abdominal pain, gastroenteritis, and inflammation of the gastrointestinal tract. Dusts of this product can be irritating to the respiratory system. Symptoms may include coughing and choking. Presumably, inhalation or ingestion of Sodium Bicarbonate over a long period of time might result in increased serum sodium levels, possibly with increased blood pressure and water retention. Evidence indicates that chronic use of Sodium Bicarbonate can interfere with the blood clotting process and that chronic ingestion of large amounts can lead to kidney stones.

B: Component Analysis - LD50/LC50

Sodium Bicarbonate (144-55-8)

LD_{50} (Oral-Rat) 4220 mg/kg ; LD_{50} (Oral-Mouse) 3360 mg/kg

B: Component Analysis - TDLo/TCLo/LD/LDLo

Sodium Bicarbonate (144-55-8)

TDLo (Intraperitoneal-Mouse) 40 mg/kg (female 7 days post): Teratogenic effects; TDLo (Oral-Infant) 1260 mg/kg: Pulmonary system effects, KID; TDLo (Oral-Man) 20 mg/kg/5 days-intermittent: Gastrointestinal tract effects; LC (Inhalation-Rat) > 900 mg/m^3; TCLo (Inhalation-Rat) 77200 µg/kg/17 weeks

Carcinogenicity

A: General Product Information

No carcinogenicity data available for this product.

B: Component Carcinogenicity

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

Epidemiology

Information not available.

Neurotoxicity

Information not available.

Mutagenicity

Mutation data are reported during unscheduled DNA synthesis via oral route to rats: Unscheduled DNA Synthesis (Oral-Rat) 50,400 mg/kg/4 week-continuous

Teratogenicity

Sodium Bicarbonate was not teratogenic in rats, mice, or rabbits. Sodium Bicarbonate should not be ingested during pregnancy due to the potential for sodium retention.

Other Toxicological Information

Information not available.

* * * Section 12 - Ecological Information * * *

Ecotoxicity

A: General Product Information

No information available.

B: Aquatic Toxicity

LC_{50} (mosquito fish) 24 hours = 7700 mg/L; LC_{50} (mosquito fish) 48 hours = 7550 mg/L; LC_{50} (bluegill sunfish) 96 hours = 8250-9000 mg/L; Immobilization Threshold (*Daphnia* water flea) = 2350 mg/L; LC_{50} (mosquito fish) 24 hours = 7700 mg/L

Environmental Fate

Sodium Bicarbonate has no biological oxygen demand and will not cause oxygen depletion in aquatic environments. Persistence: If released to water, no significant effect is expected.

* * * Section 13 - Disposal Considerations * * *

US EPA Waste Number & Descriptions

A: General Product Information

As shipped, product is not considered a hazardous waste by the EPA.

B: Component Waste Numbers

No EPA Waste Numbers are applicable for this product's components.

Disposal Instructions

Review federal, provincial, and local government requirements prior to disposal. Disposal by controlled incineration or secure landfill may be acceptable.

* * * Section 14 - Transportation Information * * *

NOTE: The shipping classification information in this section (Section 14) is meant as a guide to the overall classification of the product. However, transportation classifications may be subject to change with changes in package size. Consult shipper requirements under I.M.O., I.C.A.O. (I.A.T.A.) and 49 CFR to assure regulatory compliance.

US DOT Information

Shipping Name: Non-regulated.
Hazard Class: Not Applicable
UN/NA #: Not Applicable
Packing Group: Not Applicable
Required Label(s): None
Additional Info.: None.

International Air Transport Association (IATA)

For Shipments by Air transport: We classify this product as hazardous (Class 9) when shipped by air because 49 CFR 173.140 (a). "For the purposes of this subchapter, miscellaneous hazardous material (Class 9) means a material which presents a hazard during transportation, but which does not meet the definition of any other hazard class. This class includes: (a) Any material which has an anesthetic, noxious, or other similar property which could cause extreme annoyance or discomfort to a flight crew member so as to prevent the correct performance of assigned duties."

UN: UN 3077
Proper Shipping Name: Environmentally hazardous substance, solid, n.o.s. (sodium bicarbonate)
Hazard Class: 9
Packing Group: III
Passenger & Cargo Aircraft Packing Instruction: 911
Passenger & Cargo Aircraft Maximum Net Quantity: 400 kg
Limited Quantity Packing Instruction (Passenger & Cargo Aircraft): Y911
Limited Quantity Maximum Net Quantity (Passenger & Cargo Aircraft): 30 kg
Special Provisions: A97 A149
ERG Code: 9L

International Maritime Organization (I.M.O.) Classification

I.M.O. Classification: Sodium Bicarbonate is not regulated by the I.M.O.

* * * Section 15 - Regulatory Information * * *

US Federal Regulations

A: General Product Information

Other federal regulations may apply.

B: Component Analysis

None of this products components are listed under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65), or CERCLA (40 CFR 302.4).

SARA 302 (EHS TPQ) There are no specific Threshold Planning Quantities for Sodium Bicarbonate. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lbs. (4,540 kg) therefore applies, per 40 CFR 370.20.

C: Sara 311/312 Tier II Hazard Ratings:

Component	CAS #	Fire Hazard	Reactivity Hazard	Pressure Hazard	Immediate Health Hazard	Chronic Health Hazard
Sodium Bicarbonate	144-55-8	No	No	No	Yes	No

State Regulations

A: General Product Information

Other state regulations may apply.

B: Component Analysis - State

None of this product's components are listed on the state lists from CA, FL, MA, MN, NJ, or PA.

Component	CAS #	CA	FL	MA	MN	NJ	PA
Sodium Bicarbonate	144-55-8	No	No	No	No	No	No

Other Regulations

A: General Product Information

Not determined.

B: Component Analysis - Inventory

Component	CAS #	TSCA	DSL	EINECS
Sodium Bicarbonate	144-55-8	Yes	Yes	Yes

C: Component Analysis - WHMIS IDL

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

Component	CAS #	Minimum Concentration
Sod Sodium Bicarbonate	144-55	No disclosure limit.

ANSI Labeling (Z129.1):

CAUTION! PROLONGED OR REPEATED CONTACT MAY CAUSE IRRITATION TO THE EYES, SKIN, AND RESPIRATORY SYSTEM. Do not taste or swallow. Do not get on skin or in eyes. Avoid breathing dusts or particulates. Keep from contact with clothing. Keep container closed. Use only with adequate ventilation. Wash thoroughly after handling. Wear gloves, goggles, faceshields, suitable body protection, and NIOSH/MSHA-approved respiratory protection, as appropriate. **FIRST-AID:** In case of contact, immediately flush skin or eyes with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. If inhaled, remove to fresh air. If ingested, do not induce vomiting. Get medical attention. **IN CASE OF FIRE:** Use water fog, dry chemical, CO_2, or "alcohol" foam. **IN CASE OF SPILL:** Absorb spill with inert material. Place residue in suitable container. Consult Material Safety Data Sheet for additional information.

Material Name: Sodium Bicarbonate

ID: C1-184

* * * Section 16 - Other Information * * *

Other Information

Other Information

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Key/Legend

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

Contact: Sue Palmer-Koleman, PhD

Revision Log

08/22/00 3:14 PM SEP Changed company name, Sect 1 and 16, from Corporation to Ltd.
05/31/01 9:31 AM HDF Checked exposure limits; made changes to Sect 9; overall review, add SARA 311/312 Haz Ratings.
08/20/01 3:10 PM CLJ Add Shipments by Air information to Section 14, Changed contact to Sue, non-800 Chemtrec Num.
09/26/03 3:25 PM HDF General review of entire MSDS. Up-graded Section 3 Health Hazard information, HMIS categories. Up-dated storage information in Section 7. Up-dated PNOC exposure limits to Section 8. Addition of currently available toxicity data to Section 11. Up-Dated Section 14 Transportation Information.
06/22/05 10:27AM SEP Update IATA Section 14
10/22/07 3:06 PM SEP Update IATA Section 14

This is the end of MSDS # C1-184

Univar USA Inc Material Safety Data Sheet

MSDS No:	65099
Version No:	009 2007-11-05
Order No:	

Univar USA Inc., 17425 NE Union Hill Rd., Redmond WA 98052
(425) 889 3400

Emergency Assistance

For emergency assistance involving chemicals call
Chemtrec - (800) 424-9300

The Version Date and Number for this MSDS is : 11/05/2007 - #009

PRODUCT NAME: SODIUM BISULFITE SOLUTION

MSDS NUMBER: 65099

DATE ISSUED: 01/15/2006

SUPERSEDES: 07/19/2002

ISSUED BY: 008752

****
****

MATERIAL SAFETY DATA SHEET

PRODUCT: SODIUM BISULFITE SOLUTION

SECTION 1 - MANUFACTURER INFORMATION

Distributor:
UNIVAR USA, INC.
17425 NE Union Hill Road
Redmond WA 98052
425-889-3400

FOR TRANSPORTATION EMERGENCY ONLY - DAY OR NIGHT
CALL CHEMTREC, 1-800-424-9300

SECTION 2 -- PRODUCT IDENTITY/HAZARDOUS INGREDIENTS INFORMATION

Product name: SODIUM BISULFITE SOLUTION

Chemical name/synonyms: Sodium Bisulfite, Aqueous Solution; Sodium Acid Sulfite; Sodium Hydrogen Sulfite

Chemical formula: $NaHSO_3$
CAS number: 7631-90-5
Product Code: N/A

HAZARDOUS INGREDIENTS: Yes

Component	CAS No.	% by wt.
Sodium Bisulfite	7631-90-5	27-42%

Exposure limits:

ACGIH TLV:	5 mg/m3, 8-hr TWA
OSHA PEL:	None

IDLH None

NON-HAZARDOUS INGREDIENTS: Yes

Component	CAS No.	% by wt.
Water	7732-18-5	Balance

OSHA 29 CFR 1910.1200 EVALUATION: Hazardous

SECTION 3 -- PHYSICAL/CHEMICAL CHARACTERISTICS

APPEARANCE AND ODOR: Clear, yellow liquid with an odor of sulfur dioxide.
BOILING POINT: >100 deg C
MELTING POINT: no information
VAPOR PRESSURE (REID): 78 mm Hg @ 37.7 deg C
VAPOR DENSITY (AIR = 1): no information
SPECIFIC GRAVITY (WATER = 1): 1.26 to 1.37 @ 25 deg C
PERCENT VOLATILE BY VOL@ 55 deg C: no information
EVAPORATION RATE (BUTYL ACETATE = 1): <1
pH: 3 to 5
SOLUBILITY IN WATER: Complete

SECTION 4 -- FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP METHOD): N/A
FLAMMABLE LIMITS IN AIR, % BY VOLUME: N/A LOWER: N/A UPPER: N/A

EXTINGUISHING MEDIA: Use water, foam, dry chemical, or CO2 fire extinguishers as appropriate to fight surrounding fires. Do not allow water run-off to enter sewers or watercourses.

SPECIAL FIRE FIGHTING PROCEDURES: Wear protective clothing and protective equipment as appropriate for surrounding fire. Keep storage tanks or containers cool. Flood with water. Wear self contained breathing apparatus for major exposure when release of SO2 gas is possible.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Releases sulfur dioxide gas when heated.

SECTION 5 -- REACTIVITY DATA

STABILITY: Stable

HAZARDOUS POLYMERIZATION: will not occur

INCOMPATIBILITY (CONDITIONS AND MATERIALS TO AVOID): Material is stable when properly handled. Reacts with acids, oxidizing agents, and with heat to form toxic sulfur dioxide (SO2) gas. Avoid sources of heat.

HAZARDOUS DECOMPOSITION PRODUCTS: Decomposes with heat or oxidizing agents to

Annotation:
release toxic SO_2 gas.

SECTION 6 -- HEALTH HAZARD DATA

PRIMARY ROUTES OF ENTRY: Inhalation, ingestion, direct contact

HEALTH EFFECTS (ACUTE AND CHRONIC):
GENERAL: A skin, eye and mucous membrane irritant. Only moderately toxic by ingestion but may cause a severe allergic reaction in some asthmatics and others who are hypersensitive to sulfites. Hazards are largely those from acute exposure or direct contact rather than chronic or repeated low level exposure. The potential for exposure to sulfur dioxide must always be considered as well, particularly when the solution may become overheated.

INHALATION: Inhalation will irritate and may damage upper respiratory tract and lungs. INGESTION: May irritate gastrointestinal tract. Concentrated solutions may cause burns to the digestive tract.

DIRECT CONTACT: Direct skin contact with the solution will cause slight to Moderate skin irritation with discomfort, rash and, rarely, an allergic reaction.

EYE CONTACT: Exposure to mists or aerosols of this solution will cause eye Irritation with possible discomfort, tearing, or blurring of vision. If left untreated the solution may cause burns and some eye tissue damage.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: May cause a severe allergic reaction in some asthmatics and others who are hypersensitive to sulfites.

CARCINOGENS (NTP, IARC, OR OSHA): No

SECTION 7 -- FIRST AID

INHALATION: Remove victim to fresh air. If not breathing, perform artificial respiration and get medical attention.

INGESTION: Drink copious quantities of water or milk. Do not induce vomiting. Get immediate medical attention.

DIRECT CONTACT: Wipe off excess. Flush immediately with water for at least 15 minutes while removing contaminated clothing. Get immediate medical attention. Wash clothing before re-use. Destroy contaminated shoes.

DIRECT EYE CONTACT: Flush immediately with water for at least 15 minutes. Forcibly hold eyelids apart to ensure complete irrigation of eye/lid tissue. Get immediate medical attention.

SECTION 8 -- PRECAUTIONS FOR SAFE STORAGE, HANDLING AND USE

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: Keep storage tanks and containers out of the sun and away form sources of heat and ignition to

Annotation:
prevent decomposition and release of SO2 gas. Containers should be kept tightly closed to prevent oxidation of the product. In cold weather, store product at temperatures above 50 deg F to avoid crystallization. Do not strike containers or fittings with tools or hard objects. Emptied container retains vapor and product residue.

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Contain spill in order to prevent contamination of sewage system or waterway. If possible, neutralize on a dry basis with sodium carbonate or sodium bicarbonate; then flush with water in accordance with applicable regulations.

WASTE DISPOSAL METHODS: Dispose of spilled, neutralized, or waste product, contaminated soil and other contaminated materials in licensed landfill or treatment facility in accordance with all local, state and federal regulations.

SECTION 9 -- EXPOSURE CONTROL INFORMATION

VENTILATION: Provide ventilation to control exposure levels below airborne exposure limits. Use local exhaust ventilation. Reference NFPA Standard 91 for design of exhaust systems.

RESPIRATORY PROTECTION: Use NIOSH/MSHA approved, full-face respirator with canister approved for sulfuric acid/sulfur trioxide vapor and mist. Consult respirator manufacturer to determine appropriate equipment. If concentrations are high or unknown, use self-contained breathing apparatus.

PROTECTIVE GLOVES: Wear impervious rubber gloves.

EYE PROTECTION: Wear splash proof chemical safety goggles. Eyewash fountains recommended in all storage and handling areas. Do not wear contact lenses.

OTHER PROTECTIVE EQUIPMENT: Wear protective clothing to prevent skin contact. Full face shield and rubber footwear should be used. Acid resistant hood and full body suit recommended. Safety shower recommended in all storage and handling areas.

WORK/HYGIENIC PRACTICES: Avoid breathing mist. Use gloves when handling.

OTHER PRECAUTIONS: None

SECTION 10 -- REGULATORY INFORMATION

USDOT & TRANSPORT CANADA:
Proper shipping name: Bisulfites, aqueous solutions, n.o.s. (sodium bisulfite solution)
Hazard Class: 8
Identification Number: UN2693
Packing Group: PGIII
Marine Pollutant: No
IMO Classification Class 8

SARA TITLE III 311/312 HAZARD CLASSIFICATIONS:

ACUTE:	Yes
CHRONIC:	No
FIRE:	No
REACTIVITY:	No
PRESSURE:	No

SARA TITLE III 313 HAZARD CLASSIFICATIONS:
This product does not contain any toxic chemicals subject to the Toxic Release reporting requirements.

OTHER RATINGS: (hazard index key: 4=severe, 3=serious, 2=moderate, 1=slight, 0=minimal)
HMIS: Health=1, Flammability=0, Reactivity=1, CORROSIVE (COR)
NFPA: Health=1, Flammability=0, Reactivity=1

OTHER INFORMATION:

CERCLA HAZARDOUS SUBSTANCE:	YES, RQ=5000 lbs.
RCRA 261.33:	No
TSCA 8(d):	Reported/Included

AQUATIC TOXICITY: Corrosive 96 hr LC50 (mosquito/fish) = 240 ppm. This solution is mildly acidic and has a high chemical oxygen demand (COD). Either the solution itself or water run-off from the material could pose a threat to nearby watercourses.

WHMIS:	Class E Corrosive Material
CANADA DSL:	Yes

Univar USA Inc Material Safety Data Sheet

For Additional Information contact MSDS Coordinator during business hours, Pacific time: (425) 889-3400

Notice

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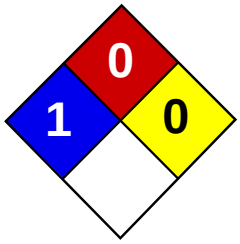
Do not use ingredient information and/or ingredient percentages in this MSDS as a product specification. For product specification information refer to a product specification sheet and/or a certificate of analysis. These can be obtained from your local Univar sales office.

All information appearing herein is based upon data obtained from the manufacturer and/or recognized technical sources. While the information is believed to be accurate, Univar makes no representations as to its accuracy or sufficiency. Conditions of use are beyond Univar's control and therefore users are responsible to verify this data under their own operating conditions to determine whether the product is suitable for their particular purposes and they assume all risks of their use, handling, and disposal of the product, or from the publication or use of, or reliance upon, information contained herein.

This information relates only to the product designated herein, and does not relate to its use in combination with any other material or in any other process



Health	1
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Sodium chloride MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sodium chloride

Catalog Codes: SLS3262, SLS1045, SLS3889, SLS1669, SLS3091

CAS#: 7647-14-5

RTECS: VZ4725000

TSCA: TSCA 8(b) inventory: Sodium chloride

CI#: Not applicable.

Synonym: Salt; Sea Salt

Chemical Name: Sodium chloride

Chemical Formula: NaCl

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Sodium chloride	7647-14-5	100

Toxicological Data on Ingredients: Sodium chloride: ORAL (LD50): Acute: 3000 mg/kg [Rat.]. 4000 mg/kg [Mouse]. DERMAL (LD50): Acute: >10000 mg/kg [Rabbit]. DUST (LC50): Acute: >42000 mg/m 1 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention.

Skin Contact:
Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops. Cold water may be used.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards: When heated to decomposition it emits toxic fumes.

Special Remarks on Explosion Hazards:
Electrolysis of sodium chloride in presence of nitrogenous compounds to produce chlorine may lead to formation of explosive nitrogen trichloride. Potentially explosive reaction with dichloromaleic anhydride + urea.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Do not ingest. Do not breathe dust. Avoid contact with eyes. Wear suitable protective clothing. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, acids.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Hygroscopic

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Solid crystalline powder.)

Odor: Slight.

Taste: Saline.

Molecular Weight: 58.44 g/mole

Color: White.

pH (1% soln/water): 7 [Neutral.]

Boiling Point: 1413°C (2575.4°F)

Melting Point: 801°C (1473.8°F)

Critical Temperature: Not available.

Specific Gravity: 2.165 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility:
Easily soluble in cold water, hot water. Soluble in glycerol, and ammonia. Very slightly soluble in alcohol. Insoluble in Hydrochloric Acid.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, high temperatures.

Incompatibility with various substances: Reactive with oxidizing agents, metals, acids.

Corrosivity: Not considered to be corrosive for metals and glass.

Special Remarks on Reactivity:
Hygroscopic. Reacts with most nonnoble metals such as iron or steel, building materials (such as cement) Sodium chloride is rapidly attacked by bromine trifluoride. Violent reaction with lithium.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 3000 mg/kg [Rat.]. Acute dermal toxicity (LD50): >10000 mg/kg [Rabbit]. Acute toxicity of the dust (LC50): >42000 mg/m3 1 hours [Rat].

Chronic Effects on Humans: MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast.

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Lowest Published Lethal Dose (LDL) [Man] - Route: Oral; Dose: 1000 mg/kg

Special Remarks on Chronic Effects on Humans:
Causes adverse reproductive effects in humans (fetotoxicity, abortion,) by intraplacental route. High intake of sodium chloride, whether from occupational exposure or in the diet, may increase risk of TOXEMIA OF PREGNANCY in susceptible women (Bishop, 1978). Hypertonic sodium chloride solutions have been used to induce abortion in late pregnancy by direct infusion into the uterus (Brown et al, 1972), but this route of administration is not relevant to occupational exposures. May cause adverse reproductive effects and birth defects in animals, particularly rats and mice (fetotoxicity, abortion, musculoskeletal abnormalities, and maternal effects (effects on ovaries, fallopian tubes) by oral, intraperitoneal, intraplacental, intrauterine, parenteral, and subcutaneous routes. While sodium chloride has been used as a negative control n some reproductive studies, it has also been used as an example that almost any chemical can cause birth defects in experimental animals if studied under the right conditions (Nishimura & Miyamoto, 1969). In experimental animals, sodium chloride has caused delayed effects on newborns, has been fetotoxic, and has caused birth defects and abortions in rats and mice (RTECS, 1997). May affect genetic material (mutagenic)

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: May cause skin irritation. Eyes: Causes eye irritation. Ingestion: Ingestion of large quantities can irritate the stomach (as in overuse of salt tablets) with nausea and vomiting. May affect behavior (muscle spasicity/contraction, somnolence), sense organs, metabolism, and cardiovascular system. Continued exposure may produce dehydration, internal organ congestion, and coma. Inhalation: Material is irritating to mucous membranes and upper respiratory tract.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations: TSCA 8(b) inventory: Sodium chloride

Other Regulations: EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC):
R40- Possible risks of irreversible effects. S24/25- Avoid contact with skin and eyes.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Splash goggles.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II.

Other Special Considerations: Not available.

Created: 10/11/2005 12:33 PM

Last Updated: 05/21/2013 12:00 PM

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(545138)

ALLIED UNIVERSAL CORPORATION

Headquarters: *3901 NW 115th Avenue, Miami, Florida 33178* *Phone:* (305) 888 - 2623

MATERIAL SAFETY DATA SHEET

May be used to comply with OSHA's Hazard Communication Standard, 29 CFR § 1910.1200.

TODAY'S DATE: 09/06/07 MSDS NUMBER: 0001

24 HOUR EMERGENCY CHEMICAL SPILL OR RELEASE PHONE NUMBERS:

Allied Universal Corp. *at* ***1-305-483-7732*** *(Digital Beeper) and/or* ***CHEMTREC*** *at* ***1-800-424-9300***

SECTION 1 CHEMICAL PRODUCT/COMPANY IDENTIFICATION

Sodium Hypochlorite

Product Names: Aqua Guard Chlorinating Sanitizer, Aqua Guard Bleach, Liquid Chlorine Solution, Liquid Bleach, Hypochlorite, Hypo and Chlorine Bleach.

Listed Strengths: 10.5%, 12.5% and 15% **CAS Number:** 7681-52-9

Date MSDS Revised: August 2007 (previous revision 11/04)

Product Use: Disinfectant and sanitizer, see product label for all approved uses & instructions.

NSF Approval: Yes. Certified to NSF/ANSI Standard 60. Maximum use in Potable Water is 84 mg/L for 12.5% bleach and 100 mg/L for 10.5% bleach.

NSF Non-Food Compounds Approval: Yes

SECTION 2 HAZARD INGREDIENTS/IDENTITY INFORMATION

Hazardous Ingredient(s): % (w/w) as Sodium Hypochlorite : 10.5-16%

Exposure Standards: None established for Sodium Hypochlorite, as Chlorine exposure standards are:

PEL (OSHA):	1 ppm as Cl_2	**STEL (OSHA):**	3 ppm as Cl_2
TLV (ACGIH):	0.5 ppm as Cl_2	**TWA (ACGIH):**	0.5 ppm as Cl_2
WEEL (AIHA):	2 mg/m3, 15 minute TWA as Cl_2	**STEL (ACGIH):**	1 ppm as Cl_2

Emergency Overview: May cause burns to the eyes, skin and mucous membranes.

SECTION 3 PHYSICAL/CHEMICAL CHARACTERISTICS

Alternate Name(s):	Bleach
Chemical Name:	Sodium Hypochlorite
Chemical Family:	Oxidizing Agent
Molecular Formula:	Na-O-Cl
Form:	Liquid
Appearance:	Water clear to a slight greenish-yellow, or light yellow aqueous solution
Odor:	Chlorine odor
pH:	11-14, dependent upon % weight as Sodium Hypochlorite
Vapor Pressure:	Not available
Vapor Density (Air=1):	Not available
Boiling Point:	Approximately 230º F (110º C)
Freezing Point:	14 F(8% w/w Cl_2 solution), 7 F(10% w/w Cl_2 solution), -3 F (12% w/w Cl_2 solution)
Solubility (Water):	Completely Soluble
Solubility (Other):	Reacts with Many Organic Solvents
Density:	Appx. 10 lbs. per gallon
Evaporation Rate:	Not Available
Specific Gravity:	1.126 (8% w/w Cl_2 solution), 1.163 (10% w/w Cl_2 solution), 1.202 (12% w/w Cl_2 solution), 1.25 (15% w/w Cl_2 solution)
Molecular Weight:	74.5

SECTION 4 STABILITY & REACTIVITY DATA

Chemical Stability	**Stable** __X__	**Unstable** _____

Incompatibility (Conditions to Avoid): Stability decreases with heat and light exposure.

Incompatibility (Materials to Avoid): May react violently with strong acids. Other incompatibles include strong caustics, ammonia, urea, reducing agents, organics, ether and oxidizable materials. Reaction with metals (nickel, iron, cobalt and copper) may produce oxygen gas, which supports combustion. May react with organohalogen compounds to

form spontaneously combustible compounds. May react explosively with nitro- and chloro-organic compounds as well as acids and reducing agents. Acidification liberates chlorine gas.
Hazardous Decomposition or Byproducts: Chlorine gas. Decomposes with heat and reacts with acids. Hazardous gases/vapors produced are hypochlorous acid, chlorine and hydrochloric acid. Composition depends upon temperature and decrease in pH. Additional decomposition products, which depend on pH, temperature and time, are sodium chloride and chlorate, and oxygen.

No Mechanical Shock or Impact	**No Static Discharge**	**Oxidizer: No if <12% by weight, Yes if > than 12% by weight**
Hazardous Polymerization	**May Occur _____**	**Will Not Occur __X__**

Note: Sodium Hypochlorite reacts violently with amines and ammonium salts. Solutions are reactive with common cleaning products such as toilet bowl cleaners, rust removers, vinegar, acids, organics and ammonia products to produce hazardous gases such as chlorine and other chlorinated species.

SECTION 5 POTENTIAL HEALTH EFFECTS AND FIRST AID INFORMATION

GENERAL: May cause immediate pain. Exposure to the skin may cause sensitization or other allergic responses. If the eye is not irrigated immediately after it has been exposed permanent eye damage may occur. Strict adherence to first aid measures following any exposure is essential. SPEED IS ESSENTIAL!

ROUTE(S) OF ENTRY AND POTENTIAL HEALTH EFFECTS	***EMERGENCY & FIRST AIDE PROCEDURES***
INHALATION: Strong irritating to mucous membranes in the nose, throat and respiratory tract. Prolonged contact can cause chronic irritation, pulmonary edema and central nervous system depression. Repeated inhalation exposure may cause impairment of lung function and permanent lung damage.	**If inhaled,** move expose person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. If breathing is difficult, have trained person administer oxygen. Call a poison control center or medical physician for further treatment advice. Have the product label or MSDS with you when calling or going for medical treatment.
SKIN CONTACT: Prolonged and repeated exposure to dilute solutions often causes irritation, redness, pain and drying and cracking of the skin. Human evidence has indicated that an ingredient in this product can cause skin sensitization. Depending upon the concentration and how soon after exposure the skin is washed with water, skin contact may cause burns and tissue destruction.	**If on skin or clothing,** take off all contaminated clothing and rinse skin immediately with plenty of water for 15-20 minutes. If irritation persists, repeat flushing. Do not transport victim unless the recommended irrigation period is completed unless flushing can be continued during transport. Call a poison control center or medical physician for treatment advice. Have the product label or MSDS with you when calling or going for medical treatment.
EYE CONTACT: Strongly irritating to eyes. Exposure to vapor can cause tearing, conjunctivitis and burning of the eyes. Eye contact may cause a corneal injury. The severity of the effects depend on the concentration and how soon after exposure the eyes are washed with water. In severe exposure cases, glaucoma, cataracts and permanent blindness may occur.	**If in eyes,** hold eye open and rinse slowly and gently with plenty of water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye for 10-15 minutes. Do not transport victim until the recommended flushing period is completed unless irrigation can be continued during transport. Call a poison control center or medical physician for further treatment advice. Have the product label and/or MSDS with you when calling or going to medical treatment.
INGESTION: Corrosive. Can cause severe corrosion of and damage to the gastrointestinal tract (including mouth, throat, and esophagus). Exposure is characterized by nausea, vomiting, abdominal pain, diarrhea, bleeding, and/or tissue ulceration.	**If swallowed,** call poison control center or medical physician immediately for treatment advice. Have the product label or MSDS with you when calling or going for medical treatment. Have exposed person sip a glass of water if able to swallow, and dilute immediately by giving milk, melted ice cream, starch paste or antacids such as milk of magnesia. Avoid sodium bicarbonate because of carbon dioxide release. DO NOT INDUCE VOMITING, LAVAGE OR ACIDIC ANTIDOTES unless told to do so by poison control center or medical physician. DO NOT give anything by mouth to an unconscious person. If spontaneous vomiting occurs, have victim lean forward with head down to avoid breathing in of vomitus, rinse mouth and administer more water.

NOTE TO PHYSICIAN(S): Pre-existing medical conditions may be aggravated by exposures affecting target organs. There are no known chronic effects. Probable mucosal damage may contraindicate the use of gastric lavage. In addition to the alkalinity of this product, the continued generation of chlorine gas after ingestion can damage further the stomach mucous, depending on the amount ingested. Consideration may be given to removal of the product from the stomach, taking care to avoid perforation of esophagus or stomach. An ounce of 1% sodium thiosulfate or milk of magnesia is helpful.

SECTION 6 TOXICOLOGICAL DATA

ANIMAL DATA: Inhalation 0.25-hour LC50 - 10.5 mg/L in rats; Acute Dermal LD50 - 10,000 mg/kg in rabbits; Acute Oral LD50 - 8910 mg/kg in rats

SUMMARY: The concentrated solution is corrosive to skin, and a 5% solution is a severe eye irritant. Solutions containing more than 5% available chlorine are classified by DOT corrosive (please see section 10 of this MSDS). Toxicity described in animals from single exposures by ingestion include muscular weakness, and hypoactivity. Repeated ingestion exposure in animals caused an increase in the relative weight of adrenal glands in one study, but no pathological changes were observed in two other studies. Long-term administration of compound in drinking water of rats caused depression of the immune system. No adverse changes were observed in an eight week dermal study of a 1% solution in guinea pigs. Tests in animals demonstrate no carcinogenic activity by either the oral or dermal routes. Tests in bacterial and mammalian cell cultures demonstrate mutagenic activity.

CARCINOGENICITY: None of the components present in this material at concentrations equal to or greater than 0.1% are listed by IARC, NTP, OSHA or ACGIH as carcinogen.

MUTAGENICITY: Sodium Hypochlorite has been shown to produce damage to genetic material when tested in vitro. Studies in vivo have shown no evidence of mutagenic potential for this material. It is judged that the risk of genetic damage is insignificant for sodium hypochlorite because of its biological activity, lack of mutagenicity in vivo, and failure to produce carcinogenic response.

SECTION 7 FIRE AND EXPLOSION HAZARD DATA

Flash Point: This product does not flash	**Flammable Limits (Lower):** Not Applicable	
Flammable Limits (Upper): Not Applicable	**Auto Ignition Temperature:** Not Applicable	
Decomposition Temperature: Not Applicable	**Rate of Burning:** Not Available	
Explosive Power: Not Available	**Sensitivity to Mechanical Impact:** Not expected to be sensitive to mechanical impact	**Sensitivity to Static Discharge:** Not expected to be sensitive to static discharge

Fire and Explosion Hazards: This material is non-flammable but is decomposed by heat and light, causing a pressure build-up which could result in an explosion. When heated, it may release chlorine gas or hydrochloric acid. Vigorous reaction with oxidizable or organic materials may result in fire.	**Extinguishing Media:** Use agents appropriate for surrounding fire. Foam, dry chemical, carbon dioxide, water fog or spray. If leak or spill has not ignited, use water spray to disperse the vapors and to protect persons attempting to stop the leak.
Fire Fighting Procedures: Water spray should be used to cool containers and may be used to knock down escaping vapor. Remove storage vessels from the fire zone.	**Fire Fighting Protective Equipment:** Full protective clothing, including a NIOSH approved self-contained breathing apparatus, must be worn in a fire involving this material. Toxic gas vapors are produced upon decomposition.

SECTION 8 ECOLOGICAL INFORMATION

The toxicity and corrosivity of this product is a function of concentration and the concentration's pH.

ECOTOXICOLOGICAL INFORMATION: Toxic to aquatic life. 96-hour LC50: fathead minnows: 0.090-5.9 mg/L, bluegill sunfish: 0.10-2.48 mg/L, shore crab: 1.418 mg/L, grass shrimp: 52.0 mg/L, scud: 0.145-4.0 mg/L, water flea: 2.1 mg/L.

ENVIRONMENTAL EFFECTS: Do not contaminate domestic or irrigation water supplies, lakes, streams, ponds, or rivers. May be an aesthetic nuisance due to color. Mammals and birds, exposed wildlife would be subject to skin irritation and burns due to the corrosive nature of this material.

SECTION 9 DISPOSAL CONSIDERATIONS

Treatment, storage, transportation, and disposal must be in accordance with applicable Federal, State, and Local regulations. Do not burn. Do not flush to surface water or sanitary sewer system. If pH of material is equal to or greater than a 12.5, the material is a RCRA Hazardous Waste D002, corrosive.

SECTION 10 TRANSPORT INFORMATION

U.S. DOT Basic Shipping Description: Hypochlorite Solutions, 8, UN1791, III

U.S. DOT Hazardous Substance: Yes, RQ 100 pounds (Sodium Hypochlorite)

U.S. DOT Marine Pollutant: No

U.S. DOT Required Label: Corrosive (see column 6, 49 CFR §172.101)

U.S. DOT Packaging Exception: Yes, if package meets the criteria of a limited quantity or consumer commodity as defined by 49 CFR §171.8, §173.144 and .154, and §172.312 and .316

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Transportation Emergency Phone Numbers: *CHEMTREC 1-800-424-9300*

SECTION 11 PRECAUTIONS FOR SAFE HANDLING AND STORAGE

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING: Take all precautions to avoid personal contact. Keep container closed except when transferring material. Locate safety shower and eyewash station close to chemical handling area. Use normal good industrial hygiene and housekeeping practices, wash thoroughly after handling. Store in a cool, dry, well-ventilated area, away from incompatibles (minimum distance of 20-25 feet per NFPA Code 1) and direct sunlight. Keep container properly labeled at all times. Vented containers must be used and must be kept closed when not

being used. Long-term storage is impossible without decomposition. Only use containers made from tinted glass, polyethylene & FRP. Keep out of reach of children.

PROCESS HAZARDS: Not Available

STORAGE TEMPERATURE: Store containers below 29°C and above freezing point. Do not expose sealed containers above 40°C. Try to store in the dark at the lowest possible temperature, but keep from freezing, to slow-down decomposition.

SECTION 12 EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS: Full handling precautions should be taken at all times. Provide good room ventilation plus local exhaust at points of emission and low level floor exhaust in immediate handling area. Where engineering controls are not feasible, use adequate local exhaust ventilation wherever mist, spray or vapor may be generated.

PERSONAL PROTECTIVE EQUIPMENT:

Eye: Use chemical safety goggles when there is potential for contact (splashing), faceshield recommended – ANSI Z87.1

Skin: Gloves and protective clothing (apron, boots, and bodysuits) made from rubber, vinyl, neoprene or PVC. Standard work clothing closed at the neck and wrist while wearing impervious equipment.

Respiratory (*Specify Type*): A NIOSH/MSHA approved air purifying respirator with an acid gas cartridge or canister may be permissible under circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air purifying respirators is limited. Use a positive pressure air supplied respirator if there is potential for uncontrolled releases, exposure levels are not known, or other circumstances where air purifying respirators may not provide adequate protection.

Other: Eyewash, shower station (ANSI Z358.1) must be provided within the immediate work area.

SECTION 13 ACCIDENTAL RELEASE MEASURES

Ventilate enclosed area. Collect product for recovery or disposal. For release to land, contain discharge by constructing dikes or applying inert absorbent; for release to water, utilize damming and/or water diversion to reduce the spread of contamination; and, for release to air, vapors may be suppressed by the use of a water fog. All run-off water must be captured for treatment and disposal. Collect contaminated soil and water, and absorbent for disposal. Notify applicable government authority if release is reportable or could adversely affect the environment. Please follow all Local, State and Federal Laws for clean-up and disposal of all contaminated material. **Deactivating Chemicals:** Sodium Sulfite, Sodium Thiosulfate and Sodium Bisulfite.

SECTION 14 REGULATORY INFORMATION

OSHA CLASSIFICATION, 29 CFR §1900-1910:

Physical Hazards: Reactivity **Health Hazards**: Acute - Skin Sensitizer, Corrosive

CERCLA AND SARA REGULATIONS, 40 CFR §300-373:

Reportable Quantity = 100 lb. **CERCLA Hazardous Material:** Yes

Title III Hazard Classifications: Acute - yes, Chronic - no, Fire - yes, Reactivity - yes & Sudden Release of Pressure - No. This product may be reportable under the requirements of 40 CFR §370.

SARA Extremely Hazardous Substance: No **SARA Toxic Chemical:** No **CA Prop 65:** No

FDA 21 CFR 178.1010: Yes, Approved as Sanitizer

NSF Whitebook (former USDA Approval) Listing: Aqua Guard Chlorinating Sanitizer 10.5% - 3D, B1, B2, D1, D2, G4, G7, GX, Q4, **Aqua Guard Bleach 12.5% -** 3D, B1, B2, D1, D2, G4, GX, Q4

EPA "CLEAN AIR ACT": This product does not contain nor is it manufactured with ozone depleting substances. It is not defined as a Hazardous Air Pollutant per 40 CFR 112.

EPA Pesticide: The 10.5% and 12.5% sodium hypochlorite products are registered with the U.S. EPA as a pesticide, as required under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). It is a violation of Federal law to use this product for pesticidal applications in a manner inconsistent with the FIFRA labeling.

NPCA-HMIS RATING: HEALTH: 3 FLAMMABILITY: 0 REACTIVITY: 2

NFPA RATING:NONE AT THIS TIME

SECTION 15 REFERENCES

Suppliers' Material Safety Data Sheets and EPA Labeling Requirements
Olin and OxyChem Sodium Hypochlorite Handbook
Chlorine Institute Sodium Hypochlorite Pamphlet #96
Chlorine Institute Product Stewardship Bulletins for Sodium Hypochlorite

Saltex, LLC
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Ft. Worth, TX 76132
USA Tel:
877-872-5839

MATERIAL SAFETY DATA SHEET
SODIUM SULFATE ANHYDROUS

January 1, 2015

SECTION I: CHEMICAL PRODUCT AND COMPANY INFORMATION

Product Name: Sodium Sulfate
General Use:
Common Synonyms: Sodium sulfate, Anhydrous; Sulfuric Acid, Disodium Salt; Disodium Sulfate
Chemical Family: Neutral Salts
Formula: Na_2SO_4
Formula Weight: 142.04
CAS No.: 7757-82-6
Manufacturer: Saltex, LLC

SECTION II: COMPOSITION/INFORMATION ON INGREDIENTS

Component	WEIGHT %	CAS #
Sodium Sulfate, Anhydrous	99 – 100	7757-82-6

Component	Hazard	OSHA STEL	OSHA PEL	ACGIH TLV
Sodium Sulfate, Anhydrous	Irritant	N/E	N/E	N/E

EXTENDED INFORMATION

SECTION III: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

CAUTION! MAY CAUSE IRRITATION. MAY BE HARMFUL IF SWALLOWED OR INHALED. HYGROSCOPIC. During use avoid contact with eyes, skin or clothing. Wash thoroughly after handling. When not in use, keep in tightly closed container.

POTENTIAL HEALTH EFFECTS

EYE CONTACT: Irritation

SKIN CONTACT: Irritation

INGESTION: Gastrointestinal irritation

INHALATION: Irritation of the upper respiratory tract.

CHRONIC: None identified

TARGET ORGANS: Respiratory system, lungs.

Primary routes of entry:

Inhalation ☑ Ingestion ☑
Skin Contact ☑ Eye Contact ☑

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: None identified

SECTION IIII: FIRST AID MEASURES

EYE CONTACT:

In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

SKIN CONTACT:

In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

INGESTION:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

INHALATION:
If a person breathers in large amounts, move the exposed person to fresh air.

NOTES TO PHYSICAN: None

SECTION V: FIRE FIGHTING INFORMATION

Flashpoint (Degrees C) and Method: N/A
Auto ignition Temperature (Degrees C): N/A

FLAMMABLE LIMITS:

Components	Upper Explosive Limit	Lower Explosive Limit
Sodium Sulfate, Anhydrous	N/A	N/A

GENERAL HAZARD:
Unusual Fire and Explosion Hazards: None Identified.

FIRE FIGHTING INSTRUCTIONS:
Use extinguishing media appropriate for surrounding fire.

FIRE FIGHTING EQUIPMENT:
Firefighters should wear proper protective equipment and self-contained breathing Apparatus with full facepiece operated in positive pressure mode.

EXTINGUISHING MEDIA:

Foam ☑ Alcohol Foam ☑ CO2 ☑
Dry Chemical ☑ Water ☑ Other ☑

HAZARDOUS COMBUSTION PRODUCTS:
Combustion may release sulfur dioxide.

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA):

NFPA Hazard Rating:	0 – Insignificant	1 – Slight	2 – Moderate
	3 - High	4 – Extreme	5 – Unknown
	*- No Information		

Health :0
Flammability :0
Reactivity :0

SPECIAL INFORMATION:

Contact Hazard:	Slight (1)
Explosion Data – Sensitivity to Mechanical Impact:	None Identified
Explosion Data - Sensitivity to Static Discharge:	None Identified

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SECTION VI: ACCIDENTAL RELEASE MEASURES

LAND SPILL:
Wear suitable protective clothing. Sweep up and remove.

SECTION VII: HANDLING AND STORAGE

GENERAL STORAGE CONDITIONS:
Keep container tightly closed. Keep from contact with oxidizing materials. Isolate from incompatible materials.
Special Precautions: material is hygroscopic.

SECTION VIII: EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS:
Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

PERSONAL PROTECTION:

RESPIRATOR:
None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

PROTECTIVE CLOTHING:
Safety goggles, rubber gloves recommended.

SECTION VIIII: PHYSICAL AND CHEMICAL PROPERTIES
Vapor Pressure (mmHg): N/A Solubility in Water: Appreciable
Specific Gravity (water=1): 2.68 pH: 6-10

Boiling Point (Degrees C): N/A Physical State: Sol.id
Freezing Point (Degrees C): 884 Vapor Density (air=1): N/A
Evaporation Rate (BuAc=1): N/A Percent Volatile by Volume:0
Viscosity: Odor: Odorless
Appearance: White crystals or powder

SECTION X: STABILITY AND REACTIVITY
GENERAL:

STABILITY:	HAZARDOUS POLYNERIZATION:
Stable: ☑	Will Not Occur: ☑
Unstable: ☐	Will Occur: ☐

INCOMPATIBLE MATERIALS:
Strong oxidizing agents.

CONDITIONS TO AVOID:
Moisture

HAZARDOUS DECOMPOSITION PRODUCTS:
Oxides of sulfur.

SECTION XI: TOXICOLOGIAL INFORMATION

GENERAL:
Sodium Sulfate, Anhydrous:
5989 mg/kg oral mouse LD50
Carcinogenicity: None identified
Reproductive Effects: None identified

CARCINOGENIC INFORMATION:

Component	CAS#	Weight%	IARC	NTP	OSHA	ACGIH	Other
Sodium Sulfate Anhydrous	7757-82-6	99-100	No	No	No	No	No

SECTION XII: ECOLOGICAL INFORMATION

Environmental Fate:
When released into the soil, this material is expected to leach into groundwater. This material is not expected to significantly bioaccumulate.
Environmental Toxicity:
This material is not expected to be toxic to aquatic life. The LC50/96-hour values for fish are over 100 mg/l. The EC50/48-hour values for daphnia are over 100 mg/l.

SECTION XIII: DISPOSAL CONSIDERATION
RCRA Hazard Class: None

METHOD OF DISPOSAL:

Dispose of in accordance with all applicable federal, state and local environmental regulations.

SECTION XIIII: TRANSPORTATION INFORMATION

DOT (Department of Transportation)

Proper Shipping Name:	Chemicals, n.o.s. (non-regulated)
Hazard Class:	None
Identification Number:	None / No UN Number assigned

SECTION XV: REGULATORY INFORMATION

TSCA (Toxic Substances Control Act):
In TSCA Inventory? Yes ☑ No ☐

CERCLA (Comprehensive Environmental Response Compensation, and Liability Act):
Classified as a Hazardous Substance? Yes ☐ No ☑

SARA TITLE III (Superfund Amendments and Reauthorization Act):
311/312 Hazard Categories:
Acute ☐ Chronic ☐ Flammability ☐ Pressure ☐ Reactivity ☐ None ☑

313 Reportable Ingredients: None

CALIFORNIA PROPOSITION 65: Not Listed

SECTION XVI: OTHER INFORMATION

Saltex, LLC provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose.

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N/A: Not Available, Not Applicable
N/D: Not Determined
N/E: Not Established

Cervantes~Delgado, Inc.

Product Name: CDI-High Purity Urea Solution, 50% (CDI HP-50)

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: CDI-High Purity Urea Solution, 50% (CDI HP-50)
Generic Name: Urea, Aqueous Solution
Chemical Family: Organic Salt Solution

Responsible Party: Cervantes~Delgado, Inc.
P.O. Box 9083
Brea, California 92822

For further information contact MSDS Coordinator
8am -4pm Pacific Time, Mon- Fri: 714-990-3940

EMERGENCY OVERVIEW

24 Hour Emergency Telephone Numbers:

For Chemical Emergencies:
Spill, Leak, Fire or Accident
Call CHEMTREC
North America: (800)424-9300
Others: (703)527-3887 (collect)

For Health Emergencies:
California Poison Control System
Cont. US: (800)356-3129
Outside US: (415)821-5338

Health Hazards: Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

Physical Hazards: None Anticipated
Physical Form: Liquid
Appearance: Colorless, clear
Odor: None to slight ammonia
Hazard Rating NFPA 704M / HMIS:

Health:	1 / 1
Flammability:	0 / 0
Reactivity:	0 / 0
Other:	0/

0 = Insignificant, 1= Slight, 2 = Moderate, 3 = High, 4 = Extreme

2. COMPOSITION/INFORMATION ON INGREDIENTS

No hazardous components identified per 29 CFR 1910.1200.

OTHER COMPONENTS	% Weight	EXPOSURE GUIDELINE Limits	Agency	Type
Urea CAS# 57-13-6	49-51	Not Established		
Water CAS# 7732-18-5	49-51	Not Established		
Methylenediurea* CAS# 13547-17-6	0.5-1.25	Not Established		

*Methylenediurea is in the class of materials known as Urea, reaction products (CAS# 68611-64-3).

Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

3. HAZARDS IDENTIFICATION

POTENTIAL HEALTH EFFECTS:

Eye: Contact may cause mild eye irritation including stinging, watering, and redness.

Skin: Contact may cause mild skin irritation including redness and burning. No harmful effects from skin absorption have been reported.

Inhalation (Breathing): No information available. Studies by other exposure routes suggest a low degree of toxicity by inhalation.

Ingestion (Swallowing): No harmful effects reported from ingestion.

Signs and Symptoms: Effects of overexposure may include irritation of the nose, throat and digestive tract, headaches, coughing, nausea, vomiting, and transient disorientation.

Cancer: Inadequate evidence available to evaluate the cancer hazard of this material.

Target Organs: No data available.

Developmental: Inadequate evidence available for this material.

Pre-Existing Medical Conditions: None known.

4. FIRST AID MEASURES

Eye: If irritation or redness develops, move victim away from exposure and into fresh air. Flush eyes with clean water. If symptoms persist, seek medical attention.

Skin: Remove contaminated shoes and clothing and cleanse affected area(s) thoroughly by washing with mild soap and water. If irritation or redness develops and persists, seek medical attention.

Inhalation (Breathing): If respiratory develop, move victim away from source of exposure and into fresh air. If symptoms persist, seek medical attention. If victim is not breathing, clear airway and immediately begin artificial respiration. If breathing difficulties develop, oxygen should be administered by qualified personnel. Seek immediate medical attention.

Ingestion (Swallowing): First aid is not normally required; however, if swallowed and symptoms develop, seek medical attention.

5. FIRE FIGHTING MEASURES

Flammable Properties: Flash Point: None to boiling
OSHA Flammability Class: Not applicable
LEL/UEL: No data
Autoignition Temperature: No data

Unusual Fire & Explosion Hazards: Closed containers exposed to extreme heat can rupture due to pressure buildup.

Extinguishing Media: Use extinguishing agent suitable for type of surrounding fire.

Fire Fighting Instructions: For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear. When the potential chemical hazard is unknown, in enclosed or confined spaces, or when explicitly required by DOT, a self-contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8). Isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done with minimal risk. Move undamaged containers from immediate hazard area if it can be done with minimal risk. Water spray may be useful in minimizing or dispersing vapors. Cool equipment exposed to fire with water, if it can be done with minimal risk.

6. ACCIDENTAL RELEASE MEASURES

Stop the source of the release if it can be done without risk. Immediately isolate the hazard area and restrict access to authorized personnel only. Wear appropriate protective equipment including respiratory protection as conditions warrant (see Section 8). To prevent spilled material from entering sewers, storm drains or natural watercourses, contain material with a dike or with appropriate absorbent materials such as sand, clay, soil or commercially available absorbent. Place reclaimed liquid and absorbent into recovery or salvage drums for disposal. Refer to Section 12 for appropriate disposal.

7. HANDLING AND STORAGE

Handling: Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits (see Section 2 and 8). Wash thoroughly after handling. Do not wear contaminated clothing or shoes. Use good personal hygiene practice.

Storage: Keep container(s) tightly closed. Do not heat or contact with strong oxidizers. Use and store this material in cool, dry, well- ventilated areas. Do not store at temperatures below 40°F. Store only in approved containers. Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering Controls: If current ventilation practices are not adequate to minimize exposure, additional ventilation or exhaust systems may be required.

Personal Protective Equipment (PPE):

Respiratory: Respiratory protection is not usually required. If significant spray or mist occurs, wear a NIOSH approved or equivalent dust respirator.

Skin: The use of gloves impermeable to the specific material handled is advised to prevent skin contact, possible irritation, and absorption (see glove manufacturer for information on permeability)

.

Eye/Face: Approved eye protection to safeguard against potential eye contact, irritation, or injury is recommended. Depending on conditions of use, a face shield may be necessary.

Other Protective Equipment: A source of clean water should be available in the work area for flushing eyes and skin. Impervious clothing should be worn as needed.

9. PHYSICAL AND CHEMICAL PROPERTIES

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm).

Flash Point:	None to boiling
Flammable/Explosive Limits (%):	Not Applicable
Autoignition Temperature:	Not Applicable
Appearance:	Colorless, Clear Physical State: Liquid
Odor:	None to slight ammonia
pH:	7.5 - 9.5
Vapor Pressure (mm Hg):	Not Applicable
Vapor Density (air=1):	0.6 H2O, >1
Aerosol Boiling Point:	>212°F
Freezing/Melting Point:	No data
Solubility in Water:	100%
Specific Gravity:	1.14
Evaporation Rate (nBuAc=1):	<1
Bulk Density:	9.5 lb/gal

10. STABILITY AND REACTIVITY

Chemical Stability: Stable under normal conditions of storage and handling.

Conditions To Avoid: None known

Incompatible Materials: Avoid contact with strong oxidizing agents such as chlorine (bleach), peroxides, chromates, nitric acid, perchlorates, concentrated oxygen or permanganates. Contact can generate heat, fires, explosions and release toxic fumes.

Hazardous Decomposition Products: If involved in a fire, oxides of carbon and nitrogen may be generated; exposure to heat may generate ammonia fumes.

Hazardous Polymerization: will not occur.

11. TOXICOLOGICAL INFORMATION

No definitive information available on carcinogenicity, mutagenicity, target organs or developmental toxicity.

12. DISPOSAL CONSIDERATIONS

This material, if discarded as produced, is not a RCRA "listed" or "characteristic" hazardous waste. Use resulting in chemical or physical change or contamination may subject it to regulation as a hazardous waste. Along with properly characterizing all waste materials consult state and local regulations regarding the proper disposal of this material.

Disposal: If this product becomes a waste, it does not meet the criteria of a hazardous waste as defined under the Resource Conservation and Recovery Act (RCRA) 40 CFR 261, since it does not have the characteristics of Subpart C, nor is it listed under Subpart D. As a non-hazardous liquid waste, it should be solidified with stabilizing agents such as sand, fly ash, or clay absorbent, so that no free liquid remains before disposal to an industrial waste landfill.

13. TRANSPORT INFORMATION

Hazard Class or Division: Not classified as hazardous

14. REGULATORY INFORMATION

This material contains the following chemicals subject to the reporting requirements of **SARA 313** and **40 CFR 372**.

--None--

Warning: This material contains the following chemicals which are known to the State of California to cause cancer, birth defects or other reproductive harm, and are subject to the requirements of **California Proposition 65** (CA Health & Safety Code Section 25249.5)

--None Known—

This material has not been identified as a carcinogen by NTP, IARC, or OSHA.

EPA (CERCLA) Reportable Quantity: --None--

15. DOCUMENTARY INFORMATION

Issue Date: 12/15/05
Previous Issue Date: 02/01/04

16. DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES

The information in this document is believed to be correct as of the date issued. **HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THIS INFORMATION, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE.** This information and product are furnished on the condition that the person receiving them shall make his own determination as to the suitability of the product for his particular purpose and on the condition that he assume the risk of his use thereof.

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	Modified	NA
H-2185A	2E	Boiler #1	2016	275.3 MMBtu/hr	Modified	NA
H-2185B	3E	Boiler #2	2016	275.3 MMBtu/hr	Modified	NA
U-1080	4E	Thermal Oxidizer	2016	11 MMBtu/hr	Modified	1C
TK-1055A	4E	Grit Clarifier Tank	2016	562,000 gal	Modified	1C
TK-1055B	4E	Stage 1 Clarifier Tank	2016	562,000 gal	Modified	1C
TK-1060A	4E	Clarifier Pump Tank A	2016	23,000 gal	Modified	1C
TK-1060B	4E	Clarifier Pump Tank B	2016	23,000 gal	Modified	1C
TK-1065	4E	Oil Collection Tank	2016	13,500 gal	Modified	1C
TK-1070	4E	Equalization Tank	2016	1,030,000 gal	Modified	1C
TK-2010	4E	Solids Clarifier Tank	2016	435,000 gal	Modified	1C
TK-2015	4E	Clarifier Effluent Tank	2016	12,000 gal	Modified	1C
TK-2020	4E	Stage 2 Sludge Holding Tank	2016	103,000 gal	Modified	1C
TK-2030	4E	Sludge Filtrate Tank	2016	8,200 gal	Removal	1C
TK-2040	4E	Thermal Feed Tank	2016	1,400,000 gal	Modified	1C
TK-2130	4E	Barometric Condenser Hot Well	2016	18,000 gal	Modified	1C
TK-2140	4E	Recovered Water Tank	2016	230,000 gal	Modified	1C
TK-2160	4E	4A Disposal Centrate Tank	2016	8,100 gal	Modified	1C
E-2076	4E	Deaerator Vent Condenser	2016	1,121 lb/hr flow	Modified	1C
TK-1120	4E	Stage 1 Sludge Holding Tank	2016	27,000 gal	New	1C
TK-1105A	4E	Stage 1 Reaction Tank A	2016	32,000 gal	New	1C
TK-1105B	4E	Stage 1 Reaction Tank B	2016	32,000 gal	New	1C
TK-1115	4E	Stage 1 Clarifier Pump Tank	2016	18,000 gal	New	1C
TK-1130	4E	Stage 1 Filtrate Tank	2016	1,700 gal	New	1C

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	Modified	NA
TK-4180	27E	Sulfuric Acid Storage Tank	2016	6,000 gal	Removal	NA
CT-2335	28E	Cooling Tower Basin	2015	34,500 gpm	NA	NA
U-1090	29E	Emergency Flare	2016	2.2 MMBtu/hr	New	2C
ENG-2	30E	Fire Water Pump Engine	2016	136 hp	New	NA
HTFUEL1	31E	Fuel Skid Heater 1	2016	2.4 MMBtu/hr	New	NA
HTFUEL2	32E	Fuel Skid Heater 2	2016	2.4 MMBtu/hr	New	NA

[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	100	NOx CO VOC PM10 SO2 Total HAPs CO2e	25.78 16.83 2.69 0.96 0.033 0.03 3598	1.29 0.84 0.13 0.048 0.0017 0.0015 179.9	25.78 16.83 2.69 0.96 0.033 0.03 3598	1.29 0.84 0.13 0.048 0.0017 0.0015 179.9	Gas/Vapor	EE	
2E	Upward vertical stack	H-2185A	Boiler 1			C	8,760	NOx CO VOC PM10 SO2 Total HAPs CO2e	10.03 10.17 1.10 2.75 0.16 0.51 32316	39.21 39.79 4.31 10.77 0.63 1.99 126393	10.03 10.17 1.10 2.75 0.16 0.51 32316	39.21 39.79 4.31 10.77 0.63 1.99 126393	Gas/Vapor	EE	
3E	Upward vertical stack	H-2185B	Boiler 2			C	8,760	NOx CO VOC PM10 SO2 Total HAPs CO2e	10.03 10.17 1.10 2.75 0.16 0.51 32316	39.21 39.79 4.31 10.77 0.63 1.99 126393	10.03 10.17 1.10 2.75 0.16 0.51 32316	39.21 39.79 4.31 10.77 0.63 1.99 126393	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-1130, TK-2020, TK-2140, E-2076)	Thermal oxidizer	1C	Thermal oxidizer	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Ammonia CO2e	--- --- 220.64 --- --- 0.47 57.68 167.68	--- --- 779.21 --- --- 1.34 244.03 274.41	1.08 0.93 4.41 1.3e-4 1.1e-5 9.5e-3 1.15 1461	4.74 4.08 15.58 5.9e-4 4.6e-5 2.7e-2 4.88 5939.2	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	

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

[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)	VOCs Total HAPs CO2e	75.91 0.40 52,406	62.76 0.36 47,820	35.29 0.12 16,455	25.58 0.11 15,015	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

Emergency Generator

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

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

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

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

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

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

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

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

8. Enter the Fuel Type using the following codes:

PQ	Pipeline Quality Natural Gas	RG	Raw Natural Gas

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

MD	Manufacturer's Data	AP	AP-42
GR	GRI-HAPCalc™	OT	Other:

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

KOHLER. POWER SYSTEMS

Emissions Data

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
2016 MODEL YEAR
CERTIFICATE OF CONFORMITY
WITH THE CLEAN AIR ACT

OFFICE OF TRANSPORTATION AND AIR QUALITY
ANN ARBOR, MICHIGAN 48105

Certificate Issued To: **Mitsubishi Heavy Industries, Ltd.**
(U.S. Manufacturer or Importer)

Certificate Number: GMVXL65.4BBA-012

Effective Date: 11/03/2015

Expiration Date: 12/31/2016

Byron J. Bunker, Division Director
Compliance Division

Issue Date: 11/03/2015

Revision Date: N/A

Model Year: 2016
Manufacturer Type: Original Engine Manufacturer
Engine Family: GMVXL65.4BBA

Mobile/Stationary Indicator: Stationary
Emissions Power Category: 560<kW<=2237
Fuel Type: Diesel
After Treatment Devices: No After Treatment Devices Installed
Non-after Treatment Devices: Engine Design Modification

Pursuant to Section 111 and Section 213 of the Clean Air Act (42 U.S.C. sections 7411 and 7547) and 40 CFR Part 60, and subject to the terms and conditions prescribed in those provisions, this certificate of conformity is hereby issued with respect to the test engines which have been found to conform to applicable requirements and which represent the following engines, by engine family, more fully described in the documentation required by 40 CFR Part 60 and produced in the stated model year.

This certificate of conformity covers only those new compression-ignition engines which conform in all material respects to the design specifications that applied to those engines described in the documentation required by 40 CFR Part 60 and which are produced during the model year stated on this certificate of the said manufacturer, as defined in 40 CFR Part 60.

It is a term of this certificate that the manufacturer shall consent to all inspections described in 40 CFR 1068 and authorized in a warrant or court order. Failure to comply with the requirements of such a warrant or court order may lead to revocation or suspension of this certificate for reasons specified in 40 CFR Part 60. It is also a term of this certificate that this certificate may be revoked or suspended or rendered void *ab initio* for other reasons specified in 40 CFR Part 60.

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

KOHLER Power Systems

2000REOZMD

60 HZ. DIESEL INDUSTRIAL GENERATOR SET
EMISSION DATA SHEET

ENGINE INFORMATION

Model:	Mitsubishi, S16R-Y2PTAW2-1	Bore:	170mm (6.69 in.)
Nameplate BHP @ 1800 RPM:	2923	Stroke:	180mm (7.09 in.)
Type:	4-Cycle, 16-V Cylinder	Displacement:	65.4 L (3989 cu. in.)
Aspiration:	Turbocharged	EPA Family:	GMVXL65.4BBA
Compression Ratio	14.0:1	EPA Certificate	GMVXL65.4BBA-012
Emission Control Device	Turbocharged and after cooled		

Table 1

PERFORMANCE DATA:	1/4 Standby	1/2 Standby	3/4 Standby	Full Standby
Engine bkW @ Stated Load	545.00	1090.00	1635.00	2180.00
Fuel Consumption (g/kWh)	254.00	232.00	229.00	235.00
Exhaust Gas Flow (m^3/s)				9.07
Exhaust Temperature (°C)				526.00

Table 2

EXHAUST EMISSION DATA:	EPA CERTIFICATE DATA
HC (Total Unburned Hydrocarbons)	0.56
NOx (Oxides of Nitrogen as NO2)	5.36
CO (Carbon Monoxide)	0.60
PM (Particular Matter)	0.17

Values are in g/KWh

TEST METHODS AND CONDITIONS

Data was recorded during steady-state rated engine speed (± 25 RPM) with full load (± 2%). Pressures, temperatures, and emission rates were stabilized

Fuel Spec	Type 2-D and ASTM D975 No.2D
Fuel Temperature	37 ± 10 ° C
Intake Temperature	25 ° C
Baro`metic Pressure	100 kPa (29.6 In Hg)
Relative Humidity	30 %
Standard	ISO 8178

The emission data here were taken from a single engine under the test condition shown above. These data are subjected to instrumentation and engine to engine variabilty.

Data and specifications subject to change without notice
For further information, please contact MENA, 630-268-0750

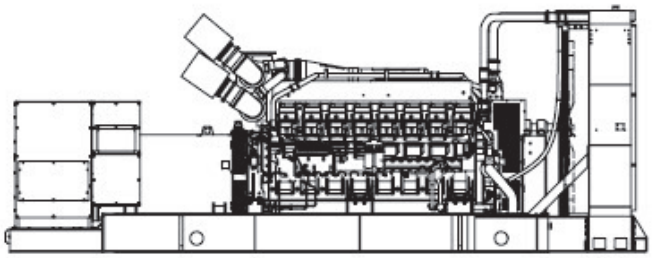
KOHLER. Power Systems

Spec Sheets

KOHLER. Power Systems

2000REOZMD
Diesel

ISO 9001 KOHLER POWER SYSTEMS NATIONALLY REGISTERED



Standard Features

- Kohler Co. provides one-source responsibility for the generating system and accessories.
- The generator set and its components are prototype-tested, factory-built, and production-tested.
- The 60 Hz generator set offers a UL 2200 listing.
- The generator set accepts rated load in one step.
- The 60 Hz generator set meets NFPA 110, Level 1, when equipped with the necessary accessories and installed per NFPA standards.
- A standard one-year limited warranty covers all systems and components. Two-, five-, and ten-year extended warranties are also available.
- Tier 2 EPA-certified for Stationary Emergency Applications

Alternator Features

- The pilot-excited, permanent magnet (PM) alternator provides superior short-circuit capability.
- The brushless, rotating-field alternator has broad range reconnectability.
- Additional alternator voltages are available including 12.47 kV, 13.2 kV, and 13.8 kV medium voltages. Contact your local distributor for more detailed information.

Other Features

- Kohler designed controllers for guaranteed system integration and remote communication.
- The low coolant level shutdown prevents overheating (standard on radiator models only).An electronic, isochronous governor delivers precise frequency regulation.
- Multiple circuit breaker configurations.

Generator Set Ratings

				Standby 130C Ratings	
Alternator	Voltage	Ph	Hz	kW/kVA	Amps
7M4056	277/480	3	60	2000 / 2500	3007

RATINGS: All three-phase units are rated at 0.8 power factor.
Standby Ratings: The standby rating is applicable to varying loads for the duration of a power outage. There is no overload capability for this rating.
Prime Power Ratings: At varying load, the number of generator set operating hours is unlimited.
A 10% overload capacity is available for one hour in twelve. Ratings are in accordance with ISO-8528-1 and ISO-3046-1. For limited running time and continuous ratings, consult the factory.
Obtain technical information bulletin (TIB-101) for ratings guidelines, complete ratings definitions, and site condition derates.
The generator set manufacturer reserves the right to change the design or specifications without notice and without any obligation or liability whatsoever.

Model: 2000REOZMD, continued

Alternator Specifications

Specifications	Alternator
Type	4-Pole, Rotating-Field
Exciter type	Brushless, Permanent-Magnet Pilot Exciter
Voltage regulator	Solid State, Volts/Hz
Insulation	NEMA MG1
Insulation: Material	Class H, Synthetic, Nonhydroscopic
Insulation: Temperature Rise	130°C, 150°C, Standby
Bearing: quantity, type	1, Sealed
Coupling	Flexible Disc
Amortisseur windings	Full
Rotor balancing (60Hz)	125%
Voltage regulation, no-load to full-load RMS	Controller Dependent
One-Step Load Acceptance	100% of rating
Unbalanced load capability	100% of Rated Standby Current

- NEMA MG1, IEEE, and ANSI standards compliance for temperature rise and motor starting.
- Sustained short-circuit current of up to 300% of the rated current for up to 10 seconds.
- Sustained short-circuit current enabling down stream circuit breakers to trip without collapsing the alternator field.
- Self-ventilated and dripproof construction.
- Superior voltage waveform from a two-thirds pitch stator and skewed rotor.
- Digital solid-state, volts-per-hertz voltage regulator with +/-0.25% no-load to full-load regulation.
- Brushless alternator with brushless pilot exciter for excellent load response.

Engine

Engine Specification

Engine Manufacturer	Mitsubishi
Engine Model	S16R-Y2PTAW2-1
Engine: type	4-Cycle, Turbocharged
Cylinder arrangement	16 V
Displacement, L (cu. in.)	65.4 (3989)
Bore and stroke, mm (in.)	170 x 180 (6.69 x 7.09)
Compression ratio	14.0:1
Piston speed, m/min. (ft./min.)	648 (2126)
Main bearings: quantity, type	9, Precision Half-Shell
Rated rpm	1800
Max. power at rated rpm, kWm (BHP)	2180 (2923)
Cylinder head material	Cast Iron
Crankshaft material	Forged Steel
Governor: type, make/model	Electronic
Frequency regulation, no-load to-full load	Isochronous
Frequency regulation, steady state	±0.25%
Frequency	Fixed
Air cleaner type, all models	Dry

Exhaust

Exhaust System

Exhaust Manifold Type	Dry
Exhaust flow at rated kW, m3/min. (cfm)	544 (19209)
Exhaust temperature at rated kW, dry exhaust, °C (°F)	526 (979)
Maximum allowable back pressure, kPa (in. Hg)	5.1 (1.5)
Exh. outlet size at eng. hookup, mm (in.)	See ADV Drawing

Model: 2000REOZMD, continued

Engine Electrical

Engine Electrical System

Battery charging alternator: Ground (negative/positive)	Negative
Battery charging alternator: Volts (DC)	24
Battery charging alternator: Ampere rating	30
Starter motor rated voltage (DC)	Dual, 24
Battery, recommended cold cranking amps (CCA): Qty., CCA rating each	Four, 1150
Battery voltage (DC)	12

Fuel

Fuel System

Fuel type	Diesel
Fuel supply line, min. ID, mm (in.)	19 (0.75)
Fuel return line, min. ID, mm (in.)	19 (0.75)
Max. lift, engine-driven fuel pump, m (ft.)	1.0 (3.0)
Max. fuel flow, Lph (gph)	660 (174)
Max. fuel pump restriction, kPa (in. Hg)	10 (3.0)
Max. return line restriction, kPa (in. Hg)	20 (5.9)
Fuel filter: quantity, type	4, Secondary
Recommended fuel	#2 Diesel

Lubrication

Lubrication System

Type	Full Pressure
Oil pan capacity, L (qt.)	200 (211)
Oil pan capacity with filter, L (qt.)	230 (243)
Oil filter: quantity, type	4, Cartridge
Oil cooler	Water-Cooled

Cooling

Radiator System

Ambient temperature, °C (°F)	40 (104)
Engine jacket water capacity, L (gal.)	170 (44.9)
Radiator system capacity, including engine, L (gal.)	367 (96.9)
Engine jacket water flow, Lpm (gpm)	1850 (489)
Charge cooler water flow, Lpm (gpm)	920 (243)
Heat rejected to cooling water at rated kW, dry exhaust, kW (Btu/min.)	780 (44374)
Heat rejected to air charge cooler at rated kW, dry exhaust, kW (Btu/min.)	780 (44374)
Water pump type	Centrifugal
Fan diameter, including blades, mm (in.)	2057 (81)
Fan, kWm (HP)	81 (109)
Max. restriction of cooling air, intake and discharge side of radiator, kPA (in. H20)	0.125 (0.5)

Model: 2000REOZMD, continued

High Ambient Radiator System

Ambient temperature, °C (°F)	50 (122)
Engine jacket water capacity, L (gal.)	170 (44.9)
Radiator system capacity, including engine, L (gal.)	386 (102)
Engine jacket water flow, Lpm (gpm)	1850 (489)
Charge cooler water flow, Lpm (gpm)	920 (243)
Heat rejected to cooling water at rated kW, dry exhaust, kW (Btu/min.)	780 (44374)
Heat rejected to charge cooling water at rated kW, dry exhaust, kW (Btu/min.)	780 (44374)
Water pump type	Centrifugal
Fan diameter, including blades, mm (in.)	2362 (93)
Fan, kWm (HP)	63 (84)
Max. restriction of cooling air, intake and discharge side of radiator, kPa (in. H2O)	0.125 (0.5)

Remote Radiator System

Exhaust manifold type	Dry
Jacket water engine inlet, mm (in.)	95 (3.75)
Jacket water engine outlet, mm (in.)	95 (3.75)
Intercooler water engine inlet, mm (in.)	83 (3.25)
Intercooler water engine outlet, mm (in.)	83 (3.25)
Static head allowable above engine, kPa (ft. H2O)	98 (32.8)
Note:	Contact your local distributor for cooling system options and specifications based on your specific application.

Operation Requirements

Air Requirements

Radiator-cooled cooling air, m3/min. (scfm) *	2209 (78000)
High ambient radiator-cooled cooling air, m3/min. (scfm)	2718 (96000)
Cooling air required for generator set when equipped with city water cooling or remote radiator, based on 14°C (25°F) rise, m3/min. rise and ambient temp. of 29°C (85°F) m3/min. (cfm)	991 (35100)
Combustion air, m3/min. (cfm)	206 (7274)
Heat rejected to ambient air: Engine, kW (Btu/min.)	180 (10240)
Heat rejected to ambient air: Alternator, kW (Btu/min.)	97 (5516)
Radiator-cooled cooling air, m3/min. (scfm) *	2209 (78000)
High ambient radiator-cooled cooling air, m3/min. (scfm)	2718 (96000)
Cooling air required for generator set when equipped with city water cooling or remote radiator, based on 14°C (25°F) rise, m3/min. rise and ambient temp. of 29°C (85°F) m3/min. (cfm)	991 (35100)
Combustion air, m3/min. (cfm)	206 (7274)
Heat rejected to ambient air: Engine, kW (Btu/min.)	180 (10240)
Heat rejected to ambient air: Alternator, kW (Btu/min.)	97 (5516)

*Air density = 1.20 kg/m3 (0.075 lbm/ft3)

Fuel Consumption

Diesel, Lph (gph), at % load	Rating
Standby Fuel Consumption at 100% load	606 Lph (160.1 gph)
Standby Fuel Consumption at 75% load	442 Lph (116.8 gph)
Standby Fuel Consumption at 50% load	299 Lph (79.0 gph)
Standby Fuel Consumption at 25% load	164 Lph (43.2 gph)

Boilers

Attachment L
Emission Unit Data Sheet
(INDIRECT HEAT EXCHANGER)

Control Device ID No. (must match List Form): NA (Emision Points: 2E & 3E)

Equipment Information

1. Manufacturer: Cleaver Brooks	2. Model No. NB-600D-125 Serial No.
3. Number of units: 2	4. Use: Steam Generation
5. Rated Boiler Horsepower: 275.3 MMBtu/hr each hp	6. Boiler Serial No.:
7. Date constructed: January 2016	8. Date of last modification and explain: December 2016
9. Maximum design heat input per unit: 275.3 ×10^6 BTU/hr	10. Peak heat input per unit: 275.3 ×10^6 BTU/hr
11. Steam produced at maximum design output: 230,000 each LB/hr 155 psig	12. Projected Operating Schedule: Hours/Day 24 Days/Week 7 Weeks/Year 52
13. Type of firing equipment to be used: ☐ Pulverized coal ☐ Spreader stoker ☐ Oil burners ☒ Natural Gas Burner ☐ Others, specify	14. Proposed type of burners and orientation: ☐ Vertical ☐ Front Wall ☐ Opposed ☐ Tangential ☐ Others, specify
15. Type of draft: ☐ Forced ☐ Induced	16. Percent of ash retained in furnace: 0 %
17. Will flyash be reinjected? ☐ Yes ☒ No	18. Percent of carbon in flyash: 0 %

Stack or Vent Data

19. Inside diameter or dimensions: 5.5 ft.	20. Gas exit temperature: 650 cooled to 300 °F
21. Height: 50 ft.	22. Stack serves: ☒ This equipment only ☐ Other equipment also (submit type and rating of all other equipment exhausted through this stack or vent)
23. Gas flow rate: 47,235 ft^3/min	
24. Estimated percent of moisture: 20 %	

Fuel Requirements

25.	Type	Fuel Oil No.	Natural Gas	Gas (other, specify)	Coal, Type:	Other:
	Quantity (at Design Output)	gph@60°F	458,833 both boilers ft^3/hr	ft^3/hr	TPH	
	Annually	$\times 10^3$ gal	3589.2 MMscf/year both boilers	$\times 10^6$ ft^3/hr	tons	
	Sulfur	Maximum: wt. % Average: wt. %	0 gr/100 ft^3	gr/100 ft^3	Maximum: wt. %	
	Ash (%)		0		Maximum	
	BTU Content	BTU/Gal. Lbs/Gal.@60°F	1200 BTU/ft^3	BTU/ft^3	BTU/lb	
	Source		Field Gas			
	Supplier					
	Halogens (Yes/No)					
	List and Identify Metals					

26. Gas burner mode of control:
☐ Manual ☐ Automatic hi-low
☐ Automatic full modulation ☐ Automatic on-off

27. Gas burner manufacture:

28. Oil burner manufacture:

29. If fuel oil is used, how is it atomized? ☐ Oil Pressure ☐ Steam Pressure ☐ Compressed Air ☐ Rotary Cup ☐ Other, specify

30. Fuel oil preheated: ☐ Yes ☐ No

31. If yes, indicate temperature: °F

32. Specify the calculated theoretical air requirements for combustion of the fuel or mixture of fuels described above actual cubic feet (ACF) per unit of fuel:
@ °F, PSIA, % moisture

33. Emission rate at rated capacity: lb/hr

34. Percent excess air actually required for combustion of the fuel described: %

Coal Characteristics

35. Seams:

36. Proximate analysis (dry basis): % of Fixed Carbon: % of Sulfur:
% of Moisture: % of Volatile Matter:
% of Ash:

Emissions Stream

37. What quantities of pollutants will be emitted from the boiler before controls?

Pollutant	Pounds per Hour lb/hr	grain/ACF	@ °F	PSIA
CO	10.17			
Hydrocarbons				
NO_x	10.03			
Pb	0.00013			
PM_{10}	2.75			
SO_2	0.16			
VOCs	1.10			
Other (specify) PM2.5	2.75			
	*emissions per boiler			

38. What quantities of pollutants will be emitted from the boiler after controls?

Pollutant	Pounds per Hour lb/hr	grain/ACF	@ °F	PSIA
CO	10.17			
Hydrocarbons				
NO_x	10.03			
Pb	0.00013			
PM_{10}	2.75			
SO_2	0.16			
VOCs	1.10			
Other (specify) PM2.5	2.75			
	*emissions per boiler			

39. How will waste material from the process and control equipment be disposed of?

40. Have you completed an *Air Pollution Control Device Sheet(s)* for the control(s) used on this Emission Unit. NA

41. Have you included the ***air pollution rates*** on the Emissions Points Data Summary Sheet? Yes

42. **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 PLAN: Please list (1) describe the process parameters and how they were chosen (2) the ranges and how they were established for monitoring to demonstrate compliance with the operation of this process equipment operation or air pollution control device.
see Attachment O

TESTING PLAN: Please describe any proposed emissions testing for this process equipment or air pollution control device.
see Attachment O

RECORDKEEPING: Please describe the proposed recordkeeping that will accompany the monitoring.
see Attachment O

REPORTING: Please describe the proposed frequency of reporting of the recordkeeping.
see Attachment O

43. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.
The boilers will be operated at steady state conditions, using the Economizer to lower the outlet temperature to maintain warranty.

BOILER PREDICTED PERFORMANCE*

Version: NB-Size-2014.0.1 **Customer:** Veolia - Antero Resourc **Engineer:** Dan Carlson
Proposal: 4435/4436 **Fuel:** Natural Gas
Model: NB-600D-125 **Design Pressure:** 250 PSIG
March 11, 2016

Boiler load - %	**100%**	**75%**	**50%**	**25%**							
Steam Flow - Gross Production	230,000	172,500	115,000	57,500							Lb/Hr
Net Steam Flow - Gross less Pegging Steam	230,000	172,500	115,000	57,500							Lb/Hr
Pegging Steam	-	-	-	-							Lb/Hr
Steam Pressure - Operating	165	165	165	165							PSIG
Steam Temperature	373	373	373	373							°F
Fuel Input (HHV)	275.3	205.1	136.1	68.4							MMBTU/Hr
Ambient Air Temperature	80	80	80	80							°F
Relative Humidity	60	60	60	60							%
Excess Air	16.0	16.0	16.0	25.0							%
Flue Gas Recirculation	17.0	17.0	17.0	17.0							%
Steam Output Duty	231.3	173.5	115.7	57.8							MMBTU/hr
Heat Release Rate - Volumetric	94,221	70,184	46,572	23,405							BTU/FT3-Hr
Heat Release Rate - Area	179,464	133,680	88,707	44,579							BTU/FT2-Hr
Heat Flux	21,351										BTU/FT2-Hr
Feed Water Temperature	227	227	227	227							°F
Water Temperature Leaving Economizer	343	326	308	291							±10°F
Blow Down	3.0	3.0	3.0	3.0							%
Boiler Gas Exit Temperature	673	597	517	436							±10°F
Economizer Gas Exit Temperature	322	293	268	249							±10°F
Air Flow	233,598	174,004	115,465	62,528							Lb/Hr
Flue Gas to Stack	245,749	183,055	121,471	65,547							Lb/Hr
Flue Gas Including FGR	287,526	214,175	142,122	76,690							Lb/Hr
Fuel Flow	12,150	9,050	6,005	3,018							Lb/Hr
Flue Gas Analysis,Losses,Efficiency - %											
Dry Gas Loss	4.6	4.1	3.6	3.5							%
Air Moisture Loss	0.1	0.1	0.1	0.1							%
Fuel Moisture Loss	9.9	9.8	9.7	9.6							%
Casing Loss	0.3	0.4	0.6	1.2							%
Margin	1.0	1.0	1.0	1.0							%
Efficiency - LHV	92.5	93.1	93.6	93.1							%
Efficiency - HHV	84.0	84.6	85.0	84.5							%
Total Pressure Drop Including Economizer	18.72	10.09	4.32	1.18							IN WC
Products of Combustion - CO2	8.82	8.82	8.82	8.23							% vol.
- H2O	16.91	16.91	16.91	15.91							% vol.
-N2	71.65	71.65	71.65	72.03							% vol.
-O2	2.63	2.63	2.63	3.83							% vol.
-SO2	-	-	-	-							% vol.

Fuel Composition - Gas		**BOILER SURFACE AREAS-ft2**		
methane	77.0411 % vol.	Furnace Volume:	2,922	ft3
ethane	14.6564 % vol.	Furnace Projected Area:	1,534	ft2
propane	4.7435 % vol.	Evaporator:	7,455	ft2
butane	1.8515 % vol.	Total Area:	8,989	ft2
pentane	0.666 % vol.	Economizer:	18,887	ft2
hexane	0.6096 % vol.	Superheater:	-	ft2
carbon dioxide	0.6 % vol.			
nitrogen	0.3719 % vol.			
LHV-Btu/lb	20,578			
HHV-Btu/lb	22,660			

Above data is predicted only, see proposal for guaranteed numbers.

17.0 EXHIBIT 7: PERFORMANCE GUARANTEES

Cleaver-Brooks offers the following performance guarantees specific to this project:

Values apply to each individual boiler package.

PROCESS GUARANTEES (NATURAL GAS / METHANE)	VALUE	UNIT
Maximum Continuous Rating (MCR) Steam Flow (at exit of non-return valve)	230,000	lb/hr
Operating Steam Pressure (at exit of non-return valve)	155	psig
Operating Steam Temperature (at exit of non-return valve at 100% MCR)	Saturated	°F
Boiler Feedwater Inlet Temperature	227°F	°F
Inlet Combustion Air Temperature	80	°F
Inlet Combustion Air Relative Humidity	60	%
Boiler Thermal Efficiency (Based on HHV and ASME PTC 4 Input-Output Method)	84.0	%
Steam Purity (With ASME Quality Water per Attached)	99.5% dry steam	
Maximum Noise Rating (at 3 Ft in a free field)	85	dBA

BURNER EMISSIONS

Guaranteed Emissions		Natural Gas
NOx	ppmv	30
CO	ppmv	50
PM (Particulate)	Lb/MMBTU	0.010
VOC	Lb/MMBTU	0.004
Based on: From 25% to 100% MCR corrected to 3% O_2 on a dry basis. **CLEAVER BROOKS** technician is required for start-up and adjustments. PM is exclusive of any particulates in combustion air or other sources of residual particulates from material.		

We are offering the above guarantees. All other data contained in this proposal is predicted only and will be finalized at time of engineering submittal after receipt of award. Guarantees are based on the unit being operated per the requirements of the operation and maintenance manual.

If performance testing is required, it is the Buyer's responsibility to provide steam load (or steam vent to atmosphere) and have the equipment tested by a third party during the stated warranty period. If equipment passes such tests, or the tests are not performed before the end of the warranty period, it will be assumed that the equipment is accepted. The cost of all tests is the responsibility of the Buyer.

The operational turndown is as listed above. Emissions guarantees are separate and valid from 25-100% unless stated otherwise.

Fire Water Pump Engine

ENGINE DATA SHEET

Source Identification Number[1]		ENG-2 / 30E					
Engine Manufacturer and Model		John Deere 4045HFC28E					
Manufacturer's Rated bhp/rpm		136					
Source Status[2]		NS					
Date Installed/Modified/Removed[3]		December 2016					
Engine Manufactured/Reconstruction Date[4]		TBD					
Is this a Certified Compression Ignition Engine according to 40CFR60 Subpart IIII? (Yes or No)[5]		Yes					
Engine, Fuel and Combustion Data	Engine Type[6]	Diesel (CI)					
	APCD Type[7]	N/A					
	Fuel Type[8]	2DO (diesel)					
	H_2S (gr/100 scf)	15 ppm					
	Operating kWe	101					
	BSFC (gal/hr)	6.9					
	Fuel throughput (gal/hr)	6.9					
	Fuel throughput (gal/yr)	3,448					
	Operation (hrs/yr)	500					
Reference[9]	Potential Emissions[10]	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
OT	NO_X	0.85	0.21				
OT	CO	1.11	0.28				
OT	VOC	0.045	0.011				
AP	SO_2	0.27	0.069				
OT	PM_{10}	0.066	0.016				
AP	Formaldehyde	.0011	2.8E-4				
OT	$PM_{2.5}$	0.066	0.016				

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

2. Enter the Source Status using the following codes:

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

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

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

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

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

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

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

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

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

8. Enter the Fuel Type using the following codes:

PQ	Pipeline Quality Natural Gas	RG	Raw Natural Gas

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

MD	Manufacturer's Data	AP	AP-42
GR	GRI-HAPCalc™	OT	Other: NSPS IIII or Engine Certification

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

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
2016 MODEL YEAR
CERTIFICATE OF CONFORMITY
WITH THE CLEAN AIR ACT

OFFICE OF TRANSPORTATION AND AIR QUALITY
ANN ARBOR, MICHIGAN 48105

Certificate Issued To: **Deere & Company**
(U.S. Manufacturer or Importer)

Certificate Number: **GJDXL04.5119-003**

Effective Date: 07/24/2015

Expiration Date: 12/31/2016

Byron J. Bunker, Division Director
Compliance Division

Issue Date: 07/24/2015

Revision Date: N/A

Model Year: 2016
Manufacturer Type: Original Engine Manufacturer
Engine Family: GJDXL04.5119

Mobile/Stationary Indicator: Stationary
Emissions Power Category: 75<=kW<130
Fuel Type: Diesel
After Treatment Devices: No After Treatment Devices Installed
Non-after Treatment Devices: Electronic Control, Smoke Puff Limiter, Non-standard Non-After Treatment Device Installed, Engine Design Modification

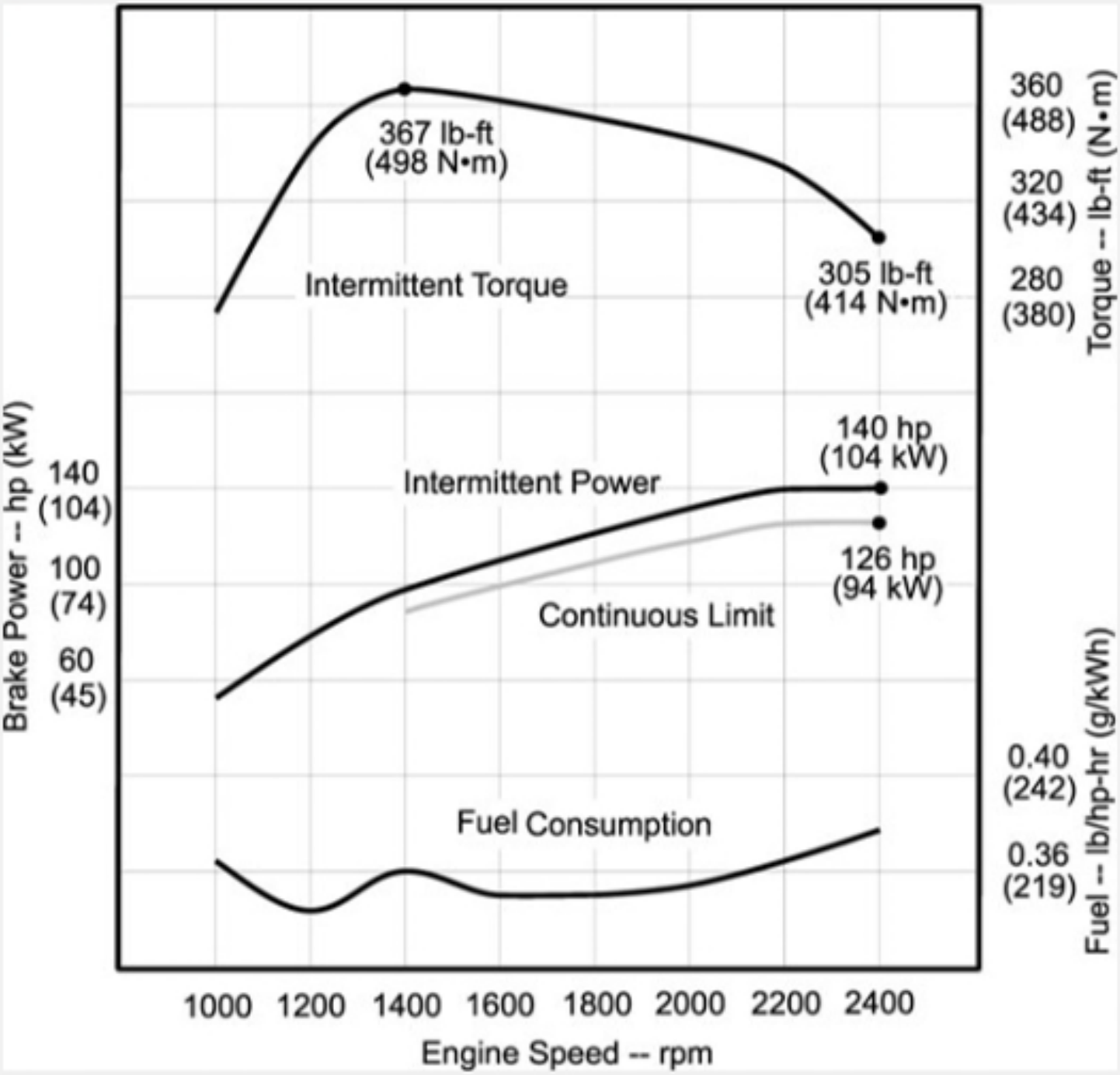
Pursuant to Section 111 and Section 213 of the Clean Air Act (42 U.S.C. sections 7411 and 7547) and 40 CFR Part 60, and subject to the terms and conditions prescribed in those provisions, this certificate of conformity is hereby issued with respect to the test engines which have been found to conform to applicable requirements and which represent the following engines, by engine family, more fully described in the documentation required by 40 CFR Part 60 and produced in the stated model year.

This certificate of conformity covers only those new compression-ignition engines which conform in all material respects to the design specifications that applied to those engines described in the documentation required by 40 CFR Part 60 and which are produced during the model year stated on this certificate of the said manufacturer, as defined in 40 CFR Part 60.

It is a term of this certificate that the manufacturer shall consent to all inspections described in 40 CFR 1068 and authorized in a warrant or court order. Failure to comply with the requirements of such a warrant or court order may lead to revocation or suspension of this certificate for reasons specified in 40 CFR Part 60. It is also a term of this certificate that this certificate may be revoked or suspended or rendered void *ab initio* for other reasons specified in 40 CFR Part 60.

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

Performance Curves



Rating Specific Emissions Data - John Deere Power Systems

JOHN DEERE

Nameplate Rating Information

Clarke Model	JU4H-UFADR0
Power Rating (BHP / kW)	136 / 101
Certified Speed (RPM)	2100

Rating Data

Rating	4045HFC28D
Certified Power (kW)	101
Rated Speed	2100
Vehicle Model Number	Clarke Fire Pump

Units	g/kW-hr	g/hp-hr
NOx	3.70	2.76
HC	0.17	0.13
NOx + HC	N/A	N/A
Pm	0.15	0.11
CO	1.7	1.3

Certificate Data

Engine Model Year	2016
EPA Family Name	GJDXL04.5119
EPA JD Name	350HAJ
EPA Certificate Number	GJDXL04.5119-003
CARB Executive Order	Not Required
Parent of Family	4045HFG82A

Units	g/kW-hr
NOx	3.36
HC	0.15
NOx + HC	N/A
Pm	0.17
CO	1.3

* The emission data listed is measured from a laboratory test engine according to the test procedures of 40 CFR 89 or 40 CFR 1039, as applicable. The test engine is intended to represent nominal production hardware, and we do not guarantee that every production engine will have identical test results. The family parent data represents multiple ratings and this data may have been collected at a different engine speed and load. Emission results may vary due to engine manufacturing tolerances, engine operating conditions, fuels used, or other conditions beyond our control.

Waste Gas Header 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 Grit Clarifier Tank
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) TK-1055A	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 4E
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) Change in process – tank is the only grit clarifier now rather than having two	
7A. Does the tank have more than one mode of operation? ☐ Yes ☒ No (e.g. Is there more than one product stored in the tank?)	
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. 562,000 gallons	
9A. Tank Internal Diameter (ft) ~75	9B. Tank Internal Height (or Length) (ft) ~17
10A. Maximum Liquid Height (ft) ~16	10B. Average Liquid Height (ft) ~16
11A. Maximum Vapor Space Height (ft) 1	11B. Average Vapor Space Height (ft) 1
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights. 529,000 gallons	

13A. Maximum annual throughput (gal/yr) 984,974,400	13B. Maximum daily throughput (gal/day) 12,617,280
14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume) 1,862	
15. Maximum tank fill rate (gal/min) 8,762	
16. Tank fill method ☐ Submerged ☒ Splash ☐ Bottom Loading	
17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☒ Does Not Apply	
17A. Volume Expansion Capacity of System (gal)	17B. Number of transfers into system per year

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

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

☐ External Floating Roof ___ pontoon roof ___ double deck roof

☐ Domed External (or Covered) Floating Roof

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

☐ Variable Vapor Space ___ lifter roof ___ diaphragm

☐ Pressurized ___ spherical ___ cylindrical

☐ Underground

☐ Other (describe)

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

19. Tank Shell Construction: ☒ Riveted ☐ Gunite lined ☐ Epoxy-coated rivets ☐ Other (describe)		
20A. Shell Color	20B. Roof Color	20C. Year Last Painted
21. Shell Condition (if metal and unlined): ☒ No Rust ☐ Light Rust ☐ Dense Rust ☐ Not applicable		
22A. Is the tank heated? ☐ YES ☒ NO		
22B. If YES, provide the operating temperature (°F)		
22C. If YES, please describe how heat is provided to tank.		
23. Operating Pressure Range (psig): atmospheric		
24. Complete the following section for **Vertical Fixed Roof Tanks** ☐ Does Not Apply		
24A. For dome roof, provide roof radius (ft) 37.5		
24B. For cone roof, provide slope (ft/ft) NA		
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) 20		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) 20		36B. Corresponding Vapor Pressure (psia) 0.05	
37A. Average Liquid Surface Temperature (°F) 50		37B. Corresponding Vapor Pressure (psia) 0.18	
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	Influent Water		
39B. CAS Number			
39C. Liquid Density (lb/gal)	8.34		
39D. Liquid Molecular Weight (lb/lb-mole)	22.56		
39E. Vapor Molecular Weight (lb/lb-mole)	22.56		

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] (Thermal Oxidizer)
- ☐ Other[1] (describe):

[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		Annual Loss (lb/yr)	Estimation Method[1]
		Amount	Units		
VOCs as oil				2,085.76	O, WATER9
Ammonia				941.65	
Benzene				4.94	
Ethylbenzene				0.24	
Toluene				6.20	
Xylenes				1.45	
Carbon Dioxide				53,250	

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

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

Attachment L

EMISSIONS UNIT DATA SHEET
STORAGE TANKS

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

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

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name Pre-Treatment	2. Tank Name Stage 1 Clarifier
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) TK-1055B	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 4E
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) Change in process – tank is repurposed from a second grit clarifier to be in the Stage 1 sludge stream further in the process flow.	
7A. Does the tank have more than one mode of operation? ☐ Yes ☒ No (e.g. Is there more than one product stored in the tank?)	
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. 562,000 gallons	
9A. Tank Internal Diameter (ft) ~75	9B. Tank Internal Height (or Length) (ft) ~17
10A. Maximum Liquid Height (ft) ~16	10B. Average Liquid Height (ft) ~16
11A. Maximum Vapor Space Height (ft) 1	11B. Average Vapor Space Height (ft) 1
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights. 529,000 gallons	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
1,132,142,400	3,497,760

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 2,140

15. Maximum tank fill rate (gal/min): 2,429

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

17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☒ Does Not Apply

17A. Volume Expansion Capacity of System (gal)	17B. Number of transfers into system per year

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

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

☐ External Floating Roof ___ pontoon roof ___ double deck roof

☐ Domed External (or Covered) Floating Roof

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

☐ Variable Vapor Space ___ lifter roof ___ diaphragm

☐ Pressurized ___ spherical ___ cylindrical

☐ Underground

☐ Other (describe)

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

19. Tank Shell Construction:

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

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

21. Shell Condition (if metal and unlined):

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

22A. Is the tank heated? ☐ YES ☒ NO

22B. If YES, provide the operating temperature (°F)

22C. If YES, please describe how heat is provided to tank.

23. Operating Pressure Range (psig): atmospheric

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

24A. For dome roof, provide roof radius (ft) 37.5

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

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) 20		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) 20		36B. Corresponding Vapor Pressure (psia) 0.05	
37A. Average Liquid Surface Temperature (°F) 50		37B. Corresponding Vapor Pressure (psia) 0.18	
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 Influent		
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] (Thermal Oxidizer)
- ☐ Other[1] (describe):

[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 as oil				2,153.9	O, WATER9
Ammonia				916.62	
Benzene				4.98	
Ethylbenzene				0.25	
Toluene				6.29	
Xylenes				0.1.47	
Carbon Dioxide				36,988	

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

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

Attachment L

EMISSIONS UNIT DATA SHEET
STORAGE TANKS

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

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

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name Pre-Treatment	2. Tank Name Clarifier Pump Tanks A & B
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) TK-1060A and TK-1060B	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 4E
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) Slight change in emissions/throughput due to process change	
7A. Does the tank have more than one mode of operation? ☐ Yes ☒ No (e.g. Is there more than one product stored in the tank?)	
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. 23,000 gallons each	
9A. Tank Internal Diameter (ft) 14	9B. Tank Internal Height (or Length) (ft) 20
10A. Maximum Liquid Height (ft) 18	10B. Average Liquid Height (ft) 18
11A. Maximum Vapor Space Height (ft) 2	11B. Average Vapor Space Height (ft) 2
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights. 21,000 gallons each	

13A. Maximum annual throughput (gal/yr) 969,206,400 for both	13B. Maximum daily throughput (gal/day) 12,466,080 for both
14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume) 23,076 each	
15. Maximum tank fill rate (gal/min) 8,657 total flow	
16. Tank fill method ☐ Submerged ☒ Splash ☐ Bottom Loading	
17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☒ Does Not Apply	
17A. Volume Expansion Capacity of System (gal)	17B. Number of transfers into system per year

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

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

☐ External Floating Roof ___ pontoon roof ___ double deck roof

☐ Domed External (or Covered) Floating Roof

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

☐ Variable Vapor Space ___ lifter roof ___ diaphragm

☐ Pressurized ___ spherical ___ cylindrical

☐ Underground

☐ Other (describe)

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

19. Tank Shell Construction: ☒ Riveted ☐ Gunite lined ☐ Epoxy-coated rivets ☐ Other (describe)		
20A. Shell Color	20B. Roof Color	20C. Year Last Painted
21. Shell Condition (if metal and unlined): ☒ No Rust ☐ Light Rust ☐ Dense Rust ☐ Not applicable		
22A. Is the tank heated? ☐ YES ☒ NO		
22B. If YES, provide the operating temperature (°F)		
22C. If YES, please describe how heat is provided to tank.		
23. Operating Pressure Range (psig): atmospheric		
24. Complete the following section for **Vertical Fixed Roof Tanks** ☐ Does Not Apply		
24A. For dome roof, provide roof radius (ft) 7		
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) 20	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) 20	36B. Corresponding Vapor Pressure (psia) 0.05
37A. Average Liquid Surface Temperature (°F) 50	37B. Corresponding Vapor Pressure (psia) 0.18
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	Clarifier Effulent		
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] (Thermal Oxidizer)
- ☐ Other[1] (describe):

[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		Annual Loss (lb/yr)	Estimation Method[1]
		Amount	Units		
VOCs as oil				308.97	O, WATER9 (Combined Total of both tanks)
Ammonia				8.63	
Benzene				0.69	
Ethylbenzene				0.009	
Toluene				0.41	
Xylenes				0.10	
Carbon Dioxide				107,625	

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

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

Attachment L

EMISSIONS UNIT DATA SHEET
STORAGE TANKS

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

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

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name Pre-Treatment	2. Tank Name Oil Collection Tank
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) TK-1065	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 4E
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) Slight change in emissions/throughput	
7A. Does the tank have more than one mode of operation? ☐ Yes ☒ No (e.g. Is there more than one product stored in the tank?)	
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. 13,500 gallons	
9A. Tank Internal Diameter (ft) 12	9B. Tank Internal Height (or Length) (ft) 16
10A. Maximum Liquid Height (ft) 15	10B. Average Liquid Height (ft) 8
11A. Maximum Vapor Space Height (ft) 1	11B. Average Vapor Space Height (ft) 8
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights. 12,690 gallons	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
6,832,800	43,200

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume)
538.42

15. Maximum tank fill rate (gal/min) 30

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

17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☒ Does Not Apply

17A. Volume Expansion Capacity of System (gal)	17B. Number of transfers into system per year

18. Type of tank (check all that apply):
- ☒ Fixed Roof X vertical ___ horizontal ___ flat roof ___ cone roof X dome roof
  ___ other (describe)
- ☐ External Floating Roof ___ pontoon roof ___ double deck roof
- ☐ Domed External (or Covered) Floating Roof
- ☐ Internal Floating Roof ___ vertical column support ___ self-supporting
- ☐ Variable Vapor Space ___ lifter roof ___ diaphragm
- ☐ Pressurized ___ spherical ___ cylindrical
- ☐ Underground
- ☐ Other (describe)

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

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

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

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

22A. Is the tank heated? ☐ YES ☒ NO

22B. If YES, provide the operating temperature (°F)

22C. If YES, please describe how heat is provided to tank.

23. Operating Pressure Range (psig): to

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

24A. For dome roof, provide roof radius (ft) 6

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)	34B. Maximum (°F)
35. Average operating pressure range of tank:	
35A. Minimum (psig)	35B. Maximum (psig)
36A. Minimum Liquid Surface Temperature (°F)	36B. Corresponding Vapor Pressure (psia)
37A. Average Liquid Surface Temperature (°F)	37B. Corresponding Vapor Pressure (psia)
38A. Maximum Liquid Surface Temperature (°F)	38B. Corresponding Vapor Pressure (psia)

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

39A. Material Name or Composition			
39B. CAS Number			
39C. Liquid Density (lb/gal)			
39D. Liquid Molecular Weight (lb/lb-mole)			
39E. Vapor Molecular Weight (lb/lb-mole)			

Maximum Vapor Pressure 39F. True (psia) 39G. Reid (psia)			
Months Storage per Year 39H. From 39I. To	 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] (Thermal Oxidizer)
- ☐ Other[1] (describe):

[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 as oil	0.0015	0.017	Lb/hr	87.12	EPA – TANKS 4.0.9d

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

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

Attachment L

EMISSIONS UNIT DATA SHEET
STORAGE TANKS

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

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

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name Pre-Treatment	2. Tank Name Equalization Tank
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) TK-1070	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 4E
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) Slight change in emissions/throughput due to process change	
7A. Does the tank have more than one mode of operation? ☐ Yes ☒ No (e.g. Is there more than one product stored in the tank?)	
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. 1,030,000 gallons	
9A. Tank Internal Diameter (ft) ~56	9B. Tank Internal Height (or Length) (ft) ~56
10A. Maximum Liquid Height (ft) 48	10B. Average Liquid Height (ft) 48
11A. Maximum Vapor Space Height (ft) 8	11B. Average Vapor Space Height (ft) 8
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights. 900,000 gallons	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
969,206,400	12,096,000

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume)
1,076

15. Maximum tank fill rate (gal/min) 8,400

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

17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☒ Does Not Apply

17A. Volume Expansion Capacity of System (gal)	17B. Number of transfers into system per year

18. Type of tank (check all that apply):
- ☒ Fixed Roof X vertical ___ horizontal ___ flat roof ___ cone roof X dome roof
  ___ other (describe)
- ☐ External Floating Roof ___ pontoon roof ___ double deck roof
- ☐ Domed External (or Covered) Floating Roof
- ☐ Internal Floating Roof ___ vertical column support ___ self-supporting
- ☐ Variable Vapor Space ___ lifter roof ___ diaphragm
- ☐ Pressurized ___ spherical ___ cylindrical
- ☐ Underground
- ☐ Other (describe)

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

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

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

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

22A. Is the tank heated? ☒ YES ☐ NO

22B. If YES, provide the operating temperature (°F) greater than or equal to 20 deg F

22C. If YES, please describe how heat is provided to tank. Via steam-powered pick heater (H-1073)

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) 28

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) 20	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) 20	36B. Corresponding Vapor Pressure (psia) 0.05
37A. Average Liquid Surface Temperature (°F) 50	37B. Corresponding Vapor Pressure (psia) 0.18
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	Pre-treated Influent Water		
39B.	CAS Number			
39C.	Liquid Density (lb/gal)	8.35		
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] (Thermal Oxidizer)
- ☐ Other[1] (describe):

[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		Annual Loss (lb/yr)	Estimation Method[1]
		Amount	Units		
VOCs as oil				372.93	O, WATER9
Ammonia				10.53	
Benzene				0.90	
Ethylbenzene				0.015	
Toluene				0.55	
Xylenes				0.15	
Carbon dioxide				107,208	

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

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

Attachment L
EMISSIONS UNIT DATA SHEET
STORAGE TANKS

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

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

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name Pre-Treatment	2. Tank Name Solids Clarifier Tank
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) TK-2010	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 4E
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) Slight change in emissions/throughput due to process change	
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. 435,000 gallons	
9A. Tank Internal Diameter (ft) 66	9B. Tank Internal Height (or Length) (ft) 17
10A. Maximum Liquid Height (ft) 16	10B. Average Liquid Height (ft) 16
11A. Maximum Vapor Space Height (ft) 1	11B. Average Vapor Space Height (ft) 1
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights. 385,000 gallons	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
1,058,558,400	3,600,000

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 2,750

15. Maximum tank fill rate (gal/min): 2,500

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) 33

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	Clarifier Feed Water		
39B. CAS Number			
39C. Liquid Density (lb/gal)	8.35		
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] (Thermal Oxidizer)
- ☐ Other[1] (describe):

[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				2,133.04	O, WATER9
Ammonia				684.41	
Benzene				3.75	
Ethylbenzene				0.19	
Toluene				4.76	
Xylenes				1.11	
Carbon dioxide				21,692	

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

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

Attachment L

EMISSIONS UNIT DATA SHEET
STORAGE TANKS

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

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

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name Pre-Treatment	2. Tank Name Clarifier Effluent Tank
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) TK-2015	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 4E
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) Slight change in emissions/throughput due to process change	
7A. Does the tank have more than one mode of operation? ☐ Yes ☒ No (e.g. Is there more than one product stored in the tank?)	
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. 12,000 gallons	
9A. Tank Internal Diameter (ft) 12	9B. Tank Internal Height (or Length) (ft) 14
10A. Maximum Liquid Height (ft) 12	10B. Average Liquid Height (ft) 12
11A. Maximum Vapor Space Height (ft) 2	11B. Average Vapor Space Height (ft) 2
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights. 10,000 gallons	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
994,960,800	3,189,600

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 99,496

15. Maximum tank fill rate (gal/min): 2,215

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) 6

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	Clarifier Effluent		
39B. CAS Number			
39C. Liquid Density (lb/gal)	8.35		
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] (Thermal Oxidizer)
- ☐ Other[1] (describe):

[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		Annual Loss (lb/yr)	Estimation Method[1]
		Amount	Units		
VOCs				325.10	O, WATER9
Ammonia				8.27	
Benzene				0.64	
Ethylbenzene				0.0087	
Toluene				0.39	
Xylenes				0.10	
Carbon dioxide				50,906	

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

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

Attachment L

EMISSIONS UNIT DATA SHEET
STORAGE TANKS

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

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

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name Pre-Treatment	2. Tank Name Sludge Holding Tank
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) TK-2020	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 4E
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) Slight change in emissions/throughput due to process change.	
7A. Does the tank have more than one mode of operation? ☐ Yes ☒ No (e.g. Is there more than one product stored in the tank?)	
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. 103,000 gallons	
9A. Tank Internal Diameter (ft) 26	9B. Tank Internal Height (or Length) (ft) 26
10A. Maximum Liquid Height (ft) 23	10B. Average Liquid Height (ft) 23
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. 90,000 gallons	

13A. Maximum annual throughput (gal/yr) 44,150,400	13B. Maximum daily throughput (gal/day) 432,000
14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume) 491	
15. Maximum tank fill rate (gal/min) 300	
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) 13

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) 20	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) 20	36B. Corresponding Vapor Pressure (psia) 0.05
37A. Average Liquid Surface Temperature (°F) 50	37B. Corresponding Vapor Pressure (psia) 0.18
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	Settled sludge		
39B. CAS Number			
39C. Liquid Density (lb/gal)			
39D. Liquid Molecular Weight (lb/lb-mole)			
39E. Vapor Molecular Weight (lb/lb-mole)			

Maximum Vapor Pressure 39F. True (psia) 39G. Reid (psia)			
Months Storage per Year 39H. From 39I. To	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] (Thermal Oxidizer)
- ☐ Other[1] (describe):

[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		Annual Loss (lb/yr)	Estimation Method[1]
		Amount	Units		
VOCs				552.17	O, WATER9
Ammonia				226.79	
Benzene				2.90	
Ethylbenzene				0.11	
Toluene				3.23	
Xylenes				0.23	
Carbon dioxide				17,687	

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

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

Attachment L

EMISSIONS UNIT DATA SHEET
STORAGE TANKS

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

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

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name Pre-Treatment	2. Tank Name Thermal Feed Tank
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) TK-2040	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 4E
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) Slight change in emissions/throughput due to process change.	
7A. Does the tank have more than one mode of operation? ☐ Yes ☒ No (e.g. Is there more than one product stored in the tank?)	
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. 1,400,000 gallons	
9A. Tank Internal Diameter (ft) 62	9B. Tank Internal Height (or Length) (ft) 62
10A. Maximum Liquid Height (ft) 54	10B. Average Liquid Height (ft) 54
11A. Maximum Vapor Space Height (ft) 8	11B. Average Vapor Space Height (ft) 8
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights. 1,240,000 gallons	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
994,960,800	3,189,600

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume) 802

15. Maximum tank fill rate (gal/min) 2,215

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) 31

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	Effluent Water		
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] (Thermal Oxidizer)
- ☐ Other[1] (describe):

[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		Annual Loss (lb/yr)	Estimation Method[1]
		Amount	Units		
VOCs				412.01	O, WATER9
Ammonia				10.63	
Benzene				0.88	
Ethylbenzene				0.017	
Toluene				0.56	
Xylenes				0.16	
Carbon dioxide				52,895	

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

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

Attachment L
EMISSIONS UNIT DATA SHEET
STORAGE TANKS

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

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

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name Pre-Treatment	2. Tank Name Stage 1 Sludge Holding Tank
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) TK-1120	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 4E
5. Date of Commencement of Construction (for existing tanks)	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable)	
7A. Does the tank have more than one mode of operation? ☐ Yes ☒ No (e.g. Is there more than one product stored in the tank?)	
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. 27,000 gallons	
9A. Tank Internal Diameter (ft) 14	9B. Tank Internal Height (or Length) (ft) 24
10A. Maximum Liquid Height (ft) 18	10B. Average Liquid Height (ft) 18
11A. Maximum Vapor Space Height (ft) 6	11B. Average Vapor Space Height (ft) 6
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights. 20,000 gallons	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
28,908,000	288,000

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume)
1,445

15. Maximum tank fill rate (gal/min) 200

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) 7

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)
37A. Average Liquid Surface Temperature (°F) 60	37B. Corresponding Vapor Pressure (psia)
38A. Maximum Liquid Surface Temperature (°F) 80	38B. Corresponding Vapor Pressure (psia)

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

39A. Material Name or Composition	Settled Sludge		
39B. CAS Number			
39C. Liquid Density (lb/gal)			
39D. Liquid Molecular Weight (lb/lb-mole)			
39E. Vapor Molecular Weight (lb/lb-mole)			

Maximum Vapor Pressure 39F. True (psia) 39G. Reid (psia)			
Months Storage per Year 39H. From 39I. To	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] (Thermal Oxidizer)
- ☐ Other[1] (describe):

[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		Annual Loss (lb/yr)	Estimation Method[1]
		Amount	Units		
VOCs				165.47	O, WATER9
Ammonia				53.08	
Benzene				0.95	
Ethylbenzene				0.028	
Toluene				0.92	
Xylenes				0.048	
Carbon dioxide				11,208	

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

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

Attachment L

EMISSIONS UNIT DATA SHEET
STORAGE TANKS

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

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

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name Pre-Treatment	2. Tank Name Stage 1 Reaction Tanks A and B
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) TK-1105A and TK-1105B	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 4E
5. Date of Commencement of Construction (for existing tanks)	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable)	
7A. Does the tank have more than one mode of operation? ☐ Yes ☒ No (e.g. Is there more than one product stored in the tank?)	
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. 32,000 gallons each	
9A. Tank Internal Diameter (ft) 14	9B. Tank Internal Height (or Length) (ft) 28
10A. Maximum Liquid Height (ft) 26	10B. Average Liquid Height (ft) 26
11A. Maximum Vapor Space Height (ft) 2	11B. Average Vapor Space Height (ft) 2
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights. 30,000 gallons	

13A. Maximum annual throughput (gal/yr) 964,476,000 for both	13B. Maximum daily throughput (gal/day) 3,168,000 for both
14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume) 16,075 each	
15. Maximum tank fill rate (gal/min) 2200	
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) 7		
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 feed		
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] (Thermal Oxidizer)
- ☐ Other[1] (describe):

[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		Annual Loss (lb/yr)	Estimation Method[1]
		Amount	Units		
VOCs				175.76	O, WATER9 Emissions for both tanks
Ammonia				57.19	
Benzene				1.36	
Ethylbenzene				0.030	
Toluene				1.08	
Xylenes				0.045	
Carbon dioxide				21,678	

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

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

Attachment L

EMISSIONS UNIT DATA SHEET
STORAGE TANKS

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

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

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name Pre-Treatment	2. Tank Name Stage 1 Clarifier Pump Tank
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) TK-1115	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 4E
5. Date of Commencement of Construction (for existing tanks)	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable)	
7A. Does the tank have more than one mode of operation? ☐ Yes ☒ No (e.g. Is there more than one product stored in the tank?)	
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. 18,000 gallons	
9A. Tank Internal Diameter (ft) 14	9B. Tank Internal Height (or Length) (ft) 15.5
10A. Maximum Liquid Height (ft) 8.5	10B. Average Liquid Height (ft) 8.5
11A. Maximum Vapor Space Height (ft) 7	11B. Average Vapor Space Height (ft) 7
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights. 10,000 gallons	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
969,206,400	3,168,000

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume)
92,920

15. Maximum tank fill rate (gal/min) 2,200

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) 7

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 Pump Water		
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] (Thermal Oxidizer)
- ☐ Other[1] (describe):

[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		Annual Loss (lb/yr)	Estimation Method[1]
		Amount	Units		
VOCs				306.47	O, WATER9
Ammonia				8.14	
Benzene				0.63	
Ethylbenzene				0.0086	
Toluene				0.38	
Xylenes				0.099	
Carbon dioxide				66,953	

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

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

Attachment L

EMISSIONS UNIT DATA SHEET
STORAGE TANKS

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

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

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name 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*) 4E
5. Date of Commencement of Construction (for existing tanks)	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable)	
7A. Does the tank have more than one mode of operation? ☐ Yes ☒ No (e.g. Is there more than one product stored in the tank?)	
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] (Thermal Oxidizer)
- ☐ Other[1] (describe):

[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		Annual Loss (lb/yr)	Estimation Method[1]
		Amount	Units		
VOCs				66.99	O, WATER9
Ammonia				7.56	
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.

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 Thermal Process	2. Tank Name Recovered Water Tank
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) TK-2140	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 4E
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) Change in process – Change in thermal process	
7A. Does the tank have more than one mode of operation? ☐ Yes ☒ No (e.g. Is there more than one product stored in the tank?)	
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. 230,000 gallons	
9A. Tank Internal Diameter (ft) ~30	9B. Tank Internal Height (or Length) (ft) ~43
10A. Maximum Liquid Height (ft) ~42	10B. Average Liquid Height (ft) ~25
11A. Maximum Vapor Space Height (ft) 1	11B. Average Vapor Space Height (ft) 18
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights. 222,000 gallons	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
8,777,250	1,810,080

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 39.52

15. Maximum tank fill rate (gal/min) 1,257

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 Xdome 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) 15

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

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) 20		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) 20		36B. Corresponding Vapor Pressure (psia) 0.05	
37A. Average Liquid Surface Temperature (°F) 50		37B. Corresponding Vapor Pressure (psia) 0.18	
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	Water		
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] (Thermal Oxidizer)
- ☐ Other[1] (describe):

[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 as oil				6797.76	O, Material Balance
Ammonia				940.824	

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

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

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

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

Identification Number (as assigned on *Equipment List Form*): E-2076 (4E)

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

   Deaerator Vent Condenser. Vents to waste gas header and thermal oxidizer.

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

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

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

   Vents at 1121 lb/hr total mass flow to thermal oxidizer

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

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

6. Combustion Data (if applicable):

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

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

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

@ °F and psia.

(d) Percent excess air:

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

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

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

7. Projected operating schedule:

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

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

@ °F and psia

a.	NO_X		lb/hr	grains/ACF
b.	SO_2		lb/hr	grains/ACF
c.	CO		lb/hr	grains/ACF
d.	PM_{10}		lb/hr	grains/ACF
e.	Hydrocarbons		lb/hr	grains/ACF
f.	VOCs	1.74	lb/hr	grains/ACF
g.	Pb		lb/hr	grains/ACF
h.	Specify other(s)			
	Ammonia	0.67	lb/hr	grains/ACF
			lb/hr	grains/ACF
			lb/hr	grains/ACF
			lb/hr	grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	RECORDKEEPING
REPORTING	TESTING

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

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

Other 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 Chemical Feed Storage	2. Tank Name Methanol Bulk Storage Tank
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) TK-4115	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 26E
5. Date of Commencement of Construction (for existing tanks)	
6. Type of change ☐ New Construction ☐ New Stored Material ☒ Other Tank Modification	
7. Description of Tank Modification (if applicable) Change in tank throughput	
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. 8,000 gallons	
9A. Tank Internal Diameter (ft) 8	9B. Tank Internal Height (or Length) (ft) 22
10A. Maximum Liquid Height (ft) 8	10B. Average Liquid Height (ft) 8
11A. Maximum Vapor Space Height (ft) 0.5	11B. Average Vapor Space Height (ft) 0.5
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights. 8,000 gallons	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
274,188	2,054

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume)
34

15. Maximum tank fill rate (gal/min)

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 vertical X 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): to

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

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

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

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

25A. Year Internal Floaters Installed:

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

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

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

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

25F. Describe deck fittings; indicate the number of each type of fitting:

ACCESS HATCH		
BOLT COVER, GASKETED:	UNBOLTED COVER, GASKETED:	UNBOLTED COVER, UNGASKETED:

AUTOMATIC GAUGE FLOAT WELL		
BOLT COVER, GASKETED:	UNBOLTED COVER, GASKETED:	UNBOLTED COVER, UNGASKETED:

COLUMN WELL		
BUILT-UP COLUMN – SLIDING COVER, GASKETED:	BUILT-UP COLUMN – SLIDING COVER, UNGASKETED:	PIPE COLUMN – FLEXIBLE FABRIC SLEEVE SEAL:

LADDER WELL	
PIP COLUMN – SLIDING COVER, GASKETED:	PIPE COLUMN – SLIDING COVER, UNGASKETED:

GAUGE-HATCH/SAMPLE PORT	
SLIDING COVER, GASKETED:	SLIDING COVER, UNGASKETED:

ROOF LEG OR HANGER WELL		
WEIGHTED MECHANICAL ACTUATION, GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	SAMPLE WELL-SLIT FABRIC SEAL (10% OPEN AREA)

VACUUM BREAKER	
WEIGHTED MECHANICAL ACTUATION, GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:

RIM VENT	
WEIGHTED MECHANICAL ACTUATION GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:

DECK DRAIN (3-INCH DIAMETER)	
OPEN:	90% CLOSED:

STUB DRAIN
1-INCH DIAMETER:

OTHER (DESCRIBE, ATTACH ADDITIONAL PAGES IF NECESSARY)

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

IV. SITE INFORMANTION (optional if providing TANKS Summary Sheets)

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

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

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

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

39A. Material Name or Composition	Methanol		
39B. CAS Number			
39C. Liquid Density (lb/gal)			
39D. Liquid Molecular Weight (lb/lb-mole)			
39E. Vapor Molecular Weight (lb/lb-mole)			

Maximum Vapor Pressure 39F. True (psia) 39G. Reid (psia)			
Months Storage per Year 39H. From 39I. To	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] (Thermal Oxidizer)
- ☐ Other[1] (describe):

[1] Complete appropriate Air Pollution Control Device Sheet.

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

Material Name & CAS No.	Breathing Loss (lb/hr)	Working Loss Amount	Working Loss Units	Annual Loss (lb/yr)	Estimation Method[1]
VOC	0.024	0.042	lb/hr	492.82	EPA – TANKS 4.0.9d
Methanol	0.024	0.042	lb/hr	492.82	

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

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

Fuel Conditioning Skid Heaters

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

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

Identification Number (as assigned on *Equipment List Form*): HTFUEL1 (31E)

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

   Fuel Conditioning Heater - 2,400,000 Btu/hr

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

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

   Natural Gas as fuel - 2,353 scf/hr

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

   Heater is used to increase temperature of gas at fuel conditioning skid

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

   Combustion process

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

6. Combustion Data (if applicable):

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

Natural gas as fuel - 2,353 scf/hr

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

Expected 1200 - 1285 Btu/scf gas; however, the standard value of 1020 Btu/scf was used in the emission calculations to be conservative

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

@ °F and psia.

(d) Percent excess air:

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

2,400,000 Btu/hr. Natural gas.

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

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

7. Projected operating schedule:

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

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

@ °F and psia

a.	NO_X	0.24	lb/hr	grains/ACF
b.	SO_2	0.0014	lb/hr	grains/ACF
c.	CO	0.20	lb/hr	grains/ACF
d.	PM_{10}	0.018	lb/hr	grains/ACF
e.	Hydrocarbons		lb/hr	grains/ACF
f.	VOCs	0.013	lb/hr	grains/ACF
g.	Pb		lb/hr	grains/ACF
h.	Specify other(s)			
	Total HAP (including HCHO)	0.0044	lb/hr	grains/ACF
	CO2e	140.9	lb/hr	grains/ACF
			lb/hr	grains/ACF
			lb/hr	grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	RECORDKEEPING
REPORTING	TESTING

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

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

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

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

Identification Number (as assigned on *Equipment List Form*): HTFUEL2 (32E)

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

   Fuel Conditioning Heater - 2,400,000 Btu/hr

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

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

   Natural Gas as fuel - 2,353 scf/hr

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

   Heater is used to increase temperature of gas at fuel conditioning skid

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

   Combustion process

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

6. Combustion Data (if applicable):

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

Natural gas as fuel - 2,353 scf/hr

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

Expected 1200 - 1285 Btu/scf gas; however, the standard value of 1020 Btu/scf was used in the emission calculations to be conservative

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

@ °F and psia.

(d) Percent excess air:

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

2,400,000 Btu/hr. Natural gas.

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

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

7. Projected operating schedule:

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

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

@ °F and psia

a.	NO_X	0.24	lb/hr	grains/ACF
b.	SO_2	0.0014	lb/hr	grains/ACF
c.	CO	0.20	lb/hr	grains/ACF
d.	PM_{10}	0.018	lb/hr	grains/ACF
e.	Hydrocarbons		lb/hr	grains/ACF
f.	VOCs	0.013	lb/hr	grains/ACF
g.	Pb		lb/hr	grains/ACF
h.	Specify other(s)			
	Total HAP (including HCHO)	0.0044	lb/hr	grains/ACF
	CO2e	140.9	lb/hr	grains/ACF
			lb/hr	grains/ACF
			lb/hr	grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	RECORDKEEPING
REPORTING	TESTING

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

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

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

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

Identification Number (as assigned on *Equipment List Form*): TK-4301, U-4302, and U-4303

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

   Dry calcium carbonate system prior to the slurry tank. Contains a silo, hopper and feeder to feed dry sodium bicarbonate into the bulk tank to be mixed with water into solution before injection into the water treatment system. Emissions assume one transfer point between each of the three pieces of equipment.

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

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

   Calcium carbonate maximum hourly dry process rate is 380 lb/hr.

   Calcium carbonate average dry process rate is 230 lb/hr.

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

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

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

6. Combustion Data (if applicable):

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

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

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

@ °F and psia.

(d) Percent excess air:

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

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

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

7. Projected operating schedule:

Hours/Day	as needed	Days/Week	7	Weeks/Year	52

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

@ 60 °F and atmospheric psia

a.	NO_X		lb/hr	grains/ACF
b.	SO_2		lb/hr	grains/ACF
c.	CO		lb/hr	grains/ACF
d.	PM_{10}	0.97	lb/hr	grains/ACF
e.	Hydrocarbons		lb/hr	grains/ACF
f.	VOCs		lb/hr	grains/ACF
g.	Pb		lb/hr	grains/ACF
h.	Specify other(s)			
	PM2.5	0.28	lb/hr	grains/ACF
			lb/hr	grains/ACF
			lb/hr	grains/ACF
			lb/hr	grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	RECORDKEEPING
REPORTING	TESTING

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

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

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

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

Identification Number (as assigned on *Equipment List Form*): VENT1

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

Fugitive emissions from venting episodes during pigging operations at the fuel skid.

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

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

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

- pigging venting - 0.004 tons VOC per event, 0.36 tons CO2e per event

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

none

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

6. Combustion Data (if applicable):

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

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

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

@ °F and psia.

(d) Percent excess air:

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

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

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

7. Projected operating schedule:

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

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

@ venting events are uncontrolled °F and psia

a.	NO_X		lb/hr	grains/ACF
b.	SO_2		lb/hr	grains/ACF
c.	CO		lb/hr	grains/ACF
d.	PM_{10}		lb/hr	grains/ACF
e.	Hydrocarbons		lb/hr	grains/ACF
f.	VOCs	7.53	lb/hr	grains/ACF
g.	Pb		lb/hr	grains/ACF
h.	Specify other(s)			
	Total HAPs	0.18	lb/hr	grains/ACF
	CO2e	710.3	lb/hr	grains/ACF
			lb/hr	grains/ACF
			lb/hr	grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	RECORDKEEPING
REPORTING	TESTING

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

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

N/A

FUGITIVE EMISSIONS FROM PAVED HAULROADS

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

I =	Industrial augmentation factor (dimensionless)	
n =	Number of traffic lanes	2
s =	Surface material silt content (%)	
L =	Surface dust loading (lb/mile)	

Item Number	Description	Mean Vehicle Weight (tons)	Miles per Trip	Maximum Trips per Hour	Maximum Trips per Year	Control Device ID Number	Control Efficiency (%)
1	Influent Water Tank Truck	40	0.83	25	219,000	NA	NA
2	Chemical Delivery Truck	40	1.06	1	1,825	NA	NA
3	Sludge and Salt Disposal Truck	60	0.38	4	27,375	NA	NA
4	Worker Vehicles	2	1.06	5	3,650	NA	NA
5	Oil Trucks	40	0.83	1	1,095	NA	NA
6							
7							
8							

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

$E = 0.077 \times I \times (4 \div n) \times (s \div 10) \times (L \div 1000) \times (W \div 3)^{0.7}$ = lb/Vehicle Mile Traveled (VMT)

Where:

I =	Industrial augmentation factor (dimensionless)	
n =	Number of traffic lanes	2
s =	Surface meterial silt content (%)	
L =	Surface dust loading (lb/mile)	
W =	Average vehicle weight (tons)	41.62

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

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

SUMMARY OF PAVED HAULROAD EMISSIONS

Item No.	Uncontrolled		Controlled	
	lb/hr	TPY	lb/hr	TPY
1	1.29	5.07	1.29	5.07
2	0.014	0.054	0.014	0.054
3	0.073	0.29	0.073	0.29
4	0.027	0.11	0.027	0.11
5	0.007	0.025	0.007	0.025
6				
7				
8				
TOTALS	1.41	5.55	1.41	5.55

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*): OILLOAD	
1. Loading Area Name: Oil loading from TK-1065	
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 –Oil
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		Oil					
Max. daily throughput (1000 gal/day)		21.63					
Max. annual throughput (1000 gal/yr)		7895					
Loading Method [1]		SUB					
Max. Fill Rate (gal/min)		TBD					
Average Fill Time (min/loading)		TBD					
Max. Bulk Liquid Temperature (°F)		80					
True Vapor Pressure [2]		3.1					
Cargo Vessel Condition [3]		U					
Control Equipment or Method [4]		None					
Minimum control efficiency (%)		0					
Maximum Emission Rate	Loading (lb/hr)	16.70					
	Annual (lb/yr)	17,443					
Estimation Method [5]		EPA					

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

[2] At maximum bulk liquid temperature

[3] B = Ballasted Vessel, C = Cleaned, U = Uncleaned (dedicated service), O = other (describe)

[4] List as many as apply (complete and submit appropriate *Air Pollution Control Device Sheets*):CA = Carbon Adsorption LOA = Lean Oil AdsorptionCO = Condensation SC = Scrubber (Absorption)CRA = Compressor-Refrigeration-Absorption TO = Thermal Oxidation or Incineration
CRC = Compression-Refrigeration-Condensation VB = Dedicated Vapor Balance (closed system)
O = other (descibe)

[5] EPA = EPA Emission Factor as stated in AP-42
MB = Material Balance
TM = Test Measurement based upon test data submittal
O = other (describe)

9. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**

Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	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

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 L
EMISSIONS UNIT DATA SHEET
GENERAL

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

Identification Number (as assigned on *Equipment List Form*): DISP1

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

   Dewatered Stage 2 Sludge Disposal into an appropriate disposal container before being trucked off site.

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

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

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

   Dewatered Sludge - 35 gallons per minute = 2,100 gallons per hour

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

   None

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

6. Combustion Data (if applicable):

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

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

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

@ °F and psia.

(d) Percent excess air:

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

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

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

7. Projected operating schedule:

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

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

@ 40-80 °F and atmospheric psia

a.	NO_X		lb/hr	grains/ACF
b.	SO_2		lb/hr	grains/ACF
c.	CO		lb/hr	grains/ACF
d.	PM_{10}		lb/hr	grains/ACF
e.	Hydrocarbons		lb/hr	grains/ACF
f.	VOCs	4.52	lb/hr	grains/ACF
g.	Pb		lb/hr	grains/ACF
h.	Specify other(s)			
	Total HAPs	0.00052	lb/hr	grains/ACF
	Ammonia	0.033	lb/hr	grains/ACF
			lb/hr	grains/ACF
			lb/hr	grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

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

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty
none

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

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

Identification Number (as assigned on *Equipment List Form*): DISP2

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

   Salt Disposal into a truck before removal off site.

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

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

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

   Salt (NaCl and CaCl) - 69,412 lb/hr from the 4A stream and 107,624 lb/hr from the 4B stream

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

   None

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

6. Combustion Data (if applicable):

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

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

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

@ °F and psia.

(d) Percent excess air:

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

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

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

7. Projected operating schedule:

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

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

@ °F and atmospheric psia

a.	NO_X		lb/hr	grains/ACF
b.	SO_2		lb/hr	grains/ACF
c.	CO		lb/hr	grains/ACF
d.	PM_{10}		lb/hr	grains/ACF
e.	Hydrocarbons		lb/hr	grains/ACF
f.	VOCs	0.064	lb/hr	grains/ACF
g.	Pb		lb/hr	grains/ACF
h.	Specify other(s)			
			lb/hr	grains/ACF
			lb/hr	grains/ACF
			lb/hr	grains/ACF
			lb/hr	grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

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

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty
none

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

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

Identification Number (as assigned on *Equipment List Form*): DISP3

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

   Dewatered Stage 1 Sludge Disposal into an appropriate disposal container before being trucked off site.

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

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

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

   Dewatered Sludge - 5 gallons per minute = 300 gallons per hour

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

   None

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

6. Combustion Data (if applicable):

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

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

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

@ °F and psia.

(d) Percent excess air:

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

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

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

7. Projected operating schedule:

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

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

@ 40-80 °F and atmospheric psia

a.	NO_X		lb/hr	grains/ACF
b.	SO_2		lb/hr	grains/ACF
c.	CO		lb/hr	grains/ACF
d.	PM_{10}		lb/hr	grains/ACF
e.	Hydrocarbons		lb/hr	grains/ACF
f.	VOCs	0.070	lb/hr	grains/ACF
g.	Pb		lb/hr	grains/ACF
h.	Specify other(s)			
	Total HAPs	0.00025	lb/hr	grains/ACF
	Ammonia	0.038	lb/hr	grains/ACF
			lb/hr	grains/ACF
			lb/hr	grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

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

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty
none

Attachment M.
Air Pollution Control Device Sheets

Thermal Oxidizer

Attachment M
Air Pollution Control Device Sheet
(FLARE SYSTEM)

Control Device ID No. (must match Emission Units Table): 1C and 4E

Equipment Information

1. Manufacturer: Process Combustion Corporation (PCC)

   Model No. Ultra Low NOx Waste-Staged

2. Method:
   - ☐ Elevated flare
   - ☐ Ground flare
   - ☒ Other

   Describe: Thermal Oxidizer

3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.

4. Method of system used:
   ☐ Steam-assisted ☐ Air-assisted ☐ Pressure-assisted ☐ Non-assisted

5. Maximum capacity of flare:
   11 MMBtu/hr
   scf/min
   scf/hr

6. Dimensions of stack:
   Diameter 1 ft.
   Height 64 ft.

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

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

9. Number of burners:
   Rating: 11,000,000 BTU/hr

10. Will preheat be used? ☐ Yes ☒ No

11. Describe method of controlling flame:

12. Flare height: 64 ft

13. Flare tip inside diameter: 1 ft

14. Natural gas flow rate to flare pilot flame per pilot light: 0.25 scf/min
    15 scf/hr

15. Number of pilot lights:
    Total BTU/hr

16. Will automatic re-ignition be used?
    ☐ Yes ☐ No

17. If automatic re-ignition will be used, describe the method:

18. Is pilot flame equipped with a monitor? ☒ Yes ☐ No
    If yes, what type?
    - ☐ Thermocouple
    - ☐ Infra-Red
    - ☐ Ultra Violet
    - ☐ Camera with monitoring control room
    - ☐ Other, Describe:

19. Hours of unit operation per year: 8,760

Steam Injection

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

Characteristics of the Waste Gas Stream to be Burned

29.

Name	Quantity Grains of H_2S/100 ft^3	Quantity (LB/hr, ft^3/hr, etc)	Source of Material
VOCs	0	220.64 lb/hr	Waste Gas Header
HAPs	0	0.47 lb/hr	Waste Gas Header
Ammonia	0	57.68 lb/hr	Waste Gas Header
Methane	0	TBD	Natural Gas

30. Estimate total combustible to flare: acf/hr LB/hr or ACF/hr
(Maximum mass flow rate of waste gas) scfm

31. Estimated total flow rate to flare including materials to be burned, carrier gases, auxiliary fuel, etc.:
LB/hr or ACF/hr

32. Give composition of carrier gases:
Methane will be added to the waste gas header stream

33. Temperature of emission stream: °F Heating value of emission stream: 1,200 BTU/ft^3 Mean molecular weight of emission stream: MW = lb/lb-mole	34. Identify and describe all auxiliary fuels to be burned. BTU/scf BTU/scf BTU/scf BTU/scf
35. Temperature of flare gas: °F	36. Flare gas flow rate: scf/min
37. Flare gas heat content: 1,200 BTU/ft^3	38. Flare gas exit velocity: TBD scf/min

39. Maximum rate during emergency for one major piece of equipment or process unit: scf/min

40. Maximum rate during emergency for one major piece of equipment or process unit: BTU/min

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

42. Describe the collection material disposal system:
NA

43. Have you included ***Flare Control Device*** in the Emissions Points Data Summary Sheet? Yes

44. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING:	RECORDKEEPING:
see Attachment O	see Attachment O
REPORTING:	TESTING:
see Attachment O	see Attachment O

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

45. Manufacturer's Guaranteed Capture Efficiency for each air pollutant.
100% for all gases

46. Manufacturer's Guaranteed Control Efficiency for each air pollutant.
VOCs >98% DRE, HAPs >98% DRE

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

2.3 SYSTEM DESIGN DESCRIPTION

The proposed system is a PCC Ultra Low NOx Waste-Staged Thermal Oxidizer designed to achieve:

- a VOC DRE of 99.9% for the Deaerator Vent stream,
- a maximum NOx emission rate of 1.08 lb/hr (= 4.50 tons/year), and
- a maximum CO emission rate of 0.93 lb/hr (= 4.08 ton/year).

The thermal oxidizer achieves these emission limits by staging the Deaerator Vent gas into multiple zones. At each zone, the chamber is designed to minimize formation of chemical and thermal NOx – which is potentially very large with nitrogen-bound waste streams (such as ammonia) in a single-stage thermal oxidizer. The thermal oxidizer also has a vertical arrangement to provide the most economical configuration. Please see Appendix A for a preliminary General Arrangement Drawing of the proposed waste-staged system.

The Ultra Low NOx Main Burner is rated for 2.2 MM Btu/hr of VRU fuel gas and a combined heat release of 6.0 MM Btu/hr HHV of natural gas and VRU fuel gas. This burner operates with a high excess air air-to-fuel ratio and provides a "cooler" flame at the burner to minimize thermal NOx. In multiple stages downstream of the burner flame front, the Deaerator Vent gas is introduced through custom-designed inlet nozzles. Each Deaerator Vent injection is given sufficient residence time to intimately mix with the products of combustion. Additional secondary combustion air is provided in select waste stages to provide additional air for cooling and to complete the combustion process. The conditions provided in each stage create an environment that biases the bound nitrogen to convert to molecular nitrogen (N2) instead of NOx.

The POC's exit the oxidizing section via the integral exhaust stack tip and are then vented to atmosphere at a termination height of 50'-0". A stainless steel rain hood is offered as an option to provide rain protection at a termination height of 64'-0".

Backup Flare

Attachment M
Air Pollution Control Device Sheet
(FLARE SYSTEM)

Control Device ID No. (must match Emission Units Table): 2C and 29E

Equipment Information

1. Manufacturer: AEREON

   Model No. SFVP-1236

2. Method: ☒ Elevated flare ☐ Ground flare ☐ Other Describe

3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.

4. Method of system used:
   ☐ Steam-assisted ☒ Air-assisted ☐ Pressure-assisted ☐ Non-assisted

5. Maximum capacity of flare:
   1,667 scf/min
   100,000 scf/hr

6. Dimensions of stack:
   Diameter 1 ft.
   Height 60 ft.

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

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

9. Number of burners:
   Rating: 1.16e8 BTU/hr

10. Will preheat be used? ☐ Yes ☒ No

11. Describe method of controlling flame:

12. Flare height: 60 ft

13. Flare tip inside diameter: 1 ft

14. Natural gas flow rate to flare pilot flame per pilot light: 1.03 scf/min
    62 scf/hr

15. Number of pilot lights:
    Total 74400 BTU/hr

16. Will automatic re-ignition be used?
    ☒ Yes ☐ No

17. If automatic re-ignition will be used, describe the method:
    Pilot is continuously monitored by a thermocouple and will provide spark ignition to ignite in the case of a flame-out situation

18. Is pilot flame equipped with a monitor? ☒ Yes ☐ No
    If yes, what type? ☒ Thermocouple ☐ Infra-Red ☐ Ultra Violet ☐ Camera with monitoring control room ☐ Other, Describe:

19. Hours of unit operation per year: pilot - 8,760; scheduled use - 120

Steam Injection

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

Characteristics of the Waste Gas Stream to be Burned

29.

Name	Quantity Grains of H_2S/100 ft^3	Quantity (LB/hr, ft^3/hr, etc)	Source of Material
Gas blanket bleed gas		2.2 MMBtu/hr	Waste Gas Header

30. Estimate total combustible to flare:	1833 acf/hr	LB/hr or ACF/hr
(Maximum mass flow rate of waste gas)	30.56	scfm

31. Estimated total flow rate to flare including materials to be burned, carrier gases, auxiliary fuel, etc.:
1833 acf/hr LB/hr or ACF/hr

32. Give composition of carrier gases:

33. Temperature of emission stream: °F Heating value of emission stream: 1200 BTU/ft^3 Mean molecular weight of emission stream: MW = lb/lb-mole	34. Identify and describe all auxiliary fuels to be burned. BTU/scf BTU/scf BTU/scf BTU/scf
35. Temperature of flare gas: °F	36. Flare gas flow rate: 30.56 scf/min
37. Flare gas heat content: 1,200 BTU/ft^3	38. Flare gas exit velocity: TBD scf/min

39. Maximum rate during emergency for one major piece of equipment or process unit: scf/min

40. Maximum rate during emergency for one major piece of equipment or process unit: BTU/min

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

42. Describe the collection material disposal system:
NA

43. Have you included ***Flare Control Device*** in the Emissions Points Data Summary Sheet? Yes

44. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING:	RECORDKEEPING:
see Attachment O	see Attachment O
REPORTING:	TESTING:
see Attachment O	see Attachment O

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

45. Manufacturer's Guaranteed Capture Efficiency for each air pollutant.
100% for all gasses

46. Manufacturer's Guaranteed Control Efficiency for each air pollutant.
VOCs >98% DRE, HAPs >98% DRE

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

Model 850 FLAMEX Pilot

Description

The Model 850 Pilot is a time-proven product that combines electric spark ignition with continuous spark monitoring, thermocouple monitoring, and retractability. The combination of these highly-demanded features has made the high-alloy, stainless steel Model 850 Pilot one of the most well-received ignition systems on the market. This electric pilot provides a rapid, direct spark every 10 to 20 seconds, ensuring reliable ignition. The Model 850 features an inspirator that induces air into the fuel gas line, creating a combustible mixture for the pilot to ignite. The pilot flame is continuously monitored by an integrated thermocouple, providing for automatic and immediate re-ignition in a flame-out scenario. Additionally, the Model 850 Pilot can be independently retracted to grade for ease of maintenance and inspection while the flare remains in service.

Design Features

- Durable, high-alloy stainless steel construction
- Fully retractable for ease of maintenance
- Low operating costs
- Eliminates the need for costly ladders and platforms
- Rapid ignition and re-ignition response time
- Low fuel consumption
- Designed to operate with 120, 240 VAC, 12, 24 VDC, and solar power
- Designed to maintain a stable flame in up to 150 mph (240 km/hr) winds
- Ease of installation for all retrofit applications

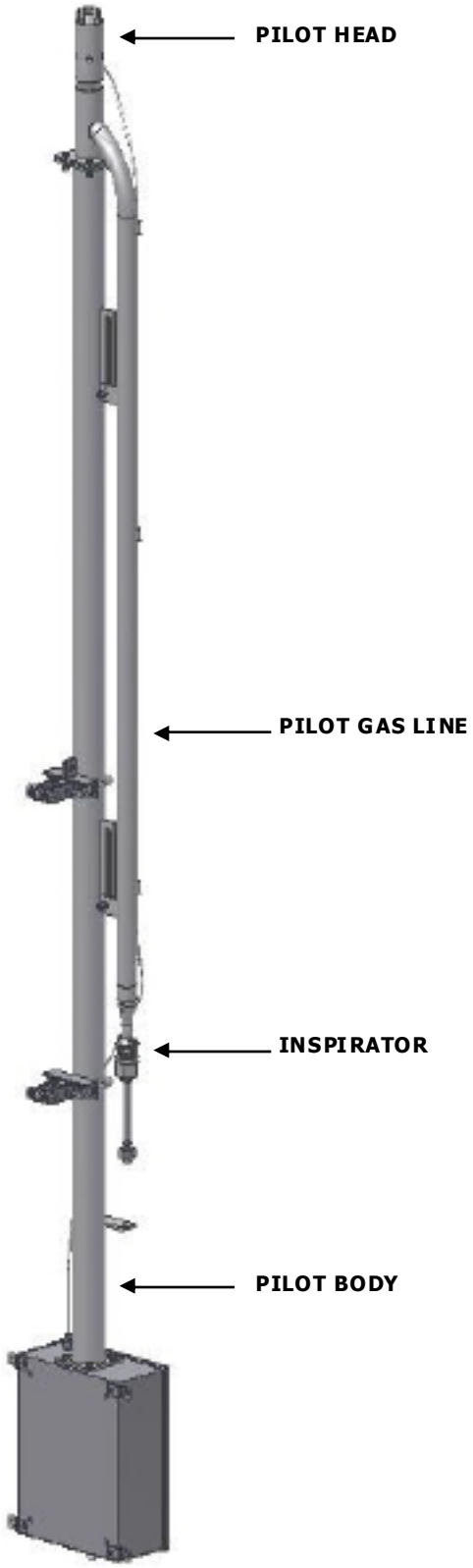
Model 850 FLAMEX Pilot

Materials

Pilot Head:	304 Stainless Steel 316 Stainless Steel 310 Stainless Steel Incoloy/ Inconel
Pilot Body:	304 Stainless Steel 316 Stainless Steel 310 Stainless Steel Incoloy/ Inconel
Inspirator:	Cast Iron
Pilot Gas Line:	304 Stainless Steel 316 Stainless Steel 310 Stainless Steel Incoloy/ Inconel

Specifications

Tip Length:	10 Feet (3.3 m)
Weight:	75 lbs (34.1 kg)
Consumption:	62 SCFH of Natural Gas @ 8 psig
Fuel:	Natural Gas, Propane, Butane



Design Results and Summary

Quote No.: 16-10444 **Customer:** Veolia Water **Location:** Antero Clearwater Facility
Description: SFVP-1236 x 60 Ft Flare System **Prepared by:** LAM
Date: 4/13/2016

AMBIENT CONDITIONS	USCS		SI	
Ambient Temperature*:	89.6	°F	32	°C
Wind Speed (Radiation Only):	20	mph	32.2	km/hr
Solar Radiation:	250	Btu/ft^2-hr	789	W/m^2

*Used only in Brzustowski's Radiation Calculation Method.

INPUT PARAMETERS				
Molecular Weight:	21.31		21.31	
Max. Volumetric Flow Rate*:	2.4	MMSCFD	67961.7	m^3/day
Max. Mass Flow Rate:	5620.8	lbs/hr	2549.5	kg/hr
Inlet Gas Temperature:	60.0	°F	15.6	°C
Total Heat Release:	1.16E+08	Btu/Hr	3.39E+04	kW

*Volumetric flow rate is considered at standard conditions.

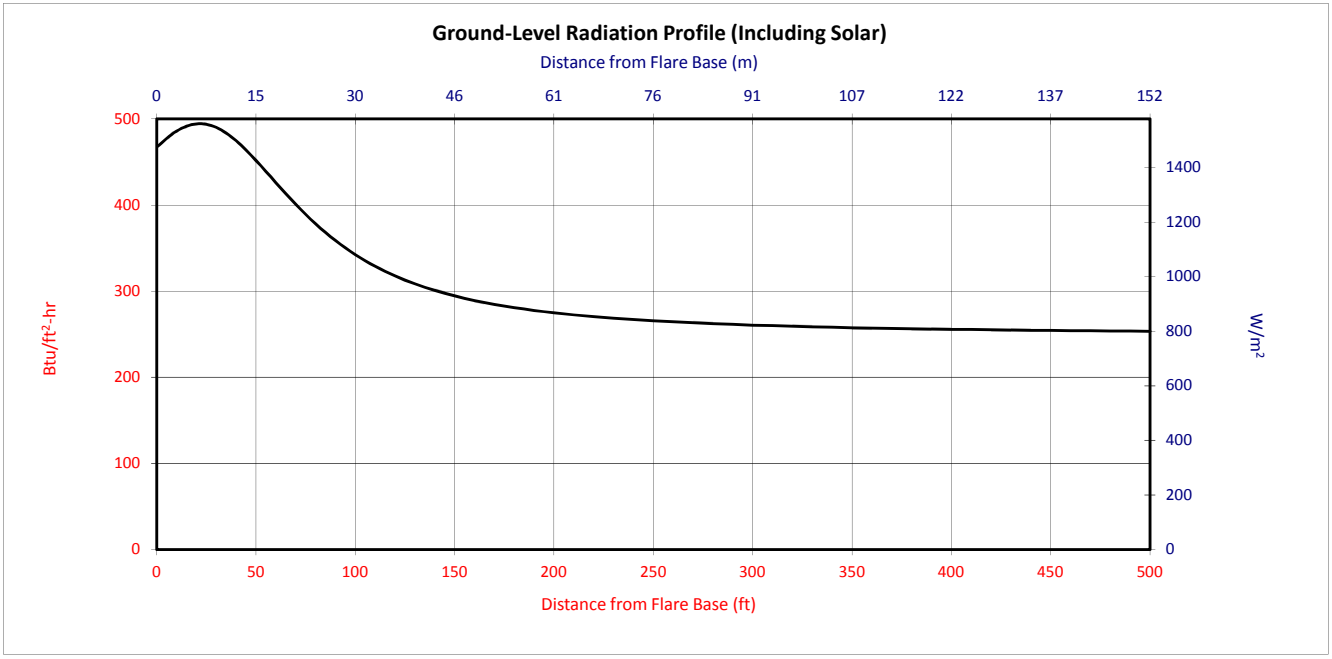
FLARE TIP CALCULATIONS				
Proposed Flare Tip:	**SFVP-1236 Air-Assist Flare**			
Flare Tip Diameter:	12.0	in	304.8	mm
Exit Velocity:	35.5	ft/sec	10.8	m/sec
Pressure Drop of Tip & Seal:	0.0	psi	0.1	kPa

FLARE RISER CALCULATIONS				
Minimum Flare Height:	60.0	Ft	18.3	m
Pressure Drop of Inlet and Riser:	0.0	psi	0.1	kPa
Total Pressure Drop of Flare Riser and Tip**:	0.0	psi	0.2	kPa

**Includes predicted inlet losses.

RADIATION RESULTS				
Maximum Radiation at Grade***:	494.3	Btu/ft^2-hr	1559.4	W/m^2
Solar Radiation Considered:	250.0	Btu/ft^2-hr	788.6	W/m^2
Distance to Maximum Radiation:	20.0	ft	6.1	m

***Maximum Radiation includes solar radiation.



Pressure/Flow Rate Modeling

AEREON

Quote No.: 16-10444 **Customer:** Veolia Water **Location:** Antero Clearwater Facility
Description: SFVP-1236 x 60 Ft Flare System **Prepared by:** LAM
Date: 4/13/2016

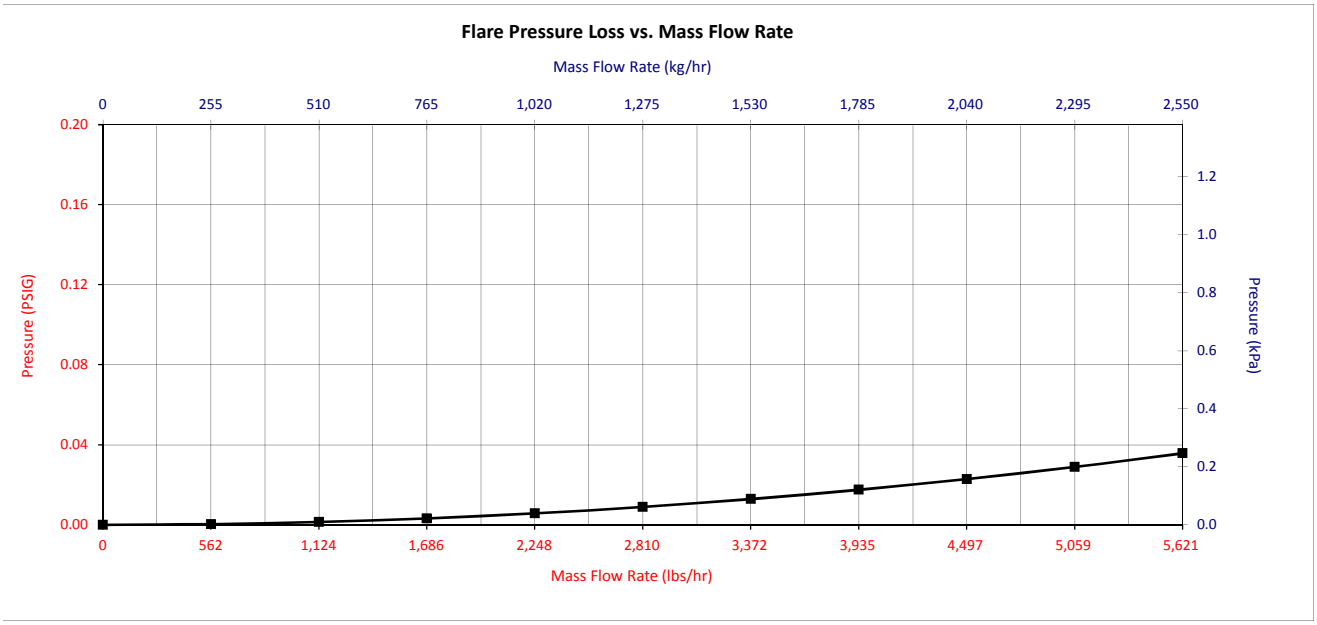
INPUT PARAMETERS	USCS	SI
Molecular Weight:	21.31	21.31
Max. Volumetric Flow Rate*:	2.4 MMSCFD	67968.0 m^3/day
Max. Mass Flow Rate:	5620.8 lbs/hr	2549.5 kg/hr
Inlet Gas Temperature:	60.0 °F	15.6 °C

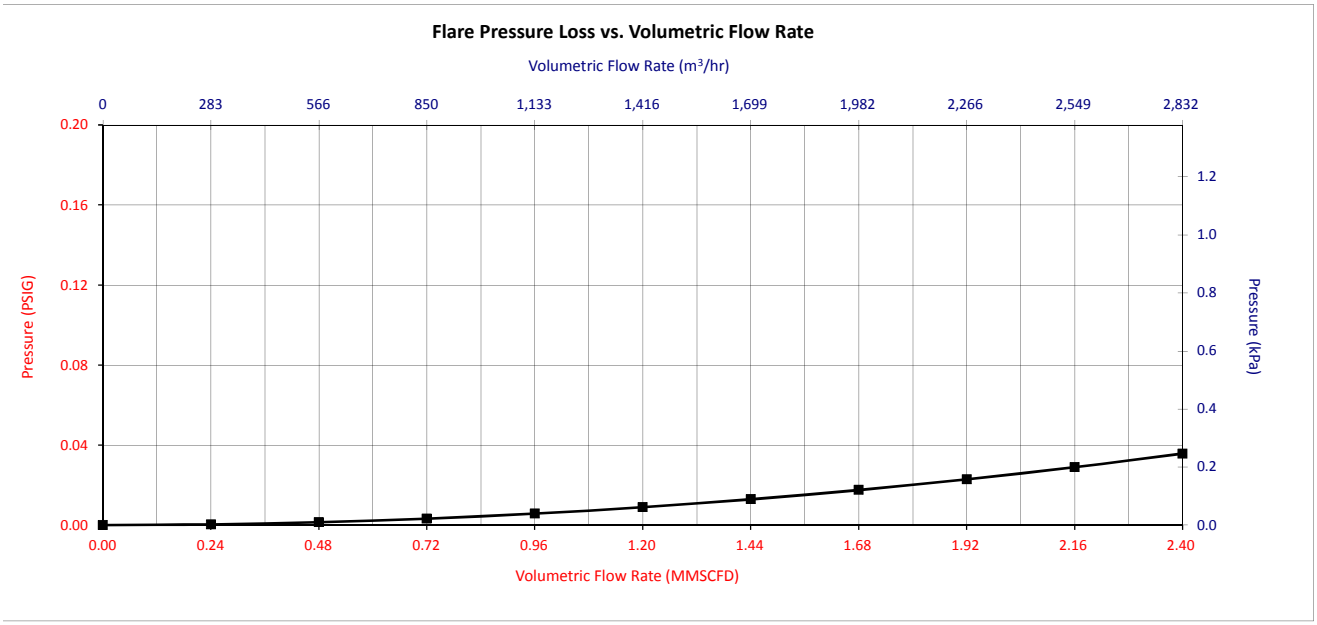
*Volumetric flow rate is considered at standard conditions.

PRESSURE CALCULATIONS

Proposed Flare Tip:	SFVP-1236 Air-Assist Flare	
Total Pressure Drop of Liquid Seal:	0.0 psi	0.0 kPa
Total Pressure Drop of Integral Knockout Drum:	0.0 psi	0.0 kPa
Total Pressure Drop of Flame Arrestor:	0.0 psi	0.0 kPa
Total Pressure Drop of Flare System*:	0.04 psi	0.2 kPa

Flare system pressure drop excludes separators, liquid seals, and flame arrestors.





Noise Analysis

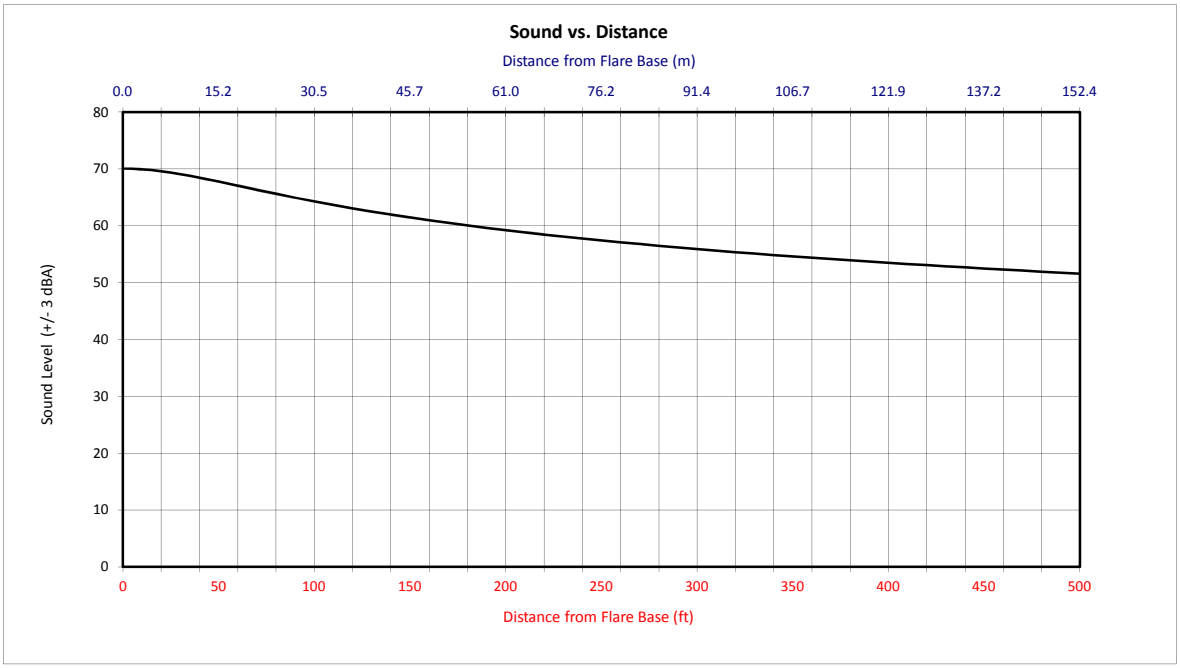
Quote No.: 16-10444 **Customer:** Veolia Water **Location:** Antero Clearwater Facility
Description: SFVP-1236 x 60 Ft Flare System **Prepared by:** LAM
Date: 4/13/2016

INPUT PARAMETERS	USCS		SI	
Molecular Weight:	21.31		21.31	
Max. Volumetric Flow Rate*:	2.4	MMSCFD	67968.0	m^3/day
Max. Mass Flow Rate:	5620.8	lbs/hr	2549.5	kg/hr
Inlet Gas Temperature:	60.0	°F	15.6	°C

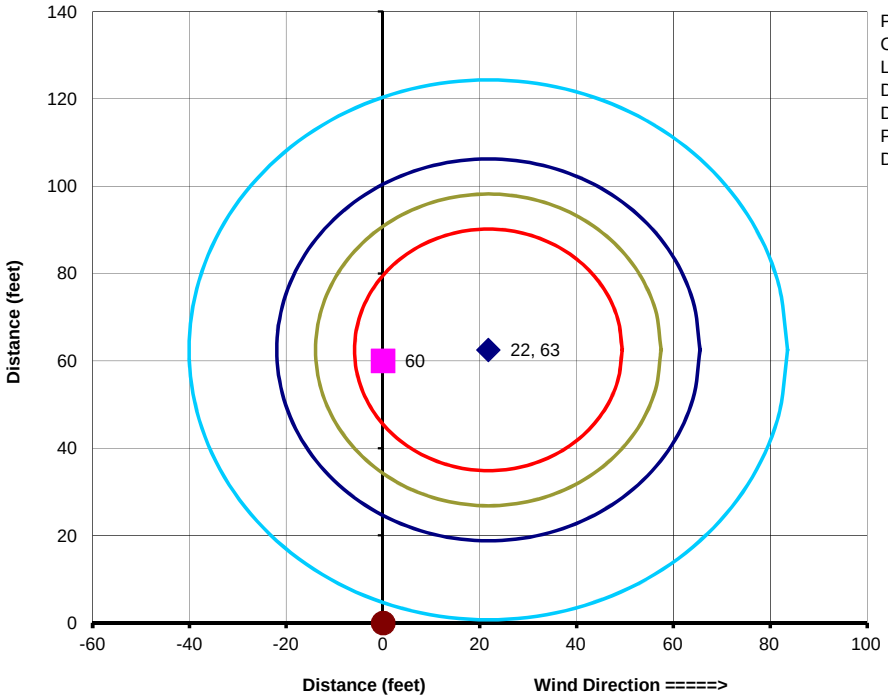
*Volumetric flow rate is considered at standard conditions.

FLARE TIP CALCULATIONS

Proposed Flare Tip:	**SFVP-1236 Air-Assist Flare**			
Flare Tip Diameter:	12.0	in	304.8	mm
Exit Velocity:	35.5	ft/sec	10.8	m/sec
Maximum Sound Level:	70.1	dB (A)		



RADIATION ISOPLETH - Elevation View Relative to Flare Tip (Fixed Wind Direction)

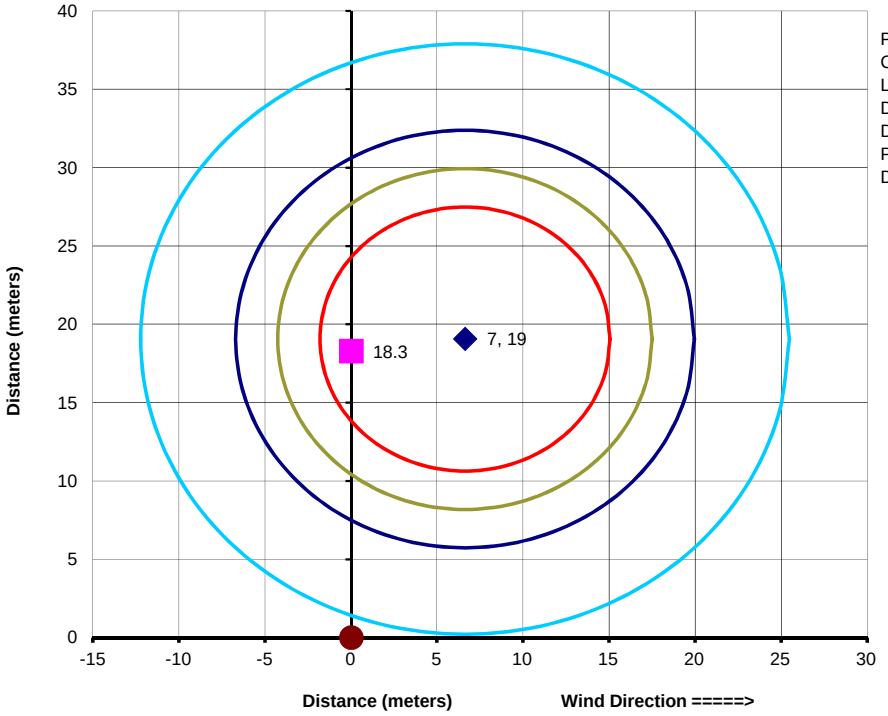


Project # / Quote #:	16-10444
Customer Name:	Veolia Water
Location:	Antero Clearwater Facility
Description:	SFVP-1236 x 60 Ft
Description:	Flare System
Prepared By:	LAM
Date:	4/13/2016

Wind Speed:	20 mph
Solar Radiation:	250 Btu/ft^2-hr

Flare Base
Flare Tip
Flame Center
500 Btu/ft2-hr
750 Btu/ft2-hr
1000 Btu/ft2-hr
1500 Btu/ft2-hr

RADIATION ISOPLETH - Elevation View Relative to Flare Tip (Fixed Wind Direction)



Project # / Quote #:	16-10444
Customer Name:	Veolia Water
Location:	Antero Clearwater Facility
Description:	SFVP-1236 x 60 Ft
Description:	Flare System
Prepared By:	LAM
Date:	4/13/2016

Wind Speed:	8.94 m/s
Solar Radiation:	0.789 kW/m^2

Flare Base
Flare Tip
Flame Center
1577 W/m2
2366 W/m2
3155 W/m2
4732 W/m2

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	Oil truck traffic added
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	New emission source
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	Modified emissions due to process change and material balance
TK-1055B	Stage 1 Clarifier Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 75' D x 17' H - 560,000 gallons working volume	Modified emissions due to change in operation
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	Modified emissions due to process change and material balance
TK-1070	Equalization Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 56' D x 56' H - 900,000 gallons working volume	Modified emissions due to process change and material balance
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	Modified emissions due to change in throughput
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	Modified emissions due to process change and material balance
TK-2015	Clarifier Effluent Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 12' D x 14' H - 10,000 gallons working volume	Modified emissions due to process change and material balance
TK-2040	Thermal Feed Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 62' D x 62' H - 1,240,000 gallons working volume	Modified emissions due to process change and material balance
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.	New emission source
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.	New emission sources
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.	New emission source
TK-1130	Stage 1 Filtrate Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 6' D x 8' H - 1,000 gallons working volume. Mixed Tank.	New emission source
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	Modified emissions due to process change and material balance
	Stage 1 Sludge Dewatering	No emissions from the enclosed dewatering system. Emissions are calculated upon disposal however.		New, but no emissions
	Stage 2 Sludge Dewatering	No emissions from the enclosed dewatering system. Emissions are calculated upon disposal however.		Not modified

Antero Treatment LLC - Antero Clearwater Facility
Equipment Summary and Emissions

TK-2030	Sludge Filtrate Tank	Tank has been removed from facility		Tank physically removed from facility
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		Modified emissions due to throughput change and operation change
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		New emission source
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	Modified emissions due to process change and material balance
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	Modified emissions due to process change and material balance. Change in tank size and not vented to thermal oxidizer anymore.
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	Modified emissions due to process change and material balance. No longer connected to the thermal oxidizer since there are no VOC emissions from the tank.
DISP2	Salt Disposal	Mass Balance Stream 269 and 283. Assumed 100% of GROs volatilize.	Comprised of streams 4A and 4B	Modified emissions due to process change and material balance
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	New tank, but no emissions
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	New tank, but no emissions
CT-2335	Cooling Tower Basin	AP-42 Chapter 13.4 and manufacturer data	Three fans	Not modified

Antero Treatment LLC - Antero Clearwater Facility
Equipment Summary and Emissions

H-2185A/B	Boiler A/B	AP-42 Chapter 1.4 and manufacturer spec sheet		Modified due to synthetic minor fuel limitation of 89% of maximum or 3589.2 MMscf/year
	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
CHEMICAL FEED				
TK-4175	Clarifier Polymer Aging Tank	Tank has been removed from facility		Tank physically removed from facility
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	New tank, but no emissions
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	Tank size change
TK-4046A/TK-4046B	Lime Silo A/B	AP-42 11.17	160 ton - 9,000 ft^3	Not modified
TK-4049A/TK-4049B	Lime Slurry Premix Tank A/B	Tanks have been removed from facility		Tank physically removed from facility
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	Tank size change
TK-4160	Solids Clarifier Polymer System Aging Tank	Tank has been removed from facility		Tank physically removed from facility
TK-4165	Dewatering Polymer System Aging Tank	Tank has been removed from facility		Tank physically removed from facility
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	Tank size change

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	Emissions change due to change in throughput
TK-4180	Sulfuric Acid Bulk Storage Tank	Tank has been removed from facility		Tank physically removed from facility
TK-4025	Hydrogen Peroxide Tank	Insignificant emissions- inorganic material	6,000 gallons - was 320 gallons in previous version	Tank size change
TK-4080	Sodium Bisulfite Tank	Insignificant emissions- inorganic material	5,400 gallons - was 320 gallons in previous version	Tank size change
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	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	New tank, but no emissions
TK-4210	Hydrex 2233 Totes	Insignificant emissions - small tank, no constituents of concern	320 gallons	New tank, but no emissions
TK-4220	Hydrex 1425 Totes	Insignificant emissions - small tank, no constituents of concern	320 gallons	New tank, but no emissions
TK-4230	Hydrex 1317 Totes	Insignificant emissions - small tank, no constituents of concern	320 gallons	New tank, but no emissions
TK-4240	Hydrex 1565 Totes	Insignificant emissions - small tank, no constituents of concern	320 gallons	New tank, but no emissions
TK-4250	Hydrex 1605 Totes	Insignificant emissions - small tank, no constituents of concern	320 gallons	New tank, but no emissions
TK-4260	Demulsifier Tote	Insignificant emissions - small tank, no constituents of concern	320 gallons	New tank, but no emissions
TK-4270	Crystallizer Antifoam Tote	Insignificant emissions - small tank, no constituents of concern	320 gallons	New tank, but no emissions

Antero Treatment LLC - Antero Clearwater Facility
Equipment Summary and Emissions

TK-4301	Calcium Carbonate Silo	AP-42 8.12 for Sodium Carbonate	36 ton - 1,200 ft^3	New emission source
TK-4309	Calcium Carbonate Hopper	AP-42 8.12 for Sodium Carbonate	25 ft^3	New emission source
TK-4310	Stage 1 Clarifier Polymer Tote	Insignificant emissions - small tank, no constituents of concern	320 gallons	New tank, but no emissions
TK-4255	Antiscalant Tote	Insignificant emissions - small tank, no constituents of concern	320 gallons	New tank, but no emissions
TK-4500	Breakpoint Chlorination Sodium Hypochlorite Tank	Insignificant emissions- inorganic material	4,000 gallons	New tank, but no emissions
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	Modified equipment - increased capacity
GEN-1	Emergency Generator	EPA Tier 2 emission factors and AP-42 Section 3.3		Modified equipment - increased horsepower and true emergency status per Quad I
U-1090	Emergency Flare	Meant to handle gas blanket bleed system while thermal oxidizer is down for maintenance		New emission source
ENG-2	Fire Water Pump Engine	EPA certified. Will meet 40 CFR Part 60, Subpart IIII emission limits. AP-42 for HAPs		New emission source
VENT1	Fuel Skid Pig Venting	6" receiver expected to operate at 1100 psi with 1025 cubic foot volume at standard conditions		New emission source
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	New tank, but no emissions
HTFUEL1	Fuel Skid Heater 1	2.4 MMBtu/hr natural gas heater - AP-42 Section 1.4 Emission Factors		New emission source
HTFUEL2	Fuel Skid Heater 2	2.4 MMBtu/hr natural gas heater - AP-42 Section 1.4 Emission Factors		New emission source
	Fuel Skid	Will also contain inlet separator, measurement skid, fuel gas scrubber, and pressure vessel - no emissions as closed loop		New equipment, but no emissions

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	1.29	16.83	0.84	2.69	0.13	0.03	0.002	0.96	0.048	0.96	0.048	0.030	0.0015	180
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 1	10.03	39.21	10.17	39.79	1.10	4.31	0.16	0.63	2.75	10.77	2.75	10.77	0.51	1.99	126,393
Boiler 2	10.03	39.21	10.17	39.79	1.10	4.31	0.16	0.63	2.75	10.77	2.75	10.77	0.51	1.99	126,393
Thermal Oxidizer															
Oxidizer, Pilot and Waste Gas-controlled Process Tanks	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Emergency Flare	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Truck Unloading															
Truck Unloading Influent Water	---	---	---	---	59.22	54.04	---	---	---	---	---	---	0.40	0.36	47,820
Truck Loading of Oil	---	---	---	---	16.70	8.72	---	---	---	---	---	---	---	---	---
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**	**81.99**	**38.68**	**82.42**	**315.75**	**879.57**	**0.63**	**1.35**	**11.57**	**37.07**	**8.60**	**28.83**	**2.19**	**6.02**	**302,835**

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	1.29	16.83	0.84	2.69	0.13	0.03	0.002	0.96	0.048	0.96	0.048	0.030	0.0015	180
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 1	10.03	39.21	10.17	39.79	1.10	4.31	0.16	0.63	2.75	10.77	2.75	10.77	0.51	1.99	126,393
Boiler 2	10.03	39.21	10.17	39.79	1.10	4.31	0.16	0.63	2.75	10.77	2.75	10.77	0.51	1.99	126,393
Thermal Oxidizer															
Oxidizer, Pilot and Waste Gas-controlled Process Tanks	1.08	4.74	0.93	4.08	4.41	15.58	1.06E-05	4.64E-05	1.34E-04	5.87E-04	1.34E-04	5.87E-04	9.49E-03	2.69E-02	5,939
Emergency Flare	0.16	0.041	0.69	0.068	0.00040	0.0018	4.38E-05	1.92E-04	5.54E-04	2.43E-03	5.54E-04	2.43E-03	1.37E-04	6.01E-04	54
Truck Unloading															
Truck Unloading Influent Water	---	---	---	---	18.59	16.86	---	---	---	---	---	---	0.12	0.11	15,015
Truck Loading of Oil	---	---	---	---	16.70	8.72	---	---	---	---	---	---	---	---	---
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**	**86.77**	**40.30**	**86.57**	**58.90**	**78.78**	**0.63**	**1.35**	**11.57**	**37.07**	**8.61**	**28.84**	**1.45**	**4.46**	**275,749**

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	8.51E-04	6.16E-03	3.08E-04	---	---	4.23E-03	2.12E-04	1.73E-03	8.65E-05	---	---	---	---	---	---
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 1	5.67E-04	2.22E-03	9.18E-04	3.59E-03	---	---	---	---	2.02E-02	7.92E-02	4.86E-01	1.90E+00	---	---	---	---
Boiler 2	5.67E-04	2.22E-03	9.18E-04	3.59E-03	---	---	---	---	2.02E-02	7.92E-02	4.86E-01	1.90E+00	---	---	---	---
Thermal Oxidizer																
Oxidizer, Pilot and Waste Gas-controlled Process Tanks	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Emergency Flare	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
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	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
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 =	**0.54**	**0.86**	**0.26**	**0.67**	**0.025**	**0.037**	**0.12**	**0.20**	**0.044**	**0.16**	**1.13**	**3.80**	**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	8.51E-04	6.16E-03	3.08E-04	---	---	4.23E-03	2.12E-04	1.73E-03	8.65E-05	---	---	---	---	---	---
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 1	5.67E-04	2.22E-03	9.18E-04	3.59E-03	---	---	---	---	2.02E-02	7.92E-02	4.86E-01	1.90E+00	---	---	---	---
Boiler 2	5.67E-04	2.22E-03	9.18E-04	3.59E-03	---	---	---	---	2.02E-02	7.92E-02	4.86E-01	1.90E+00	---	---	---	---
Thermal Oxidizer																
Oxidizer, Pilot and Waste Gas-controlled Process Tanks	4.42E-03	1.15E-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	---	---	---	---
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	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
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 =	**0.12**	**0.11**	**0.040**	**0.049**	**0.0082**	**0.0057**	**0.033**	**0.036**	**0.044**	**0.16**	**1.13**	**3.81**	**0.067**	**0.25**	**3.49**	**14.25**

*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]	100	hrs/yr

Notes:

1) Calculated

2) Generator will be used for emergency purposes only with 100 hours/year allotted for testing and maintenance.

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] (lb/MMBtu)	Emission Factor[4] (g/bhp-hr)	Estimated Emissions (lb/hr)	Estimated Emissions (lb/yr)	Estimated Emissions (tpy)	Source of Emissions Factors
NOx	---	4.0	25.78	---	1.29	EPA Certification data
CO	---	2.6	16.83	---	0.84	EPA Tier 2 Nonroad Diesel Engine Emission Factor per Quad I
VOC	---	0.42	2.69	---	0.13	EPA Certification data for Total Hydrocarbons
SO_2	1.52E-03	---	0.033	---	0.0017	AP-42, Chapter 3.4, Table 3.4-1; 15 ppm sulfur
PM_{10}	---	0.15	0.96	---	0.048	EPA Tier 2 Nonroad Diesel Engine Emission Factor per Quad I
$PM_{2.5}$	---	0.15	0.96	---	0.048	EPA Tier 2 Nonroad Diesel Engine Emission Factor per Quad I
Acetaldehyde	2.52E-05	---	5.53E-04	0.055	2.76E-05	AP-42, Chapter 3.4, Table 3.4-3
Acrolein	7.88E-06	---	1.73E-04	0.017	8.64E-06	AP-42, Chapter 3.4, Table 3.4-3
Benzene	7.76E-04	---	1.70E-02	1.70	8.51E-04	AP-42, Chapter 3.4, Table 3.4-3
Formaldehyde	7.89E-05	---	1.73E-03	0.17	8.65E-05	AP-42, Chapter 3.4, Table 3.4-3
Toluene	2.81E-04	---	6.16E-03	0.62	3.08E-04	AP-42, Chapter 3.4, Table 3.4-3
Xylenes	1.93E-04	---	4.23E-03	0.42	2.12E-04	AP-42, Chapter 3.4, Table 3.4-3
Total HAPS			0.030	2.99	0.0015	

Pollutant	Emission Factor (kg/MMBtu)	Estimated Emissions (lb/hr)		Estimated Emissions (tpy)	Source of Emissions Factors
CO_2	73.96	3,586	---	179.3	40 CFR Part 98, Subpart C, Table C-1
CH_4	0.003	0.15	---	0.0073	40 CFR Part 98, Subpart C, Table C-2
N_2O	0.0006	0.029	---	0.0015	40 CFR Part 98, Subpart C, Table C-2
CO_2e	---	3,598	---	179.9	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 per Boiler [1]

Pollutant	Emission Factor (lb/MMBtu)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
NO_X	0.036	10.03	39.21	Manufacturer Spec Sheet (converted from ppmw)
CO	0.037	10.17	39.79	Manufacturer Spec Sheet (converted from ppmw)
VOC	0.004	1.10	4.31	Manufacturer Spec Sheet
PM_{10}	0.010	2.75	10.77	Manufacturer Spec Sheet
$PM_{2.5}$	0.010	2.75	10.77	Manufacturer Spec Sheet
Pollutant	**Emission Factor (lb/MMscf)**	**Emissions (lb/hr)**	**Emissions (tpy)**	**Emission Factor Source**
SO_2	0.6	0.16	0.63	AP-42 Ch. 1.4 Table 1.4-2
Lead	0.0005	0.00013	0.00053	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	0.00057	0.0022	AP-42 Ch. 1.4 Table 1.4-3
Dichlorobenzene	1.20E-03	0.00032	0.0013	AP-42 Ch. 1.4 Table 1.4-3
Formaldehyde	7.50E-02	0.020	0.079	AP-42 Ch. 1.4 Table 1.4-3
n-Hexane	1.80E+00	0.49	1.90	AP-42 Ch. 1.4 Table 1.4-3
Naphthalene	6.10E-04	0.00016	0.00064	AP-42 Ch. 1.4 Table 1.4-3
Toluene	3.40E-03	0.00092	0.0036	AP-42 Ch. 1.4 Table 1.4-3
Other HAPs	8.82E-05	0.000024	0.000093	AP-42 Ch. 1.4 Table 1.4-3-sum of minor HAPs
Total HAPs	1.88E+00	0.51	1.99	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	32,282	126,263	40 CFR Part 98, Subpart C, Table C-1
Methane	0.001	0.61	2.38	40 CFR Part 98, Subpart C, Table C-2
Nitrous Oxide	0.0001	0.061	0.24	40 CFR Part 98, Subpart C, Table C-2
CO_2e	----	32,316	126,393	40 CFR Part 98, Subpart A, Table A-1

Notes

1. Total fuel usage is assumed to be equally split between the two boilers for emissions purposes; however 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]:	120	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	0.0090
Carbon Monoxide (CO)	0.31	0.68	0.041

[1] Flare will be used for 5 days 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	0.041
Sulfur Dioxide (SO_2)	4.38E-05	1.92E-04
Carbon Monoxide (CO)	0.69	0.068
Volatile Organic Compounds (VOC)	4.01E-04	1.76E-03
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	53.69	40 CFR Part 98, Subpart C, Table C-1
Methane	0.001	0.0050	0.0010	40 CFR Part 98, Subpart C, Table C-2
Nitrous Oxide	0.0001	0.00050	0.00010	40 CFR Part 98, Subpart C, Table C-2
CO_2e	----	12.3	53.75	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)
Oil from TK-1065	0.6	3.10	50.00	65.0	2.21	515	8.72

Source	S[1]	P (psia)[2]	M[3]	T (ºF)[4]	L_L (lb/1000 gal)	Loading[5] (bbl/hr)	VOC (lb/hr)
Oil from TK-1065	0.6	3.10	50.00	65.0	2.21	180	16.70

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.
5. Short term loading assumes one truck per hour with an 180 bbl truck.

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-1130		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)	(lb/hr)	(tpy)
VOCs	2.78	10.30	0.91	2.18	1.13	4.14	0.43	1.67	3.84	13.80	38.80	169.94	86.90	380.62	220.64	779.21
Ammonia	0.071	0.27	----	----	0.34	1.33	0.044	0.19	1.47	5.67	5.37	23.52	33.60	147.17	57.68	244.03
Benzene	0.0060	0.022	----	----	0.0081	0.024	0.0018	0.0072	0.025	0.073	----	----	----	----	0.22	0.57
Ethylbenzene	0.00011	0.00041	----	----	0.00019	0.00070	5.43E-24	2.30E-23	0.00074	0.0027	----	----	----	----	0.0071	0.023
Toluene	0.0036	0.014	----	----	0.0067	0.023	9.49E-24	3.91E-23	0.024	0.081	----	----	----	----	0.21	0.62
Xylene	0.0010	0.0039	----	----	0.00030	0.0012	5.93E-25	2.59E-24	0.0014	0.0058	----	----	----	----	0.035	0.12
Manganese	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Selenium	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
TOTAL HAPs	0.011	0.040	----	----	0.015	0.049	0.0018	0.0072	0.051	0.16	----	----	----	----	0.47	1.34
Carbon Dioxide	6.95	26.45	----	----	2.36	5.60	0.11	0.36	3.44	8.84	----	----	----	----	167.68	274.41

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-1130		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)	(lb/hr)	(tpy)
VOCs	0.056	0.21	0.018	0.044	0.023	0.083	0.0086	0.033	0.077	0.28	0.78	3.40	1.74	7.61	4.41	15.58
Ammonia	0.0014	0.0053	----	----	0.0069	0.027	0.00088	0.0038	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	3.7E-05	1.4E-04	5.0E-04	1.5E-03	----	----	----	----	4.42E-03	1.15E-02
Ethylbenzene	2.1E-06	8.3E-06	----	----	3.8E-06	1.4E-05	1.1E-25	4.6E-25	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	1.9E-25	7.8E-25	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	1.2E-26	5.2E-26	2.7E-05	1.2E-04	----	----	----	----	7.06E-04	2.48E-03
Manganese	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Selenium	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
TOTAL HAPs	0.00021	0.00080	----	----	0.00030	0.0010	0.000037	0.00014	0.0010	0.0032	----	----	----	----	9.46E-03	2.68E-02
Carbon Dioxide	6.95	26.45	----	----	2.36	5.60	0.11	0.36	3.44	8.84	----	----	----	----	167.68	274.41

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.
   E-2076 has VOCs in the stream whereas it did not during the initial application. The process changed such that most of the VOCs will be vented through this point from the thermal system.
   The process has also changed such that the VOCs in the liquid in TK-2130 will stay in solution and ultimately be vented from TK-2140, which emits much more VOC than previously.
   TK-2130 is no longer connected to the waste gas header and thermal oxidizer.
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-2160 and TK-2460 do not have VOCs being vented due to process change. Neither tank is hooked up to the waste gas header or thermal oxidizer.

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:

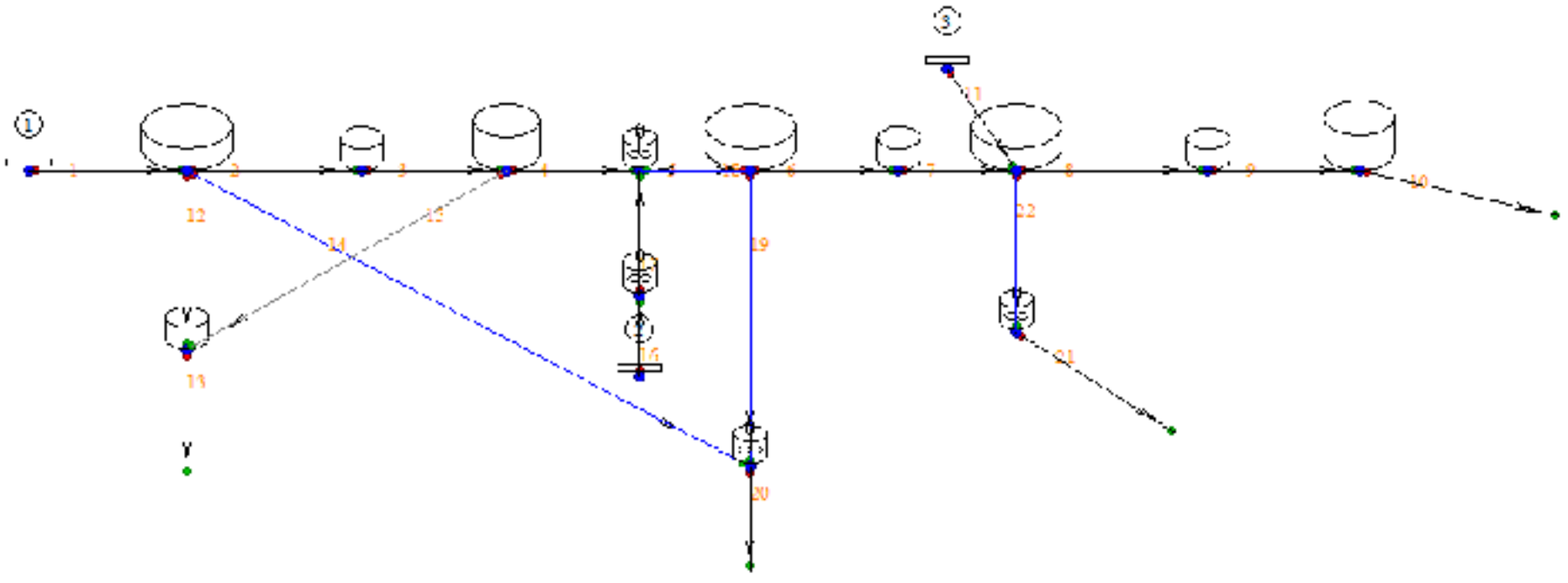
1. Truck weights are assumed to be empty on one leg and loaded on the other.
2. Influent trucks are based on 100 bbl trucks at 60,000 bbl/day. Chemical trucks are based on at most 24,000 gallons of chemicals per day needed at the facility in 5,000 gallon trucks. Sludge and salt disposal trucks are based 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.

WATER9 Model Output

A LISTING OF WATER FLOWS IN EACH UNIT

08-12-2016

No.	Name	Unit type	flow rate (L/s)	pH
1	Influent to TK1055	hard piped, no headspace	118.23	0
2	TK1055A	circular clarifier	116.28	0
3	TK1060AB	storage tank	116.28	0
4	TK1070	storage tank	115.71	0
5	TK1105AB	mix tank	135.01	0
6	TK1055B	circular clarifier	115.39	0
7	TK1115	storage tank	115.39	0
8	TK2010	circular clarifier	122.49	0
9	TK2015	storage tank	122.49	0
10	TK2040	storage tank	122.49	0
11	Solids Recycle	hard piped, no headspace	14.73	0
12	Oil from TK1055A	oil removal stream	.25	0
13	TK1065	storage tank	.82	0
14	Sludge from TK1055	divert flow	1.7	0
15	Oil from TK1070	oil removal stream	.57	0
16	Stage 1 Filtrate	hard piped, no headspace	1.45	0
17	TK1130	mix tank	1.45	0
18	Solids Recycle	divert flow	17.85	0
19	Stage 1 Sludge	divert flow	1.77	0
20	TK1120	mix tank	3.47	0
21	TK2020	mix tank	7.63	0
22	Stage 2 Sludge	divert flow	7.63	0



A LISTING OF WATER FLOWS IN EACH UNIT

08-12-2016

No.	Name	Unit type	flow rate (L/s)	pH
1	Influent to TK1055	hard piped, no headspace	552.8	0
2	TK1055A	circular clarifier	546.17	0
3	TK1060AB	storage tank	546.17	0
4	TK1070	storage tank	545.22	0
5	TK1105AB	mix tank	176.02	0
6	TK1055B	circular clarifier	138.17	0
7	TK1115	storage tank	144.48	0
8	TK2010	circular clarifier	151.01	0
9	TK2015	storage tank	151.01	0
10	TK2040	storage tank	151.01	0
11	Solids Recycle	hard piped, no headspace	22.93	0
12	Oil from TK1055A	oil removal stream	.95	0
13	TK1065	storage tank	1.9	0
14	Sludge from TK1055	divert flow	5.68	0
16	Stage 1 Filtrate	hard piped, no headspace	6.31	0
17	TK1130	mix tank	6.31	0
18	Solids Recycle	divert flow	30.91	0
19	Stage 1 Sludge	divert flow	6.94	0
20	TK1120	mix tank	12.62	0
21	TK2020	mix tank	16.4	0
22	Stage 2 Sludge	divert flow	16.4	0
23	default hard piped	hard piped, no headspace	138.8	0
24	Oil from TK1070	oil removal stream	.95	0

SPECIFIED UNIT PROPERTIES 08-12-2016

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General System Specifications.....

1	Total water added at the unit (l/s)	0	0
2	Area of openings at unit (cm2)		50
3	Radius of drop pipe (cm)		5
4	Drop length to conduit (cm)		61
5	Humidity of inlet air (%)		40
6	Temperature of air (C)		25
7	Drain air velocity (ft/min)		84
8	manhole air velocity (ft/min)		128
9	Conduit air velocity (ft/min)		66
10	Wind speed (cm/s at 10 m)		447
11	distance to next unit (cm)		500
12	slope of underflow conduit		.015
13	friction factor liquid		.016
14	friction factor gas		.006
15	radius of underflow conduit (cm)		12
16	Underflow T (C)		25
17	oscillation cycle time (min)		5
18	design collection velocities (ft/s)		2
19	design branch line fraction full		.4
20	fraction of wind speed on open drains		.5

Type of unit is hard piped, no headspace

1	101 Description of unit	1	Influent to TK1055
2	102 Underflow T (C)		25
3	103 Total water added at the unit (l/s)		0
7	107 Open surface=1		0
8	108 Subsurface entrance=1		1
9	109 subsurface exit =1		1
10	110 radius of underflow conduit (cm)		12
11	111 distance to next unit (cm)		500
12	112 slope of underflow conduit		0.015

waste 1 added to system at unit	1	
waste 2 added to system at unit	0	
waste 3 added to system at unit	0	

Type of unit is circular clarifier

1	101 Description of unit	2	TK1055A
2	2 Wastewater temperature (C)		25
3	35 secondary clarifier diameter (m)		22.86
4	36 secondary clarifier depth (m)		5.1816
5	83 clarifier solids removal efficiency		0.7
6	12 waterfall drop height (cm)		20
7	13 clarifier weir/circumference		0.5
8	364 Center well present, =1		0
10	366 number of identical units in parallel		1

waste 1 added to system at unit	0	
waste 2 added to system at unit	0	
waste 3 added to system at unit	0	

SPECIFIED UNIT PROPERTIES 08-12-2016

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Type of unit is storage tank

1 101	Description of unit	3 TK1060AB
2 2	Wastewater temperature (C)	25
3 84	Open surface area of tank (m2)	0
4 85	Density of liquid in tank (g/cc)	1
5 92	tank waste Mwt, water=18	18
6 93	unit storage time (days)	0
7 94	tank paint factor	0.6
8 95	tank diameter (m)	4.2672
9 96	tank vapor space height (m)	0.53
10 97	diurnal temp. change (deg.C)	11
11 99	tank height (m)	6.096
12 9	oil in composite wastewater (wt. %)	0
13 515	Product factor crude oil =0.75 else 1.0	1

 waste 1 added to system at unit 0
 waste 2 added to system at unit 0
 waste 3 added to system at unit 0

Type of unit is storage tank

1 101	Description of unit	4 TK1070
2 2	Wastewater temperature (C)	25
3 84	Open surface area of tank (m2)	0
4 85	Density of liquid in tank (g/cc)	1
5 92	tank waste Mwt, water=18	18
6 93	unit storage time (days)	0
7 94	tank paint factor	0.6
8 95	tank diameter (m)	17.069
9 96	tank vapor space height (m)	2.2
10 97	diurnal temp. change (deg.C)	11
11 99	tank height (m)	17.069
12 9	oil in composite wastewater (wt. %)	0
13 515	Product factor crude oil =0.75 else 1.0	1

 waste 1 added to system at unit 0
 waste 2 added to system at unit 0
 waste 3 added to system at unit 0

Type of unit is mix tank

1 101	Description of unit	5 TK1105AB
2 2	Wastewater temperature (C)	25
3 37	length of unit (m)	4.2672
4 59	width of unit (m)	4.2672
5 38	depth of unit (m)	8.5344
6 29	Area of agitation (each aerator,m2)	13
7 30	Total number of agitators in the unit	1
8 31	Power of agitation (each aerator,HP)	10
9 32	Impeller diameter (cm)	60
10 33	Impeller rotation (RPM)	1200
13 72	if there is plug flow, enter 1	0

15 87 Aeration air flow (m3/s) 0
16 234 vent air emission control factor 0
17 65 If covered, then enter 1 0
 waste 1 added to system at unit 0
 waste 2 added to system at unit 0
 waste 3 added to system at unit 0

Type of unit is circular clarifier
1 101 Description of unit 6 TK1055B
2 2 Wastewater temperature (C) 25
3 35 secondary clarifier diameter (m) 22.86
4 36 secondary clarifier depth (m) 5.1816
5 83 clarifier solids removal efficiency 0.7
6 12 waterfall drop height (cm) 20
7 13 clarifier weir/circumference 0.5
8 364 Center well present, =1 0
10 366 number of identical units in parallel 1
 waste 1 added to system at unit 0
 waste 2 added to system at unit 0
 waste 3 added to system at unit 0

Type of unit is storage tank
1 101 Description of unit 7 TK1115
2 2 Wastewater temperature (C) 25
3 84 Open surface area of tank (m2) 0
4 85 Density of liquid in tank (g/cc) 1
5 92 tank waste Mwt, water=18 18
6 93 unit storage time (days) 0
7 94 tank paint factor 0.6
8 95 tank diameter (m) 4.2672
9 96 tank vapor space height (m) 2
10 97 diurnal temp. change (deg.C) 11
11 99 tank height (m) 4.7244
12 9 oil in composite wastewater (wt. %) 0
13 515 Product factor crude oil =0.75 else 1.0 1
 waste 1 added to system at unit 0
 waste 2 added to system at unit 0
 waste 3 added to system at unit 0

Type of unit is circular clarifier
1 101 Description of unit 8 TK2010
2 2 Wastewater temperature (C) 25
3 35 secondary clarifier diameter (m) 20.117
4 36 secondary clarifier depth (m) 5.1816
5 83 clarifier solids removal efficiency 0.7
6 12 waterfall drop height (cm) 20
7 13 clarifier weir/circumference 0.5
8 364 Center well present, =1 0
10 366 number of identical units in parallel 1

SPECIFIED UNIT PROPERTIES 08-12-2016

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```
 waste 1 added to system at unit     0
 waste 2 added to system at unit     0
 waste 3 added to system at unit     0

Type of unit is storage tank
1 101 Description of unit                      9 TK2015
2 2 Wastewater temperature   (C)                 25
3 84 Open surface area of tank  (m2)             0
4 85 Density of liquid in tank (g/cc)            1
5 92 tank waste Mwt, water=18                    18
6 93 unit storage time (days)                    0
7 94 tank paint factor                           0.6
8 95 tank diameter (m)                           3.6576
9 96 tank vapor space height (m)                 0.66
10 97 diurnal temp. change (deg.C)               11
11 99 tank height (m)                            4.2672
12 9 oil in composite wastewater (wt. %)         0
13 515 Product factor crude oil =0.75 else 1.0   1
 waste 1 added to system at unit     0
 waste 2 added to system at unit     0
 waste 3 added to system at unit     0

Type of unit is storage tank
1 101 Description of unit                     10TK2040
2 2 Wastewater temperature   (C)                 25
3 84 Open surface area of tank  (m2)             0
4 85 Density of liquid in tank (g/cc)            1
5 92 tank waste Mwt, water=18                    18
6 93 unit storage time (days)                    0
7 94 tank paint factor                           0.6
8 95 tank diameter (m)                           18.898
9 96 tank vapor space height (m)                 2.2
10 97 diurnal temp. change (deg.C)               11
11 99 tank height (m)                            18.898
12 9 oil in composite wastewater (wt. %)         0
13 515 Product factor crude oil =0.75 else 1.0   1
 waste 1 added to system at unit     0
 waste 2 added to system at unit     0
 waste 3 added to system at unit     0

Type of unit is hard piped, no headspace
1 101 Description of unit                     11Solids Recycle
2 102 Underflow T (C)                            25
3 103 Total water added at the unit (l/s)        14.73
7 107 Open surface=1                             0
8 108 Subsurface entrance=1                      1
9 109 subsurface exit =1                         1
10 110 radius of underflow conduit (cm)          12
11 111 distance to next unit (cm)                500
```

12	112	slope of underflow conduit	0.015
		waste 1 added to system at unit	3
		waste 2 added to system at unit	0
		waste 3 added to system at unit	0

Type of unit is oil removal stream

1	101	Description of unit	12Oil from TK1055A
2	134	flow diversion rate (l/s)	0.25
3	121	fraction oil in waste diverted	1
		waste 1 added to system at unit	0
		waste 2 added to system at unit	0
		waste 3 added to system at unit	0

Type of unit is storage tank

1	101	Description of unit	13TK1065
2	2	Wastewater temperature (C)	25
3	84	Open surface area of tank (m2)	0
4	85	Density of liquid in tank (g/cc)	0.847
5	92	tank waste Mwt, water=18	80
6	93	unit storage time (days)	0
7	94	tank paint factor	0.6
8	95	tank diameter (m)	3.6576
9	96	tank vapor space height (m)	0.55
10	97	diurnal temp. change (deg.C)	11
11	99	tank height (m)	4.8768
12	9	oil in composite wastewater (wt. %)	10
13	515	Product factor crude oil =0.75 else 1.0	0.75
		waste 1 added to system at unit	0
		waste 2 added to system at unit	0
		waste 3 added to system at unit	0

Type of unit is divert flow

1	101	Description of unit	14Sludge from TK1055
2	134	flow diversion rate (l/s)	1.7
4	343	fraction waste flow diverted	0
		waste 1 added to system at unit	0
		waste 2 added to system at unit	0
		waste 3 added to system at unit	0

Type of unit is oil removal stream

1	101	Description of unit	15Oil from TK1070
2	134	flow diversion rate (l/s)	0.57
3	121	fraction oil in waste diverted	1
		waste 1 added to system at unit	0
		waste 2 added to system at unit	0
		waste 3 added to system at unit	0

Type of unit is hard piped, no headspace

1	101	Description of unit	16Stage 1 Filtrate

SPECIFIED UNIT PROPERTIES 08-12-2016

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2 102 Underflow T (C) 25
3 103 Total water added at the unit (l/s) 1.45
7 107 Open surface=1 0
8 108 Subsurface entrance=1 1
9 109 subsurface exit =1 1
10 110 radius of underflow conduit (cm) 12
11 111 distance to next unit (cm) 500
12 112 slope of underflow conduit 0.015
 waste 1 added to system at unit 2
 waste 2 added to system at unit 0
 waste 3 added to system at unit 0

Type of unit is mix tank
1 101 Description of unit 17TK1130
2 2 Wastewater temperature (C) 25
3 37 length of unit (m) 1.8288
4 59 width of unit (m) 1.8288
5 38 depth of unit (m) 2.4384
6 29 Area of agitation (each aerator,m2) 2
7 30 Total number of agitators in the unit 1
8 31 Power of agitation (each aerator,HP) 5
9 32 Impeller diameter (cm) 60
10 33 Impeller rotation (RPM) 1200
13 72 if there is plug flow, enter 1 0
15 87 Aeration air flow (m3/s) 0
16 234 vent air emission control factor 0
17 65 If covered, then enter 1 0
 waste 1 added to system at unit 0
 waste 2 added to system at unit 0
 waste 3 added to system at unit 0

Type of unit is divert flow
1 101 Description of unit 18Solids Recycle
2 134 flow diversion rate (l/s) 17.85
4 343 fraction waste flow diverted 0
 waste 1 added to system at unit 0
 waste 2 added to system at unit 0
 waste 3 added to system at unit 0

Type of unit is divert flow
1 101 Description of unit 19Stage 1 Sludge
2 134 flow diversion rate (l/s) 1.77
4 343 fraction waste flow diverted 0
 waste 1 added to system at unit 0
 waste 2 added to system at unit 0
 waste 3 added to system at unit 0

Type of unit is mix tank
1 101 Description of unit 20TK1120

SPECIFIED UNIT PROPERTIES 08-12-2016

Project C:\WATER9\Clearwater\Clearwater_Aug16_pre 11:29:25

2	2	Wastewater temperature (C)	25
3	37	length of unit (m)	4.2672
4	59	width of unit (m)	4.2672
5	38	depth of unit (m)	7.3152
6	29	Area of agitation (each aerator,m2)	13
7	30	Total number of agitators in the unit	1
8	31	Power of agitation (each aerator,HP)	10
9	32	Impeller diameter (cm)	60
10	33	Impeller rotation (RPM)	1200
13	72	if there is plug flow, enter 1	0
15	87	Aeration air flow (m3/s)	0
16	234	vent air emission control factor	0
17	65	If covered, then enter 1	0

waste 1 added to system at unit	0	
waste 2 added to system at unit	0	
waste 3 added to system at unit	0	

Type of unit is mix tank

1	101	Description of unit	21TK2020
2	2	Wastewater temperature (C)	25
3	37	length of unit (m)	7.9248
4	59	width of unit (m)	7.9248
5	38	depth of unit (m)	7.9248
6	29	Area of agitation (each aerator,m2)	45
7	30	Total number of agitators in the unit	1
8	31	Power of agitation (each aerator,HP)	30
9	32	Impeller diameter (cm)	60
10	33	Impeller rotation (RPM)	1200
13	72	if there is plug flow, enter 1	0
15	87	Aeration air flow (m3/s)	0
16	234	vent air emission control factor	0
17	65	If covered, then enter 1	0

waste 1 added to system at unit	0	
waste 2 added to system at unit	0	
waste 3 added to system at unit	0	

Type of unit is divert flow

1	101	Description of unit	22Stage 2 Sludge
2	134	flow diversion rate (l/s)	7.63
4	343	fraction waste flow diverted	0

waste 1 added to system at unit	0	
waste 2 added to system at unit	0	
waste 3 added to system at unit	0	

SUMMARY FOR EMISSIONS AT UNIT 2 TK1055A circular claifier
8/12/2016 11:03

COMPOUND NAME	conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *	1.32E+02	0.04339	0	1.24E+02	6.77E-01
BENZENE	5.74E-01	0.05232	0	5.34E-01	3.55E-03
ETHYLBENZENE	4.40E-02	0.03358	0	4.17E-02	1.75E-04
OIL (decane as surrogate)	2.81E+02	0.04516	0	2.62E+02	1.50E+00
TOLUENE	9.07E-01	0.04156	0	8.53E-01	4.46E-03
XYLENE	5.53E-01	0.01597	0	5.34E-01	1.04E-03
CARBON DIOXIDE	9.90E+01	0.06544	0	9.10E+01	7.66E-01
MANGANESE	0.00E+00	0	0	0.00E+00	0.00E+00
SELENIUM	0.00E+00	0	0	0.00E+00	0.00E+00
Total rate for all compounds					2.95E+00

SUMMARY FOR EMISSIONS AT UNIT 3 TK1060AB storage tank
8/12/2016 11:03

COMPOUND NAME	conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *	1.26E+02	0.00042	0	1.26E+02	6.21E-03
BENZENE	5.43E-01	0.00789	0	5.39E-01	4.99E-04
ETHYLBENZENE	4.24E-02	0.00133	0	4.24E-02	6.54E-06
OIL (decane as surrogate)	2.67E+02	0.00717	0	2.65E+02	2.22E-01
TOLUENE	8.68E-01	0.00295	0	8.65E-01	2.97E-04
XYLENE	5.43E-01	0.00117	0	5.42E-01	7.38E-05
CARBON DIOXIDE	9.25E+01	0.14398	0	7.92E+01	1.55E+00
MANGANESE	0.00E+00	0	0	0.00E+00	0.00E+00
SELENIUM	0.00E+00	0	0	0.00E+00	0.00E+00
Total rate for all compounds					1.78E+00

SUMMARY FOR EMISSIONS AT UNIT 4 TK1070 storage tank
8/12/2016 11:03

COMPOUND NAME	conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *	1.26E+02	0.00052	0	1.26E+02	7.57E-03
BENZENE	5.39E-01	0.01034	0	5.31E-01	6.48E-04
ETHYLBENZENE	4.24E-02	0.0023	0	4.21E-02	1.14E-05
OIL (decane as surrogate)	2.65E+02	0.00872	0	2.61E+02	2.68E-01
TOLUENE	8.65E-01	0.00396	0	8.57E-01	3.98E-04
XYLENE	5.42E-01	0.00169	0	5.39E-01	1.06E-04
CARBON DIOXIDE	7.92E+01	0.16755	0	6.56E+01	1.54E+00
MANGANESE	0.00E+00	0	0	0.00E+00	0.00E+00
SELENIUM	0.00E+00	0	0	0.00E+00	0.00E+00
Total rate for all compounds					1.82E+00

SUMMARY FOR EMISSIONS AT UNIT 5 TK1105AB mix tank
8/12/2016 11:03

COMPOUND NAME	conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *	1.27E+02	0.00241	0	1.26E+02	4.11E-02
BENZENE	5.44E-01	0.01328	0	5.37E-01	9.76E-04
ETHYLBENZENE	4.26E-02	0.00373	0	4.24E-02	2.14E-05
OIL (decane as surrogate)	2.66E+02	0.00352	0	2.65E+02	1.26E-01
TOLUENE	8.66E-01	0.00665	0	8.60E-01	7.77E-04
XYLENE	5.47E-01	0.00044	0	5.47E-01	3.24E-05
CARBON DIOXIDE	6.53E+01	0.03539	0	6.30E+01	3.12E-01
MANGANESE	8.01E+00	2.96E-25	0	8.01E+00	3.21E-25
SELENIUM	3.40E-01	2.96E-25	0	3.40E-01	1.36E-26
Total rate for all compounds					4.81E-01

SUMMARY FOR EMISSIONS AT UNIT 6 TK1055B circular clarifier
8/12/2016 11:03

COMPOUND NAME	conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *	1.26E+02	0.03869	0	1.03E+02	6.59E-01
BENZENE	5.37E-01	0.04943	0	4.25E-01	3.59E-03
ETHYLBENZENE	4.24E-02	0.03121	0	3.41E-02	1.79E-04
OIL (decane as surrogate)	2.65E+02	0.04325	0	2.11E+02	1.55E+00
TOLUENE	8.60E-01	0.03896	0	6.87E-01	4.52E-03
XYLENE	5.47E-01	0.01435	0	4.48E-01	1.06E-03
CARBON DIOXIDE	6.30E+01	0.06258	0	4.96E+01	5.32E-01
MANGANESE	0.00E+00	0	0	0.00E+00	0.00E+00
SELENIUM	0.00E+00	0	0	0.00E+00	0.00E+00
Total rate for all compounds					2.75E+00

SUMMARY FOR EMISSIONS AT UNIT 7 TK1115 storage tank
8/12/2016 11:03

COMPOUND NAME	conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *	1.20E+02	0.00042	0	1.20E+02	5.85E-03
BENZENE	4.97E-01	0.00792	0	4.93E-01	4.54E-04
ETHYLBENZENE	3.99E-02	0.00135	0	3.99E-02	6.22E-06
OIL (decane as surrogate)	2.46E+02	0.00775	0	2.45E+02	2.20E-01
TOLUENE	8.03E-01	0.00296	0	8.01E-01	2.75E-04
XYLENE	5.24E-01	0.00118	0	5.23E-01	7.12E-05
CARBON DIOXIDE	5.80E+01	0.14393	0	4.96E+01	9.63E-01
MANGANESE	0.00E+00	0	0	0.00E+00	0.00E+00
SELENIUM	0.00E+00	0	0	0.00E+00	0.00E+00
Total rate for all compounds					1.19E+00

SUMMARY FOR EMISSIONS AT UNIT 8 TK2010 circular clarifier
8/12/2016 11:03

COMPOUND NAME	conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *	1.19E+02	0.03175	0	1.08E+02	4.92E-01
BENZENE	4.93E-01	0.04209	0	4.43E-01	2.70E-03
ETHYLBENZENE	3.96E-02	0.02627	0	3.62E-02	1.36E-04
OIL (decane as surrogate)	3.18E+02	0.03705	0	2.87E+02	1.53E+00
TOLUENE	7.98E-01	0.03299	0	7.23E-01	3.42E-03
XYLENE	5.17E-01	0.01185	0	4.79E-01	7.97E-04
CARBON DIOXIDE	4.40E+01	0.05446	0	3.91E+01	3.12E-01
MANGANESE	0.00E+00	0	0	0.00E+00	0.00E+00
SELENIUM	0.00E+00	0	0	0.00E+00	0.00E+00
Total rate for all compounds					2.35E+00

SUMMARY FOR EMISSIONS AT UNIT 9 TK2015 storage tank
8/12/2016 11:03

COMPOUND NAME	conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *	1.15E+02	0.00042	0	1.15E+02	5.95E-03
BENZENE	4.70E-01	0.00795	0	4.67E-01	4.58E-04
ETHYLBENZENE	3.85E-02	0.00134	0	3.84E-02	6.29E-06
OIL (decane as surrogate)	3.05E+02	0.00625	0	3.03E+02	2.34E-01
TOLUENE	7.69E-01	0.00297	0	7.66E-01	2.80E-04
XYLENE	5.09E-01	0.00118	0	5.08E-01	7.36E-05
CARBON DIOXIDE	4.15E+01	0.14395	0	3.56E+01	7.32E-01
MANGANESE	0.00E+00	0	0	0.00E+00	0.00E+00
SELENIUM	0.00E+00	0	0	0.00E+00	0.00E+00
Total rate for all compounds					9.73E-01

SUMMARY FOR EMISSIONS AT UNIT 10 TK2040 storage tank
8/12/2016 11:03

COMPOUND NAME	conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *	1.15E+02	0.00054	0	1.15E+02	7.64E-03
BENZENE	4.67E-01	0.01108	0	4.61E-01	6.33E-04
ETHYLBENZENE	3.84E-02	0.00253	0	3.83E-02	1.19E-05
OIL (decane as surrogate)	3.03E+02	0.00798	0	3.01E+02	2.96E-01
TOLUENE	7.66E-01	0.00425	0	7.63E-01	3.99E-04
XYLENE	5.08E-01	0.00182	0	5.08E-01	1.13E-04
CARBON DIOXIDE	3.56E+01	0.17472	0	2.93E+01	7.61E-01
MANGANESE	0.00E+00	0	0	0.00E+00	0.00E+00
SELENIUM	0.00E+00	0	0	0.00E+00	0.00E+00
Total rate for all compounds					1.07E+00

SUMMARY FOR EMISSIONS AT UNIT 13 TK1065 storage tank
8/12/2016 11:03

COMPOUND NAME	conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *	1.27E+02	0.00152	0	1.27E+02	1.59E-04
BENZENE	6.20E-01	0.00115	0	6.19E-01	5.86E-07
ETHYLBENZENE	5.71E-02	0.00036	0	5.71E-02	1.70E-08
OIL (decane as surrogate)	5.17E+02	1.56E-05	0	5.17E+02	6.62E-06
TOLUENE	1.08E+00	0.00044	0	1.08E+00	3.90E-07
XYLENE	7.32E-01	0.00018	0	7.31E-01	1.06E-07
CARBON DIOXIDE	7.73E+01	0.06427	0	7.23E+01	4.07E-03
MANGANESE	0.00E+00	0	0	0.00E+00	0.00E+00
SELENIUM	0.00E+00	0	0	0.00E+00	0.00E+00
Total rate for all compounds					4.24E-03

SUMMARY FOR EMISSIONS AT UNIT 17 TK1130 mix tank
8/12/2016 11:03

COMPOUND NAME	conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *	1.26E+02	0.02977	0	1.22E+02	5.44E-03
BENZENE	1.00E+00	0.1423	0	8.58E-01	2.06E-04
ETHYLBENZENE	1.00E-20	0.04556	0	9.54E-21	6.61E-25
OIL (decane as surrogate)	2.32E+02	0.14322	0	1.99E+02	4.82E-02
TOLUENE	1.00E-20	0.07754	0	9.23E-21	1.12E-24
XYLENE	1.00E-20	0.00513	0	9.95E-21	7.44E-26
CARBON DIOXIDE	2.40E+01	0.30096	0	1.68E+01	1.05E-02
MANGANESE	8.00E+00	4.05E-24	0	8.00E+00	4.70E-26
SELENIUM	3.40E-01	4.05E-24	0	3.40E-01	2.00E-27
Total rate for all compounds					6.43E-02

SUMMARY FOR EMISSIONS AT UNIT 20 TK1120 mix tank
8/12/2016 11:03

COMPOUND NAME	conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *	1.28E+02	0.08586	0	1.17E+02	3.82E-02
BENZENE	5.72E-01	0.34352	0	3.75E-01	6.82E-04
ETHYLBENZENE	4.56E-02	0.12683	0	3.98E-02	2.01E-05
OIL (decane as surrogate)	2.85E+02	0.12038	0	2.51E+02	1.19E-01
TOLUENE	9.23E-01	0.2064	0	7.33E-01	6.61E-04
XYLENE	5.92E-01	0.01676	0	5.82E-01	3.44E-05
CARBON DIOXIDE	7.90E+01	0.58794	0	3.26E+01	1.61E-01
MANGANESE	8.23E+00	1.15E-23	0	8.23E+00	3.28E-25
SELENIUM	3.50E-01	1.15E-23	0	3.50E-01	1.40E-26
Total rate for all compounds					3.20E-01

SUMMARY FOR EMISSIONS AT UNIT 21 TK2020 mix tank
8/12/2016 11:03

COMPOUND NAME	conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *	1.18E+02	0.18104	0	9.67E+01	1.63E-01
BENZENE	4.99E-01	0.54822	0	2.25E-01	2.09E-03
ETHYLBENZENE	4.10E-02	0.24677	0	3.09E-02	7.71E-05
OIL (decane as surrogate)	3.25E+02	0.16003	0	2.73E+02	3.97E-01
TOLUENE	8.18E-01	0.37289	0	5.13E-01	2.33E-03
XYLENE	5.42E-01	0.04011	0	5.20E-01	1.66E-04
CARBON DIOXIDE	4.32E+01	0.77207	0	9.84E+00	2.54E-01
MANGANESE	7.29E+00	2.62E-23	0	7.29E+00	1.46E-24
SELENIUM	3.09E-01	2.62E-23	0	3.09E-01	6.17E-26
Total rate for all compounds					8.19E-01

SUMMARY FOR EMISSIONS AT UNIT 2 TK1055A circular clarifier
8/12/2016 11:59

COMPOUND NAME	conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *	1.32E+02	0.01067	0	1.29E+02	7.78E-01
BENZENE	5.74E-01	0.02474	0	5.52E-01	7.85E-03
ETHYLBENZENE	4.40E-02	0.0125	0	4.28E-02	3.04E-04
OIL (decane as surrogate)	2.81E+02	0.02707	0	2.68E+02	4.21E+00
TOLUENE	9.07E-01	0.01749	0	8.79E-01	8.77E-03
XYLENE	5.53E-01	0.00412	0	5.43E-01	1.26E-03
CARBON DIOXIDE	9.90E+01	0.03629	0	9.42E+01	1.99E+00
MANGANESE	0.00E+00	0	0	0.00E+00	0.00E+00
SELENIUM	0.00E+00	0	0	0.00E+00	0.00E+00
Total rate for all compounds					6.99E+00

SUMMARY FOR EMISSIONS AT UNIT 3 TK1060AB storage tank
8/12/2016 11:59

COMPOUND NAME	conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *	1.31E+02	0.00042	0	1.31E+02	3.00E-02
BENZENE	5.59E-01	0.00784	0	5.55E-01	2.40E-03
ETHYLBENZENE	4.33E-02	0.0013	0	4.33E-02	3.09E-05
OIL (decane as surrogate)	2.72E+02	0.00701	0	2.70E+02	1.04E+00
TOLUENE	8.90E-01	0.00293	0	8.87E-01	1.42E-03
XYLENE	5.49E-01	0.00116	0	5.49E-01	3.48E-04
CARBON DIOXIDE	9.54E+01	0.14354	0	8.17E+01	7.48E+00
MANGANESE	0.00E+00	0	0	0.00E+00	0.00E+00
SELENIUM	0.00E+00	0	0	0.00E+00	0.00E+00
Total rate for all compounds					8.55E+00

SUMMARY FOR EMISSIONS AT UNIT 4 TK1070 storage tank
8/12/2016 11:59

COMPOUND NAME	conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *	1.31E+02	0.00044	0	1.30E+02	3.14E-02
BENZENE	5.55E-01	0.00836	0	5.49E-01	2.53E-03
ETHYLBENZENE	4.33E-02	0.00151	0	4.31E-02	3.57E-05
OIL (decane as surrogate)	2.70E+02	0.00737	0	2.67E+02	1.09E+00
TOLUENE	8.87E-01	0.00314	0	8.83E-01	1.52E-03
XYLENE	5.49E-01	0.00127	0	5.47E-01	3.80E-04
CARBON DIOXIDE	8.17E+01	0.14867	0	6.94E+01	6.63E+00
MANGANESE	0.00E+00	0	0	0.00E+00	0.00E+00
SELENIUM	0.00E+00	0	0	0.00E+00	0.00E+00
Total rate for all compounds					7.76E+00

SUMMARY FOR EMISSIONS AT UNIT 5 TK1105AB mix tank
8/12/2016 11:59

COMPOUND NAME	conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *	1.32E+02	0.00185	0	1.31E+02	4.29E-02
BENZENE	5.90E-01	0.01023	0	5.84E-01	1.06E-03
ETHYLBENZENE	4.43E-02	0.00286	0	4.41E-02	2.23E-05
OIL (decane as surrogate)	2.78E+02	0.0027	0	2.78E+02	1.32E-01
TOLUENE	8.85E-01	0.00511	0	8.80E-01	7.96E-04
XYLENE	5.53E-01	0.00034	0	5.53E-01	3.28E-05
CARBON DIOXIDE	6.84E+01	0.02739	0	6.65E+01	3.30E-01
MANGANESE	8.14E+00	2.27E-25	0	8.14E+00	3.25E-25
SELENIUM	4.81E-02	2.27E-25	0	4.81E-02	1.92E-27
Total rate for all compounds					5.06E-01

SUMMARY FOR EMISSIONS AT UNIT 6 TK1055B circular clarifier
8/12/2016 11:59

COMPOUND NAME	conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *	1.31E+02	0.03065	0	9.72E+01	7.09E-01
BENZENE	5.84E-01	0.04395	0	4.08E-01	4.52E-03
ETHYLBENZENE	4.41E-02	0.02674	0	3.12E-02	2.08E-04
OIL (decane as surrogate)	2.78E+02	0.03965	0	1.94E+02	1.94E+00
TOLUENE	8.80E-01	0.03405	0	6.19E-01	5.28E-03
XYLENE	5.53E-01	0.01148	0	3.98E-01	1.12E-03
CARBON DIOXIDE	6.65E+01	0.05699	0	4.70E+01	6.67E-01
MANGANESE	0.00E+00	0	0	0.00E+00	0.00E+00
SELENIUM	0.00E+00	0	0	0.00E+00	0.00E+00
Total rate for all compounds					3.32E+00

SUMMARY FOR EMISSIONS AT UNIT 7 TK1115 storage tank
8/12/2016 11:59

COMPOUND NAME	conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *	1.18E+02	0.00042	0	1.18E+02	7.22E-03
BENZENE	4.97E-01	0.0079	0	4.93E-01	5.68E-04
ETHYLBENZENE	3.81E-02	0.00134	0	3.80E-02	7.37E-06
OIL (decane as surrogate)	2.36E+02	0.00809	0	2.34E+02	2.76E-01
TOLUENE	7.54E-01	0.00295	0	7.52E-01	3.22E-04
XYLENE	4.84E-01	0.00117	0	4.84E-01	8.22E-05
CARBON DIOXIDE	5.72E+01	0.14383	0	4.90E+01	1.19E+00
MANGANESE	0.00E+00	0	0	0.00E+00	0.00E+00
SELENIUM	0.00E+00	0	0	0.00E+00	0.00E+00
Total rate for all compounds					1.47E+00

SUMMARY FOR EMISSIONS AT UNIT 8 TK2010 circular clarifier
8/12/2016 11:59

COMPOUND NAME	conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *	1.18E+02	0.0258	0	1.03E+02	5.08E-01
BENZENE	4.93E-01	0.03794	0	4.23E-01	3.13E-03
ETHYLBENZENE	3.80E-02	0.02309	0	3.31E-02	1.47E-04
OIL (decane as surrogate)	3.25E+02	0.03412	0	2.79E+02	1.85E+00
TOLUENE	7.55E-01	0.02939	0	6.53E-01	3.71E-03
XYLENE	4.82E-01	0.00994	0	4.25E-01	8.02E-04
CARBON DIOXIDE	4.23E+01	0.05007	0	3.60E+01	3.55E-01
MANGANESE	0.00E+00	0	0	0.00E+00	0.00E+00
SELENIUM	0.00E+00	0	0	0.00E+00	0.00E+00
Total rate for all compounds					2.72E+00

SUMMARY FOR EMISSIONS AT UNIT 9 TK2015 storage tank
8/12/2016 11:59

COMPOUND NAME	conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *	1.14E+02	0.00042	0	1.14E+02	7.27E-03
BENZENE	4.69E-01	0.00821	0	4.65E-01	5.81E-04
ETHYLBENZENE	3.67E-02	0.00139	0	3.67E-02	7.69E-06
OIL (decane as surrogate)	3.10E+02	0.00616	0	3.08E+02	2.88E-01
TOLUENE	7.24E-01	0.00309	0	7.22E-01	3.38E-04
XYLENE	4.72E-01	0.00123	0	4.71E-01	8.74E-05
CARBON DIOXIDE	3.99E+01	0.14463	0	3.41E+01	8.71E-01
MANGANESE	0.00E+00	0	0	0.00E+00	0.00E+00
SELENIUM	0.00E+00	0	0	0.00E+00	0.00E+00
Total rate for all compounds					1.17E+00

SUMMARY FOR EMISSIONS AT UNIT 10 TK2040 storage tank
8/12/2016 11:59

COMPOUND NAME	conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *	1.14E+02	0.00052	0	1.14E+02	8.95E-03
BENZENE	4.65E-01	0.01082	0	4.60E-01	7.60E-04
ETHYLBENZENE	3.67E-02	0.0024	0	3.66E-02	1.33E-05
OIL (decane as surrogate)	3.08E+02	0.00754	0	3.06E+02	3.51E-01
TOLUENE	7.22E-01	0.00417	0	7.19E-01	4.55E-04
XYLENE	4.71E-01	0.00177	0	4.70E-01	1.26E-04
CARBON DIOXIDE	3.41E+01	0.16987	0	2.83E+01	8.75E-01
MANGANESE	0.00E+00	0	0	0.00E+00	0.00E+00
SELENIUM	0.00E+00	0	0	0.00E+00	0.00E+00
Total rate for all compounds					1.24E+00

SUMMARY FOR EMISSIONS AT UNIT 13 TK1065 storage tank
8/12/2016 11:59

COMPOUND NAME	conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *	1.32E+02	0.00125	0	1.32E+02	3.15E-04
BENZENE	7.23E-01	0.00075	0	7.23E-01	1.03E-06
ETHYLBENZENE	7.34E-02	0.00018	0	7.34E-02	2.48E-08
OIL (decane as surrogate)	7.87E+02	1.11E-05	0	7.87E+02	1.66E-05
TOLUENE	1.32E+00	0.00028	0	1.32E+00	6.91E-07
XYLENE	9.31E-01	9.94E-05	0	9.31E-01	1.76E-07
CARBON DIOXIDE	8.88E+01	0.05436	0	8.40E+01	9.17E-03
MANGANESE	0.00E+00	0	0	0.00E+00	0.00E+00
SELENIUM	0.00E+00	0	0	0.00E+00	0.00E+00
Total rate for all compounds					9.50E-03

SUMMARY FOR EMISSIONS AT UNIT 17 TK1130 mix tank
8/12/2016 11:59

COMPOUND NAME	conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *	1.26E+02	0.007	0	1.25E+02	5.57E-03
BENZENE	1.00E+00	0.03672	0	9.63E-01	2.32E-04
ETHYLBENZENE	1.00E-20	0.01085	0	9.89E-21	6.85E-25
OIL (decane as surrogate)	2.32E+02	0.03699	0	2.23E+02	5.42E-02
TOLUENE	1.00E-20	0.01895	0	9.81E-21	1.20E-24
XYLENE	1.00E-20	0.00118	0	9.99E-21	7.47E-26
CARBON DIOXIDE	2.40E+01	0.09003	0	2.18E+01	1.36E-02
MANGANESE	8.00E+00	9.31E-25	0	8.00E+00	4.70E-26
SELENIUM	3.40E-01	9.31E-25	0	3.40E-01	2.00E-27
Total rate for all compounds					7.36E-02

SUMMARY FOR EMISSIONS AT UNIT 20 TK1120 mix tank
8/12/2016 11:59

COMPOUND NAME	conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *	1.36E+02	0.02518	0	1.33E+02	4.33E-02
BENZENE	6.39E-01	0.12586	0	5.59E-01	1.02E-03
ETHYLBENZENE	4.98E-02	0.03842	0	4.79E-02	2.41E-05
OIL (decane as surrogate)	3.11E+02	0.03624	0	3.00E+02	1.42E-01
TOLUENE	9.97E-01	0.06677	0	9.30E-01	8.40E-04
XYLENE	6.32E-01	0.00467	0	6.29E-01	3.72E-05
CARBON DIOXIDE	8.35E+01	0.28189	0	5.99E+01	2.97E-01
MANGANESE	8.46E+00	3.16E-24	0	8.46E+00	3.37E-25
SELENIUM	1.82E-01	3.16E-24	0	1.82E-01	7.26E-27
Total rate for all compounds					4.84E-01

SUMMARY FOR EMISSIONS AT UNIT 21 TK2020 mix tank

8/12/2016 11:59

COMPOUND NAME	conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *	1.19E+02	0.09485	0	1.08E+02	1.85E-01
BENZENE	5.21E-01	0.37154	0	3.27E-01	3.18E-03
ETHYLBENZENE	4.11E-02	0.13792	0	3.54E-02	9.29E-05
OIL (decane as surrogate)	3.47E+02	0.08494	0	3.18E+02	4.83E-01
TOLUENE	8.09E-01	0.22496	0	6.27E-01	2.98E-03
XYLENE	5.28E-01	0.02	0	5.17E-01	1.73E-04
CARBON DIOXIDE	4.27E+01	0.61895	0	1.63E+01	4.34E-01
MANGANESE	6.91E+00	1.23E-23	0	6.91E+00	1.40E-24
SELENIUM	4.48E-02	1.23E-23	0	4.48E-02	9.06E-27
Total rate for all compounds					1.11E+00

TANKS 4.0.9d Model Output

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

Identification

User Identification:	TK-1065 - Average Flow
City:	Bridgeport
State:	West Virginia
Company:	Antero Treatment LLC
Type of Tank:	Vertical Fixed Roof Tank
Description:	Oil Collection Tank 12,000 Gallons Average Flow

Tank Dimensions

Shell Height (ft):	16.00
Diameter (ft):	12.00
Liquid Height (ft) :	15.00
Avg. Liquid Height (ft):	8.00
Volume (gallons):	12,690.44
Turnovers:	538.42
Net Throughput(gal/yr):	6,832,800.00
Is Tank Heated (y/n):	N

Paint Characteristics

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

Roof Characteristics

Type:	Dome
Height (ft)	1.00
Radius (ft) (Dome Roof)	6.00

Breather Vent Settings

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

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

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

TK-1065 - Average Flow - Vertical Fixed Roof Tank
Bridgeport, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Crude oil (RVP 5)	All	57.20	47.16	67.23	52.14	2.7228	2.2221	3.3106	50.0000			207.00	Option 4: RVP=5

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

TK-1065 - Average Flow - Vertical Fixed Roof Tank
Bridgeport, West Virginia

Annual Emission Calcaulations	
Standing Losses (lb):	661.9249
Vapor Space Volume (cu ft):	961.8509
Vapor Density (lb/cu ft):	0.0245
Vapor Space Expansion Factor:	0.1711
Vented Vapor Saturation Factor:	0.4490
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	961.8509
Tank Diameter (ft):	12.0000
Vapor Space Outage (ft):	8.5046
Tank Shell Height (ft):	16.0000
Average Liquid Height (ft):	8.0000
Roof Outage (ft):	0.5046
Roof Outage (Dome Roof)	
Roof Outage (ft):	0.5046
Dome Radius (ft):	6.0000
Shell Radius (ft):	6.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0245
Vapor Molecular Weight (lb/lb-mole):	50.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.7228
Daily Avg. Liquid Surface Temp. (deg. R):	516.8667
Daily Average Ambient Temp. (deg. F):	49.0583
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	511.8083
Tank Paint Solar Absorptance (Shell):	0.6800
Tank Paint Solar Absorptance (Roof):	0.6800
Daily Total Solar Insulation Factor (Btu/sqft day):	1,193.8870
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.1711
Daily Vapor Temperature Range (deg. R):	40.1436
Daily Vapor Pressure Range (psia):	1.0884
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.7228
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	2.2221
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	3.3106
Daily Avg. Liquid Surface Temp. (deg R):	516.8667
Daily Min. Liquid Surface Temp. (deg R):	506.8308
Daily Max. Liquid Surface Temp. (deg R):	526.9026
Daily Ambient Temp. Range (deg. R):	24.1833
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.4490
Vapor Pressure at Daily Average Liquid:	
Surface Temperature (psia):	2.7228
Vapor Space Outage (ft):	8.5046
Working Losses (lb):	3,694.0651
Vapor Molecular Weight (lb/lb-mole):	50.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.7228
Annual Net Throughput (gal/yr.):	6,832,800.0000
Annual Turnovers:	538.4209
Turnover Factor:	0.2224
Maximum Liquid Volume (gal):	12,690.4443
Maximum Liquid Height (ft):	15.0000
Tank Diameter (ft):	12.0000
Working Loss Product Factor:	0.7500
Total Losses (lb):	4,355.9900

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

Emissions Report for: Annual

TK-1065 - Average Flow - Vertical Fixed Roof Tank
Bridgeport, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Crude oil (RVP 5)	3,694.07	661.92	4,355.99

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

Identification

User Identification:	TK-1065 - Peak Flow
City:	Bridgeport
State:	West Virginia
Company:	Antero Treatment LLC
Type of Tank:	Vertical Fixed Roof Tank
Description:	Oil Collection Tank 12,000 Gallons Peak Flow

Tank Dimensions

Shell Height (ft):	16.00
Diameter (ft):	12.00
Liquid Height (ft) :	15.00
Avg. Liquid Height (ft):	8.00
Volume (gallons):	12,690.44
Turnovers:	1,242.51
Net Throughput(gal/yr):	15,768,000.00
Is Tank Heated (y/n):	N

Paint Characteristics

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

Roof Characteristics

Type:	Dome
Height (ft)	1.00
Radius (ft) (Dome Roof)	6.00

Breather Vent Settings

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

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

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

TK-1065 - Peak Flow - Vertical Fixed Roof Tank
Bridgeport, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Crude oil (RVP 5)	All	57.20	47.16	67.23	52.14	2.7228	2.2221	3.3106	50.0000			207.00	Option 4: RVP=5

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

TK-1065 - Peak Flow - Vertical Fixed Roof Tank
Bridgeport, West Virginia

Annual Emission Calcaulations	
Standing Losses (lb):	661.9249
Vapor Space Volume (cu ft):	961.8509
Vapor Density (lb/cu ft):	0.0245
Vapor Space Expansion Factor:	0.1711
Vented Vapor Saturation Factor:	0.4490
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	961.8509
Tank Diameter (ft):	12.0000
Vapor Space Outage (ft):	8.5046
Tank Shell Height (ft):	16.0000
Average Liquid Height (ft):	8.0000
Roof Outage (ft):	0.5046
Roof Outage (Dome Roof)	
Roof Outage (ft):	0.5046
Dome Radius (ft):	6.0000
Shell Radius (ft):	6.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0245
Vapor Molecular Weight (lb/lb-mole):	50.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.7228
Daily Avg. Liquid Surface Temp. (deg. R):	516.8667
Daily Average Ambient Temp. (deg. F):	49.0583
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	511.8083
Tank Paint Solar Absorptance (Shell):	0.6800
Tank Paint Solar Absorptance (Roof):	0.6800
Daily Total Solar Insulation Factor (Btu/sqft day):	1,193.8870
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.1711
Daily Vapor Temperature Range (deg. R):	40.1436
Daily Vapor Pressure Range (psia):	1.0884
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.7228
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	2.2221
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	3.3106
Daily Avg. Liquid Surface Temp. (deg R):	516.8667
Daily Min. Liquid Surface Temp. (deg R):	506.8308
Daily Max. Liquid Surface Temp. (deg R):	526.9026
Daily Ambient Temp. Range (deg. R):	24.1833
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.4490
Vapor Pressure at Daily Average Liquid:	
Surface Temperature (psia):	2.7228
Vapor Space Outage (ft):	8.5046
Working Losses (lb):	7,314.4359
Vapor Molecular Weight (lb/lb-mole):	50.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.7228
Annual Net Throughput (gal/yr.):	15,768,000.0000
Annual Turnovers:	1,242.5097
Turnover Factor:	0.1908
Maximum Liquid Volume (gal):	12,690.4443
Maximum Liquid Height (ft):	15.0000
Tank Diameter (ft):	12.0000
Working Loss Product Factor:	0.7500
Total Losses (lb):	7,976.3609

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

Emissions Report for: Annual

TK-1065 - Peak Flow - Vertical Fixed Roof Tank
Bridgeport, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Crude oil (RVP 5)	7,314.44	661.92	7,976.36

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

Identification

User Identification:	TK2120
City:	
State:	Doddridge County, WV
Company:	Antero Resources
Type of Tank:	Horizontal Tank
Description:	Process Distillate Level Tank 5575 gallons Sandstrom Water Treatment

Tank Dimensions

Shell Length (ft):	26.00
Diameter (ft):	6.00
Volume (gallons):	5,575.00
Turnovers:	104,205.91
Net Throughput(gal/yr):	599,184,000.00
Is Tank Heated (y/n):	Y
Is Tank Underground (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good

Breather Vent Settings

Vacuum Settings (psig):	0.00
Pressure Settings (psig)	0.00

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

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

TK2120 - Horizontal Tank

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
TK2120	All	154.00	88.00	200.00	154.00	4.1618	0.6778	11.6651	18.0063			18.02	
ammonia						461.8699	176.6238	798.7771	17.0300	0.0001	0.0131	17.03	Option 2: A=7.55466, B=1002.711, C=247.885
Water						4.1046	0.6558	11.5669	18.0200	0.9999	0.9869	18.02	Option 2: A=8.10765, B=1750.286, C=235

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

TK2120 - Horizontal Tank

Annual Emission Calcaulations	
Standing Losses (lb):	1,557.3748
Vapor Space Volume (cu ft):	468.2374
Vapor Density (lb/cu ft):	0.0114
Vapor Space Expansion Factor:	1.3307
Vented Vapor Saturation Factor:	0.6018
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	468.2374
Tank Diameter (ft):	6.0000
Effective Diameter (ft):	14.0970
Vapor Space Outage (ft):	3.0000
Tank Shell Length (ft):	26.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0114
Vapor Molecular Weight (lb/lb-mole):	18.0063
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	4.1618
Daily Avg. Liquid Surface Temp. (deg. R):	613.6700
Daily Average Ambient Temp. (deg. F):	49.0583
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	613.6700
Tank Paint Solar Absorptance (Shell):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,193.8870
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	1.3307
Daily Vapor Temperature Range (deg. R):	112.0000
Daily Vapor Pressure Range (psia):	10.9874
Breather Vent Press. Setting Range(psia):	0.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	4.1618
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.6778
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	11.6651
Daily Avg. Liquid Surface Temp. (deg R):	613.6700
Daily Min. Liquid Surface Temp. (deg R):	547.6700
Daily Max. Liquid Surface Temp. (deg R):	659.6700
Daily Ambient Temp. Range (deg. R):	24.1833
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.6018
Vapor Pressure at Daily Average Liquid:	
Surface Temperature (psia):	4.1618
Vapor Space Outage (ft):	3.0000
Working Losses (lb):	178,489.8067
Vapor Molecular Weight (lb/lb-mole):	18.0063
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	4.1618
Annual Net Throughput (gal/yr.):	599,184,000.0000
Annual Turnovers:	104,205.9130
Turnover Factor:	0.1670
Tank Diameter (ft):	6.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	180,047.1815

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

Emissions Report for: Annual

TK2120 - Horizontal Tank

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
TK2120	178,489.81	1,557.37	180,047.18
Water	176,150.63	1,536.96	177,687.60
ammonia	2,339.17	20.41	2,359.58

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

Identification

User Identification:	TK2120
City:	
State:	Doddridge County, WV
Company:	Antero Resources
Type of Tank:	Horizontal Tank
Description:	Process Distillate Level Tank 5575 gallons Sandstrom Water Treatment

Tank Dimensions

Shell Length (ft):	26.00
Diameter (ft):	6.00
Volume (gallons):	5,575.00
Turnovers:	117,187.59
Net Throughput(gal/yr):	653,320,800.00
Is Tank Heated (y/n):	Y
Is Tank Underground (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good

Breather Vent Settings

Vacuum Settings (psig):	0.00
Pressure Settings (psig)	0.00

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

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

TK2120 - Horizontal Tank

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
TK2120	All	154.00	88.00	200.00	154.00	4.1618	0.6778	11.6651	18.0063			18.02	
ammonia						461.8699	176.6238	798.7771	17.0300	0.0001	0.0131	17.03	Option 2: A=7.55466, B=1002.711, C=247.885
Water						4.1046	0.6558	11.5669	18.0200	0.9999	0.9869	18.02	Option 2: A=8.10765, B=1750.286, C=235

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

TK2120 - Horizontal Tank

Annual Emission Calcaulations	
Standing Losses (lb):	1,557.3748
Vapor Space Volume (cu ft):	468.2374
Vapor Density (lb/cu ft):	0.0114
Vapor Space Expansion Factor:	1.3307
Vented Vapor Saturation Factor:	0.6018
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	468.2374
Tank Diameter (ft):	6.0000
Effective Diameter (ft):	14.0970
Vapor Space Outage (ft):	3.0000
Tank Shell Length (ft):	26.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0114
Vapor Molecular Weight (lb/lb-mole):	18.0063
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	4.1618
Daily Avg. Liquid Surface Temp. (deg. R):	613.6700
Daily Average Ambient Temp. (deg. F):	49.0583
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	613.6700
Tank Paint Solar Absorptance (Shell):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,193.8870
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	1.3307
Daily Vapor Temperature Range (deg. R):	112.0000
Daily Vapor Pressure Range (psia):	10.9874
Breather Vent Press. Setting Range(psia):	0.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	4.1618
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.6778
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	11.6651
Daily Avg. Liquid Surface Temp. (deg R):	613.6700
Daily Min. Liquid Surface Temp. (deg R):	547.6700
Daily Max. Liquid Surface Temp. (deg R):	659.6700
Daily Ambient Temp. Range (deg. R):	24.1833
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.6018
Vapor Pressure at Daily Average Liquid:	
Surface Temperature (psia):	4.1618
Vapor Space Outage (ft):	3.0000
Working Losses (lb):	194,579.3416
Vapor Molecular Weight (lb/lb-mole):	18.0063
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	4.1618
Annual Net Throughput (gal/yr.):	653,320,800.0000
Annual Turnovers:	117,187.5874
Turnover Factor:	0.1669
Tank Diameter (ft):	6.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	196,136.7164

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

Emissions Report for: Annual

TK2120 - Horizontal Tank

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
TK2120	194,579.34	1,557.37	196,136.72
Water	192,029.31	1,536.96	193,566.27
ammonia	2,550.03	20.41	2,570.44

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

Identification

User Identification:	TK-4115 Methanol Bulk Tank
City:	Doddridge County
State:	West Virginia
Company:	Antero Treatment
Type of Tank:	Horizontal Tank
Description:	8000 gallon storage tank

Tank Dimensions

Shell Length (ft):	22.00
Diameter (ft):	8.00
Volume (gallons):	8,000.00
Turnovers:	34.27
Net Throughput(gal/yr):	274,188.00
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N

Paint Characteristics

Shell Color/Shade:	Gray/Medium
Shell Condition	Good

Breather Vent Settings

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

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

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

TK-4115 Methanol Bulk Tank - Horizontal Tank
Doddridge County, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Methyl alcohol	All	57.20	47.16	67.23	52.14	1.3195	0.9508	1.8044	32.0400			32.04	Option 2: A=7.897, B=1474.08, C=229.13

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

TK-4115 Methanol Bulk Tank - Horizontal Tank
Doddridge County, West Virginia

Annual Emission Calcaulations	
Standing Losses (lb):	216.8293
Vapor Space Volume (cu ft):	704.3571
Vapor Density (lb/cu ft):	0.0076
Vapor Space Expansion Factor:	0.1416
Vented Vapor Saturation Factor:	0.7814
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	704.3571
Tank Diameter (ft):	8.0000
Effective Diameter (ft):	14.9734
Vapor Space Outage (ft):	4.0000
Tank Shell Length (ft):	22.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0076
Vapor Molecular Weight (lb/lb-mole):	32.0400
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	1.3195
Daily Avg. Liquid Surface Temp. (deg. R):	516.8667
Daily Average Ambient Temp. (deg. F):	49.0583
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	511.8083
Tank Paint Solar Absorptance (Shell):	0.6800
Daily Total Solar Insulation Factor (Btu/sqft day):	1,193.8870
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.1416
Daily Vapor Temperature Range (deg. R):	40.1436
Daily Vapor Pressure Range (psia):	0.8536
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	1.3195
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.9508
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	1.8044
Daily Avg. Liquid Surface Temp. (deg R):	516.8667
Daily Min. Liquid Surface Temp. (deg R):	506.8308
Daily Max. Liquid Surface Temp. (deg R):	526.9026
Daily Ambient Temp. Range (deg. R):	24.1833
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.7814
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	1.3195
Vapor Space Outage (ft):	4.0000
Working Losses (lb):	275.9956
Vapor Molecular Weight (lb/lb-mole):	32.0400
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	1.3195
Annual Net Throughput (gal/yr.):	274,188.0000
Annual Turnovers:	34.2735
Turnover Factor:	1.0000
Tank Diameter (ft):	8.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	492.8249

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

Emissions Report for: Annual

TK-4115 Methanol Bulk Tank - Horizontal Tank
Doddridge County, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Methyl alcohol	276.00	216.83	492.82

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

Identification

User Identification:	TK-4115 Methanol Bulk Tank
City:	Doddridge County
State:	West Virginia
Company:	Antero Treatment
Type of Tank:	Horizontal Tank
Description:	8000 gallon storage tank

Tank Dimensions

Shell Length (ft):	22.00
Diameter (ft):	8.00
Volume (gallons):	8,000.00
Turnovers:	93.73
Net Throughput(gal/yr):	749,856.00
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N

Paint Characteristics

Shell Color/Shade:	Gray/Medium
Shell Condition	Good

Breather Vent Settings

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

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

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

TK-4115 Methanol Bulk Tank - Horizontal Tank
Doddridge County, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Methyl alcohol	All	57.20	47.16	67.23	52.14	1.3195	0.9508	1.8044	32.0400			32.04	Option 2: A=7.897, B=1474.08, C=229.13

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

TK-4115 Methanol Bulk Tank - Horizontal Tank
Doddridge County, West Virginia

Annual Emission Calcaulations	
Standing Losses (lb):	216.8293
Vapor Space Volume (cu ft):	704.3571
Vapor Density (lb/cu ft):	0.0076
Vapor Space Expansion Factor:	0.1416
Vented Vapor Saturation Factor:	0.7814
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	704.3571
Tank Diameter (ft):	8.0000
Effective Diameter (ft):	14.9734
Vapor Space Outage (ft):	4.0000
Tank Shell Length (ft):	22.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0076
Vapor Molecular Weight (lb/lb-mole):	32.0400
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	1.3195
Daily Avg. Liquid Surface Temp. (deg. R):	516.8667
Daily Average Ambient Temp. (deg. F):	49.0583
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	511.8083
Tank Paint Solar Absorptance (Shell):	0.6800
Daily Total Solar Insulation Factor (Btu/sqft day):	1,193.8870
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.1416
Daily Vapor Temperature Range (deg. R):	40.1436
Daily Vapor Pressure Range (psia):	0.8536
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	1.3195
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.9508
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	1.8044
Daily Avg. Liquid Surface Temp. (deg R):	516.8667
Daily Min. Liquid Surface Temp. (deg R):	506.8308
Daily Max. Liquid Surface Temp. (deg R):	526.9026
Daily Ambient Temp. Range (deg. R):	24.1833
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.7814
Vapor Pressure at Daily Average Liquid:	
Surface Temperature (psia):	1.3195
Vapor Space Outage (ft):	4.0000
Working Losses (lb):	367.3821
Vapor Molecular Weight (lb/lb-mole):	32.0400
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	1.3195
Annual Net Throughput (gal/yr.):	749,856.0000
Annual Turnovers:	93.7320
Turnover Factor:	0.4867
Tank Diameter (ft):	8.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	584.2114

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

Emissions Report for: Annual

TK-4115 Methanol Bulk Tank - Horizontal Tank
Doddridge County, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Methyl alcohol	367.38	216.83	584.21

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

i. 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.

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.

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 Modification Application – 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 modification 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: 39.26425N, 80.90675W.

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)	-8.09
Carbon Monoxide (CO)	-8.84
Volatile Organic Compounds (VOCs)	12.24
Particulate Matter less than 10 µm (PM_{10})	1.90
Particulate Matter less than 2.5 µm ($PM_{2.5}$)	-0.23
Sulfur Dioxide (SO_2)	-0.47
Total Hazardous Air Pollutants (HAPs)	0.55
Carbon Dioxide Equivalent (CO_2e)	-26,220

Startup of operation is planned to begin on or about March 2017, with construction starting in December 2016. Written comments will be received by the West Virginia Department of Environmental Protection, Division of Air Quality, 601 57th Street, SE, Charleston, WV 25304, for at least 30 calendar days from the date of publication of this notice.

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

Dated this the 26th day of September 2016.

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