July 20, 2015

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

RE: Antero Resources Corporation – Sandstrom Water Treatment Facility
West Virginia Department of Environmental Protection, Division of Air Quality, 45CSR13 Air Permit Application

To Whom It May Concern,

On behalf of Antero Resources Corporation, please find attached the 45CSR13 Air Permit Application for the proposed Sandstrom Water Treatment Facility located in Doddridge County, West Virginia. Sandstrom Water Treatment Facility is a new 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.

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

Sincerely,
KLEINFELDER

Michele Steyskal

Michele Steyskal
Air Quality Specialist

Enclosures: Sandstrom Water Treatment Facility Air Permit Application

1801 California Street, Suite 1100 ❖ Denver, CO 80202 ❖ 303.237.6601 ❖ fax 303.237.6602

Antero Resources Corporation

Sandstrom Water Treatment Facility

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

Doddridge County, West Virginia

July 2015

Prepared by:

1801 California Street, Suite 1100
Denver, CO 80202
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www.kleinfelder.com

DEN15O22724

Table of Contents

	45CSR13 Application Form
	Discussion of Nearby Facilities
Attachment A.	Business Certificate
Attachment B.	Area and Topographic Maps
Attachment C.	Installation and Startup Schedule
Attachment D.	Regulatory Discussion
Attachment E.	Plot Plan
Attachment F.	Process Flow Diagram
Attachment G.	Process Description
Attachment H.	Material Safety Data Sheets
Attachment I.	Emission Units Table
Attachment J.	Emission Point Data Summary Sheet
Attachment K.	Fugitive Emissions Data Summary Sheet
Attachment L.	Emissions Unit Data Sheets a. Emergency Generator Engine b. Boilers c. Cooling Tower d. Waste Gas Header Storage Tanks e. Post Treatment System Storage Tanks f. Other Storage Tanks g. Bulk Loading and Fugitives
Attachment M.	Air Pollution Control Device Sheets a. Thermal Oxidizer
Attachment N.	Supporting Emissions Calculations a. Emission Calculations b. WATER9 Model Output c. TANKS 4.0.9d Output d. Material Balance Streams
Attachment O.	Monitoring, Recordkeeping, Reporting, and Testing Plans
Attachment P.	Public Notice
Attachment R.	Authority/Delegation of Authority

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 Resources Corporation

2. Federal Employer ID No. ***(FEIN):***
80-0162034

3. Name of facility *(if different from above):*
Sandstrom Water Treatment 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 Resources Corporation 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):
–

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

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 under 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:
New construction

14A. Provide the date of anticipated installation or change: January 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: April 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: Generator engine, cooling tower, material transfer points, process tanks

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

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

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

☐ Other Collectors, specify :

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

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

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

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

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

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

☐ **YES** ☒ **NO**

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

Section III. Certification of Information

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

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

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

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

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

Certification of Truth, Accuracy, and Completeness

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

Compliance Certification

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

SIGNATURE Barry Schatz *(Please use blue ink)* DATE: 7/16/2015 *(Please use blue ink)*

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

PLEASE CHECK ALL APPLICABLE ATTACHMENTS INCLUDED WITH THIS PERMIT APPLICATION:

- ☒ **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

Sandstrom Water Treatment Facility –

Closest Antero Resources Corporation 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 and Antero Midstream LLC.

2. SIC Code: The Sandstrom Water Treatment 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 proposed water treatment facility. However, this production facility operates under the SIC code of 1311. There are no nearby facilities owned by Antero Resources Corporation operating with the SIC code of 1389.

3. Continuous or Adjacent: The land between the Sandstrom Water Treatment Facility and its nearest facility is not owned or managed by Antero Resources Corporation. Therefore, the facilities are not considered to be adjacent or continuous.

Based on this three-pronged evaluation, there are no other existing facilities that should aggregate emissions with Sandstrom Water Treatment Facility.

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 RESOURCES CORPORATION

a corporation formed under the laws of Delaware, which is authorized to transact business in West Virginia by a Certificate of Authority has filed in my office as required by the provisions of the West Virginia Code, a copy of an amendment to its Articles of Incorporation authenticated by the proper office of the state or country of its incorporation and was found to conform to law.

Therefore, I issue this

CERTIFICATE OF AMENDMENT TO CERTIFICATE OF AUTHORITY

Given under my hand and the Great Seal of the State of West Virginia on this day of June 10, 2013

Natalie E Tennant

Secretary of State

Attachment B.
Area and Topographic Maps

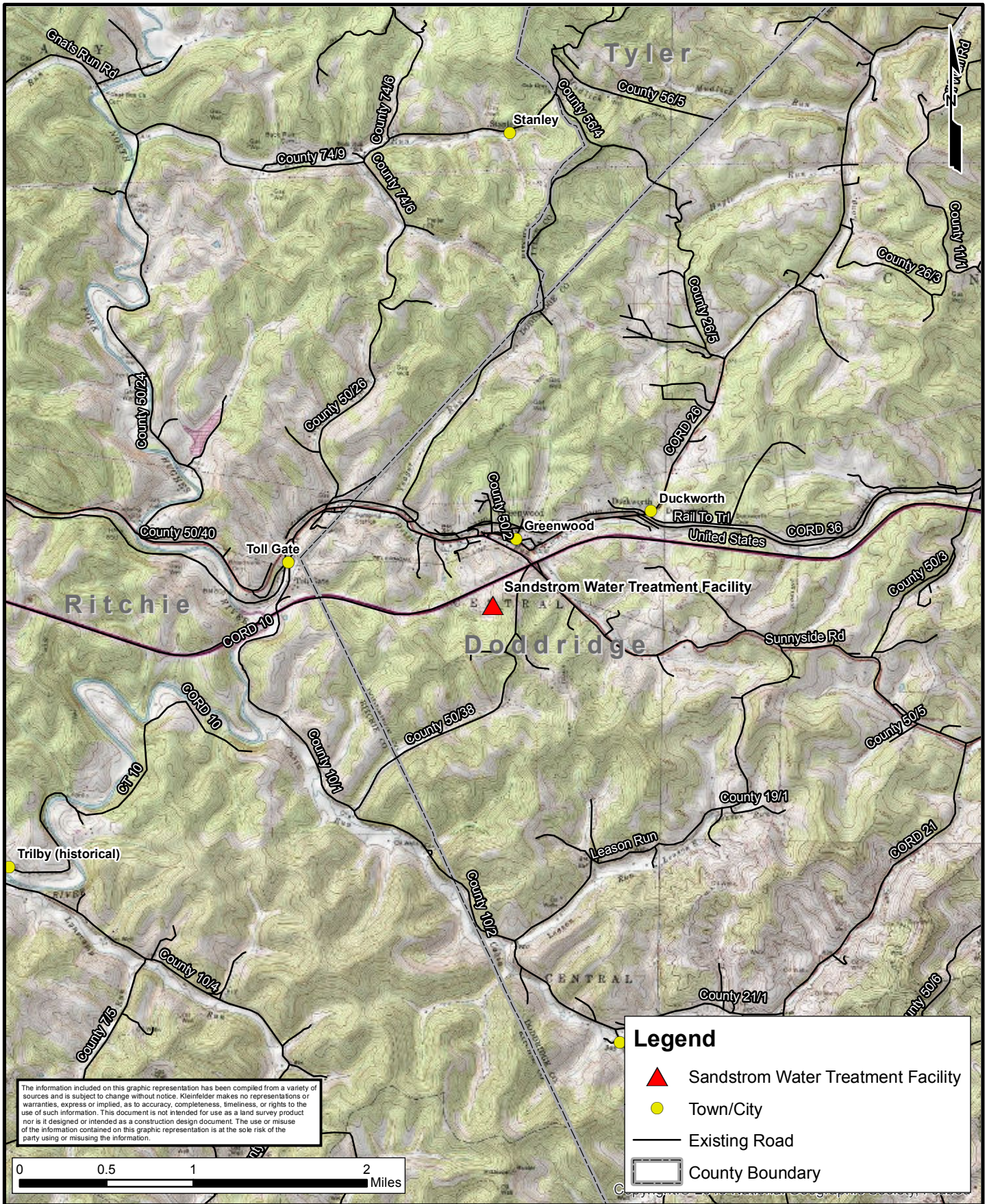
KLEINFELDER
Bright People. Right Solutions.
www.kleinfelder.com

PROJECT NO.	20161200
DRAWN:	7/7/2015
DRAWN BY:	A.Leonard
CHECKED BY:	K.Meszaros
FILE NAME:	SandstromWaterTreatment_Receptor.mxd

Antero Resources Corporation

Sandstrom Water Treatment Facility
Doddridge County, West Virginia

FIGURE



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PROJECT NO.	20161200
DRAWN:	7/7/2015
DRAWN BY:	A.Leonard
CHECKED BY:	K.Meszaros
FILE NAME:	SandstromWaterTreatment_Topo.mxd

Antero Resources Corporation

Sandstrom Water Treatment Facility
Doddridge County, West Virginia

FIGURE

Attachment C.
Installation and Startup Schedule

Sandstrom Water Treatment Facility – Installation and Startup Schedule

The Sandstrom Water Treatment Facility will be a new facility located in Doddridge County, WV, approximately 0.5 miles south of Greenwood, WV. Ground clearing and other site preparation activities are anticipated to occur starting in August 2015. Installation of equipment is anticipated to begin in January 2016. Facility operations are scheduled to begin on or around April 2017.

Attachment D.
Regulatory Discussion

Sandstrom Water Treatment 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 Sandstrom Water Treatment 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)	Sludge filtrate tank (TK-2030)
CIP tank (TK-2320)	Process distillate level tank (TK-2120)	Steam condensate level tank (TK-2085)
Disposal centrate tank (TK-2160)	Boiler deaerator tank (TK-2315)	Brine maker tank (TK-2150)
Post Treatment effluent tank (TK-2515)	Post Treatment sludge tank (TK-2520)	Clarifer polymer aging tank (TK-4175)
Sodium sulfate day tank (TK-4039)	Lime slurry premix tank A and B (TK-4049A and TK-4049B)	Lime slurry tank A and B (TK-4049A and TK-4049B)
Dewatering polymer system aging tank (TK-4165)	Sodium bicarbonate day tank (TK-4014)	Post Treatment polymer system aging tank (TK-4170)
Ferric chloride storage tank (TK-4000)	Caustic bulk storage tank (TK-4020)	Methanol bulk storage tank (TK-4115)
Sulfuric acid bulk storage tank (TK-4180)	Solids Clarifier Polymer System Aging Tank (TK-4160)	All totes (TK-4025, 4080, 4054, 4057, 4120, 4155, 4015, 4125, 4150, 4065, 4185, 4190)

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.

Clarifier Tanks A & B (TK-1055A & TK-1055B)	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)	Barometric Condenser Hotwell Tank (TK-2130)	Solids Clarifier Tank (TK-2010)
Post Treatment System Tanks (CF-2510)		

All onsite storage tanks were addressed for applicability to Subpart Kb. With the determinations above, Subpart Kb is not applicable to the Sandstrom Water Treatment 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 Sandstrom Water Treatment Facility will be constructed after May 4, 1987, it is not considered a petroleum refinery. Therefore, Subpart QQQ does not apply to the Sandstrom Water Treatment 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 Sandstrom Water Treatment Facility since the emergency generator engine will be installed after July 2005 and manufactured after April 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 Sandstrom

Water Treatment 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 Sandstrom Water Treatment 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 Sandstrom Water Treatment 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 Sandstrom 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 Sandstrom Water Treatment 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 Sandstrom Water Treatment Facility as the generator engine is a new RICE. The engine will meet Subpart ZZZZ by meeting 40 CFR Part 60, Subpart IIII as the Sandstrom Water Treatment 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 Sandstrom Water Treatment 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 Sandstrom Water Treatment 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 Sandstrom Water Treatment 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*

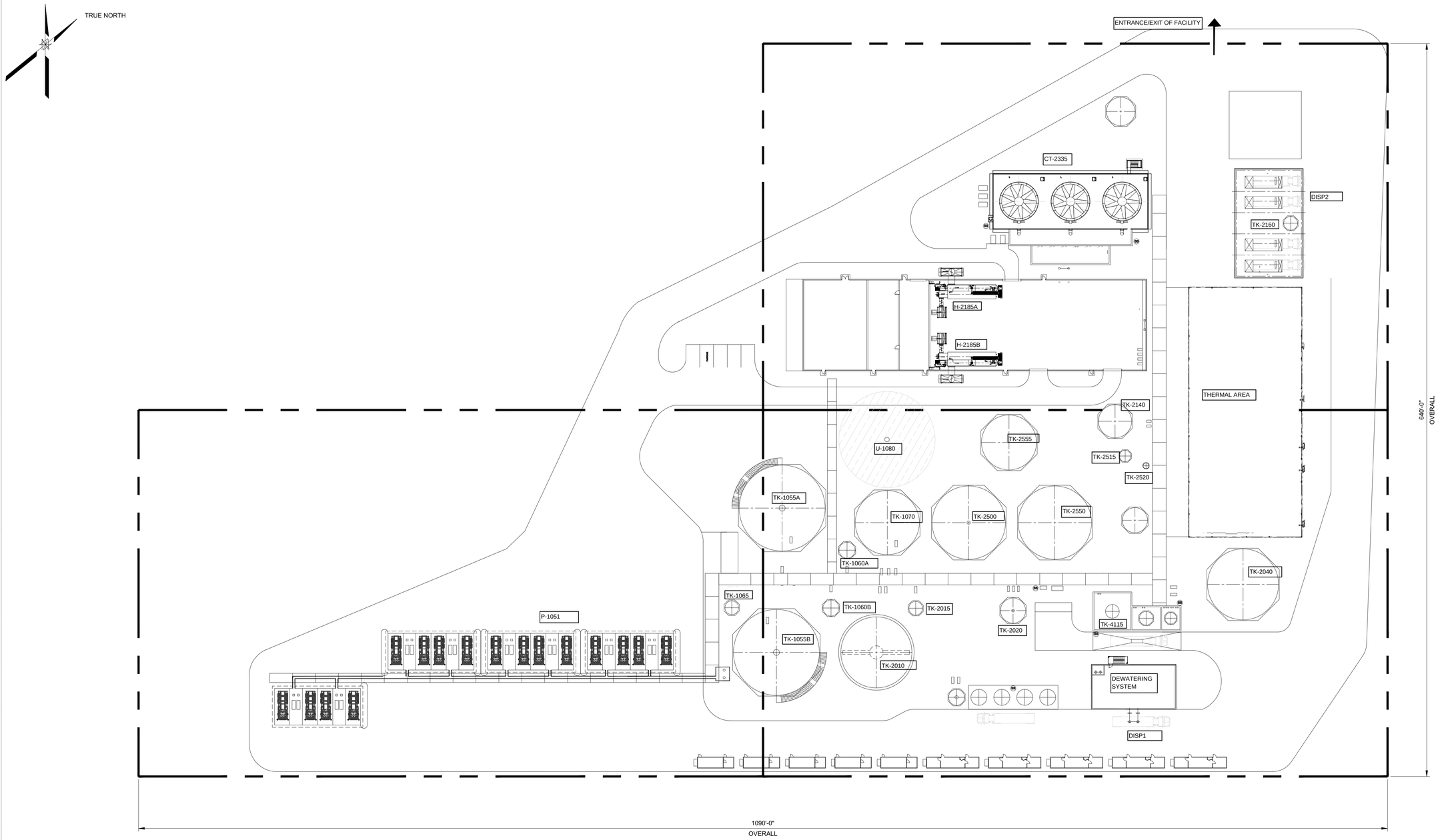
XII. *45CSR33 – Acid Rain Provisions and Permits*

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



PLAN VIEW

AVERAGE FACILITY ELEVATION = 1040 FEET

REVISION IN PROGRESS CHECK PRINT NO.	INITIALS	DATE

RELEASE	
NO	☐
YES	☐

CORRECTIONS VERIFIED BY	

CORRECTIONS MADE BY	

DRAWING CHECKER	

DESIGN ORIGINATOR	

REV. NO.	ISSUE DATE	DESIGNED BY	CHECKED BY	APPROVED BY	DESCRIPTION
G		B. MCGINNIS	J. PITTS		IN PROGRESS
F	6-26-15	B. MCGINNIS	J. PITTS		UPDATED FOR 60,000 BARRELS PER DAY
E	4-24-15	T. FORSYTHE	J. TOAL		PRELIMINARY
D	4-1-15	J. YINGST	J. TOAL		UPDATED PER REVISED LAYOUT
C	3-2-15	T. FORSYTHE	J. TOAL		PRELIMINARY
B	2-24-15	T. FORSYTHE	J. TOAL		PRELIMINARY
A	1-20-15	T. FORSYTHE	J. TOAL		PRELIMINARY

DESIGN ENGINEERING

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

REVISION IN PROGRESS

SCALE	DRAWN BY
1/16"=1'-0"	T. FORSYTHE

TITLE

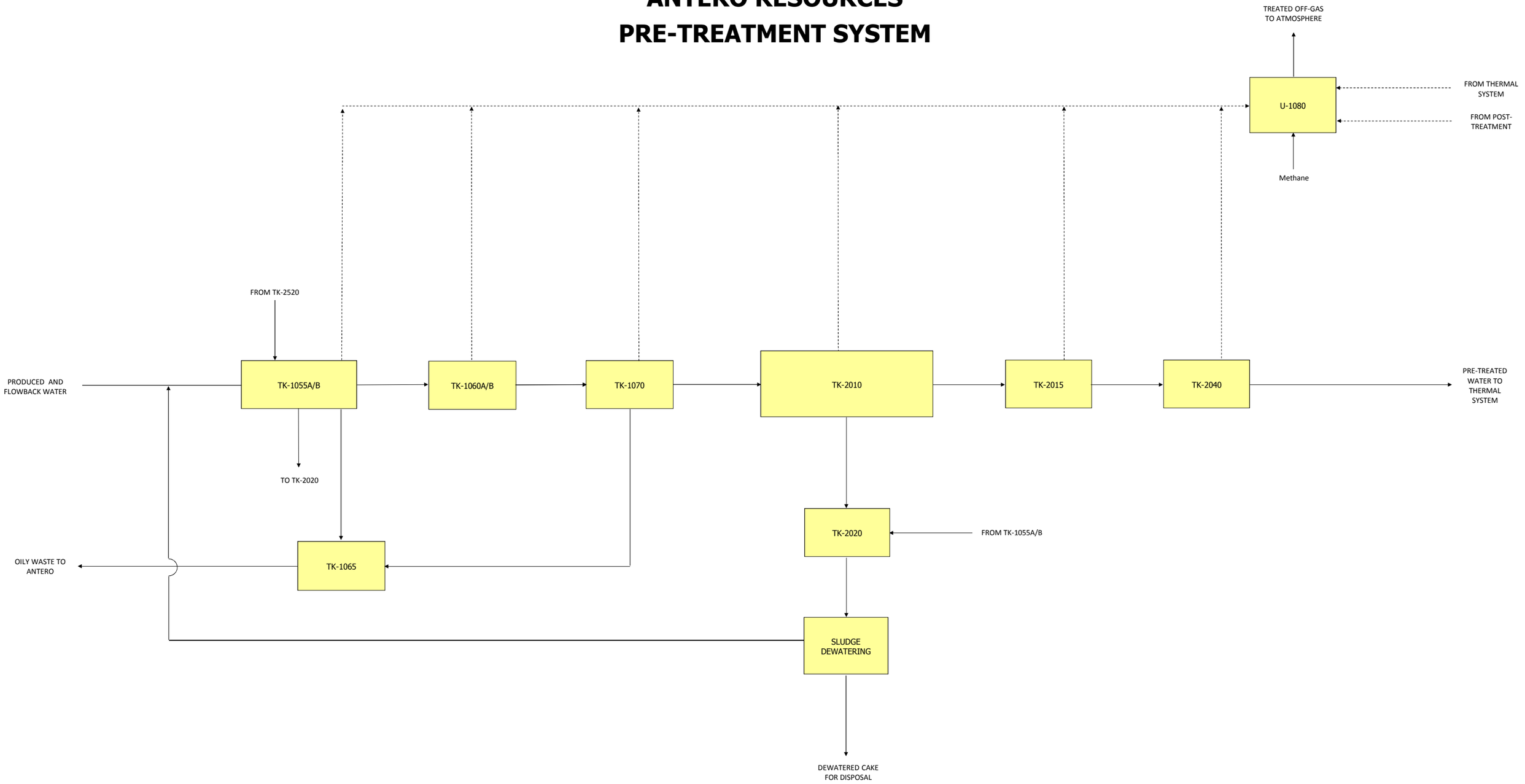
ANTERO RESOURCES
SHALE GAS WATER TREATMENT
BRIDGEPORT, WV

MECHANICAL
WATER TREATMENT PLANT
GENERAL ARRANGEMENT

CONTRACT NO.	DWG. NO.	REV
5600215036	M101-01	G

Attachment F.
Process Flow Diagram

ANTERO RESOURCES
PRE-TREATMENT SYSTEM



PAGE 1

REV. NO.	ISSUE DATE	DRAWN BY	CHECKED BY	REVIEWED BY	APPROVED BY	APPROVED BY (OPTIONAL)	DESCRIPTION
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0	4/23/15	HLK	BAB	JAS	CDB		
		DESIGN/DRAFTING		ENGINEERING			

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VEOLIA

INDUSTRIAL PROJECTS, MOON TOWNSHIP, PA 15108 USA. TEL 1-412-809-8000

SCALE

DRAWN BY

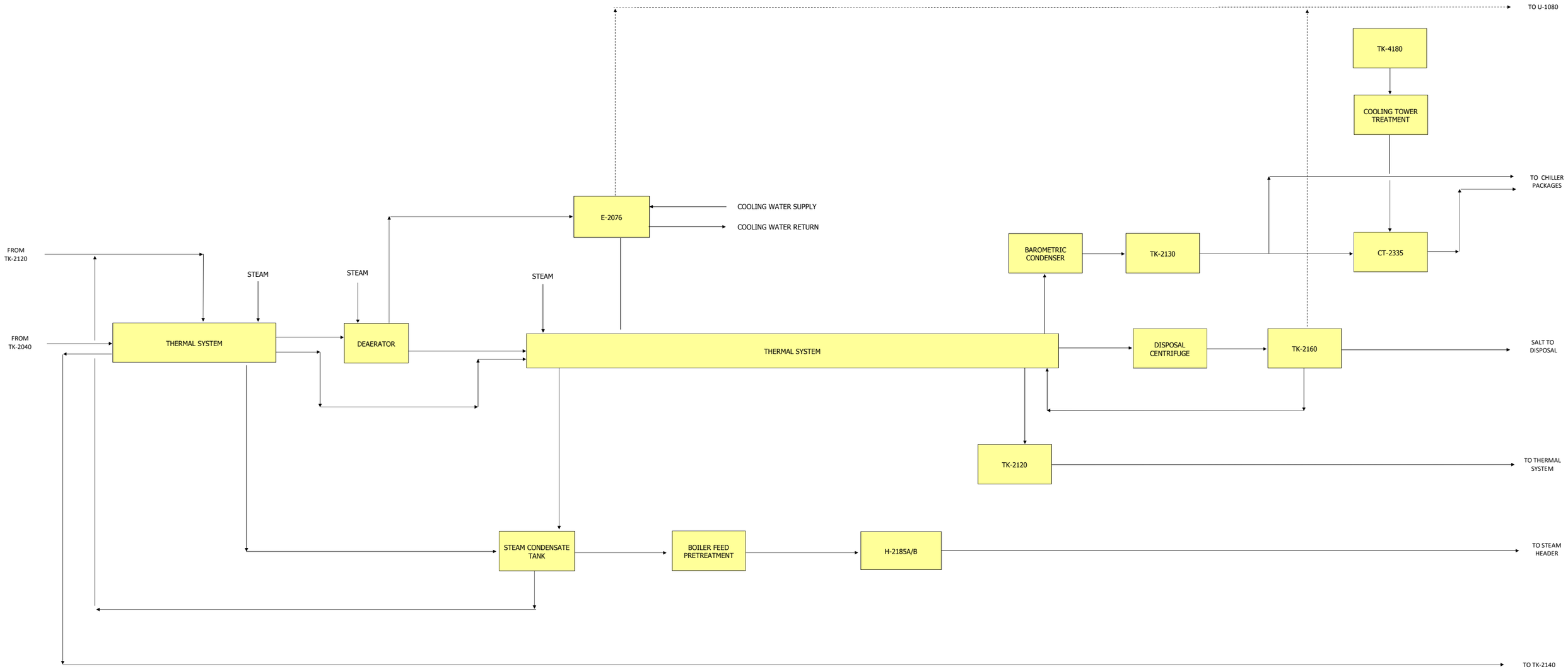
TITLE

WATER BALANCE DIAGRAM
PRODUCED / FLOWBACK WATER PRETREATMENT

ANTERO RESOURCES
MARCELLUS / UTICA SHALE PROJECT
60,000 BPD INFLUENT CAPACITY

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

ANTERO RESOURCES
THERMAL SYSTEM



PAGE 2

PREV. NO.	ISSUE DATE	DRAWN BY	CHECKED BY	REVIEWED BY	APPROVED BY	APPROVED BY (OPTIONAL)	DESCRIPTION
0	7/13/15	HLK					

DESIGN/DRAFTING | ENGINEERING

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INDUSTRIAL PROJECTS, MOON TOWNSHIP, PA 15108 USA, TEL. 1-412-809-6000

SCALE | DRAWN BY

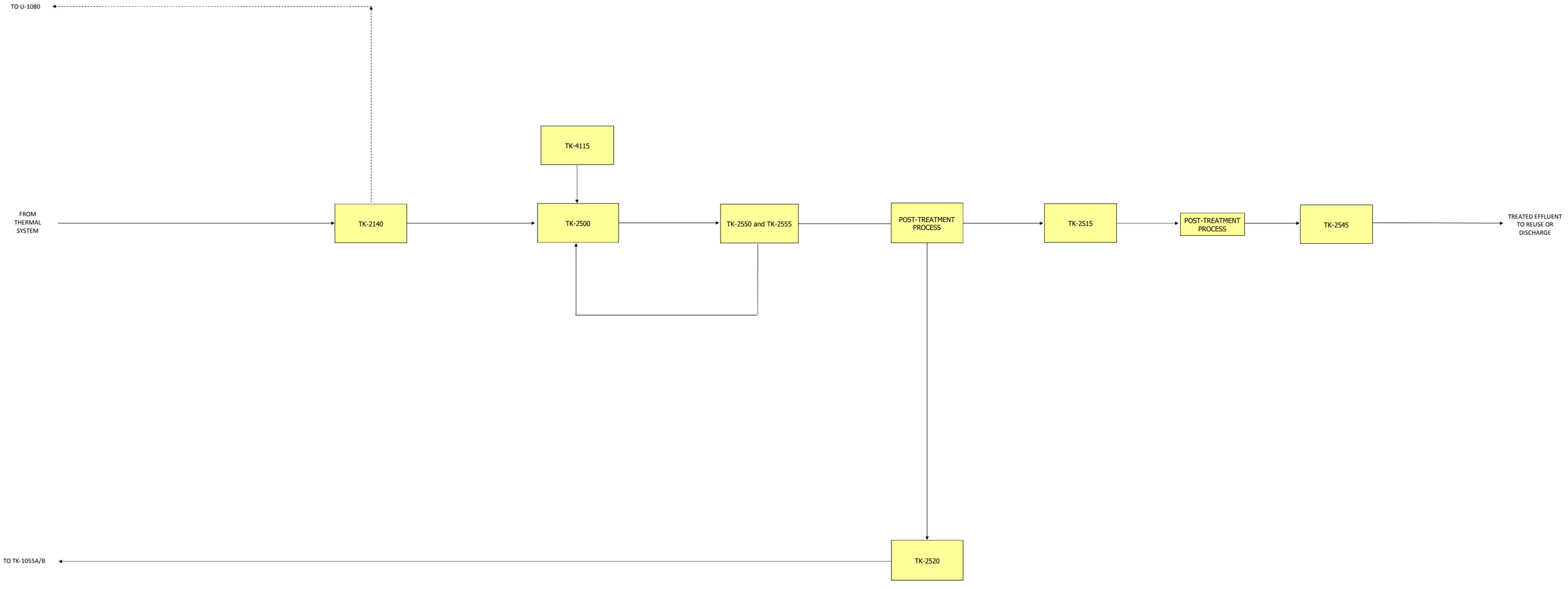
TITLE

WATER BALANCE DIAGRAM
PRODUCED / FLOWBACK WATER POSTTREATMENT

ANTERO RESOURCES
MARCELLUS / UTICA SHALE PROJECT
60,000 BPD INFLUENT CAPACITY

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

ANTERO RESOURCES
POST-TREATMENT SYSTEM



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REV. NO.	ISSUE DATE	DRAWN BY	CHECKED BY	REVIEWED BY	APPROVED BY	APPROVED BY (OPTIONAL)	DESCRIPTION
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0	4/23/15	HLK	BAB	JAS	CDB		
		DESIGN/DRAFTING		ENGINEERING			

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INDUSTRIAL PROJECTS, MOON TOWNSHIP, PA 15108 USA, TEL. 1-412-909-6000

SCALE:

DRAWN BY:

TITLE

WATER BALANCE DIAGRAM
PRODUCED / FLOWBACK WATER POSTTREATMENT

ANTERO RESOURCES
MARCELLUS / UTICA SHALE PROJECT
60,000 BPD INFLUENT CAPACITY

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

Attachment G.
Process Description

Attachment G – Summarized Process Description
Sandstrom 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. 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.

Pre-Treatment Technology Description

Clarifiers

The raw influent is transferred to two 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 Clarifiers (TK-1055A and TK-1055B) will be pumped to the Sludge Holding Tank (TK-2020). Oil that is removed from the Clarifiers (TK-1055A and TK-1055B) will be pumped to the Oil Collection Tank (TK-1065). Water will flow from the 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 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 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. 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 an 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 Clarifiers (TK-1055A and TK-1055B).

The sludge is continuously pumped from the Sludge Holding Tank (TK-2020) to Dewatering Equipment. Recovered filtrate from dewatering equipment is then sent to the Sludge Filtrate Tank (TK-2030) for temporary storage before it is recycled to the Clarifiers (TK-1055A and TK-1055B) to be retreated. The dewatered cake will be transferred for transport to a landfill (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.

Thermal Process System

Thermal Feed brine is pumped from the Thermal 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. Chemicals are added to the boilers via the Boiler Chemical Treatment A and B (U-4105 and U-4110) to optimize boiler performance.

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. Centrate from the dewatering process is returned to the thermal process after temporary storage in the Disposal Centrate Tank (TK-2160). The Disposal Centrate Tank (TK-2160) is controlled by the thermal oxidizer (U-1080).

The vast majority of the water that enters the system leaves as clean, recovered distillate. 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.

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.

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 TK2555). 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 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 (TK2520) and ultimately the same dewatering system as the pretreatment sludge by being returned to the TK-1055 A/B in the pretreatment process.

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.

Sodium Bisulfite Tote (TK-4080)	Dewatering Polymer System Aging Tank (TK-4165)	Hydrogen Peroxide Tote (TK-4025)
Sodium Sulfate Day Tank (TK-4039)	Sodium Bicarbonate Day Tank (TK-4014)	Polymer Totes (TK-4054, TK-4120, TK-4015, TK-4155 and TK-4057)
Urea Tote (TK-4065)	Post Treatment Polymer System Aging Tank (TK-4170)	CO2 Feeder System (U-4075)
Lime Slurry Premix Tanks A&B (TK-4049A/B)	Ferric Chloride Storage Tank (TK-4000)	Phosphoric Acid Tote (TK-4125)
Clarifier Polymer Aging Tank (TK-4175)	Caustic Bulk Storage Tank (TK-4020)	Micronutrient Tote (TK-4150)
Lime Slurry Tanks A&B (TK-4049A/B)	Methanol Bulk Storage Tank (TK-4115)	Hydrex 2126 Tote (TK-4190)
Solids Clarifier Polymer System Aging Tank (TK-4160)	Sulfuric Acid Bulk Storage Tank (TK-4180)	Sodium Hypochlorite Tote (TK-4185)
Sodium Bicarbonate Bin Feeder (U-4013)		

Attachment H.
Material Safety Data Sheets

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

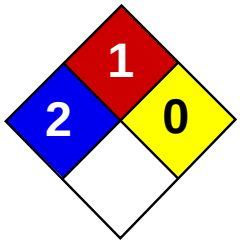
The method of hazard communication for Bayer MaterialScience LLC is comprised of Product Labels and Material Safety Data Sheets. HMIS and NFPA ratings are provided by Bayer MaterialScience LLC as a customer service.

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.



Health	2
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Citric acid MSDS

Section 1: Chemical Product and Company Identification

Product Name: Citric acid

Catalog Codes: SLC5449, SLC2665, SLC4453, SLC1660, SLC3451

CAS#: 77-92-9

RTECS: GE7350000

TSCA: TSCA 8(b) inventory: Citric acid

CI#: Not available.

Synonym: 2-Hydroxy-1,2,3-propanetricarboxylic acid

Chemical Name: Citric Acid

Chemical Formula: C6H8O7

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
Citric acid	77-92-9	100

Toxicological Data on Ingredients: Citric acid: ORAL (LD50): Acute: 5040 mg/kg [Mouse]. 3000 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of eye contact (irritant), of inhalation (lung irritant). Slightly hazardous in case of skin contact (irritant, sensitizer), of ingestion. The amount of tissue damage depends on length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering. Severe over-exposure can produce lung damage, choking, unconsciousness or death.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (sensitizer). CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to teeth. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung 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 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. 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: May be combustible at high temperature.

Auto-Ignition Temperature: 1010°C (1850°F)

Flash Points: Not available.

Flammable Limits: LOWER: 0.28 Kg/M3 (Dust) UPPER: 2.29 Kg/M3 (Dust)

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances:
Slightly flammable to flammable in presence of heat. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:
Slightly explosive in presence of open flames and sparks. Non-explosive in presence of shocks.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: As with most organic solids, fire is possible at elevated temperatures

Special Remarks on Explosion Hazards:
Fine dust dispersed in air in sufficient concentrations, and in the presences of an ignition source is a potential dust explosion hazard.

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:
Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe dust. Avoid contact with eyes. 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. Keep away from incompatibles such as oxidizing agents, reducing agents, metals, alkalis.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

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. Lab coat. Gloves (impervious). Dust respirator. Be sure to use an approved/certified respirator or equivalent. The dust respirator should be used for conditions where exposure has exceeded recommended exposure limits, dust is apparent, and engineering controls(adequate ventilation) are not feasible.

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:
No exposure guidelines have been established. ACGIH, NIOSH and OSHA have not developed exposure limits for this product. The exposure limits given below are for particulates not otherwise classified: ACGIH: 10 mg/m3 TWA (Total Inhalable fraction); 3 mg/m3 TWA (Respirable fraction) OSHA: 15 mg/m3 TWA (Total dust); 5 mg/m3 TWA (Respirable Fraction)

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Crystalline powde)

Odor: Odorless.

Taste: Acid. (Strong.)

Molecular Weight: 192.13 g/mole

Color: Not available.

pH (1% soln/water): Not available.

Boiling Point: Decomposes.

Melting Point: 153°C (307.4°F)

Critical Temperature: Not available.

Specific Gravity: 1.665 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: The product is more soluble in water; log(oil/water) = -1.7

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility:
Soluble in cold water, hot water, diethyl ether. Insoluble in benzene.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, reducing agents, metals, alkalis.

Corrosivity:
Corrosive in presence of aluminum, of zinc, of copper. Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Incompatible with oxidizing agents, potassium tartrate, alkali, alkaline earth carbonates and bicarbonates, acetates, and sulfides, metal nitrates

Special Remarks on Corrosivity: Will corrode copper, zinc, aluminum and their alloys.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 3000 mg/kg [Rat].

Chronic Effects on Humans: May cause damage to the following organs: teeth.

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

Special Remarks on Toxicity to Animals: LDL[Rabbit] - Route: oral; Dose: 7000mg/kg

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Causes mild to moderate skin irritation. May cause skin sensitization, an allergic reaction, which becomes evident upon re-exposure to this material. Eyes: Causes moderate to severe eye irritation and possible injury. Ingestion: May cause gastrointestinal (digestive) tract irritation with nausea, vomiting, diarrhea. Excessive intake may cause erosion of teeth and hypocalcemia (calcium deficiency in blood). May affect behavior/central nervous system (tremor, convulsions, muscle contraction or spasticity). Inhalation: Causes moderate respiratory tract and mucous membrane irritation. Chronic Potential Health Effects: Frequent intake of citrated beverages may cause erosion of dental enamel and irritation of mucous membranes.

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: Citric acid

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

Other Classifications:

WHMIS (Canada): CLASS E: Corrosive solid.

DSCL (EEC):
R36/37/38- Irritating to eyes, respiratory system and skin. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S37/39- Wear suitable gloves and eye/face protection.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: e

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

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves (impervious). Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. 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 04:56 PM

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

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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.

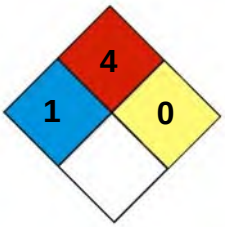
First Aid: Ingestion (swallowing)

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

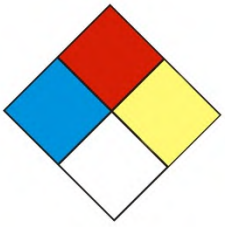
The following components are identified under the Canadian Hazardous Products Act Ingredient Disclosure List:

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

Material Safety Data Sheet
The Dow Chemical Company

Product Name: VERSENE* Tetraammonium EDTA Chelating Agent **Issue Date:** 03/12/2010
Print Date: 15 Mar 2010

The Dow Chemical Company encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

1. Product and Company Identification

Product Name
VERSENE* Tetraammonium EDTA Chelating Agent

COMPANY IDENTIFICATION
The Dow Chemical Company
2030 Willard H. Dow Center
Midland, MI 48674
USA

Customer Information Number: 800-258-2436

EMERGENCY TELEPHONE NUMBER
24-Hour Emergency Contact: 989-636-4400
Local Emergency Contact: 989-636-4400

2. Hazards Identification

Emergency Overview
Color: White to yellow
Physical State: Liquid.
Odor: Ammoniacal
Hazards of product:

CAUTION! May cause eye irritation. Isolate area.

OSHA Hazard Communication Standard
This product is not a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Potential Health Effects
Eye Contact: May cause pain disproportionate to the level of irritation to eye tissues. May cause slight eye irritation. May cause slight corneal injury. Vapor may cause eye irritation experienced as mild discomfort and redness.
Skin Contact: Brief contact is essentially nonirritating to skin. May cause more severe response if skin is abraded (scratched or cut). Repeated contact may cause slight skin irritation with local redness.

Skin Absorption: Prolonged skin contact is unlikely to result in absorption of harmful amounts.
Inhalation: In aqueous solutions small amounts of ammonia may evolve which may be irritating to the eyes, upper respiratory tract (nose and throat) , and lungs.
Ingestion: Low toxicity if swallowed. Small amounts swallowed incidentally as a result of normal handling operations are not likely to cause injury; however, swallowing larger amounts may cause injury.
Aspiration hazard: Based on physical properties, not likely to be an aspiration hazard.
Birth Defects/Developmental Effects: EDTA and its sodium salts have been reported to cause birth defects in laboratory animals only at exaggerated doses that were toxic to the mother. These effects are likely associated with zinc deficiency due to chelation.

3. Composition Information

Component	CAS #	Amount
Water	7732-18-5	53.0 %
Tetrammonium salt of ethylenediaminetetraacetic acid	22473-78-5	47.0 %

(Active ingredients as EDTA acid - 38%)

4. First-aid measures

Eye Contact: Flush eyes thoroughly with water for several minutes. Remove contact lenses after the initial 1-2 minutes and continue flushing for several additional minutes. If effects occur, consult a physician, preferably an ophthalmologist.
Skin Contact: Wash skin with plenty of water.
Inhalation: Move person to fresh air; if effects occur, consult a physician.
Ingestion: If swallowed, seek medical attention. Do not induce vomiting unless directed to do so by medical personnel.
Notes to Physician: No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.
Emergency Personnel Protection: If potential for exposure exists refer to Section 8 for specific personal protective equipment.

5. Fire Fighting Measures

Extinguishing Media: To extinguish combustible residues of this product use water fog, carbon dioxide, dry chemical or foam.
Fire Fighting Procedures: Keep people away. Isolate fire and deny unnecessary entry. To extinguish combustible residues of this product use water fog, carbon dioxide, dry chemical or foam.
Special Protective Equipment for Firefighters: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves). If protective equipment is not available or not used, fight fire from a protected location or safe distance.
Unusual Fire and Explosion Hazards: This material will not burn until the water has evaporated. Residue can burn.
Hazardous Combustion Products: Under fire conditions some components of this product may decompose. The smoke may contain unidentified toxic and/or irritating compounds. Combustion products may include and are not limited to: Nitrogen oxides. Carbon monoxide. Carbon dioxide. Ammonia.

6. Accidental Release Measures

Steps to be Taken if Material is Released or Spilled: Small spills: Absorb with materials such as: Dirt. Sand. Non-combustible material. Collect in suitable and properly labeled containers. Large spills: Dike area to contain spill. Contain spilled material if possible. See Section 13, Disposal Considerations, for additional information.
Personal Precautions: Isolate area. Keep unnecessary and unprotected personnel from entering the area. Refer to Section 7, Handling, for additional precautionary measures. Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection.
Environmental Precautions: Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.

7. Handling and Storage

Handling
General Handling: Avoid contact with eyes. Wash thoroughly after handling. See Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION.

Storage
Do not store in: Opened or unlabeled containers. Zinc. Aluminum and its alloys. Carbon steel. Copper. Copper alloys. Galvanized containers. Nickel. Store in original unopened container. See Section 10 for more specific information. Additional storage and handling information on this product may be obtained by calling your sales or customer service contact.

Shelf life: Use within 24 Months
Storage temperature: -18 - 49 °C

8. Exposure Controls / Personal Protection

Exposure Limits

None established

Personal Protection
Eye/Face Protection: Use chemical goggles. If exposure causes eye discomfort, use a full-face respirator.
Skin Protection: Wear clean, body-covering clothing.

Hand protection: Use gloves chemically resistant to this material when prolonged or frequently repeated contact could occur. If hands are cut or scratched, use gloves chemically resistant to this material even for brief exposures. Examples of preferred glove barrier materials include: Butyl rubber. Polyethylene. Chlorinated polyethylene. Ethyl vinyl alcohol laminate ("EVAL"). Examples of acceptable glove barrier materials include: Viton. Neoprene. Natural rubber ("latex"). Polyvinyl chloride ("PVC" or "vinyl"). Nitrile/butadiene rubber ("nitrile" or "NBR"). Avoid gloves made of: Polyvinyl alcohol ("PVA"). NOTICE: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

Respiratory Protection: Respiratory protection should be worn when there is a potential to exceed the exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, wear respiratory protection when adverse effects, such as respiratory irritation or discomfort have been experienced, or where indicated by your risk assessment process. For most conditions no respiratory protection should be needed; however, if discomfort is experienced, use an approved air-purifying respirator. The following should be effective types of air-purifying respirators: Ammonia cartridge with particulate pre-filter.

Ingestion: Use good personal hygiene. Do not consume or store food in the work area. Wash hands before smoking or eating.

Engineering Controls

Ventilation: Use local exhaust ventilation, or other engineering controls to maintain airborne levels below exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, general ventilation should be sufficient for most operations. Local exhaust ventilation may be necessary for some operations.

9. Physical and Chemical Properties

Physical State	Liquid.
Color	White to yellow
Odor	Ammoniacal
Odor Threshold	No test data available
Flash Point - Closed Cup	*Pensky-Martens Closed Cup ASTM D 93* no measurable flash point
Flammability (solid, gas)	Not applicable to liquids
Flammable Limits In Air	**Lower**: Not applicable **Upper**: Not applicable
Autoignition Temperature	Not applicable
Vapor Pressure	Same as water
Boiling Point (760 mmHg)	88 °C (190 °F) *Literature* .
Vapor Density (air = 1)	Same as water
Specific Gravity (H2O = 1)	1.18 25 °C/25 °C *Literature*
Freezing Point	-28 °C (-18 °F) *Literature*
Melting Point	Not applicable to liquids
Solubility in water (by weight)	completely miscible with water
pH	9.0 - 9.5 (@ 1 %) *Literature*
Decomposition Temperature	No test data available
Partition coefficient, n-octanol/water (log Pow)	No data available for this product.
Evaporation Rate (Butyl Acetate = 1)	< 0.8 *Estimated.*
Kinematic Viscosity	7.3 cSt @ 20 °C *Literature*

10. Stability and Reactivity

Stability/Instability

Thermally stable at typical use temperatures.
Conditions to Avoid: Some components of this product can decompose at elevated temperatures.

Incompatible Materials: Avoid contact with oxidizing materials. Flammable hydrogen may be generated from contact with metals such as: Aluminum.

Hazardous Polymerization

Will not occur.

Thermal Decomposition

Decomposition products depend upon temperature, air supply and the presence of other materials. Decomposition products can include and are not limited to: Ammonia.

11. Toxicological Information

Acute Toxicity
Ingestion
LD50, Rat > 3,980 mg/kg
Dermal
The dermal LD50 has not been determined.
Inhalation
The LC50 has not been determined.

Serious eye damage/eye irritation
May cause pain disproportionate to the level of irritation to eye tissues. May cause slight eye irritation. May cause slight corneal injury. Vapor may cause eye irritation experienced as mild discomfort and redness.

Skin corrosion/irritation
Brief contact is essentially nonirritating to skin. May cause more severe response if skin is abraded (scratched or cut). Repeated contact may cause slight skin irritation with local redness.

Sensitization
Skin
No relevant information found.
Respiratory
No relevant information found.

Repeated Dose Toxicity
Based on available data, repeated exposures are not anticipated to cause additional significant adverse effects.

Chronic Toxicity and Carcinogenicity
The trisodium salt of EDTA did not cause cancer in laboratory animals.

Developmental Toxicity
EDTA and its sodium salts have been reported to cause birth defects in laboratory animals only at exaggerated doses that were toxic to the mother. These effects are likely associated with zinc deficiency due to chelation.

Reproductive Toxicity
Limited data in laboratory animals suggest that the material does not affect reproduction.

Genetic Toxicology
Most data indicate that EDTA and its salts are not mutagenic. Minimal effects reported are likely due to trace metal deficiencies resulting from chelating by EDTA.

12. Ecological Information

ENVIRONMENTAL FATE

Movement & Partitioning
For similar material(s): Bioconcentration potential is low (BCF less than 100 or log Pow less than 3).

Persistence and Degradability
For this family of materials: Biodegradation under aerobic laboratory conditions is below detectable limits (BOD20 or BOD28/ThOD < 2.5%).

ECOTOXICITY
Material is practically non-toxic to fish on an acute basis (LC50 > 100 mg/L).

Fish Acute & Prolonged Toxicity
LC50, bluegill (Lepomis macrochirus), 96 h: 705 mg/l

13. Disposal Considerations

DO NOT DUMP INTO ANY SEWERS, ON THE GROUND, OR INTO ANY BODY OF WATER. All disposal practices must be in compliance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. AS YOUR SUPPLIER, WE HAVE NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESSES OF PARTIES HANDLING OR USING THIS MATERIAL. THE INFORMATION PRESENTED HERE PERTAINS ONLY TO THE PRODUCT AS SHIPPED IN ITS INTENDED CONDITION AS DESCRIBED IN MSDS SECTION: Composition Information. FOR UNUSED & UNCONTAMINATED PRODUCT, the preferred options include sending to a licensed, permitted: Recycler. Reclaimer.

14. Transport Information

DOT Non-Bulk
NOT REGULATED

DOT Bulk
NOT REGULATED

IMDG
NOT REGULATED

ICAO/IATA
NOT REGULATED

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

15. Regulatory Information

OSHA Hazard Communication Standard
This product is not a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Sections 311 and 312

Immediate (Acute) Health Hazard	No
Delayed (Chronic) Health Hazard	No
Fire Hazard	No
Reactive Hazard	No
Sudden Release of Pressure Hazard	No

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Section 313
To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

Pennsylvania (Worker and Community Right-To-Know Act): Pennsylvania Hazardous Substances List and/or Pennsylvania Environmental Hazardous Substance List:

To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

Pennsylvania (Worker and Community Right-To-Know Act): Pennsylvania Special Hazardous Substances List:
To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986)
This product contains no listed substances known to the State of California to cause cancer, birth defects or other reproductive harm, at levels which would require a warning under the statute.

US. Toxic Substances Control Act
All components of this product are on the TSCA Inventory or are exempt from TSCA Inventory requirements under 40 CFR 720.30
CEPA - Domestic Substances List (DSL)
All substances contained in this product are listed on the Canadian Domestic Substances List (DSL) or are not required to be listed.

16. Other Information

Hazard Rating System

NFPA	Health	Fire	Reactivity
	2	1	0

Recommended Uses and Restrictions

Chelating agent. For industrial use only. We recommend that you use this product in a manner consistent with the listed use. If your intended use is not consistent with the stated use, please contact your sales or technical service representative.

Revision

Identification Number: 50118 / 1001 / Issue Date 03/12/2010 / Version: 3.0
Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

Legend

N/A	Not available
W/W	Weight/Weight
OEL	Occupational Exposure Limit
STEL	Short Term Exposure Limit
TWA	Time Weighted Average
ACGIH	American Conference of Governmental Industrial Hygienists, Inc.
DOW IHG	Dow Industrial Hygiene Guideline
WEEL	Workplace Environmental Exposure Level
HAZ_DES	Hazard Designation
Action Level	A value set by OSHA that is lower than the PEL which will trigger the need for activities such as exposure monitoring and medical surveillance if exceeded.

The Dow Chemical Company urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that his activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is

the buyer's/user's duty to determine the conditions necessary for the safe use of this product. Due to the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.

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 2126**
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
	Specific target organ toxicity, single exposure	Category 3 respiratory tract irritation
Environmental hazards	Hazardous to the aquatic environment, acute hazard	Category 1
	Hazardous to the aquatic environment, long-term hazard	Category 1
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. May cause respiratory irritation. Very toxic to aquatic life. Very toxic 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. 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. 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 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	None.

3. Composition/information on ingredients

Mixtures

Chemical name	Common name and synonyms	CAS number	%
Citric acid		77-92-9	2.5 - 10
Hydrochloric Acid		7647-01-0	2.5 - 10
Zinc Chloride		7646-85-7	2.5 - 10
2-phosphonobutane-1,2,4-tricarboxylic acid		37971-36-1	1 - 2.5
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
Remove victim to fresh air and keep at rest in a position comfortable for breathing. 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. 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.

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
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.

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 Avoid release to the environment. Prevent further leakage or spillage if safe to do so. Do not contaminate water. 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. Provide adequate ventilation. Wear appropriate personal protective equipment. 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	Form
Hydrochloric Acid (CAS 7647-01-0)	Ceiling	7 mg/m3 5 ppm	
Zinc chloride (CAS 7646-85-7)	PEL	1 mg/m3	Fume.

US. ACGIH Threshold Limit Values

Components	Type	Value	Form
Hydrochloric Acid (CAS 7647-01-0)	Ceiling	2 ppm	
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
Hydrochloric Acid (CAS 7647-01-0)	Ceiling	7 mg/m3 5 ppm	
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 to Hazy
Physical state	Liquid.
Form	Liquid
Color	Light yellow
Odor	Mild
pH	1 - 1.2
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)	100 %
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	Not available.
Other information	
Density	1.13 g/cm³
Specific gravity	1.1 - 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	Hazardous polymerization does not occur.
Conditions to avoid	Reacts violently with strong alkaline substances. Do not mix with other chemicals. This product may react with reducing agents. Contact with incompatible materials.
Incompatible materials	Bases. Strong oxidizing agents. This product may react with reducing agents. Reducing agents. Metals. Incompatible with bases. Do not mix with other chemicals.
Hazardous decomposition products	Hydrogen chloride. Hydrogen cyanide (hydrocyanic acid). Toxic gas.

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. May cause respiratory irritation.

Information on toxicological effects

Acute toxicity May cause respiratory irritation.

Product	Species	Test Results
Hydrex 2126		
Acute		
Dermal		
LD50	Mouse	>= 30000 mg/kg Calculated
Inhalation		
LC50	Rat	>= 45 mg/l, 10 Minutes Calculated
Oral		
LD50	Rat	>= 6000 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.

IARC Monographs. Overall Evaluation of Carcinogenicity

Hydrochloric Acid (CAS 7647-01-0) 3 Not classifiable as to carcinogenicity to humans.

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 respiratory irritation.

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 Very toxic to aquatic life with long lasting effects. 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 2126			
Aquatic			
Acute			
Fish	LC50	Rainbow Trout	> 2.5 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. 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	UN3264
UN proper shipping name	Corrosive liquid, acidic, inorganic, n.o.s. (ZINC CHLORIDE, Hydrochloric Acid)
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
Reportable Quantity (Lbs)	25000

IATA

UN number	UN3264
UN proper shipping name	Corrosive liquid, acidic, inorganic, n.o.s. (ZINC CHLORIDE, Hydrochloric Acid)
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. (ZINC CHLORIDE, Hydrochloric Acid)
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)

Hydrochloric Acid (CAS 7647-01-0)	Listed.
Zinc Chloride (CAS 7646-85-7)	Listed.

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

Hydrochloric Acid (CAS 7647-01-0)	5000 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 - No
Fire Hazard - No
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
Hydrochloric Acid	7647-01-0	5000	500 lbs		

SARA 311/312 Hazardous chemical

Yes

SARA 313 (TRI reporting)

Chemical name	CAS number	% by wt.
Hydrochloric Acid	7647-01-0	2.5 - 10
Zinc Chloride	7646-85-7	2.5 - 10

Other federal regulations

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

Hydrochloric Acid (CAS 7647-01-0)

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

Hydrochloric Acid (CAS 7647-01-0)

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

Hazardous substance

Safe Drinking Water Act (SDWA)

Not regulated.

Drug Enforcement Administration (DEA). List 2, Essential Chemicals (21 CFR 1310.02(b) and 1310.04(f)(2) and Chemical Code Number

Hydrochloric Acid (CAS 7647-01-0) 6545

Drug Enforcement Administration (DEA). List 1 & 2 Exempt Chemical Mixtures (21 CFR 1310.12(c))

Hydrochloric Acid (CAS 7647-01-0) 20 %WV

DEA Exempt Chemical Mixtures Code Number

Hydrochloric Acid (CAS 7647-01-0) 6545

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

Hydrochloric Acid (CAS 7647-01-0)
Zinc Chloride (CAS 7646-85-7)

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

Hydrochloric Acid (CAS 7647-01-0)
Zinc Chloride (CAS 7646-85-7)

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

Hydrochloric Acid (CAS 7647-01-0)
Zinc Chloride (CAS 7646-85-7)

US. Rhode Island RTK

Hydrochloric Acid (CAS 7647-01-0)
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)	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).

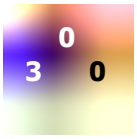
16. Other information, including date of preparation or last revision

Issue date 05-07-2015

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: Product Review
Composition / Information on Ingredients: Ingredients
Physical & Chemical Properties: Multiple Properties
Toxicological Information: Toxicological Data
Ecological Information: Ecotoxicity
Transport Information: Proper Shipping Name/Packing Group
Regulatory Information: United States

HYDREX 2126

Product information

Cooling Water Treatment

Description and Use

Hydrex 2126 is a multi-component cooling water treatment product that is excellent in the prevention of scale formation in cooling systems under a wide variety of operating conditions.

Hydrex 2126 also has excellent corrosion control capabilities for all metals including copper. It will also aid in the dispersion of other mineral contaminants in cooling water such as iron or manganese.

Hydrex 2126 is stable under stressed conditions provides superior results for systems operating at higher cycles of concentration.

Advantages

- Effective scale inhibitor
- Effective corrosion inhibition
- Liquid product easy to handle
- Good general dispersant properties
- Designed for soft water programs

Application Information

Hydrex 2126 can be either fed neat directly from the shipping container or diluted to any convenient concentration via an inline static mixer.

Dosage must be calculated based upon water characteristics and operating conditions.

Please contact your Hydrex Representative for the proper dosage and specific control limits for Hydrex 2126.

Specifications

Physical Form : Liquid
Density at 20°C (kg/l) : 1.10 kg/l (average)
Specific Gravity (g/cm3) @ 25°C : 1.10 - 1.15 (Water = 1.00)
Product pH (as supplied) : 1.0 - 1.2
Odor : Mild Odor
Color : Light Yellow
Freezing Point (°C/°F) : 0°C / 32°F
Boiling Point (°C/°F) : 100°C
Solubility : Complete in water
Viscosity : As water

Materials Compatibility

Crosslinked polyethylene (HDPE), PP, PVDF, stainless steel and lined mild steel are the preferred material of construction for bulk tanks. Unlined steel, galvanized steel and copper are NOT recommended in any part of the chemical feed system. Stainless steel, HDPE, PVDF or PVC are generally the best choices for the pump heads and feed lines.

Handling – Storage - Packaging

For best results, store product at 0-32°C. Protect from freezing. If product freezes, allow to warm in heated area and thaw thoroughly before using; mix container prior to use. If product spills clean it up as soon as possible; please refer to the MSDS for information.

Shipping:
Hydrex 2126 is available in bulk, semi bulk and small containers. Details are available on request.

Safety Information

Detailed information on the product described in this leaflet can be found in our relevant health and safety information (Safety Data Sheet). Please contact us for further information.

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Website : www.veoliawaterst.com

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.

VEOLIA WATER Solutions & Technologies

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

HYDREX 2982

Product information

Cooling Water Treatment

Description and Use

Hydrex 2982 is a silicone based organic antifoam that is highly effective for controlling and eliminating foaming in cooling water, process water, and waste water systems.

Its unique chemistry generates a quick kill of foaming in most applications when applied as a slug dosage and can provide consistent control of foaming if applied on a slow continuous feed for systems that exhibit a constant tendency to foam.

Due to its organic nature, a very low dosage of product is typically required in most applications.

Advantages

- Effective silicone based antifoam
- Easy to feed
- Fast acting
- Liquid product

Application Information

Hydrex 2982 can be fed as the neat product or as a solution.

Please contact your Hydrex Representative for the proper dosage and specific control limits for Hydrex 2982 based upon water quality.

Specifications

Physical Form : Liquid
Density at 20°C (kg/l) : 0.95 - 1.05 kg/l
Specific Gravity (g/cm3) @ 25°C : 0.95-1.05 (Water = 1.00)
Product pH (as supplied) : 6.7 - 7.3 (neat)
Odor : Low, non-irritating odor
Color : Opaque white
Freezing Point (°C/°F) : 0°C / 32°F
Solubility : Complete

Materials Compatibility

Crosslinked polyethylene (HDPE), PP, PVDF, stainless steel and lined mild steel are the preferred material of construction for bulk tanks.

Unlined steel, galvanized steel, and copper are NOT recommended in any part of the chemical feed system. Stainless steel, HDPE, PVDF or PVC are generally the best choices for the pump heads and feed lines.

Handling – Storage - Packaging

For best results, store product at temperature between 0-32°C. Protect from freezing. If product freezes, allow to warm in heated area and thaw thoroughly before using. Also, please adhere to your local and state code requirements.

Packaging:
Hydrex 2982 is available in bulk, semi bulk and small containers. Details are available on request.

Safety Information

Detailed information on the product described in this leaflet can be found in our relevant health and safety information (Safety Data Sheet). Please contact us for further information.

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Tél. +33 1 45 11 55 55
Website : www.veoliawaterst.com

MATERIAL SAFETY DATA SHEET

1. Product and Company Identification

Material name	**Hydrex 6161**
Version #	02
Issue date	03-18-2014
Revision date	04-29-2014
Supersedes date	03-18-2014
CAS #	Proprietary
Product use	Wastewater Flocculant Wastewater Treatment
Manufacturer	
Supplier	Veolia Water Solutions & Technologies - Industrial Solutions and Services
Address	945 S. Brown School Road Vandalia, Ohio 45377
Contact Person	Hydrex Product Manager
Telephone	1-800-875-4075
Fax	+1-937-890-5495
e-mail	hydrex.msds@veolia.com
Global Emergency Contact	+1-760-476-3962 (Code: 333239)

2. Hazards identification

Emergency overview	Exposure to powder or dusts may be irritating to eyes, nose and throat.
OSHA regulatory status	This material is not considered hazardous by the OSHA Hazard Communication Standard, OSHA 29 CFR 1910.1200.
Potential health effects	
Routes of exposure	Inhalation. Ingestion. Skin contact. Eye contact.
Eyes	Dust in the eyes will cause irritation. Do not get this material in contact with eyes.
Skin	Non-irritating to the skin.
Inhalation	Dust may irritate respiratory system.
Ingestion	May cause irritation. Do not ingest.
Potential environmental effects	Components of this product are hazardous to aquatic life. 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	Remove contact lenses, if present and easy to do. Continue rinsing.
Skin contact	Before washing use a dry brush to remove dust from skin. Wash off with soap and water. Get medical attention if irritation develops and persists.
Inhalation	Do not use mouth-to-mouth method if victim inhaled the substance. Move to fresh air. Call a physician if symptoms develop or persist.
Ingestion	Rinse mouth thoroughly. Product is not considered toxic in small amounts. Get medical attention if symptoms occur.
Notes to physician	In case of shortness of breath, give oxygen. Keep victim warm.
General advice	In case of shortness of breath, give oxygen. Do not use mouth-to-mouth method if victim ingested the substance.

5. Fire Fighting Measures

Extinguishing media

Suitable extinguishing media	Water. Extinguish with foam, carbon dioxide, dry powder or water fog.
Unsuitable extinguishing media	Do not use a solid water stream as it may scatter and spread fire.

Protection of firefighters

Specific hazards arising from the chemical	Fire may produce irritating, corrosive and/or toxic gases. Material can be slippery when wet.
Fire fighting equipment/instructions	In case of fire and/or explosion do not breathe fumes. Move containers from fire area if you can do so without risk.
Specific methods	In the event of fire and/or explosion do not breathe fumes. Cool containers exposed to flames with water until well after the fire is out.

6. Accidental Release Measures

Personal precautions	In case of spills, beware of slippery floors and surfaces. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Avoid inhalation of dust from the spilled material.
Environmental precautions	Prevent further leakage or spillage if safe to do so. Do not contaminate water.
Methods for containment	If sweeping of a contaminated area is necessary use a dust suppressant agent which does not react with the product. Prevent entry into waterways, sewer, basements or confined areas.
Methods for cleaning up	DO NOT GET WATER on spilled material or inside containers. Should not be released into the environment. Collect dust using a vacuum cleaner equipped with HEPA filter. Avoid dust formation. Following product recovery, flush area with water. For waste disposal, see section 13 of the MSDS.

7. Handling and Storage

Handling	Do not smoke. Do not get this material on clothing. Use only in area provided with appropriate exhaust ventilation. Wash thoroughly after handling. Avoid release to the environment. Avoid contact with skin and eyes. Avoid dust formation. Do not breathe dust from this material. Use mechanical ventilation in case of handling which causes formation of dust. Material can be slippery when wet.
Storage	Keep out of the reach of children. Store in cool, dry place. Keep at temperature not exceeding 32 °C.

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).
Engineering controls	If engineering measures are not sufficient to maintain concentrations of dust particulates below the OEL, suitable respiratory protection must be worn. Additional area ventilation or local exhaust may be required to maintain air concentrations below recommended exposure limits.

Personal protective equipment

Eye / face protection	Do not get in eyes. Contact lenses should not be worn when working with this chemical! Wear safety glasses with side shields (or goggles).
Skin protection	Chemical resistant gloves.
Respiratory protection	Do not breathe dust/fume/gas/mist/vapors/spray. No specific recommendation made, but protection against nuisance dust must be used when the general level exceeds 10 mg/m3.
General hygiene considerations	When using, do not eat, drink or smoke. Do not breathe dust. Do not get in eyes. Do not get this material in contact with skin. Do not get this material on clothing. Handle in accordance with good industrial hygiene and safety practice.

9. Physical & Chemical Properties

Appearance	Powder.
Physical state	Solid.
Form	Granular.
Color	White
Odor	Not available.

pH	Not available.
Vapor pressure	Not applicable.
Vapor density	Not available.
Boiling point	Not applicable.
Melting point/Freezing point	Not applicable.
Solubility (water)	Not available.
Specific gravity	0.6 - 0.9
Flash point	Not applicable.
Auto-ignition temperature	Not applicable.
Partition coefficient (n-octanol/water)	0
Other data	
Density	0.75 g/cm3
pH in aqueous solution	5 - 7

10. Chemical Stability & Reactivity Information

Chemical stability	Material is stable under normal conditions.
Conditions to avoid	Avoid spread of dust. Heat, flames and sparks. Avoid contact with oxidizing agents.
Incompatible materials	Not available.
Hazardous decomposition products	Carbon oxides. Nitrogen oxides (NOx).
Possibility of hazardous reactions	Hazardous polymerization does not occur.

11. Toxicological Information

Toxicological data

Product	Species	Test Results
Hydrex 6161 (CAS Proprietary)		
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.

Sensitization	Not a skin sensitizer.
Acute effects	No known chronic or acute health risks.
Chronic effects	At the concentrations used in this material, the components are not expected to cause dermal sensitization based on testing of similar formulations and/or the components.
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.

Skin corrosion/irritation	Not expected to be hazardous by OSHA criteria.

12. Ecological Information

Ecotoxicological data

Product		Species	Test Results
Hydrex 6161 (CAS Proprietary)			
Algae	LC50	Algae	> 100 mg/l, 72 hours
Crustacea	LC50	Daphnia	> 100 mg/l, 48 hours

Product		Species	Test Results
Other	LC50	Rainbow Trout	> 100 mg/l, 96 hours

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

Ecotoxicity Components of this product are hazardous to aquatic life.

Aquatic toxicity Not expected to be harmful to aquatic organisms. The environmental hazard of the product is considered to be limited.

Persistence and degradability The product is not readily biodegradable. Transformation due to hydrolysis not expected to be significant.

Bioaccumulation / Accumulation The product is not bioaccumulating.

Bioaccumulative potential

Octanol/water partition coefficient log Kow

1

13. Disposal Considerations

Disposal instructions Consult authorities before disposal. Incinerate the material under controlled conditions in an approved incinerator. Do not incinerate sealed containers. Do not allow this material to drain into sewers/water supplies. Dispose in accordance with all applicable regulations.

Contaminated packaging Recycle empty drums at an appropriate facility in accordance with current applicable laws and regulations, and product characteristics at time of disposal. Ensure drums are tightly sealed.

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 a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Drug Enforcement Administration (DEA). List 2, Essential Chemicals (21 CFR 1310.02(b) and 1310.04(f)(2) and Chemical Code Number

Not listed.

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.

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

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

Not listed.

SARA 311/312 Hazardous chemical No

Inventory status

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).

US state regulations

WARNING: This product contains a chemical known to the State of California to cause cancer: Residual acrylamide.

US. Massachusetts RTK - Substance List

Not regulated.

US. Pennsylvania RTK - Hazardous Substances

Not regulated.

US. Rhode Island RTK

Not regulated.

16. Other Information

Further information

HMIS® is a registered trade and service mark of the NPCA.

HMIS® ratings

Health: 1
Flammability: 1
Physical hazard: 0

NFPA ratings

Health: 1
Flammability: 1
Instability: 0

Disclaimer

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):

Physical & Chemical Properties: Multiple Properties
Physical & Chemical Properties: Form
Disposal Considerations: Waste codes
Regulatory Information: United States

HYDREX 6161

Product information

Waste Water Treatment

Description and Use

Hydrex 6161 is a high molecular weight, medium charged polyacrylamide that is used as a flocculant or coagulant aid in a wide variety of mining, municipal, and industrial water and wastewater treatment applications.

This product can be used alone or in conjunction with other organic or inorganic coagulants.

It is typically used in liquid/solid separations, dewatering, and filtration.

Application Information

Hydrex 6161 is water soluble and certain precautions should be followed to obtain total dissolution with minimum loss of activity.

Complete wetting of the individual particles is the most important factor in the preparation of powdered flocculants.

Veolia Water can supply the required equipment to achieve the best mixing results.

Normal ‘make-down’ concentrations are between 0.1 - 0.5% by weight.

Specifications

Physical Form : White powder
Viscosity : 5.0 g/L 1800 cps - 2.5 g/L 700 cps - 1.0 g/L 300 cps

Materials Compatibility

Crosslinked polyethylene, fiberglass, stainless steel and lined mild steel are the preferred material of construction for bulk tanks. Unlined steel, black iron, galvanized steel, and copper are NOT recommended in any part of the polymer feed system. Stainless steel or PVC are the best choices for the pump heads and feed lines.

Packaging

For best results, store product at 0-32°C. Product spilled will be extremely slippery. See MSDS for handling spills. Do not spray water on spilled material because of the resulting slippery condition it can create. Rock salt cures the slipperiness.

Packaging : on request.

Safety Information

Detailed information on the product described in this leaflet can be found in our relevant health and safety information (Safety Data Sheet). Please contact us for further information.

Veolia Water Solutions & Technologies Headquarters
"L'aquarène" 1, Place Montgolfier - 94417 Saint-Maurice Cedex - France
Tél. +33 1 45 11 55 55
Website : www.veoliawaterst.com

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

****
****

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

Notice

Univar USA Inc. (”Univar”) expressly disclaims all express or implied warranties of merchantability and fitness for a particular purpose, with respect to the product or information provided herein, and shall under no circumstances be liable for incidental or consequential damages.

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

MicroClear® M-100

Micro Stimulant

Product Bulletin

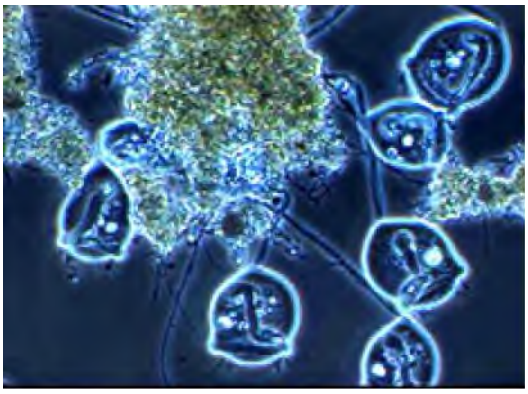
Environmental Leverage has Lab Analysis Service Available

MicroClear® M-100 is a proprietary formulation of micronutrients designed to enhance the performance of biological systems. It enhances biological growth, shortens lag time, increases biological activity and provides the critical building blocks necessary to maintaining a healthy floc-forming population. The formulation consists of micronutrients, trace minerals, amino acids and vitamins. There are sixteen trace minerals, including calcium, iron, magnesium, manganese and zinc. The formulation also includes twenty amino acids, such as glycine, and thirteen vitamins, including folic acid.

Product Uses: Regular application of **MicroClear® M-100** can provide numerous benefits to operators of all types of biological waste treatment processes. Research has shown that inadequate micronutrients can lead to poor settling or high effluent suspended solids due to unhealthy floc. The addition of micronutrients also increases the biological degradation rate in many situations which will allow the biomass to more rapidly respond to sudden increases in loads or toxic shocks. Finally, laboratory studies indicate that application of micronutrients can lower final effluent BOD_5 levels by maintaining a healthy population capable of more complete organic reduction in a shorter time.

Enzymatic Activity

All Natural Inorganic Vitamins & Nutrients To Enhance Biological Growth



Product Advantages

Shortens Lag Time
Enhances BOD/COD removal
Reduces sludge buildup
Cost effective/Easy to use
Changes biomass dynamics
No special equipment needed
Increases system efficiency
Increase characteristics in floc structure

Applications of Use

RBC'S
Primary CLARIFIERS
DIGESTERS
SLUDGE TANKS
Secondary CLARIFIERS
AERATED BASINS
GREASE TRAPS
AERATION TANKS
LAGOONS
TRICKLING FILTERS
STATIC PONDS

Packaging of Product

MicroClear® M-100 comes in 1-lb. water soluble Bio-pouches.
Packaged in 25-lb. Plastic Pails.
Bulk packaging available upon request.

Environmental Leverage® Inc.
812 Dogwood Dr. Suite A
North Aurora, IL 60542
admin@environmentalLeverage.com
630-906-9791 fax 630-906-9792
www.EnvironmentalLeverage.com

MicroClear® M-100

Micro Stimulant

Product Bulletin

Environmental Leverage has Lab Analysis Service Available

Typical Properties of Product

Appearance.....Dark Green
Fragrance.....mild-earthy
Form.....powder
pH.....6.5-7.5
Shelf-Life.....2 years/u.o.c.
Flash Point.....none

Performance Properties

Effective pH range.....5.2 - 9.5
Effective Temperature Range.....35 - 130°F

Storage & Handling

Storage.....Store in a cool, dry place. Do Not Freeze
Container.....Keep lid closed on Plastic Pail. Do not store water soluble pouches out of plastic container.

Handling.....Wash hands thoroughly with warm, soapy water

Micronutrients, Trace Minerals & Elements

16 Trace Minerals

Calcium	1.9%
Iron	.08%
Magnesium	.123%
Zinc	.0035%
Phosphorus	0.1 %
Trace Vitamins:	**A, B, D, E & K**
Folic Acid	0.3mg
Ascorbic Acid	150,000 mg
Niacin	2,500 mg

Enzymatic Activity

All Natural Inorganic Vitamins & Nutrients To Enhance Biological Growth

Environmental Leverage® Inc.
812 Dogwood Dr. Suite A
North Aurora, IL 60542
admin@environmentalLeverage.com
630-906-9791 fax 630-906-9792
www.EnvironmentalLeverage.com

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.

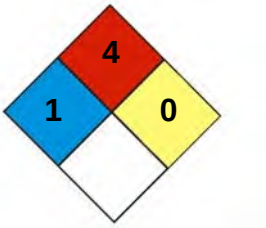
First Aid: Ingestion

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

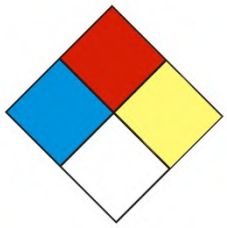
The following components appear on one or more of the following state hazardous substances lists:

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.

Material Safety Data Sheet

Revision Issued: 1/31/2013	Supersedes: 10/23/2009	First Issued: 4/11/1996

Section I – Product and Company Identification

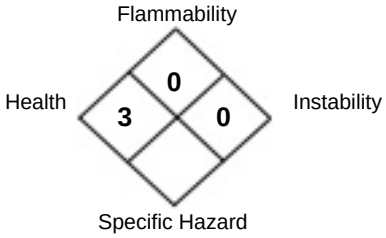
Product Name: **Phosphoric Acid 85-90% Food Grade**

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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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.

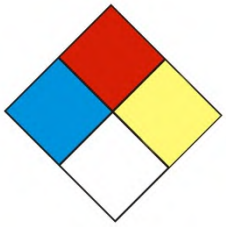
First Aid: Ingestion (Swallowing)
First aid is not required, normally. If spontaneous vomiting occurs, lean the victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. If symptoms develop, seek medical attention.

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

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.

* * * 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: NaHSO3
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 SO2 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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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

(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

N. AMERICAN EMERGENCY GUIDE PAGE NUMBER: 154

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
7755 Bellaire South
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.

SALTEX, LLC MAKES NO REPRESENTATIONS, OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, SALTEX, LLC WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

N/A: Not Available, Not Applicable
N/D: Not Determined
N/E: Not Established

Material Safety Data Sheet

SULFURIC ACID 93%

Date Prepared: 1/14/09 **Supersedes Date: 0/00/00**

1. PRODUCT AND COMPANY DESCRIPTION

RHODIA INC.
ECO SERVICES
CN 7500
Cranbury NJ 08512

Emergency Phone Numbers:
FOR EMERGENCIES INVOLVING A SPILL, LEAK, FIRE, EXPOSURE OR ACCIDENT CONTACT: CHEMTREC (800-424-9300 within the United States or 703-527-3887 for international collect calls) or Rhodia CAERS (Communication and Emergency Response System) at 800-916-3232.

For Product Information:
(800) 642-4200

Chemical Name or Synonym:
SULFURIC ACID

Molecular Formula:
H_2SO_4

2. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS Reg Number	OSHA Hazard	Percentage
SULFURIC ACID	7664-93-9	Y	93
WATER	7732-18-5	N	7

3. HAZARDS IDENTIFICATION

A. EMERGENCY OVERVIEW:

Physical Appearance and Odor:
colorless oily liquid, odorless.

Warning Statements:
DANGER! CAUSES SEVERE BURNS. REACTS VIOLENTLY WITH WATER. CONTENTS MAY BE UNDER PRESSURE OF EXPLOSIVE, FLAMMABLE HYDROGEN GAS. HIGHLY REACTIVE AND CAPABLE OF IGNITING COMBUSTIBLE MATERIAL ON CONTACT.

B. POTENTIAL HEALTH EFFECTS:

Acute Eye:

Corrosive. Causes burns, tissue destruction, Can cause blindness.

Acute Skin:
Corrosive. Causes redness, inflammation, burns.

Acute Inhalation:
Harmful if inhaled. Causes upper respiratory tract irritation, lung irritation, chest pain, wheezing, shortness of breath, a burning sensation, tickling of the nose and throat, sneezing, Repeated exposure to high levels of sulfuric acid mist may cause etching of tooth enamel in persons who breathe through their mouths.

Acute Ingestion:
Harmful if ingested. Can cause irritation, abdominal pain, corrosion, burns to mouth and esophagus, death.

Chronic Effects:
When mists are released from this product they are considered to be probable or suspected human carcinogens (see Section 11 - Chronic).

4. FIRST AID MEASURES

FIRST AID MEASURES FOR ACCIDENTAL:

Eye Exposure:
Hold eyelids open and flush with a steady, gentle stream of water for at least 15 minutes. Seek immediate medical attention.

Skin Exposure:
In case of contact, immediately wash with plenty of water for at least 15 minutes. Seek medical attention if irritation developes or persists. Remove contaminated clothing and shoes. Clean contaminated clothing and shoes before re-use.

Inhalation:
Remove victim from immediate source of exposure and assure that the victim is breathing. If breathing is difficult, administer oxygen, if available. If victim is not breathing, administer CPR (cardio-pulmonary resuscitation). Seek medical attention.

Ingestion:
DO NOT INDUCE VOMITING. If the person is conscious and has no trouble breathing a small (no more than one glass) amount of water may be given. Do not leave victim unattended. To prevent aspiration of the swallowed product, lay victim on side with head lower than waist. If vomiting occurs do not re-administer water. Do not give anything by mouth to an unconscious person. IMMEDIATELY obtain medical attention.

MEDICAL CONDITIONS POSSIBLY AGGRAVATED BY EXPOSURE:
Inhalation of product may aggravate existing chronic respiratory problems such as asthma, emphysema or bronchitis. Skin contact may aggravate existing skin disease.

NOTES TO PHYSICIAN:
All treatments should be based on observed signs and symptoms of distress in the patient. Consideration should be given to the possibility that overexposure to materials other than this product may have occurred.

This material is an acid. The primary toxicity of this product is due to its irritant effects on mucous membranes.

INHALATION: If cough or shortness of breath occurs, evaluate the possibility of bronchitis or pneumonitis. Chest x-ray and arterial blood gases can be used to determine the presence of pulmonary edema. In severe cases, use of humidified oxygen and assisted ventilation including positive end expiratory pressure (PEEP) may be needed. Parenteral steroids may be useful in limiting the extent of pulmonary damage.

SKIN: Wash exposed area thoroughly with soap and water. Chemical burns from strong acids are generally treated the same as thermal burns.

EYES: Irrigate eyes for 15 minutes with sterile saline. If irritation, pain, swelling, photophobia or lacrimation persist, examination by an ophthalmologist is recommended.

INGESTION: If not already performed by first aid personnel, irrigate mouth with large amounts of water and dilute the acid by

having victim drink 4 to 8 ounces of water or milk. DO NOT induce vomiting. Use of gastric lavage is controversial. The advantage of removal of acid must be weighted against the risk of perforation or bleeding. If a large amount of acid (> 1 ml/kg body weight) has been recently ingested, cautious gastric lavage is generally advised if the patient is alert and there is little risk of convulsions. Consultation with a gastroenterologist and/or surgeon is advised. Serious complications such as perforation or stricture of the esophagus may occur requiring care by specialists. Laryngeal edema may develop requiring intubation or tracheostomy.

5. FIRE FIGHTING MEASURES

FIRE HAZARD DATA:

Flash Point:
Not Applicable

Extinguishing Media:
Not combustible. Use extinguishing method suitable for surrounding fire. Recommended (small fires): dry chemical.

Special Fire Fighting Procedures:
Firefighters should wear NIOSH/MSHA approved positive pressure breathing apparatus with full face-piece and full acid-resistant protective clothing. Fight fire from maximum distance.

Unusual Fire and Explosion Hazards:
Not combustible. Strong oxidizers can react with reducing agents or combustibles producing heat and causing ignition. Reacts violently with water releasing heat and corrosive material.

Hazardous Decomposition Materials (Under Fire Conditions):
oxides of sulfur

6. ACCIDENTAL RELEASE MEASURES

Evacuation Procedures and Safety:
Personnel handling this material should be thoroughly trained to handle spills and releases. Do not direct hose streams into an unignited transportation spill (tank truck or tank car).

Containment of Spill:
Stop leak if it can be done without risk. Dike spill using absorbent or impervious materials such as earth, sand or clay. Dike or retain dilution water or water from firefighting for later disposal.

Cleanup and Disposal of Spill:
Pump any free liquid into an appropriate closed container (see Section 7: Handling and Storage). Exercise caution during neutralization as considerable heat may be generated. Carefully neutralize spill with soda ash. Absorb neutralized spill with an inert absorbent. Scrape up and place in appropriate closed container (see Section 7: Handling and Storage).

Environmental and Regulatory Reporting:
Do not flush to drain. Runoff from fire control or dilution water may cause pollution. Dispose of as a hazardous waste. Spills may be reportable to the National Response Center (800-424-8802) and to state and/or local agencies. Large spills should be handled according to a predetermined plan. For assistance in developing a plan contact the Technical Service Department using the Product Information phone number in Section 1.

7. HANDLING AND STORAGE

Minimum/Maximum Storage Temperatures:
Not Available

Handling:
Do not breathe vapors and mists. Do not get on skin or in eyes. This product reacts violently with bases liberating heat and causing spattering.

When diluting an acid, ALWAYS add the acid slowly to water and stir well to avoid spattering. NEVER ADD WATER TO ACID.

Storage:
Store in tightly closed containers. Store in an area that is dry, well-ventilated, diked with impermeable material, Freezing point varies with concentration. Maximum recommended storage temperature = 104F (40C). Corrosion rates increase at elevated temperatures.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Introductory Remarks:
These recommendations provide general guidance for handling this product. Because specific work environments and material handling practices vary, safety procedures should be developed for each intended application. While developing safe handling procedures, do not overlook the need to clean equipment and piping systems for maintenance and repairs. Waste resulting from these procedures should be handled in accordance with Section 13: Disposal Considerations.

Assistance with selection, use and maintenance of worker protection equipment is generally available from equipment manufacturers.

Exposure Guidelines:
Exposure limits represent regulated or recommended worker breathing zone concentrations measured by validated sampling and analytical methods, meeting the regulatory requirements. The following limits apply to this material, where, if indicated, S=skin and C=ceiling limit:

SULFURIC ACID

	Notes	TWA	STEL
ACGIH		0.2 mg/cu m	
OSHA		1 mg/cu m	
RHODIA		0.3 mg/cu m	

Engineering Controls:
Where engineering controls are indicated by use conditions or a potential for excessive exposure exists, the following traditional exposure control techniques may be used to effectively minimize employee exposures: local exhaust ventilation at the point of generation.

Respiratory Protection:
When respirators are required, select NIOSH/MSHA approved equipment based on actual or potential airborne concentrations and in accordance with the appropriate regulatory standards and/or industrial recommendations.

If the exposure limit is exceeded and engineering controls are not feasible, a full facepiece respirator with an acid gas cartridge and particulate filter (NIOSH type N100 filter) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P particulate filter. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator.

Eye/Face Protection:
Eye and face protection requirements will vary dependent upon work environment conditions and material handling practices. Appropriate ANSI Z87 approved equipment should be selected for the particular use intended for this material. Contact to face and eyes should be prevented through use of a face shield and splash proof goggles. An emergency eye wash must be readily accessible to the work area.

Skin Protection:
Skin contact must be prevented through the use of permeation resistant clothing, gloves and footwear, selected with regard for use conditions and exposure potential. An emergency shower must be readily accessible to the work area. Consideration must be given both to durability as well as permeation resistance.

Work Practice Controls:
Personal hygiene is an important work practice exposure control measure and the following general measures should be taken when working with or handling this material:

(1) Do not store, use, and/or consume foods, beverages, tobacco products, or cosmetics in areas where this material is stored.
(2) Wash hands and face carefully before eating, drinking, using tobacco, applying cosmetics, or using the toilet.
(3) Wash exposed skin promptly to remove accidental splashes or contact with this material.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical and Chemical properties here represent typical properties of this product. Contact the business area using the Product Information phone number in Section 1 for its exact specifications.

Physical Appearance:
colorless oily liquid.

Odor:
odorless.

pH:
1 at 1 wt/wt%.

Specific Gravity:
1.836 at 16 C (61 F).

Water Solubility:
miscible

Melting Point Range:
-32 C (-26 F)

Boiling Point Range:
276 C (529 F) at 760 mmHg

Vapor Pressure:
< 1 mmHg at 40 C (104 F)

Vapor Density:
3.4

Molecular Weight:
98.08

10. STABILITY AND REACTIVITY

Chemical Stability:
This material is stable under normal handling and storage conditions described in Section 7.

Conditions To Be Avoided:
none known

Materials/Chemicals To Be Avoided:
water
strong reducing agents

halogens
bases
metals
nitrogen compounds

The Following Hazardous Decomposition Products Might Be Expected:

Decomposition Type: thermal
oxides of sulfur

Hazardous Polymerization Will Not Occur.

Avoid The Following To Inhibit Hazardous Polymerization:
not applicable

11. TOXICOLOGICAL INFORMATION

Acute Eye Irritation:
Toxicological Information and Interpretation:
eye - eye irritation, 250 ug/24 hr, rabbit. Severely irritating.

Acute Skin Irritation:
No test data found for product. This product was not tested because strong acids are known to be corrosive and to cause severe tissue destruction.

Acute Dermal Toxicity:
No test data found for product. This product was not tested because strong acids are known to be corrosive and to cause severe tissue destruction.

Acute Respiratory Irritation:
Toxicological Information and Interpretation:
lung - lung irritation, < 5 mg/cu m, human. Mildly irritating.

Acute Inhalation Toxicity:
Toxicological Information and Interpretation:
LC50 - lethal concentration 50% of test species, 347 ppm/1 hr, rat.
LC50 - lethal concentration 50% of test species, 510 mg/cu m/2 hr, rat.

Acute Oral Toxicity:
Toxicological Information and Interpretation:
LD50 - lethal dose 50% of test species, 2140 mg/kg, rat.

Chronic Toxicity:
This product contains the substances that are considered to be "probable" or "suspected" human carcinogens as follows:

The International Agency for Research on Cancer (IARC) and the National Toxicology Program (NTP) have classified "occupational exposure to strong inorganic acid mists containing sulfuric acid" as a known human carcinogen (IARC Category 1). This classification applies only to sulfuric acid when generated as a mist. There is still debate in the scientific community whether the studies reviewed by IARC and NTP adequately controlled for confounding occupational exposures and personal habits such as cigarette smoking and alcohol consumption. A few epidemiology studies have suggested a possible association between sulfuric acid exposure and laryngeal or lung cancer; however, in all these studies, workers were exposed to many other chemicals, some of which are recognized carcinogens, such as diethylsulfate and nickel. Considering the multiple chemical exposures and other limitations of the studies, we disagree with IARC's conclusion that a cause and effect relationship between cancer and "occupational exposure to strong inorganic acid mist containing sulfuric acid" has been demonstrated. Also more recent epidemiological studies have failed to find any association between "occupational exposure to strong inorganic acid mist containing sulfuric acid" and laryngeal or lung cancer. ACGIH has classified "sulfuric acid as contained in strong inorganic acid mists" as a suspect human carcinogen. This classification does not apply to sulfuric acid per se. Lifetime animal studies in hamsters, rats and guinea pigs were conducted in the 1970's under sponsorship of the Environmental Protection Agency (EPA) or the National Institutes of Environmental Health Sciences (NIEHS). All three lifetime studies were negative for carcinogenic

effects. These studies were not formally published by the government agencies because they were satisfied that sulfuric acid mist was not a carcinogenic problem. Because these studies were not published, IARC or NTP did not consider them in their deliberations.

	Regulatory Agency Listing Carcinogen			
Ingredient Name	**OSHA**	**IARC**	**NTP**	**ACGIH**
OCCUPATIONAL EXPOSURES TO STRONG-INORGANIC-ACID MISTS CONTAINING	No	1	Yes	A2

12. ECOLOGICAL INFORMATION

Ecotoxicological Information:

Ecotoxological Information and Interpretation:

The toxicity of sulfuric acid to fish is dependent on the resulting pH of the water. lethality at a pH of 5.0 or below. required to cause lethality varies depending on the hardness of the water (hard water has some buffering capacity) and the species of fish (some fish are more resistant to the effects of acidity). McKee, JE, and Wolf, HA (Editors), Water Quality Criteria, 2nd ed., Publication No. 3-A, p. 279, California State Water Resources Control Board, Sacramento, CA (rev. 1963).

Chemical Fate Information:
No data found for product.

13. DISPOSAL CONSIDERATIONS

Waste Disposal Method:
Chemical additions, processing or otherwise altering this material may make the waste management information presented in this MSDS incomplete, inaccurate or otherwise inappropriate. Please be advised that state and local requirements for waste disposal may be more restrictive or otherwise different from federal laws and regulations. Consult state and local regulations regarding the proper disposal of this material.

EPA Hazardous Waste - YES

EPA RCRA HAZARDOUS WASTE CODES:
"C" Corrosive; "R" Reactive.

14. TRANSPORTATION INFORMATION

Transportation Status: IMPORTANT! Statements below provide additional data on listed DOT classification.
The listed Transportation Classification does not address regulatory variations due to changes in package size, mode of shipment or other regulatory descriptors.

US Department of Transportation
Hazard Class..... 8
Shipping Name:
SULFURIC ACID
ID Number..... UN1830
Packing Group.... II
Labels..... CORROSIVE
Emergency Guide #.... 137

15. REGULATORY INFORMATION

Inventory Status

Inventory	Status
UNITED STATES (TSCA)	Y
CANADA (DSL)	Y
EUROPE (EINECS/ELINCS)	Y
AUSTRALIA (AICS)	Y
JAPAN (MITI)	Y
SOUTH KOREA (KECL)	Y

Y = All ingredients are on the inventory.
E = All ingredients are on the inventory or exempt from listing.
P = One or more ingredients fall under the polymer exemption or are on the no longer polymer list. All other ingredients are on the inventory or exempt from listing.
N = Not determined or one or more ingredients are not on the inventory and are not exempt from listing.

FEDERAL REGULATIONS

Inventory Issues:
All functional components of this product are listed on the TSCA Inventory.

SARA Title III Hazard Classes:

Fire Hazard	- NO
Reactive Hazard	- YES
Release of Pressure	- NO
Acute Health Hazard	- YES
Chronic Health Hazard	- NO

SARA 313 Chemicals
SULFURIC ACID (93%)

SARA Extremely Hazardous Substances (EHS)/CERCLA Hazardous Substances

Ingredient	CERCLA/SARA RQ	SARA EHS TPQ
SULFURIC ACID	1000 lbs	1000 lbs
UNLISTED HAZARDOUS WASTES - CHARACTERISTIC OF CORROSIVITY	100 lbs	
UNLISTED HAZARDOUS WASTES - CHARACTERISTIC OF REACTIVITY	100 lbs	

STATE REGULATIONS:
This product contains the following components that are regulated under California Proposition 65:

Ingredient Name	Cancer List	Reprod. List	No Sign. Risk Lvl (ug/day) California	RPI
OCCUPATIONAL EXPOSURES TO STRONG-INORGANIC-AC ID MISTS CONTAINING SULFU	Y	N	ND	ND

16. OTHER INFORMATION

National Fire Protection Association Hazard Ratings--NFPA(R):

3 Health Hazard Rating--Serious
0 Flammability Rating--Minimal
2 Instability Rating--Moderate
0 * NO WATER

National Paint & Coating Hazardous Materials Identification System--HMIS(R):

3 Health Hazard Rating--Serious
0 Flammability Rating--Minimal
2 Reactivity Rating--Moderate

Reason for Revisions:
New product MSDS.

Key Legend Information:
ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
TLV - Threshold Limit Value
PEL - Permissable Exposure Limit
TWA - Time Weighted Average
STEL - Short Term Exposure Limit
NTP - National Toxicology Program
IARC - International Agency for Research on Cancer
ND - Not determined
RHODIA - Rhodia Established Exposure Limits

Disclaimer:
The information herein is given in good faith but no warranty, expressed or implied, is made.

** End of MSDS Document **

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	2015	1,194 hp	New	NA
H-2185A	2E	Boiler #1	2015	276.5 MMBtu/hr	New	NA
H-2185B	3E	Boiler #2	2015	276.5 MMBtu/hr	New	NA
U-1080	4E	Thermal Oxidizer	2015	3 MMBtu/hr	New	1C
TK-1055A	5E	Clarifier Tank A	2015	562,000 gal	New	1C
TK-1055B	6E	Clarifier Tank B	2015	562,000 gal	New	1C
TK-1060A	7E	Clarifier Pump Tank A	2015	23,000 gal	New	1C
TK-1060B	8E	Clarifier Pump Tank B	2015	23,000 gal	New	1C
TK-1065	9E	Oil Collection Tank	2015	13,500 gal	New	1C
TK-1070	10E	Equalization Tank	2015	1,030,000 gal	New	1C
TK-2010	11E	Solids Clarifier Tank	2015	435,000 gal	New	1C
TK-2015	12E	Clarifier Effluent Tank	2015	12,000 gal	New	1C
TK-2020	13E	Sludge Holding Tank	2015	103,000 gal	New	1C
TK-2030	14E	Sludge Filtrate Tank	2015	8,200 gal	New	1C
TK-2040	15E	Thermal Feed Tank	2015	1,400,000 gal	New	1C
TK-2130	16E	Barometric Condenser Hot Well	2015	107,000 gal	New	1C
TK-2140	17E	Recovered Water Tank	2015	230,000 gal	New	1C
TK-2160	18E	Disposal Centrate Tank	2015	7,560 gal	New	1C
E-2076	19E	Deaerator Vent Condenser	2015	1,500 sq ft	New	1C
TK-2120	20E	Process Distillate Level Tank	2015	5,575 gal	New	NA
TK-2500	21E	Post Treatment Tank 1	2015	770,000 gal	New	NA
TK-2550	22E	Post Treatment Tank 2	2015	770,000 gal	New	NA
TK-2555	23E	Post Treatment Tank 3	2015	406,100 gal	New	NA
TK-2515	24E	Post Treatment Effluent Tank	2015	12,000 gal	New	NA
TK-2520	25E	Post Treatment Sludge Tank	2015	1,270 gal	New	NA

TK-4115	26E	Methanol Bulk Storage Tank	2015	8,000 gal	New	NA
TK-4180	27E	Sulfuric Acid Storage Tank	2015	6,000 gal	New	NA
CT-2335	28E	Cooling Tower Basin	2015	34,500 gpm	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	500	NOx CO VOC PM10 SO2 Total HAPs CO2e	12.64 6.84 0.005 0.39 0.096 0.011 1304	3.16 1.71 0.0013 0.099 0.024 0.0027 325.9	12.64 6.84 0.005 0.39 0.096 0.011 1304	3.16 1.71 0.0013 0.099 0.024 0.0027 325.9	Gas/Vapor	EE	
2E	Upward vertical stack	H-2185A	Boiler 1			C	8,760	NOx CO VOC PM10 SO2 Total HAPs CO2e	9.95 10.23 1.88 2.59 0.20 0.41 32547	43.60 44.81 8.22 11.36 0.90 1.78 142160	9.95 10.23 1.88 2.59 0.20 0.41 32547	43.60 44.81 8.22 11.36 0.90 1.78 142160	Gas/Vapor	EE	
3E	Upward vertical stack	H-2185B	Boiler 2			C	8,760	NOx CO VOC PM10 SO2 Total HAPs CO2e	9.95 10.23 1.88 2.59 0.20 0.41 32547	43.60 44.81 8.22 11.36 0.90 1.78 142160	9.95 10.23 1.88 2.59 0.20 0.41 32547	43.60 44.81 8.22 11.36 0.90 1.78 142160	Gas/Vapor	EE	

4E	Upward vertical stack	U-1080	Thermal oxidizer			C	8,760	NOx CO VOC PM10 SO2 Total HAPs CO2e	---- ---- ---- ---- ---- ---- ----	---- ---- ---- ---- ---- ---- ----	1.08 0.93 1.0E-4 1.4E-4 1.1E-5 3.6E-5 352	4.50 4.08 4.6E-4 6.3E-4 5.0E-5 1.6E-4 1542	Gas/Vapor	EE	
5E	Upward vertical stack	TK-1055A	Clarifier Tank A	1C	Thermal Oxidizer	C	8,760	VOC Total HAPs Ammonia CO2e	20.61 0.12 5.86 11.35	33.57 0.24 21.03 18.77	0.41 0.0023 0.12 11.35	0.67 0.0048 0.42 18.77	Gas/Vapor	EE	
6E	Upward vertical stack	TK-1055B	Clarifier Tank B	1C	Thermal Oxidizer	C	8,760	VOC Total HAPs Ammonia CO2e	20.61 0.12 5.86 11.35	33.57 0.24 21.03 18.77	0.41 0.0023 0.12 11.35	0.67 0.0048 0.42 18.77	Gas/Vapor	EE	
7E	Upward vertical stack	TK-1060A	Clarifier Pump Tank A	1C	Thermal Oxidizer	C	8,760	VOC Total HAPs Ammonia CO2e	4.16 0.20 0.12 36.78	4.20 0.18 0.12 35.91	0.09 0.0039 0.0024 36.78	0.09 0.0037 0.0023 35.91	Gas/Vapor	EE	
8E	Upward vertical stack	TK-1060B	Clarifier Pump Tank B	1C	Thermal Oxidizer	C	8,760	VOC Total HAPs Ammonia CO2e	4.16 0.20 0.12 36.78	4.20 0.18 0.12 35.91	0.09 0.0039 0.0024 36.78	0.09 0.0037 0.0023 35.91	Gas/Vapor	EE	
9E	Upward vertical stack	TK-1065	Oil Collection Tank	1C	Thermal Oxidizer	C	8,760	VOC	1.09	2.16	0.022	0.043	Gas/Vapor	EE	
10E	Upward vertical stack	TK-1070	Equalization Tank	1C	Thermal Oxidizer	C	8,760	VOC Total HAPs Ammonia CO2e	8.67 0.39 0.25 63.60	9.98 0.43 0.28 68.80	0.17 0.0078 0.0050 63.60	0.20 0.0086 0.0055 68.80	Gas/Vapor	EE	
11E	Upward vertical stack	TK-2010	Solids Clarifier Tank	1C	Thermal Oxidizer	C	8,760	VOC Total HAPs Ammonia CO2e	26.09 0.11 4.65 9.52	41.47 0.24 16.84 16.11	0.52 0.0022 0.093 9.52	0.83 0.0049 0.34 16.11	Gas/Vapor	EE	

12E	Upward vertical stack	TK-2015	Clarifier Effluent Tank	1C	Thermal Oxidizer	C	8,760	VOC Total HAPs Ammonia CO2e	8.46 0.030 0.23 43.42	8.81 0.030 0.22 40.53	0.17 0.0006 0.0047 43.42	0.18 0.0006 0.0044 40.53	Gas/Vapor	EE	
13E	Upward vertical stack	TK-2020	Sludge Holding Tank	1C	Thermal Oxidizer	C	8,760	VOC Total HAPs Ammonia CO2e	6.21 0.045 1.06 2.02	25.45 0.17 4.43 5.97	0.12 0.0009 0.021 2.02	0.51 0.0033 0.089 5.97	Gas/Vapor	EE	
14E	Upward vertical stack	TK-2030	Sludge Filtrate Tank	1C	Thermal Oxidizer	C	8,760	VOC Total HAPs Ammonia CO2e	0.28 0.0042 0.093 2.0E-5	1.23 0.018 0.40 8.4E-5	0.0057 8.0E-5 0.0019 2.0E-5	0.025 0.00037 0.0081 8.4E-5	Gas/Vapor	EE	
15E	Upward vertical stack	TK-2040	Thermal Feed Tank	1C	Thermal Oxidizer	C	8,760	VOC Total HAPs Ammonia CO2e	8.95 0.033 0.25 38.95	10.97 0.041 0.27 41.44	0.18 0.0007 0.005 38.95	0.22 0.0008 0.0055 41.44	Gas/Vapor	EE	
16E	Upward vertical stack	TK-2130	Barometric Condenser Hot Well	1C	Thermal Oxidizer	C	8,760	VOC	0.0020	0.0078	3.9E-5	1.6E-4	Gas/Vapor	EE	
17E	Upward vertical stack	TK-2140	Recovered Water Tank	1C	Thermal Oxidizer	C	8,760	VOC Total HAPs Ammonia	3.4E-6 3.4E-6 3.7E-4	1.5E-5 1.5E-5 2.7-4	6.8E-8 6.8E-8 7.4E-6	3.0E-7 3.0E-7 5.4E-6	Gas/Vapor	EE	
18E	Upward vertical stack	TK-2160	Disposal Centrate Tank	1C	Thermal Oxidizer	C	8,760	VOC	1.10	4.38	0.022	0.088	Gas/Vapor	EE	
19E	Upward vertical stack	E-2076	Deaerator Vent Condenser	1C	Thermal Oxidizer	C	8,760	Ammonia	44.70	195.79	0.89	3.92	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	0.038 0.038	0.14 0.14	0.038 0.038	0.14 0.14	Gas/Vapor	EE	
27E	Upward vertical stack	TK-4180	Sulfuric Acid Storage Tank			C	8,760	Sulfuric Acid	0.0	0.0	0.0	0.0	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	

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	0.42	1049	5721	343 dual exhaust	314	17	4346.7115	509.1779
2E	5.5	unknown	unknown	unknown	314	50	4346.7115	509.2044
3E	5.5	300	unknown	unknown	314	50	4346.6861	509.2044
4E	TBD	~1800	TBD	TBD	314	TBD	4346.6781	509.1755
5E-19E	Vents to 4E				314			
20E	0.17	144	unknown	unknown	314	0.17	4346.6540	509.2749
21E	Open tanks	80-90	unknown	unknown	314	N/A	4346.6471	509.2085
22E	Open tanks	80-90	unknown	unknown	314	N/A	4346.6471	509.2346
23E	Open tanks	80-90	unknown	unknown	314	N/A	4346.6699	509.2216
24E	0.17	80-90	unknown	unknown	314	0.17	4346.6657	509.2539
25E	Open tank	80-90	unknown	unknown	314	N/A	4346.6629	509.2591
26E	0.17	atmospheric	unknown	unknown	314	0.17	4346.6230	509.2494
27E	0.17	atmospheric	unknown	unknown	314	0.17	4346.6216	509.2408
28E	unknown	unknown	unknown	unknown	314	38.84	4346.732	509.2371

[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	1.32 0.32	5.17 1.27	1.32 0.32	5.17 1.27	EE
Storage Pile Emissions						
Loading/Unloading Operations (P-1051)	VOCs Total HAPs CO2e	31.32 0.23 22.95	28.58 0.21 20.94	31.32 0.23 22.95	28.58 0.21 20.94	EE
Wastewater Treatment Evaporation & Operations (DISP1 and DISP2)	VOCs Total HAPs CO2e NH3	4.93 0.0038 0.000003 0.22	21.60 0.017 0.00001 0.97	4.93 0.0038 0.000003 0.22	21.60 0.017 0.00001 0.97	MB
Equipment Leaks						
General Clean-up VOC Emissions						
Other all Transfer Points	PM-10 PM-2.5	1.67 0.47	3.06 0.87	1.67 0.47	3.06 0.87	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 Engine

GENERATOR ENGINE DATA SHEET

Source Identification Number[1]		GEN-1 / 1E					
Engine Manufacturer and Model		MTU/Detroit Diesel 12V2000 G85					
Manufacturer's Rated bhp/rpm		1,194					
Source Status[2]		NS					
Date Installed/Modified/Removed[3]		January 2016					
Engine Manufactured/Reconstruction Date[4]		TBD					
Is this a Certified Stationary Spark Ignition Engine according to 40CFR60 Subpart JJJJ? (Yes or No)[5]		No					
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	825					
	BSFC (gal/hr)	58					
	Fuel throughput (gal/hr)	58					
	Fuel throughput (gal/yr)	5800					
	Operation (hrs/yr)	500					
Reference[9]	Potential Emissions[10]	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
OT	NO_X	12.64	3.16				
OT	CO	6.84	1.71				
AP	VOC	0.0051	0.0013				
AP	SO_2	0.096	0.024				
OT	PM_{10}	0.39	0.099				
AP	Formaldehyde	6.27E-04	1.57E-4				
OT	$PM_{2.5}$	0.039	0.099				

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: EPA Tier 2 Nonroad Diesel Engine

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*.

HMW
MTU

HMW-810 T6

Powered by:

MTU 12V 2000 G85

809 kW at 60 Hz

Generating Set Performance		60 Hz	
SERVICE		*P.R.P* (1)	*Standby* (2)
Rated output	kVA	920	1,011
Active power output *	kW	**736**	**809**
Rated speed	r.p.m.	1,800	
Standard Voltage	V	480	
Voltage available	V	480/277 - 440/254	

Performance data refers to Standard Reference Conditions of **ISO 8528** : + 25 °C , 100 m ALT, relative humidity 30 %
During running-in period the output increases by approx. 5 % which is taken into consideration at delivery.
Power reduction acc. to **DIN ISO 3046**. Standard values: Above 100 m ALT approx. 1 % per 100 m. Above 25 °C (77 °F) approx. 4 % per 10 °C (50 °F).
* Considering cos phi= 0,8

Prime Mover Performance		1,800 r.p.m.	
SERVICE		*P.R.P* (1)	*Standby* (2)
Rated output	kW	810	890
Manufacturer		MTU	
Engine model		12V 2000 G85	
4 stroke Diesel Engine - Injection type		DIRECT	
Aspiration type		TURBOCHARGED AND AFTERCOOLED	
Cylinders, number and arrangement		12 - V	
Bore x stroke	mm	130 x 150	
Total displacement	L	23.88	
Cooling system		WATER	
Lube oil specifications		SAE 15 W 40	
Compression ratio		16 : 1	
Specific fuel consumption (P.R.P)	g/kWh	209	
Specific oil consumption (at full load)	%	1.00	
Lube oil maximum capacity	L	74	
Total coolant capacity	L	90	
Speed governor	Type	Electronic, system MDEC	
Air filter	Type	DRY	

(1) Prime Power (P.R.P.) - ISO 8528: prime power is the maximum power available during a variable power sequence, which may be run for an unlimited number of hours per year, between stated maintenance intervals. The permissible average power output during a 24 hours period shall not exceed 80% of the prime power. 10% overload available for governing purposes only.

(2) Max Stand-by power (ISO 3046 Fuel Stop power): power available for use at variable loads for limited annual time (500h), within the following limits of maximum operating time: 100% loads 25 h per year - 90% loads 200 h per year No overload available. Applicable in case of failure of the main in areas of reliable electrical network.

Synchronous Generator *		
Poles	Nº	4
Winding connections (standard)		Star - serie
Frame mounting		SAE 0 - 18”
Insulation	class	H
Enclosure (according to IEC-34-5)		IP 23
Exciter system		Self-regulating Brushless
Voltage regulator		**A.V.R** (Electronic)
Steady voltage precision		within ± 1.5% from no load to full loading with cosϕ=0.8÷1

*Alternator used by Hardy Diesel Gensets meet the requirements of following Standard: BS5000, VDE 0530, NEMA MG1-32, IEC34, CSA C22.2-100, AS1359.

HMW 810 T6 - 809 kW at 60 Hz

Generating Set Installation Data		1,800 r.p.m.
EXHAUST SYSTEM		
Max. exhaust temperature at full load	º C	565
	º F	1049
Exhaust gas flow	m³/s	2.7
Maximum allowed back pressure	mbar	85
Recommended exhaust pipe size for L= 5 m	mm	-
AIR REQUIREMENT		
Air requirement for combustion at 100% load / rated speed	m³/min	63
	ft³/min	2,224.85
ELECTRIC STARTING SYSTEM		
Starting motor output	kW	9.0
	CV	12.24
Minimum recommended battery capacity	Ah	-
Auxiliary voltage	Vcc.	24V
LIQUID CAPACITY		
Lube oil system including sump, filters, etc.	L	77
FUEL TANK CAPACITY		
Open Skid Genset	L	999
Soundproofed	L	999

Generating Set transport data		
WEIGHT AND DIMENSIONS OPEN SKID GENSET		
Length	m - ft	4.2 - 13.77
Width	m - ft	1.6 - 5.24
Height	m - ft	2.23 - 7.31
Shipping volume seaworthy (Standard supplier)	m³ - ft³	14.98 - 527.45
Dry weight (with standard accessories)	kg - lb	5,600 - 12,320

WEIGHT AND DIMENSIONS SOUNDPROOFED GENSET		
Length	m - ft	6 - 19.6
Width	m - ft	1.9 - 6.23
Height	m - ft	2.3 - 7.54
Shipping volume seaworthy (Standard supplier)	m³ - ft³	26.22 - 920.69
Dry weight (with standard accessories)	kg - lb	7,400 - 16,280
Sound level at 7m	dB(A)	N/A

WEIGHT AND DIMENSIONS SOUNDPROOFED CONTAINER 20'		
Length	m - ft	6.06 - 19.8
Width	m - ft	2.44 - 8
Height	m - ft	2.59 - 8.49
Shipping volume seaworthy (Standard supplier)	m³ - ft³	38.29 - 1,344.81
Dry weight (with standard accessories)	kg - lb	9,400 - 20,680
Sound level at 7m	dB(A)	70

*** Weights and dimmensions approximate. To consult in factory.**

Hardy Diesels & Equipment Inc
15749 Lyons Valley Rd
Jamul, Ca 91935
www.hardydiesl.com
800 341 7027

Model: 800REOZDE

KOHLER. Power Systems

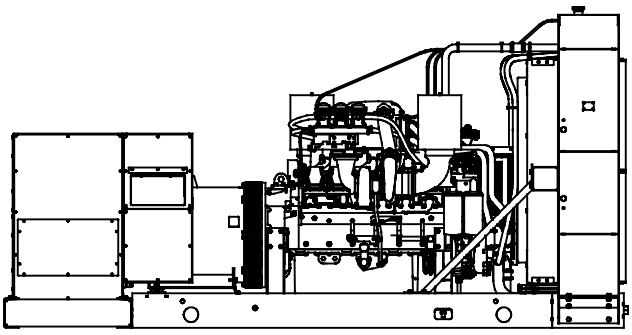
380-600 V **Diesel**

ISO 9001 KOHLER POWER SYSTEMS NATIONALLY REGISTERED

Tier 2 EPA-Certified for Stationary Emergency Applications

Ratings Range

		60 Hz	50 Hz
Standby:	**kW**	725-800	584-696
	kVA	906-1000	730-870
Prime:	**kW**	680-725	528-632
	kVA	850-906	660-790



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.
- Alternator features:
  - The pilot-excited, permanent magnet (PM) alternator provides superior short-circuit capability.
  - The brushless, rotating-field alternator has broadrange reconnectability.
- Other features:
  - Kohler designed controllers for guaranteed system integration and remote communication. See Controllers on page 3.
  - The low coolant level shutdown prevents overheating (standard on radiator models only).
  - Integral vibration isolation eliminates the need for under-unit vibration spring isolators.
  - An electronic, isochronous governor delivers precise frequency regulation.
  - Multiple circuit breaker configurations.

Generator Set Ratings

				150°C Rise Standby Rating		130°C Rise Standby Rating		125°C Rise Prime Rating		105°C Rise Prime Rating	
Alternator	**Voltage**	**Ph**	**Hz**	**kW/kVA**	**Amps**	**kW/kVA**	**Amps**	**kW/kVA**	**Amps**	**kW/kVA**	**Amps**
5M4034	240/416	3	60	725/906	1258	725/906	1258	680/850	1180	680/850	1180
	277/480	3	60	790/988	1188	750/938	1128	720/900	1083	710/888	1067
	220/380	3	50	652/815	1238	640/800	1215	600/750	1140	588/735	1117
	230/400	3	50	632/790	1140	612/765	1104	600/750	1083	560/700	1010
	240/416	3	50	604/755	1048	584/730	1013	552/690	958	528/660	916
5M4036	240/416	3	60	795/994	1379	785/981	1362	720/900	1249	720/900	1249
	277/480	3	60	795/944	1195	795/994	1195	720/900	1083	720/900	1083
	220/380	3	50	688/860	1307	652/815	1238	624/780	1185	612/765	1162
	230/400	3	50	688/860	1241	688/860	1241	624/780	1126	624/780	1126
	240/416	3	50	668/835	1159	640/800	1110	624/780	1083	584/730	1013
5M4038	240/416	3	60	800/1000	1388	800/1000	1388	725/906	1258	725/906	1258
	277/480	3	60	800/1000	1203	800/1000	1203	725/906	1090	725/906	1090
	220/380	3	50	696/870	1322	696/870	1322	632/790	1200	632/790	1200
	230/400	3	50	696/870	1256	696/870	1256	632/790	1140	632/790	1140
	240/416	3	50	696/870	1207	696/870	1207	632/790	1096	632/790	1096
5M4166	220/380	3	60	800/1000	1519	800/1000	1519	725/906	1377	725/906	1377
5M4278	347/600	3	60	800/1000	962	800/1000	962	725/906	872	725/906	872

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.

Alternator Specifications

Specifications		Alternator
Type		4-Pole, Rotating-Field
Exciter type		Brushless, Permanent-Magnet Pilot Exciter
Leads: quantity, type		10, Reconnectable
Voltage regulator		Solid-State, Volts/Hz
Insulation:		NEMA MG1
Material		Class H, Synthetic, Nonhygroscopic
Temperature rise		130°C, 150°C Standby
Bearing: quantity, type		1, Sealed
Coupling		Flexible Disc
Amortisseur windings		Full
Rotor balancing		125%
Rotor balancing		125%
Voltage regulation, no-load to full-load		Controller Dependent
One-step load acceptance at 60 Hz		100% of Rating
Unbalanced load capability		100% of Rated Standby Current
Peak motor starting kVA:		(35% dip for voltages below)
480 V	5M4034 (10 lead)	2600 (60 Hz), 2000 (50 Hz)
480 V	5M4036 (10 lead)	3200 (60 Hz), 2400 (50 Hz)
480 V	5M4038 (4 lead)	3050 (60 Hz), 2350 (50 Hz)
380 V	5M4166 (4 lead)	2700 (60 Hz)
600 V	5M4278 (4 lead)	3450 (60 Hz)

- 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 downstream circuit breakers to trip without collapsing the alternator field.
- Self-ventilated and dripproof construction.
- Superior voltage waveform from two-thirds pitch windings and skewed stator.
- 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.

Application Data

Engine

Engine Specifications	60 Hz	50 Hz
Manufacturer	Detroit Diesel/MTU	
Engine: model	12V2000 G85 R123-8A37	12V2000 G65 R123-8A38
Engine: type	4-Cycle, Turbocharged, Intercooled	
Cylinder arrangement	12-V	
Displacement, L (cu. in.)	23.9 (1458)	
Bore and stroke, mm (in.)	130 x 150 (5.12 x 5.91)	
Compression ratio	16.0:1	
Piston speed, m/min. (ft./min.)	540 (1772)	
Main bearings: quantity, type	7, Precision Half Shells	
Rated rpm	1800	1500
Max. power at rated rpm, kWm (BHP)	890 (1194)	765 (1026)
Cylinder head material	Cast Iron	
Crankshaft material	Forged Steel	
Valve (exhaust) material	Austenitic Steel	
Governor: type, make/model	ADEC Electronic Control	
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	60 Hz	50 Hz
Exhaust flow at rated kW, m^3/min. (cfm)	174 (6145)	123 (4344)
Exhaust temperature at rated kW, dry exhaust, °C (°F)	580 (1076)	565 (1049)
Maximum allowable back pressure, kPa (in. Hg)	8.5 (2.5)	
Exh. outlet size at eng. hookup, mm (in.)	See ADV drawing	

Engine Electrical

Engine Electrical System	60 Hz	50 Hz
Battery charging alternator:		
Ground (negative/positive)	Negative	
Volts (DC)	24	
Ampere rating	70	
Starter motor rated voltage (DC)	24	
Battery, recommended cold cranking amps (CCA):		
Qty., CCA rating each	Two, 1150	
Battery voltage (DC)	12	

Fuel

Fuel System	60 Hz	50 Hz
Fuel supply line, min. ID, mm (in.)	12 (0.5)	
Fuel return line, min. ID, mm (in.)	6 (0.25)	
Max. fuel flow, Lph (gph)	480 (127)	
Min./max. fuel pressure at engine supply connection, kPa (in. Hg)	-30/50 (-8.8/14.8)	
Max. return line restriction, kPa (in. Hg)	50 (14.7)	
Fuel filter: quantity, type	1, Secondary	
Recommended fuel	#2 Diesel	

Lubrication

Lubricating System	60 Hz	50 Hz
Type	Full Pressure	
Oil pan capacity dipstick mark max., L (qt.)	67 (71)	
Oil pan capacity, initial filling, L (qt.)	77 (81)	
Oil filter: quantity, type	2, Cartridge	
Oil cooler	Water-Cooled	

Application Data

Cooling

Radiator System	60 Hz	50 Hz
Ambient temperature, °C (°F)*	50 (122)	
Engine water capacity, L (gal.)	130 (34)	
Radiator system capacity, including engine, L (gal.)	310 (82)	
Engine jacket water flow, Lpm (gpm)	833 (220)	667 (176)
Charge cooler water flow, Lpm (gpm)	258 (68)	233 (62)
Heat rejected to cooling water at rated kW, dry exhaust, kW (Btu/min.)	315 (17930)	305 (17360)
Heat rejected to charge cooling water at rated kW, dry exhaust, kW (Btu/min.)	270 (15368)	185 (10530)
Water pump type	Centrifugal	
Fan diameter, including blades, mm (in.)	1524 (60)	
Fan, kWm (HP)	43 (58)	25 (34)
Max. restriction of cooling air, intake and discharge side of radiator, kPa (in. H_2O)	0.125 (0.5)	

* Enclosure with enclosed silencer reduces ambient temperature capability by 5°C (9°F).

Remote Radiator System†	60 Hz	50 Hz
Exhaust manifold type	Dry	
Connection sizes:		
Water inlet/outlet, mm (in.)	77 (3)	
Intercooler inlet/outlet, mm (in.)	51 (2)	
Static head allowable above engine, kPa (ft. H_2O)	149 (50)	

† Contact your local distributor for cooling system options and specifications based on your specific requirements.

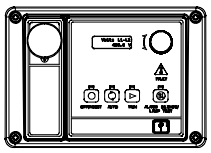
Operation Requirements

Air Requirements	60 Hz	50 Hz
Radiator-cooled cooling air, m^3/min. (scfm)‡	1285 (45380)	1071 (37817)
Cooling air required for generator set when equipped with city water cooling or remote radiator, based on 14°C (25°F) rise, m^3/min. (scfm)‡	311 (11000)	
Combustion air, m^3/min. (cfm)	66 (2330)	54 (1907)
Heat rejected to ambient air:		
Engine, kW (Btu/min.)	40 (2275)	
Alternator, kW (Btu/min.)	47 (2673)	

‡ Air density = 1.20 kg/m^3 (0.075 lbm/ft^3)

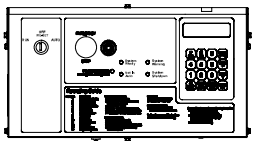
Fuel Consumption	60 Hz	50 Hz
Diesel, Lph (gph) at % load	Standby Rating	
100%	219.6 (58.0)	183.4 (48.4)
75%	165.5 (43.7)	136.8 (36.2)
50%	111.9 (29.6)	93.9 (24.8)
25%	60.9 (16.1)	51.2 (13.5)
Diesel, Lph (gph) at % load	Prime Rating	
100%	199.9 (52.8)	165.8 (43.8)
75%	150.6 (39.8)	124.9 (33.0)
50%	101.9 (26.9)	86.2 (22.8)
25%	56.7 (15.0)	47.2 (12.5)

Controllers



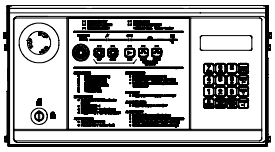
Decision-Maker® 3000 Controller
Provides advanced control, system monitoring, and system diagnostics for optimum performance and compatibility.
- Digital display and menu control provide easy local data access
- Measurements are selectable in metric or English units
- Remote communication thru a PC via network or modem configuration
- Integrated hybrid voltage regulator with ±0.5% regulation
- Built-in alternator thermal overload protection
- NFPA 110 Level 1 capability

Refer to G6-100 for additional controller features and accessories.



Decision-Maker® 550 Controller
Provides advanced control, system monitoring, and system diagnostics with remote monitoring capabilities.
- Digital display and keypad provide easy local data access
- Measurements are selectable in metric or English units
- Remote communication thru a PC via network or modem configuration
- Controller supports Modbus® protocol
- Integrated voltage regulator with ±0.25% regulation
- Built-in alternator thermal overload protection
- NFPA 110 Level 1 capability

Refer to G6-46 for additional controller features and accessories.



Decision-Maker® 6000 Paralleling Controller
Provides advanced control, system monitoring, and system diagnostics with remote monitoring capabilities for paralleling multiple generator sets.
- Paralleling capability with first-on logic, synchronizer, kW and kVAR load sharing, and protective relays
- Digital display and keypad provide easy local data access
- Measurements are selectable in metric or English units
- Remote communication thru a PC via network or modem configuration
- Controller supports Modbus® protocol
- Integrated voltage regulator with ±0.25% regulation
- Built-in alternator thermal overload protection
- NFPA 110 Level 1 capability

Refer to G6-107 for additional controller features and accessories.

KOHLER CO., Kohler, Wisconsin 53044 USA
Phone 920-457-4441, Fax 920-459-1646
For the nearest sales and service outlet in the
US and Canada, phone 1-800-544-2444
KOHLERPower.com

Kohler Power Systems
Asia Pacific Headquarters
7 Jurong Pier Road
Singapore 619159
Phone (65) 6264-6422, Fax (65) 6264-6455

Standard Features

- Alternator Protection
- Customer Connection
  (standard with Decision-Maker® 6000 controller only)
- Engine Closed Crankcase Breather
- Local Emergency Stop Switch
- Oil Drain Extension
- Operation and Installation Literature
- Radiator Core Guard

Available Options

Approvals and Listings

- ❑ CSA Approval
- ❑ IBC Seismic Certification
- ❑ UL 2200 Listing

Enclosed Unit

- ❑ Sound Enclosure/Fuel Tank Package
- ❑ Weather Enclosure/Fuel Tank Package

Open Unit

- ❑ Exhaust Silencer, Critical
  (kits: PA-354880, qty. 2, PA-354898 qty. 1, or PA-354894 qty. 1)
- ❑ Exhaust Silencer, Hospital
  (kits: PA-354905 qty. 2, PA-354912 qty. 1, or PA-354907 qty. 1)
- ❑ Flexible Exhaust Connector, Stainless Steel

Fuel System

- ❑ Flexible Fuel Lines
- ❑ Fuel Pressure Gauge
- ❑ Fuel/Water Separator

Controller

- ❑ Common Failure Relay
  (Decision-Maker® 550 and 6000 controllers only)
- ❑ Communication Products and PC Software
- ❑ Customer Connection (Decision-Maker® 550 controller only)
- ❑ Decision-Maker® Paralleling System (DPS)
  (Decision-Maker® 6000 controller only)
- ❑ Dry Contact (isolated alarm)
  (Decision-Maker® 550 and 6000 controllers only)
- ❑ Input/Output Module (Decision-Maker® 3000 controller only)
- ❑ Prime Power Switch (Decision-Maker® 550 and 6000 controllers)
- ❑ Remote Audiovisual Alarm Panel (Decision-Maker® 550 only)
- ❑ Remote Emergency Stop
- ❑ Remote Mounting Cable
- ❑ Remote Serial Annunciator Panel
- ❑ Run Relay

Cooling System

- ❑ Block Heater; 9000 W, 208 V, 1 Ph
- ❑ Block Heater; 9000 W, 240 V, (Select 1 Ph or 3 Ph)
- ❑ Block Heater; 9000 W, 380 V, 3 Ph
- ❑ Block Heater; 9000 W, 480 V, (Select 1 Ph or 3 Ph)
  Recommended for Ambient Temperatures Below 10°C (50°F)
- ❑ Remote Radiator Setup

Electrical System

- ❑ Alternator Strip Heater
- ❑ Battery
- ❑ Battery Charger, Equalize/Float Type
- ❑ Battery Heater
- ❑ Battery Rack and Cables
- ❑ Bus Bar
- ❑ Line Circuit Breaker (NEMA type 1 enclosure)
- ❑ Line Circuit Breaker with Shunt Trip (NEMA type 1 enclosure)

Paralleling System

- ❑ Manual Speed Adjustment
  (Decision-Maker® 3000 and 550 controllers only)
- ❑ Remote Voltage Adjustment Control
- ❑ Voltage Sensing (Decision-Maker® 6000 controller only)

Miscellaneous

- ❑ Air Cleaner, Heavy Duty
- ❑ Air Cleaner Restriction Indicator
- ❑ Engine Fluids (oil and coolant) Added
- ❑ Rated Power Factor Testing

Literature

- ❑ General Maintenance
- ❑ NFPA 110
- ❑ Overhaul
- ❑ Production

Warranty

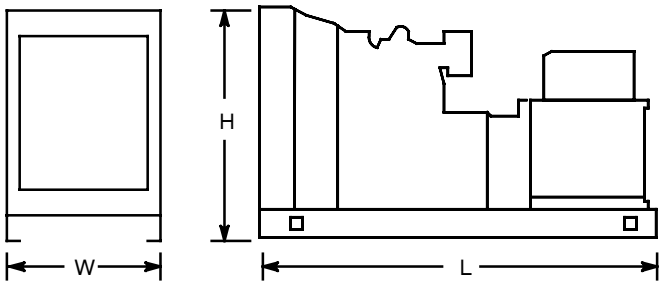
- ❑ 2-Year Basic
- ❑ 2-Year Prime
- ❑ 5-Year Basic
- ❑ 5-Year Comprehensive
- ❑ 10-Year Major Components

Other Options

- ❑ _____
- ❑ _____

Dimensions and Weights

Overall Size, max., L x W x H, mm (in.):	4749 x 1929 x 2364 (187.0 x 75.9 x 93.1)
Weight, radiator model, max. wet, kg (lb.):	6123 (13500)



NOTE: This drawing is provided for reference only and should not be used for planning installation. Contact your local distributor for more detailed information.

DISTRIBUTED BY:

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: Babcock & Wilcox Power Generation Group, Inc.	2. Model No. FM120-136 Serial No.
3. Number of units: 2	4. Use: Steam Generation
5. Rated Boiler Horsepower: 276.5 MMBtu/hr each hp	6. Boiler Serial No.:
7. Date constructed: January 2016	8. Date of last modification and explain: NA
9. Maximum design heat input per unit: 276.5 ×10^6 BTU/hr	10. Peak heat input per unit: 276.5 ×10^6 BTU/hr
11. Steam produced at maximum design output: 230,000 LB/hr 350 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: 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	215,343 ft^3/hr	ft^3/hr	TPH	
	Annually	$\times 10^3$ gal	0.215 $\times 10^6$ ft^3/hr	$\times 10^6$ 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	1284 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: Zeeco, Inc.

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	10.23			
Hydrocarbons				
NO_x	9.95			
Pb	0.00017			
PM_{10}	2.59			
SO_2	0.20			
VOCs	1.88			
Other (specify) PM2.5	2.59			

38. What quantities of pollutants will be emitted from the boiler after controls?

Pollutant	Pounds per Hour lb/hr	grain/ACF	@ °F	PSIA
CO	10.23			
Hydrocarbons				
NO_x	9.95			
Pb	0.00017			
PM_{10}	2.59			
SO_2	0.20			
VOCs	1.88			
Other (specify) PM2.5	2.59			

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.

2.2 DETAILS

2.2.1 BOILER

Item	Description	Units	Values
A. GENERAL			
1	B&W Boiler Model		FM120-136
2	Boiler Type		D-Type Watertube
3	Construction Type		Sshop Assembled
4	Design		
	A. Maximum Continuous Rating	lb/hr	230,000
	B. Maximum Allowable Working Pressure	psig	350
	C. Construction	ASME	Section 1, B31.1
	D. Maximum Heat Input	(10^6) Btu/hr	156.52
	E. Primary Fuel Fired		Natural Gas
5	Operating Conditions at Main Steam Stop Valve		
	A. Steam Flow	lb/hr	230,000
	B. Pressure	psig	300
	C. Temperature	°F	422 (SAT)
6	Furnace		
	A. Dimensions		
	i. Width	ft	6.80
	ii. Height	ft	10.31
	iii. Overall Length	ft	39.96
	iv. Length of Division Wall	ft	33.25
	B. Flat Projected Surface Area	ft^2	1,532
	C. Volume	ft^3	2,851
7	Generating Bank Surface Area	ft^2	8,555
8	Boiler Size & Weight		
	A. Dimensions		
	i. Width	ft	11.97
	ii. Height	ft	15.13
	iii. Length (not including windbox or heads)	ft	41.74
	B. Weight (estimated)		
	i. Dry	lb	208,650

Item	Description	Units	Values
1	Type		VFD
2	Manufacturer		ABB
3	Power	HP	600
4	Enclosure		NEMA 12
5	Amps	Amps	848
6	Voltage	V	460
7	Phase	Ph	3
8	Hertz	Hz	60

2.2.4 BURNER

Item	Description	Units	Values
A. GENERAL			
1	Burner Manufacturer		Zeeco, Inc.
2	Model		FreeJet
3	Number of Burners per Boiler		1
4	Natural Gas Firing per Burner		
	A. Heat Input	mmBtu/hr	276.5
	B. Turndown		10:1
	C. Pressure Required @ Train Inlet	psig	35 (Regulated)
	D. Excess Air @ MCR	%	~15
	E. Recycle Flue Gas Rate @ MCR	%	5
7	Fuel Train Construction		
	A. Insurance Guidelines		NFPA 85 for single burner
	B. Construction		ASME B31.3
8	Ignitor Specifications		
	A. Number per Boiler		1
	B. Type		Gas Electric
	C. Air Requirements	SCFH	1609
	D. Pressure @ Burner	psig	10
	E. Classification		Class 3 Special

2.2.5 BOILER / BURNER CONTROL SYSTEM

Item	Description	Units	Values
A. GENERAL			
1	Manufacturer		EDE
2	Remote BMS/CCS Panel Dimensions		
	A. Height	in.	72
	B. Width	in.	60
	C. Depth	in.	18
3	Local Operator Interface Panel Dimensions		
	D. Height	in.	36
	E. Width	in.	30
	F. Depth	in.	12
4	Panel Electrical Rating	NEMA	4X
5	Compliance		
	A. General Panel Specification	UL	508
	B. Applicable Codes	NFPA	70 / 85 2011ed.
6	Power to Enclosures	Vac	120
7	Communication		EtherNet
8	PLC Manufacturer		Allen-Bradley
9	PLC Model Number		CompactLogix L33ER
10	HMI Manufacturer		Allen-Bradley
11	HMI Model		PanelView
12	HMI Size	in.	12
13	HMI Software		FactoryTalk View ME

2.2.6 INSTRUMENTATION & FIELD DEVICES

Item	Description	Units	Values
A. GENERAL			
1	Steam Drum Press. Gauge Diameter	in.	8 ½
2	Process Pressure Gauge Diameter	in.	4 ½
3	Temperature Gauge Diameter	in.	5
4	Instrument Power	Vac	120

Item	Description	Units	Values
5	Instrument Air Pressure	psig	80-100
6	Transmitter Signal	mA	4-20
7	Limit Switches Included for Damper Actuators		Yes
8	Flow Element Types		Orifice Plate

2.2.7 ECONOMIZER

Item	Description	Units	Values
A. GENERAL			
1	Manufacturer		Applied Heat Recovery
2	Gas Flow Direction		Vertical Up
3	Water Flow Direction		Cross-Flow
4	Construction	ASME	Section I
5	Registration		NB
6	Economizer Box		
	A. Length	ft	22.00
	B. Height	ft	7.20
	C. Width	ft	6.25
	D. Duct Opening (L x W)	ft	19.00 x 5.25
	E. Dry Weight	lbs	41,975
	F. Flooded Weight	lbs	47,038
7	Economizer Tubes		
	A. Number of Tubes		196
	B. Diameter (OD)	in	2.00
	C. Thickness (MW)	in	0.105
	D. Material	ASME	SA-178A
	E. Finned or Bare Tubes		Finned
	F. Fin Density	fins/in	6
	G. Fin Thickness	in	0.05
	H. Fin Height	in	0.75
	I. Fin Material		Carbon Steel
	J. Fin Type		Serrated

Item	Description	Units	Values
	K. Tube Pitch (L x T)	in	4.5 x 4.5
8	Economizer Headers		
	A. Size	in	6
	B. Pipe Material	ASME	SA106B
	C. Connection Type		RFWN
	D. Connection Rating	ANSI	CL300
9	Economizer Construction		
	A. Inner Casing Thickness	ga	10
	B. Inner Casing Material		Carbon Steel
	C. Insulation Thickness	in	3
	D. Insulation Material		Mineral Fiber
	E. Outer Lagging Thickness	ga	30
	F. Outer Lagging Material		Corr. Steel
	G. Number of Wall Boxes for Sootblowers		0
10	Effective Heating Surface	ft^2	24,600
11	Fouling Factor (Tube / Shell)		0.001 / 0.001
12	Design Pressure	psig	450

2.2.8 STACK

Item	Description	Units	Values
A. GENERAL			
1	Manufacturer		Warren Environment
2	Free-Standing (FS) or Economizer Stub Stack (ES)		FS
3	Stack Height Above Grade	ft	50
4	Shell Diameter (Top / Bottom)	in	66
5	Shell Thickness	in	3/16
6	Shell Material		A36
7	False Bottom		Yes
8	Windload		
	A. Speed	mph	90
	B. Design Standard	ASCE	7-05

2.4 APPROVED MANUFACTURERS LIST

Description	Manufacturer	Comment
A. MAJOR EQUIPMENT		
Burners (Low NOx)	Zeeco, Inc.	Broken Arrow, OK
Economizers	Applied Heat Recovery	Fair Oaks Ranch, TX
Fans	Robinson Fans	Lakeland, FL
Steam Coil Air Preheaters	Aerofin, Super Radiator Coil	Vendor To Be Determined
Deaerator	Newterra	Trooper, PA
Control Systems	Electro Design Engineering	Bradenton, FL
BFW Pumps	Goulds	Supplied by D/A Vendor
B. BOILER VALVES		
2 ½" and smaller	Vogt	S/W or THD
2 ½" and Larger	Powell, Newco, Crane	Flanged or B/W
Non-Return	Edward	Flanged or B/W
Ball	Apollo	THD, S/W, or Flgd
Steam Trap	Armstrong	THD, S/W, or Flgd
Gage Glass Isolation	Clark-Reliance	THD
Safety Valve	Consolidated	1811
Pneumatic Control Valves	Fisher	667
C. WATER LEVEL		
Probe Type Water Column	Clark-Reliance	W0350-EA4
Gage Glass	Clark-Reliance	Prismatic Glass, C8
Aux. Low Water Cut-out	Clark-Reliance	Probe Type, EA101SW
D. INSTRUMENTATION		
Steam Gauge	Ashcroft	1010, 8 ½" Dia.
Pressure Transmitter	ABB, Foxboro, Siemens, Rosemount, Yokogawa	
Temperature Transmitter	ABB, Foxboro, Siemens, Rosemount, Yokogawa	
Oxygen Transmitter	Amitek (Thermox)	
Flame Scanner	Zeeco	ProFlame
Fan Actuators	Kinetrol	
E. FUEL TRAINS		
Pressure Gauges	Ashcroft or equal	

SECTION 4.0: SCHEDULE

Item	Description	Weeks ARO	
		Unit #1	Unit #2
1	Complete Material Calculations	2	
2	Order Long Lead Time Materials (Drums & Tubes)	2	
3	Receive Tubes	12	
4	Panels Ready for Installation	24	27
5	Receive Drums at Assembly Plant	24	27
6	Pressure Part Assembly Complete and Ready for Hydro Test	30	33
7	Inner Casing Installed and Ready for Air Test	32	35
8	Install Burner	32	35
9	Boiler Finish Paint & Ready to be Shipped	34	37

Notes:

1) Drums and tubes are ordered immediately following B&W's acceptance of a written purchase order and completion of calculations. Drums and tubes are long lead time items that are per B&W standard designs (as allowed by ASME Code) and are not subject to approval. If approval is required before purchase of long lead time items, the fabrication completion schedule will be based on the date approval is received.
2) Schedule above is based on a typical schedule during normal working hours on a best-effort basis. The actual fabrication schedule may differ depending on shop loads available at time of award, holidays, and material availability. In the event a fabrication schedule must be guaranteed, additional time will be added for "float" to account for unforeseen issues that may exist during fabrication and assembly. The boilers will be built in the fastest time available under normal working conditions and may be available earlier.

SECTION 5.0: PERFORMANCE

5.1 GENERAL PERFORMANCE

All performance data listed here are based on the conditions stated below, together with all conditions appearing in the Predicted Performance section of this proposal.

All performance data and conditions listed here, including the sheets listed above, are made a part of this Proposal.

It is recognized that the performance of the equipment covered in this Proposal cannot be exactly predicted for every possible operating condition. In consequence, any predicted performance data submitted are intended to show probable operating results.

CONDITIONS

Any performance curves submitted are for the PURCHASER'S convenience and the performance indicated thereon is not offered by the COMPANY, nor to be construed by the PURCHASER, as a Proposal or Contract obligation.

The general arrangement of equipment furnished by the COMPANY, and the general design and arrangement of related equipment furnished by others shall not be less favorable than indicated on the enclosed drawing(s).

The equipment shall have been erected in accordance with the COMPANY'S plans and specifications, properly maintained and operated by the PURCHASER, and shall be in operating condition satisfactory to the COMPANY. The heat absorbing surfaces shall be clean inside and out.

5.2 GUARANTEED PERFORMANCE CONDITIONS

1. **EXCESS AIR.** The excess air in gas leaving the furnace shall be determined by sampling uniformly across the width of the furnace. There shall be no delayed combustion beyond the furnace outlet.

2. **WATER.** The condition of the concentrated boiler water shall be such that the total alkalinity and total suspended solids do not exceed the respective amounts corresponding to the drum pressure as tabulated below:

Drum Pressure, PSIG	Total Solids Boiler Water, PM (MAX)	Total Alkalinity Boiler Water PPM	Suspended Solids Boiler Water PPM (MAX)	Max pH
0-300	3500-700	700-140	10	11.4
301-450	3000-600	600-120	8	11.4
451-600	2500-500	500-100	6	11.4
601-750	2000-400	400-80	4	11.2
751-900	1500-300	300-60	2	11.2
901-1000	1250-250	250-50	1	11.2

Maximum allowable boiler water solids concentration in the steam drum is given in the Guaranteed Performance portion of this Proposal. Chemicals used for internal treatment should be supplied to the boiler preferably through a separate boiler connection, used exclusively for that purpose, and in such a manner as to prevent deposits on drum internals which would interfere with proper operation.

Samples of water for testing shall be taken from the continuous blowdown, if installed, otherwise through a suitable located sampling pipe. Samples are taken through a cooling coil to prevent flashing. Sampling and determination of boiler water conditions shall be under the methods contained in Publication D-3370 of the American Society for Testing and Materials.

3. **RESPONSIBILITY.** The treatment of feedwater and the conditioning of boiler water are beyond the control of the COMPANY. Therefore, the COMPANY shall not be held responsible for the deterioration of performance caused by the presence of oil, grease, scale or deposits on the internal surfaces of the equipment; or, by the chemical conditions of the boiler water that results in foaming, corrosion or

caustic embrittlement. The COMPANY shall not be responsible for moisture carry-over with the steam resulting from the presence of oil, grease or other foam-inducing materials. B&W water treatment recommendations are available on request and are a part of the operating instructions furnished with the equipment.

4. **TEST PROCEDURES FOR SOLIDS IN STEAM.** Samples of condensed steam for determination of solids shall be obtained in accordance with the method specified in the latest edition of the "Method of Sampling Steam" (ASTM D-1066), published by the American Society for Testing and Materials.

There are two commonly accepted methods for the determination of solids in steam. These are:

4.1 Sodium tracer method for total solids

4.2 Gravimetric method for total solids.

The sodium tracer method is preferred. This method is outlined in ASTM Standard, Designation (ASTM D-2186) entitled "Standard Test Methods for Deposit-Forming Impurities in Steam". This method is the most applicable, sensitive, and repeatable measure of total solids in a condensed steam sample taken from an operating steam generator.

5. **PERFORMANCE TESTS.** Performance tests, if required, shall be run within 30 days after the PURCHASER shall have received notice from the COMPANY that the equipment furnished is ready for testing, it being understood that the COMPANY may require preliminary tests. Tests shall be conducted only on one representative unit mutually agreed upon by the PURCHASER and the COMPANY. The PURCHASER, at his own expense, shall make all preparations, furnish all operating and testing personnel and incur all expenses connected with such tests, and shall give to the COMPANY at least 15 days notice of the date or dates on which tests will be made.

The COMPANY'S representative shall have access to the records at all times, and the test shall be conducted in such a manner as to satisfy the COMPANY that the specified performance conditions are being maintained. A complete copy of the test data and results shall be furnished to the COMPANY.

The equipment shall be considered as accepted if tests show that the guarantees, if made, have been fulfilled, or if the PURCHASER shall fail to have said equipment tested within period mentioned. In case of failure to meet performance guarantees, the COMPANY reserves the right to change or replace the equipment furnished so that guaranteed performance will be obtained.

Performance tests, if required, and performance calculations shall be made in accordance with the applicable ASME Test Form for Abbreviated Efficiency Tests in the latest edition of the PTC 4.1 "Steam Generating Units-Power Test Code" of The American Society of Mechanical Engineers and the measure of performance shall be the results of such tests. Performance calculations shall be based on the ASME Steam Tables published in 1967. Performance tests for boiler efficiency shall be made on the basis of the Heat Loss Method.

6. **HYDROSTATIC PRESSURE TESTING.** The COMPANY'S standard test procedure requirements for the shop-assembled, pressure-fired package boiler prior to shop application of insulation and outer casing, is as follows:

The hydrostatic test shall be done after expanding the tubes in to the drums. The boiler hydro tests all steam/water pressure parts at 1-1/2 times the maximum allowable working pressure (MAWP). The hydro test pressure is held for fifteen minutes. The test pressure is then reduced to and held at the MAWP while visually inspecting all welding and the complete vessel.

7. **AIR PRESSURE TESTING.** The COMPANY'S standard test procedure requirements for the shop-assembled, pressure-fired package boiler prior to shop application of insulation and outer casing, is as follows:

   The inner casing of the shop-assembled water tube unit, which is normally operated under pressure, shall be shop tested pneumatically at 1-1/2 times the lowest design pressure of any part within the enclosure with a minimum of 10" WG and a maximum of 20" WG. Any leakage in the enclosure shall be located by soap-bubble test and rewelded where leakage occurs, regardless of the amount of leakage. When bottled up, the unit will be considered tight when the pressure drop from the test pressure does not exceed one inch of water in twenty minutes. Heat reclaiming apparatus shall be excluded from the test.

8. **NOISE LEVELS.** Since the site and other environmental conditions are both unknown and beyond the control of the COMPANY and relative locations of equipment not furnished by the COMPANY enter into noise level measurements, any noise level data submitted by the COMPANY or its vendors to the PURCHASER shall be considered informative only and shall not be construed as a warranty or guarantee that the equipment or any component thereof will, in service, comply with any noise level rules and regulations including those of OSHA and the Walsh-Healy Act.

   Cooperation between the PURCHASER, the PURCHASER'S engineers and the COMPANY in the arrangement of equipment will be utilized in the design stage in efforts to achieve compliance with noise level rules and regulations, provided that the contract price and schedule shall be subject to appropriate adjustment should equipment rearrangement be required.

5.3 GUARANTEED PERFORMANCE

Subject to the conditions in the preceding standard Performance Forms, together with those special conditions (if any) accompanying specific guarantees, the COMPANY makes the following guarantees:

5.3.1 BOILER PERFORMANCE

Based on the unit being fired with the specified Natural Gas, and on the other performance conditions shown in the Predicted Performance Section, at the capacity of 230,000 lbs/hr at 300 psig at the main steam stop valve outlet nozzle with a feedwater temperature of 227°F at the Economizer inlet:

1. The boiler will have a maximum normal capacity of 230,000 lbs/hr at 300 psig at the main steam stop valve outlet nozzle with a feedwater temperature of 227°F at the Economizer inlet.

2. The average solids content in the steam leaving the boiler will not exceed 3 ppm with a boiler water solids concentration of 3000 ppm.

3. Noise level - see statement in Performance Section of Proposal.

5.3.2 EFFICIENCY

Based on the unit being fired with the specified Natural Gas, and on the other performance conditions shown in the Predicted Performance Section, at the capacity of 230,000 lbs/hr at 300 psig at the main steam stop valve outlet nozzle with a feedwater temperature of 227°F at the Economizer inlet:

1. The efficiency of the unit will not be less than 84.33 percent. The following stipulations apply:

5.3.3 EMISSIONS

Based on the unit being fired with the specified Natural Gas, and on the other performance conditions shown in the Predicted Performance Section, at the capacity of 230,000 lbs/hr at 300 psig at the main steam stop valve outlet nozzle with a feedwater temperature of 227°F at the Economizer inlet, the COMPANY guarantees that the unit is capable of being operated to attain at the unit outlet, (provided the boiler and auxiliary equipment are operated according to the Company's recommendations:)

The following performance guarantees will be extended from twenty-five (25) to one hundred (100) percent of boiler load, provided that the system is operated at steady state conditions, in accordance with the Burner Design Basis and Predicted Performance:

- Maximum emission levels on natural gas, with all concentrations corrected to 3% oxygen, on a dry basis:

EMISSION	PPM	LB/MMBTU	LB/HR	Ton/yr
NOx	30	0.036	9.96	43.48
CO	50	0.037	10.23	44.69

Note: Ton/yr is based on a max heat input of 276.50 mmBtu/hr at 100% MCR, 24hr/day, 8,736 hr/yr

5.3.3 PERFORMANCE DISCLAIMER

All performance specifications stated throughout this proposal are intended to show probable operating results only which cannot be guaranteed except as expressly stated in the guarantees.

The test procedure for flue gas emissions shall be in general accordance with EPA reference test methods as published in the current (as of proposal date) Codes of Federal Regulations, Title 40, Part 60, Appendix A. Specifically the COMPANY shall use the following test method:

Parameter	EPA Reference Method
O2	M-3A
Particulate (PM10)	M-5
SO2	M-6
NOX	M-7 through M-7E
CO	M-10
Emissions Rate	M-19
UBHC	M-25A
VOC	M-25A

Additionally, heat input and volumetric flue gas flow rates, determined by EPA Method 2, shall be confirmed by heat and material balance in general accordance with the ASME Power Test Code 4.1.

INASMUCH AS OPERATION OF THE EQUIPMENT SUPPLIED HEREUNDER IS TO BE WITHIN THE CONTROL OF THE PURCHASER, AND COMPANY HAS EXCLUSIVELY SET OUT HEREIN ITS GUARANTEES, NO OTHER GUARANTEE, WARRANTY OR REPRESENTATION IS MADE OR TO BE IMPLIED THAT THE OPERATION OF EQUIPMENT TO BE SUPPLIED HEREUNDER WILL COMPLY WITH FEDERAL, STATE OR LOCAL LAWS OR REGULATIONS GOVERNING ENVIRONMENTAL IMPACT.

FURTHER, THE COMPANY AND THE PURCHASER AGREE THAT IN CONSIDERATION OF THE ABOVE EXPRESS PERFORMANCE GUARANTEES THAT ALL OTHER PERFORMANCE GUARANTEES EITHER EXPRESSED OR IMPLIED, WHETHER ARISING UNDER LAW OR EQUITY, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE EXCLUDED FROM THIS CONTRACT.

The Material and Workmanship Warranty is set forth in Babcock & Wilcox Power Generation Group, Inc. Terms of Sale.

Cooling Tower

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*): 28E

1. Name or type and model of proposed affected source: CT-2335 - Cooling Tower Basin. Tower model number: F448A40D.003A
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: Water: 34,500 gallons per minute = 2,070,000 gallons per hour.
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:

NA

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

NA

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

NA @ NA °F and NA psia.

(d) Percent excess air: NA

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

NA

(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:

NA

(g) Proposed maximum design heat input: NA $\times 10^6$ 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	lb/hr	0	grains/ACF
b.	SO_2	0	lb/hr	0	grains/ACF
c.	CO	0	lb/hr	0	grains/ACF
d.	PM_{10}	0.94	lb/hr		grains/ACF
e.	Hydrocarbons	0	lb/hr	0	grains/ACF
f.	VOCs	0	lb/hr	0	grains/ACF
g.	Pb	0	lb/hr	0	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

Table 1
Cooling Tower Make-up Water Quality

	Units	Average Concentration
Cations:		
Calcium	mg/L as Ca	25
Magnesium	mg/L as Mg	< 0.2
Sodium	mg/L	127
Potassium	mg/L	< 0.5
Barium	mg/L	< 0.5
Strontium	mg/L	< 0.5
Total Iron	mg/L	< 0.1
Ammonium	mg/L	3.7
Manganese	mg/L	< 0.1
Lithium	mg/L	< 0.5
Anions:		
Bicarbonate	mg/L	146
Carbonate	mg/L	0.3
Hydroxide	mg/L	0.0
Sulfate	mg/L	< 10
Bromide	mg/L	< 0.2
Chloride	mg/L	95
Nitrate	mg/L	133
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	545
Total Alkalinity	mg/L as $CaCO_3$	121
Total Suspended Solids	mg/L	< 25
Free Oil & Grease (> 20 µm)	mg/L	< 0.5

Table 2
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
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

DESIGN CONDITIONS:	Flow	34,500 gpm
	Hot Water	99.2 °F
	Cold Water	85 °F
	Wet Bulb	78 °F
	Plume Abatement	
TOWER DESCRIPTION:	Model	F448A40D3.003A
	Number of Cells	3
	Pump Head	21.59 ft
	Fan Diameter	14 ft
	Motor Size	3 @ 200 Hp
	Brake Horsepower	3 @ 199.5 BHp
	Evaporation	472 gpm
	Drift Rate	0.001 %
TOWER DIMENSION:	Tower Width	54 ft
	Tower Length	126 ft
	Tower Height	38.84 ft
	Fan Deck Height	25.09 ft
BASIN DIMENSION:	Basin Width	54 ft
	Basin Length	126 ft

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 Clarifier Tanks A & B
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) TK-1055A and TK-1055B	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 5E and 6E
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) NA	
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 each	
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. 528,768.5 gallons each	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
1,052,776,800 total for both	12,546,720 total for both

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

15. Maximum tank fill rate (gal/min) 8,713

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)	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				2,685.1	O, WATER9 (Combined Total of both tanks)
Ammonia				1,682.5	
Benzene				6.8	
3&4 Methylbenzene				0.012	
Cumene				0.14	
Ethylbenzene				0.36	
Phenol				0.00061	
Toluene				8.8	
Xylenes				2.5	
Carbon Dioxide				75,087	

[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*) 7E and 8E
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. 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)	13B. Maximum daily throughput (gal/day)
1,029,650,400 for both	12,373,920 for both

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume)
24,515 each

15. Maximum tank fill rate (gal/min) 8,593

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 Amount	Working Loss Units	Annual Loss (lb/yr)	Estimation Method[1]
VOCs as oil				335.7	O, WATER9 (Combined Total of both tanks)
Ammonia				9.2	
Benzene				3.5	
3&4 Methylbenzene				0.00020	
Cumene				0.22	
Ethylbenzene				0.36	
Phenol				0.000017	
Toluene				6.3	
Xylenes				4.1	
Carbon Dioxide				143,639	

[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*) 9E
5. Date of Commencement of Construction (for existing tanks)	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable)	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ No	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode).	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): None	

II. TANK INFORMATION (required)

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height. 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)
8,935,200	64,800

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 704

15. Maximum tank fill rate (gal/min): 45

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		Annual Loss (lb/yr)	Estimation Method[1]
		Amount	Units		
VOCs as oil	0.00075	0.021	Lb/hr	86.3	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*) 10E
5. Date of Commencement of Construction (for existing tanks)	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable)	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ No	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode).	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): None	

II. TANK INFORMATION (required)

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height. 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)
1,029,650,400	12,096,000

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 1,144

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 Amount	Working Loss Units	Annual Loss (lb/yr)	Estimation Method[1]
VOCs as oil				399.2	O, WATER9
Ammonia				11.1	
Benzene				4.2	
3&4 Methylbenzene				0.00058	
Cumene				0.27	
Ethylbenzene				0.45	
Phenol				0.000079	
Toluene				7.4	
Xylenes				4.9	
Carbon dioxide				137,591	

[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*) 11E
5. Date of Commencement of Construction (for existing tanks)	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable)	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ No	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode).	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): None	

II. TANK INFORMATION (required)

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height. 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. 409,478 gallons	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
1,081,159,200	3,412,800

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 2,640

15. Maximum tank fill rate (gal/min): 2,370

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				1,658.9	O, WATER9
Ammonia				673.4	
Benzene				3.61	
3&4 Methylbenzene				0.0047	
Cumene				0.062	
Ethylbenzene				0.173	
Phenol				0.00024	
Toluene				4.49	
Xylenes				1.02	
Carbon dioxide				32,225	

[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*) 12E
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. 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)
1,032,278,400	3,189,600

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 9137

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 Amount	Working Loss Units	Annual Loss (lb/yr)	Estimation Method[1]
VOCs				352.5	O, WATER9
Ammonia				8.7	
Benzene				0.68	
3&4 Methylbenzene				0.00016	
Cumene				0.0026	
Ethylbenzene				0.0088	
Phenol				0.000010	
Toluene				0.41	
Xylenes				0.10	
Carbon dioxide				81067	

[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*) 13E
5. Date of Commencement of Construction (for existing tanks)	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable)	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ No	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode).	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): None	

II. TANK INFORMATION (required)

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height. 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)	13B. Maximum daily throughput (gal/day)
96,710,400	561,600

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 1075

15. Maximum tank fill rate (gal/min): 390

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 Amount	Working Loss Units	Annual Loss (lb/yr)	Estimation Method[1]
VOCs				1,018.1	O, WATER9
Ammonia				177.2	
Benzene				3.09	
3&4 Methylbenzene				0.0015	
Cumene				0.032	
Ethylbenzene				0.091	
Phenol				0.000070	
Toluene				2.92	
Xylenes				0.16	
Carbon dioxide				11,938	

[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 Storage	2. Tank Name Sludge Filtrate Tank
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) TK-2030	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 14E
5. Date of Commencement of Construction (for existing tanks)	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable)	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ No	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode).	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): None	

II. TANK INFORMATION (required)

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height. 8,200 gallons	
9A. Tank Internal Diameter (ft) 10	9B. Tank Internal Height (or Length) (ft) 14
10A. Maximum Liquid Height (ft) 13	10B. Average Liquid Height (ft) 13
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. 7,500 gallons	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
82,519,200	302,400

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 11,003

15. Maximum tank fill rate (gal/min): 210

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): 5

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	Sludge Filtrate		
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				49.32	O, WATER9
Ammonia				16.17	
Benzene				0.37	
3&4 Methylbenzene				0.00014	
Cumene				0.0031	
Ethylbenzene				0.0084	
Phenol				0.0000071	
Toluene				0.30	
Xylenes				0.012	
Carbon dioxide				0.17	

[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*) 15E
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. 1,400,000 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)
1,032,278,400	3,189,600

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 832

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 Amount	Working Loss Units	Annual Loss (lb/yr)	Estimation Method[1]
VOCs				438.7	O, WATER9
Ammonia				10.98	
Benzene				0.91	
3&4 Methylbenzene				0.00054	
Cumene				0.0055	
Ethylbenzene				0.016	
Phenol				0.000058	
Toluene				0.56	
Xylenes				0.15	
Carbon dioxide				82874	

[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 Barometric Condenser Hotwell Tank
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) TK-2130	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 16E
5. Date of Commencement of Construction (for existing tanks)	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable)	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ No	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode).	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): None	

II. TANK INFORMATION (required)

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height. 107,000 gallons	
9A. Tank Internal Diameter (ft) 25	9B. Tank Internal Height (or Length) (ft) 29
10A. Maximum Liquid Height (ft) 27	10B. Average Liquid Height (ft) 19
11A. Maximum Vapor Space Height (ft) 2	11B. Average Vapor Space Height (ft) 10
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights. 100,000 gallons	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
11,126,952,000	33,533,280

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 111,270

15. Maximum tank fill rate (gal/min): 23,287

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)

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		Annual Loss (lb/yr)	Estimation Method[1]
		Amount	Units		
VOCs		3.5E-5	Lb/hr	0.31	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 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*) 17E
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. 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. 222,083 gallons	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
8,777,520	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 _ 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) 0.06

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		6.8E-8	Lb/hr	0.00060	EPA-TANKS 4.0.9d
Ammonia	7.5E-7	6.6E-6	Lb/hr	0.0108	
Benzene		4.5E-8	Lb/hr	0.00040	
Toluene		2.2E-8	Lb/hr	0.00020	

[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 Disposal Centrate Tank
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) TK-2160	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 18E
5. Date of Commencement of Construction (for existing tanks)	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable)	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ No	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode).	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): None	

II. TANK INFORMATION (required)

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height. 7,560 gallons	
9A. Tank Internal Diameter (ft) 12	9B. Tank Internal Height (or Length) (ft) 8.8
10A. Maximum Liquid Height (ft) 7.8	10B. Average Liquid Height (ft) 7.8
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. 6,600 gallons	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
372,124,800	1,120,320

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume)
56,383

15. Maximum tank fill rate (gal/min) 778

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 _X_ 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) 159	34B. Maximum (°F) 159
35. Average operating pressure range of tank:	
35A. Minimum (psig) atmospheric	35B. Maximum (psig) atmospheric
36A. Minimum Liquid Surface Temperature (°F) 159	36B. Corresponding Vapor Pressure (psia) 4.62
37A. Average Liquid Surface Temperature (°F) 159	37B. Corresponding Vapor Pressure (psia) 4.62
38A. Maximum Liquid Surface Temperature (°F) 159	38B. Corresponding Vapor Pressure (psia) 4.62

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	Centrate Fluids		
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				175.1	O, WATER9

[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 (19E)

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 178 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: $\times 10^6$ 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:

@ 199 °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		lb/hr	grains/ACF
g.	Pb		lb/hr	grains/ACF
h.	Specify other(s)			
	Ammonia	0.89	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

Post Treatment System Storage Tanks

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-2500 (21E)

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

   Post Treatment Tank 1. Open top process tank. 64 foot diameter by 32 foot height with 726,500 gallon working volume.

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:

   Post Treatment system influent water - maximum 8959.1 gallons per minute =537,546 gallons per hour. Average flow is 8190.4 gallons per minute = 491,424 gallons per hour.

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

   Effluent flow to the Post Treatment Tanks 2 and 3

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

   Ammonia and volatiles such as benzene are consumed and/or adsorbed onto biosolids. See Attachment G and N for more details on the reactions.

* 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	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:

@ 80-90 °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	1.18	lb/hr	grains/ACF
g.	Pb		lb/hr	grains/ACF
h.	Specify other(s)			
	Total HAPs	0.012	lb/hr	grains/ACF
	Ammonia	1.96	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-2550 and TK-2555 (22E and 23E)

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

Post Treatment Tanks 2 and 3. Open top aerated process tanks. Tank 2 is 64 foot diameter by 32 foot height with 726,500 gallon working volume. Tank 3 is 48 foot diameter by 30 foot height with 363,300 gallon working volume.

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:

Post Treatment Tank 1 Effluent - maximum 9002 gallons per minute =540,120 gallons per hour. Average flow is 8184 gallons per minute = 491,040 gallons per hour.

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

Effluent flow to the Post Treatment System downstream tanks

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	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:

@ 80-90 °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		lb/hr	grains/ACF
g.	Pb		lb/hr	grains/ACF
h.	Specify other(s)			
	Carbon dioxide	120.35	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
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 Post Treatment System	2. Tank Name Post Treatment Effluent Tank
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) TK-2515	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 24E
5. Date of Commencement of Construction (for existing tanks)	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable)	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ No	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode).	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): None	

II. TANK INFORMATION (required)

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height. 12,000 gallons	
9A. Tank Internal Diameter (ft) 12	9B. Tank Internal Height (or Length) (ft) 14
10A. Maximum Liquid Height (ft) 13	10B. Average Liquid Height (ft) 13
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. 10,000 gallons	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
1,049,623,200	3,163,680

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume)
104,962

15. Maximum tank fill rate (gal/min) 2,197

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): 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) 80	34B. Maximum (°F) 90
35. Average operating pressure range of tank:	
35A. Minimum (psig) atmospheric	35B. Maximum (psig) atmospheric
36A. Minimum Liquid Surface Temperature (°F) 80	36B. Corresponding Vapor Pressure (psia) 0.51
37A. Average Liquid Surface Temperature (°F) 85	37B. Corresponding Vapor Pressure (psia) 0.60
38A. Maximum Liquid Surface Temperature (°F) 90	38B. Corresponding Vapor Pressure (psia) 0.70

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	Post Treatment 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 Amount	Working Loss Units	Annual Loss (lb/yr)	Estimation Method[1]
VOC				6198.2	O-WATER9
Ammonia				11.32	
Benzene				1.00	
3&4 Methylbenzene				0.00006	
Toluene				1.91	
Xylene				1.25	
Carbon dioxide				7,620	

[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*): TK-2520 (25E)

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

   Post Treatment Sludge Tank. Mixed open top process tank. 6 foot diameter by 6 foot height with 750 gallon working volume.

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:

   Post Treatment sludge - maximum 70 gallons per minute =4200 gallons per hour. Average flow is 66 gallons per minute = 3930 gallons per hour.

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

   Recycles to Clarifier Tanks A and B.

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	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:

@ 80-90 °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	0.015	lb/hr	grains/ACF
g.	Pb		lb/hr	grains/ACF
h.	Specify other(s)			
	Total HAPs	0.00005	lb/hr	grains/ACF
	Ammonia	0.00089	lb/hr	grains/ACF
	Carbon dioxide	0.027	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 Thermal Process Area	2. Tank Name Process Distillate Level Tank
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) TK-2120	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 20E
5. Date of Commencement of Construction (for existing tanks)	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable)	
7A. Does the tank have more than one mode of operation? ☐ 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. 5575 gallons	
9A. Tank Internal Diameter (ft) 6	9B. Tank Internal Height (or Length) (ft) 26
10A. Maximum Liquid Height (ft)	10B. Average Liquid Height (ft)
11A. Maximum Vapor Space Height (ft)	11B. Average Vapor Space Height (ft)
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights. 5575 gallons	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
599,184,000	1,789,920

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 104,206

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): atmospheric

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. 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) 88	34B. Maximum (°F) 200
35. Average operating pressure range of tank:	
35A. Minimum (psig) atmospheric	35B. Maximum (psig) atmospheric
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]
Ammonia	0.0023	0.27	Lb/hr	2,359.58	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 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)	
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) 9.5	9B. Tank Internal Height (or Length) (ft) 15
10A. Maximum Liquid Height (ft) 14	10B. Average Liquid Height (ft) 7.5
11A. Maximum Vapor Space Height (ft) 1	11B. Average Vapor Space Height (ft) 7.5
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights. 7,423 gallons	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
267,180	1,840.8

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 36

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 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): 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	0.0072	0.031	lb/hr	281.01	EPA – TANKS 4.0.9d
Methanol	0.0072	0.031	lb/hr	281.01	

[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 Chemical Feed Storage	2. Tank Name Sulfuric Acid Bulk Storage Tank
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) TK-4180	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 27E
5. Date of Commencement of Construction (for existing tanks)	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable)	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ No	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode).	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): None	

II. TANK INFORMATION (required)

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height. 6,000 gallons	
9A. Tank Internal Diameter (ft) 8	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. 5,640 gallons	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
150,672	825.6

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 26.71

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 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): to

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

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

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

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

25A. Year Internal Floaters Installed:

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

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

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

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

25F. Describe deck fittings; indicate the number of each type of fitting:

ACCESS HATCH		
BOLT COVER, GASKETED:	UNBOLTED COVER, GASKETED:	UNBOLTED COVER, UNGASKETED:

AUTOMATIC GAUGE FLOAT WELL		
BOLT COVER, GASKETED:	UNBOLTED COVER, GASKETED:	UNBOLTED COVER, UNGASKETED:

COLUMN WELL		
BUILT-UP COLUMN – SLIDING COVER, GASKETED:	BUILT-UP COLUMN – SLIDING COVER, UNGASKETED:	PIPE COLUMN – FLEXIBLE FABRIC SLEEVE SEAL:

LADDER WELL	
PIP COLUMN – SLIDING COVER, GASKETED:	PIPE COLUMN – SLIDING COVER, UNGASKETED:

GAUGE-HATCH/SAMPLE PORT	
SLIDING COVER, GASKETED:	SLIDING COVER, UNGASKETED:

ROOF LEG OR HANGER WELL		
WEIGHTED MECHANICAL ACTUATION, GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	SAMPLE WELL-SLIT FABRIC SEAL (10% OPEN AREA)

VACUUM BREAKER	
WEIGHTED MECHANICAL ACTUATION, GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:

RIM VENT	
WEIGHTED MECHANICAL ACTUATION GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:

DECK DRAIN (3-INCH DIAMETER)	
OPEN:	90% CLOSED:

STUB DRAIN
1-INCH DIAMETER:

OTHER (DESCRIBE, ATTACH ADDITIONAL PAGES IF NECESSARY)

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

IV. SITE INFORMANTION (optional if providing TANKS Summary Sheets)

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

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

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

39. Provide the following for <u>each</u> liquid or gas to be stored in tank. Add additional pages if necessary.

39A. Material Name or Composition			
39B. CAS Number			
39C. Liquid Density (lb/gal)			
39D. Liquid Molecular Weight (lb/lb-mole)			
39E. Vapor Molecular Weight (lb/lb-mole)			

Maximum Vapor Pressure 39F. True (psia) 39G. Reid (psia)			
Months Storage per Year 39H. From 39I. To	 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]
Sulfuric Acid	0.0	0.0	lb/hr	0.0	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.

Bulk Loading and Fugitives

Attachment L
FUGITIVE EMISSIONS FROM UNPAVED HAULROADS

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

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

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

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

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

Where:

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

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

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

SUMMARY OF UNPAVED HAULROAD EMISSIONS

Item No.	PM				PM-10			
	Uncontrolled		Controlled		Uncontrolled		Controlled	
	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
1								
2								
3								
4								
5								
6								
7								
8								
TOTALS								

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 Wetcake Disposal Truck	40	0.38	3	21,900	NA	NA
4	Worker Vehicles	2	1.06	5	3,650	NA	NA
5							
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)	39.44

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	1.22	4.80	1.22	4.80
2	0.013	0.051	0.013	0.051
3	0.056	0.22	0.056	0.22
4	0.026	0.10	0.026	0.10
5				
6				
7				
8				
TOTALS	1.32	5.17	1.32	5.17

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*): P-1051	
1. Loading Area Name: Influent Water Unloading	
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:	16 – use electric truck pumps
Number of liquids loaded:	1 –Influent Water
Maximum number of marine vessels, tank trucks, tank cars, and/or drums loading at one time	Sixteen trucks could offload simultaneously.
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	N/A				
Liquid Name		Influent Water					
Max. daily throughput (1000 gal/day)		2,520					
Max. annual throughput (1000 gal/yr)		919,800					
Loading Method [1]		SUB					
Max. Fill Rate (gal/min)		8,400					
Average Fill Time (min/loading)		TBD					
Max. Bulk Liquid Temperature (^{o}F)		80					
True Vapor Pressure [2]		0.24					
Cargo Vessel Condition [3]		U					
Control Equipment or Method [4]		None					
Minimum control efficiency (%)		0					
Maximum Emission Rate	Loading (lb/hr)	31.32					
	Annual (lb/yr)	57,160					
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 Sludge Disposal into a dumpster before being trucked off site. Some emissions will volatilize before leaving the Facility.

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 - 33 gallons per minute = 1,980 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: $\times 10^6$ 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	4.82	lb/hr	grains/ACF
g.	Pb		lb/hr	grains/ACF
h.	Specify other(s)			
	Total HAPs	0.0038	lb/hr	grains/ACF
	Ammonia	0.22	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:

   Wetcake Disposal into a dumpster before being trucked off site. Some emissions will volatilize before leaving the Facility.

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:

   Wetcake - 1,365 cubic feet/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: $\times 10^6$ 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:

@ 159 °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	0.11	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*): TK-4046A, U-4047A, and U-4048A

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

   Dry lime system prior to the slurry tank. Contains a silo, bin discharger and bin feeder to feed dry lime into the slurry 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:

   Dry lime maximum hourly process rate is 600 lb/hr.

   Dry lime average process rate is 250 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}	0.65	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	0.18	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

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-4046B, U-4047B, and U-4048B

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

   Dry lime system prior to the slurry tank. Contains a silo, bin discharger and bin feeder to feed dry lime into the slurry 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:

   Dry lime maximum hourly process rate is 600 lb/hr.

   Dry lime average process rate is 250 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}	0.65	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	0.18	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

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-4011, U-4012, and U-4013

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

   Dry sodium bicarbonate system prior to the slurry tank. Contains a silo, bin discharger and bin feeder to feed dry sodium bicarbonate into the slurry 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:

   Sodium bicarbonate maximum hourly dry process rate is 25 lb/hr.

   Sodium bicarbonate average dry process rate is 11.7 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}	0.064	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	0.018	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

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-4036, U-4037, and U-4038

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

   Dry sodium sulfate system prior to the slurry tank. Contains a silo, bin discharger and bin feeder to feed dry sodium sulfate into the slurry 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:

   Sodium sulfate maximum hourly dry process rate is 120 lb/hr.

   Sodium sulfate average dry process rate is 49.5 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}	0.31	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	0.087	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

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 M.
Air Pollution Control Device Sheets

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. Custom designed (waste and natural gas)

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:
   38.94 scf/min
   2,336 scf/hr

6. Dimensions of stack:
   Diameter TBD ft.
   Height TBD 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: 3,000,000 BTU/hr

10. Will preheat be used? ☐ Yes ☒ No

11. Describe method of controlling flame:
    Unit is enclosed

12. Flare height: TBD ft

13. Flare tip inside diameter: TBD 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 19,260 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	110.36 lb/hr	Waste Gas Header
HAPs	0	1.22 lb/hr	Waste Gas Header
Ammonia	0	63.20 lb/hr	Waste Gas Header
Methane	0	94.49 lb/hr	Natural Gas

30. Estimate total combustible to flare: 2,336 acf/hr LB/hr or ACF/hr
(Maximum mass flow rate of waste gas) 38.94 scfm

31. Estimated total flow rate to flare including materials to be burned, carrier gases, auxiliary fuel, etc.:
2,336 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: 1,294 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: 38.94 scf/min
37. Flare gas heat content: 1,294 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.

Attachment N.
Supporting Emissions Calculations

Emission Calculations

Antero Resources Corporation Sandstrom Water Treatment Facility
General Emission Notes

1. In any of the emission models used (WATER9, TANKS 4.0.9d, or mass balance), if the concentration of a constituent is below the detection limit in the Material Balance Sheet, it was not added to the model as emissions are not quantifiable.
2. It was assumed that free oils, gasoline range organics and diesel range organics would all contribute to VOC emissions.
3. Annual emissions in tons per year were calculated using the average flows from the Material Balance Sheets, whereas hourly emissions in pounds per hour were calculated using the peak flows.
4. In some cases the actual tank dimensions was known and in other cases the working volume was known.
5. Material balance concentration data are from bench scale testing.

Antero Resources Corporation Sandstrom Water Treatment 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
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.
PRE-TREATMENT			
TK-1055A/TK-1055B	Clarifier Tanks A and B	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
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
TK-1070	Equalization Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 56' D x 56' H - 900,000 gallons workikng volume
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
TK-2010	Solids Clarifier Tank	WATER9. Add Material Balance Streams C, D, E, and F.	Covered and controlled by thermal oxidizer. 66' D x 17' H
TK-2015	Clarifier Effluent Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 12' D x 14' H - 10,000 gallons working volume
TK-2040	Thermal Feed Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 62' D x 62' H - 1,240,000 gallons working volume
TK-2020	Sludge Holding Tank	WATER9 program. Material Balance Streams 105 and 112.	Covered and controlled by thermal oxidizer. 26' D x 26' H - 90,000 gallons working volume. Mixed Tank
	Sludge Dewatering System	Based on mass balance of Material Balance Stream 114 vs 115 and 117, there are no emissions from the enclosed dewatering system. Emissions are calculated upon disposal however.	
TK-2030	Sludge Filtrate Tank	WATER9 program. Material Balance Stream 115.	Covered and controlled by thermal oxidizer. 10' D x 14' H - 7,500 gallons working volume. Mixed Tank
DISP1	Dewatered Sludge Disposal	Mass Balance of Stream 117 and assumed short term storage. 10% volatilize based on EPA-453/R-94-080A Section 9	

Antero Resources Corporation Sandstrom Water Treatment Facility
Equipment Summary and Emissions

THERMAL PROCESS SYSTEM			
	Thermal System	No emissions. Steam from the boiler is used as a heat source. Also contains heat exchangers.	
TK-2320	CIP Tank	Flat cover tank. No emissions. Contains mild acid solution for descaling (dilute hydrochloric or citric)	1,950 gallons
E-2076	Deaerator Vent Condenser	Mass Balance Stream 225	Vents to thermal oxidizer
TK-2085	Steam Condensate Level Tank	Incoming and outgoing streams show only water with no organics. No emissions.	4,800 gallons - non-pressurized bullet tank
TK-2180	Boiler Feedwater Tank	Only water with no organics. No emissions.	17.5' D x 17.5' H - 54,200 gallons
TK-2150	Brine Maker Tank	Based on surrounding material streams only water without organics. No emissions	
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
TK-2130	Barometric Condenser Hot Well	TANKS 4.0.9d Material Balance Stream 282/283	100,000 gallon tank working volume - Vents to thermal oxidizer
TK-2160	Disposal Centrate Tank	WATER9 program. Material Balance Stream 270.	Covered and vents to thermal oxidizer - 7,560 gallons Mixed tank
DISP2	Wet Cake Disposal	Mass Balance of Stream 274 and assumed short term storage. 10% volatilize based on EPA-453/R-94-080A Section 9	
TK-2140	Recovered Water Tank	TANKS 4.0.9d Material Balance Stream 161	230,000 gallons - Vents to thermal oxidizer
TK-2315	Boiler Deaerator Tank	Incoming stream shows only water and no organics. No emissions - pressurized.	Bullet type tank - 15 psi - 9,942 gallons
CT-2335	Cooling Tower Basin	AP-42 Chapter 13.4 and manufacturer data	Three fans
H-2185A/B	Boiler A/B	AP-42 Chapter 1.4 and manufacturer spec sheet	
U-4105/4110	Boiler Chemical Treatment A/B	DeMinimis Source #9 from 45CSR13 Table 45-13B - Boiler water treatment operations	

Antero Resources Corporation Sandstrom Water Treatment Facility
Equipment Summary and Emissions

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'
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
CF-2510	Post Treatment Package System	Mass Balance Streams 406. Open top tanks and mixed. See notes on emission tab	
TK-2515	Post Treatment Effulent Tank	Mass Balance Stream 407. WATER9	Closed top - 10,000 gal - 12' D x 14'
TK-2520	Post Treatment Sludge Tank	Mass Balance Stream 408 - Mixed tank. WATER9	Open top - 750 gal - 6' D x 6'
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
CHEMICAL FEED			
TK-4175	Clarifier Polymer Aging Tank	No emissions - Polymer contains no volatiles or other components of concern.	75 gallons - closed top, mixed tank
TK-4036	Sodium Sulfate Silo	AP-42 8.12 for Sodium Carbonate	90 ton - 2,200 ft^3
U-4037/U-4038	Sodium Sulfate Bin Discharger and Feeder	AP-42 8.12 for Sodium Carbonate	200-2000 lbs/hr
TK-4039	Sodium Sulfate Day Tank	Inorganic material and wet process - Insignificant emissions	1,500 gallons
TK-4046A/TK-4046B	Lime Silo A/B	AP-42 11.17	160 ton - 9,000 ft^3
TK-4049A/TK-4049B	Lime Slurry Premix Tank A/B	Inorganic material and wet process - Insignificant emissions	1,800 gallons
U-4047A/U-4047B	Lime Bin Discharger A/B	AP-42 11.17	1,500 - 8,000 lb/hr
TK-4049A/TK-4049B	Lime Slurry Tank A/B	Inorganic material and wet process - no emissions	15,000 gallons
TK-4160	Solids Clarifier Polymer System Aging Tank	Insignificant emissions - Polymer contains no volatiles or other components of concern.	Closed top - 75 gallons
TK-4165	Dewatering Polymer System Aging Tank	Insignificant emissions - Polymer contains no volatiles or other components of concern.	Closed top - 250 gallons
TK-4011	Sodium Bicarbonate Silo	AP-42 8.12 for Sodium Carbonate	
U-4012/U-4013	Sodium Bicarbonate Bin Discharger and Feeder	AP-42 8.12 for Sodium Carbonate	
TK-4014	Sodium Bicarbonate Day Tank	Mixed Tank - Inorganic material and wet process - no emissions	1,000 gallons
TK-4170	Post Treatment Polymer System Aging Tank	Insignificant emissions - Polymer contains no volatiles or other components of concern.	Closed top - 75 gallons

Antero Resources Corporation Sandstrom Water Treatment Facility
Equipment Summary and Emissions

U-4075	CO2 Feeder System	CO2 is pressurized and dissolved in water. No emissions from the feeder system due to pressurizing.	
TK-4000	Ferric Chloride Storage Tank	Inorganic material and wet process - Insignificant emissions	Closed top - 6,000 gallons
TK-4020	Caustic Bulk Storage Tank	Sodium hydroxide in dilute solution - Insignificant emissions	Closed top - 7,000 gallons
TK-4115	Methanol Bulk Storage Tank	TANKS 4.0.9	Closed top - 8,000 gallons
TK-4180	Sulfuric Acid Bulk Storage Tank	TANKS 4.0.9	Closed top - 6,000 gallons
TK-4025	Hydrogen Peroxide Tote	Insignificant emissions- small tank and inorganic	320 gallons
TK-4080	Sodium Bisulfite Tote	Insignificant emissions- small tank and inorganic	320 gallons
TK-4054/4057/4120 /4155	Polymer Totes	Insignificant emissions - Polymer contains no volatiles or other components of concern.	320 gallons
TK-4015	Antifoam Tote	Insignificant emissions - Antifoam contains no volatiles or other components of concern.	320 gallons
TK-4125	Phosphoric Acid Tote	Insignificant emissions - small tank, inogranic, stable liquid, low vapor pressure	320 gallons
TK-4150	Micronutrient Tote	Insignificant Emissions - Micro Stimulant blend of micronutrients, trace minerals, amio acids and vitamins	320 gallons
TK-4065	Urea Tote	Insignificant Emissions - small tank, insignificant volatility, 50/50 mix water and urea	320 gallons
TK-4185	Sodium Hypochlorite Tote	Insignificant emissions - small tank, inorganic material, < 15% solution	320 gallons
TK-4190	Hydrex 2126 Tote	Insignificant emissions - small tank, no constituents of concern	320 gallons
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 various processes.	
U-1080	Thermal Oxidizer	3 MMBtu/hr	Controls gas from waste gas header
GEN-1	Emergency Generator	EPA Tier 2 emission factors and AP-42	

Emissions Summary Total

Company:	**Antero Resources Corporation**
Facility Name:	**Sandstrom Water Treatment 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	12.64	3.16	6.84	1.71	0.0051	0.0013	0.096	0.024	0.39	0.099	0.39	0.099	0.011	0.0027	326
Boilers															
Boiler 1	9.95	43.60	10.23	44.81	1.88	8.22	0.20	0.90	2.59	11.36	2.59	11.36	0.41	1.78	142,160
Boiler 2	9.95	43.60	10.23	44.81	1.88	8.22	0.20	0.90	2.59	11.36	2.59	11.36	0.41	1.78	142,160
Thermal Oxidizer															
Oxidizer, Pilot and Waste Gas-controlled Process Tanks	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Truck Unloading															
Truck Unloading Influent Water	---	---	---	---	31.32	28.58	---	---	---	---	---	---	0.23	0.21	21
Cooling Tower															
Cooling Tower	---	---	---	---	---	---	---	---	0.94	4.12	0.94	4.12	---	---	---
Tanks															
Process Tanks	---	---	---	---	112.34	187.88	---	---	---	---	---	---	1.22	1.79	765
Storage Tanks	---	---	---	---	0.038	0.14	---	---	---	---	---	---	0.038	0.14	---
Fugitive Emissions															
Sludge and Wetcake Disposal	---	---	---	---	4.93	21.60	---	---	---	---	---	---	0.0038	0.017	0.00001
Bulk Transfer Points	---	---	---	---	---	---	---	---	1.67	0.30	0.47	0.08	---	---	---
Fugitive Dust Emissions	---	---	---	---	---	---	---	---	1.32	5.17	0.32	1.27	---	---	---
Facility PTE =	**32.54**	**90.36**	**27.31**	**91.33**	**152.39**	**254.64**	**0.51**	**1.82**	**9.51**	**32.41**	**7.32**	**28.29**	**2.31**	**5.71**	**285,432**

Emissions Summary Total

Company:	**Antero Resources Corporation**
Facility Name:	**Sandstrom Water Treatment 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	12.64	3.16	6.84	1.71	0.0051	0.0013	0.096	0.024	0.39	0.099	0.39	0.099	0.011	0.0027	326
Boilers															
Boiler 1	9.95	43.60	10.23	44.81	1.88	8.22	0.20	0.90	2.59	11.36	2.59	11.36	0.41	1.78	142,160
Boiler 2	9.95	43.60	10.23	44.81	1.88	8.22	0.20	0.90	2.59	11.36	2.59	11.36	0.41	1.78	142,160
Thermal Oxidizer															
Oxidizer, Pilot and Waste Gas-controlled Process Tanks	1.08	4.50	0.93	4.08	2.21	3.60	1.13E-05	4.96E-05	1.44E-04	6.29E-04	1.44E-04	6.29E-04	0.024	0.035	1825
Truck Unloading															
Truck Unloading Influent Water	---	---	---	---	31.32	28.58	---	---	---	---	---	---	0.23	0.21	21
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	---	---	---	---	0.038	0.14	---	---	---	---	---	---	0.038	0.14	---
Fugitive Emissions															
Sludge and Wetcake Disposal	---	---	---	---	4.93	21.60	---	---	---	---	---	---	0.0038	0.017	0.00001
Bulk Transfer Points	---	---	---	---	---	---	---	---	1.67	0.30	0.47	0.08	---	---	---
Fugitive Dust Emissions	---	---	---	---	---	---	---	---	1.32	5.17	0.32	1.27	---	---	---
Facility PTE =	**33.62**	**94.86**	**28.24**	**95.41**	**44.23**	**78.26**	**0.51**	**1.82**	**9.51**	**32.41**	**7.32**	**28.29**	**1.13**	**4.01**	**286,974**

Emissions Summary Total

Company:	**Antero Resources Corporation**
Facility Name:	**Sandstrom Water Treatment Facility**
Facility Location:	**Doddridge County, WV**

SPECIATED HAPS UNCONTROLLED POTENTIAL EMISSION SUMMARY

Source	BENZENE		TOLUENE		ETHYLBENZENE		XYLENES		FORMALDEHYDE		n-HEXANE		CUMENE		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	lb/hr	tpy
Engines																		
Emergency Generator	0.0062	0.00154	0.0022	0.00056	---	---	0.0015	0.000383	0.00063	0.000157	---	---	---	---	---	---	---	---
Boilers																		
Boiler 1	0.00045	0.0020	0.00073	0.0032	---	---	---	---	0.016	0.071	0.39	1.70	---	---	---	---	---	---
Boiler 2	0.00045	0.0020	0.00073	0.0032	---	---	---	---	0.016	0.071	0.39	1.70	---	---	---	---	---	---
Thermal Oxidizer																		
Oxidizer, Pilot and Waste Gas-controlled Process Tanks	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Truck Unloading																		
Truck Unloading Influent Water	0.063	0.057	0.099	0.090	0.0049	0.0044	0.060	0.055	---	---	---	---	0.0021	0.0019	---	---	---	---
Cooling Tower																		
Cooling Tower	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Tanks																		
Process Tanks	0.38	0.59	0.54	0.80	0.027	0.038	0.26	0.34	---	---	---	---	0.015	0.019	---	---	65.17	268.39
Storage Tanks	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0.038	0.14	0.29	1.18
Fugitive Emissions																		
Sludge and Wetcake Disposal	9.60E-04	4.20E-03	1.52E-03	6.64E-03	7.44E-05	3.26E-04	9.25E-04	4.05E-03	---	---	---	---	3.14E-05	1.38E-04	---	---	0.22	0.97
Bulk Transfer Points	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Fugitive Dust Emissions	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Facility PTE =	**0.45**	**0.66**	**0.64**	**0.91**	**0.032**	**0.042**	**0.32**	**0.40**	**0.033**	**0.14**	**0.78**	**3.40**	**0.018**	**0.021**	**0.038**	**0.14**	**65.7**	**270.5**

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

Emissions Summary Total

Company:	**Antero Resources Corporation**
Facility Name:	**Sandstrom Water Treatment Facility**
Facility Location:	**Doddridge County, WV**

SPECIATED HAPS CONTROLLED POTENTIAL EMISSION SUMMARY

Source	BENZENE		TOLUENE		ETHYLBENZENE		XYLENES		FORMALDEHYDE		n-HEXANE		CUMENE		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	lb/hr	tpy
Engines																		
Emergency Generator	0.0062	0.00154	0.0022	0.00056	---	---	0.0015	0.00038	0.00063	0.00016	---	---	---	---	---	---	---	---
Boilers																		
Boiler 1	0.00045	0.0020	0.00073	0.0032	---	---	---	---	0.016	0.071	0.39	1.70	---	---	---	---	---	---
Boiler 2	0.00045	0.0020	0.00073	0.0032	---	---	---	---	0.016	0.071	0.39	1.70	---	---	---	---	---	---
Thermal Oxidizer																		
Oxidizer, Pilot and Waste Gas-controlled Process Tanks	7.53E-03	1.16E-02	1.06E-02	1.56E-02	5.34E-04	7.36E-04	5.14E-03	6.48E-03	1.42E-06	6.20E-06	3.40E-05	1.49E-04	3.06E-04	3.65E-04	---	---	1.26	5.21
Truck Unloading																		
Truck Unloading Influent Water	0.063	0.057	0.099	0.090	0.0049	0.0044	0.060	0.055	---	---	---	---	0.0021	0.0019	---	---	---	---
Cooling Tower																		
Cooling Tower	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Tanks																		
Process Tanks	0.0033	0.013	0.0052	0.021	0.00022	0.00090	0.0031	0.012	---	---	---	---	0.00011	0.00044	---	---	2.0	7.9
Storage Tanks	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0.038	0.14	0.29	1.18
Fugitive Emissions																		
Sludge and Wetcake Disposal	9.60E-04	4.20E-03	1.52E-03	6.64E-03	7.44E-05	3.26E-04	9.25E-04	4.05E-03	---	---	---	---	3.14E-05	1.38E-04	---	---	0.22	0.97
Bulk Transfer Points	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Fugitive Dust Emissions	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Facility PTE =	**0.082**	**0.092**	**0.12**	**0.14**	**0.0057**	**0.0064**	**0.071**	**0.078**	**0.033**	**0.14**	**0.78**	**3.40**	**0.0025**	**0.0028**	**0.038**	**0.14**	**3.7**	**15.2**

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

Emergency Generator Emission Calculations

Company:	**Antero Resources Corporation**
Facility Name:	**Sandstrom Water Treatment Facility**
Facility Location:	**Doddridge County, WV**
Source Description:	**Emergency Generator**
Emission Unit ID:	**GEN-1**

Source Information - Per Engine

Make/Model	MTU/Detroit Diesel 12V2000 G85	
Generator Rating	825	kWe
Horsepower at Rated kW	1,194	bhp
Fuel Consumption	58	gallons/hr
Heating Value[1]	7.95	MMBtu/hr
Density of Fuel	7.10	lb/gal
Fuel Heating Value	19,300	Btu/lb
Operating Hours[2]	500	hrs/yr

Notes:

1) Calculated

2) Generator will be used for emergency purposes only with 500 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		Estimated Emissions			Source of Emissions Factors
	(lb/MMBtu)	(g/bhp-hr)	(lb/hr)	(lb/yr)	(tpy)	
NOx	---	4.80	12.64	---	3.16	EPA Tier 2 Nonroad Diesel Engine Emission Factor
CO	---	2.60	6.84	---	1.71	EPA Tier 2 Nonroad Diesel Engine Emission Factor
VOC	6.42E-04	---	0.0051	---	0.0013	AP-42, Chapter 3.4, Table 3.4-1; footnote f
SO_2	1.21E-02	---	0.096	---	0.024	AP-42, Chapter 3.4, Table 3.4-1; 15 ppm sulfur
PM_{10}	---	0.15	0.39	---	0.099	EPA Tier 2 Nonroad Diesel Engine Emission Factor
$PM_{2.5}$	---	0.15	0.39	---	0.099	EPA Tier 2 Nonroad Diesel Engine Emission Factor
Acetaldehyde	2.52E-05	---	2.00E-04	0.10	5.01E-05	AP-42, Chapter 3.4, Table 3.4-3
Acrolein	7.88E-06	---	6.26E-05	0.03	1.57E-05	AP-42, Chapter 3.4, Table 3.4-3
Benzene	7.76E-04	---	6.17E-03	3.08	1.54E-03	AP-42, Chapter 3.4, Table 3.4-3
Formaldehyde	7.89E-05	---	6.27E-04	0.31	1.57E-04	AP-42, Chapter 3.4, Table 3.4-3
Toluene	2.81E-04	---	2.23E-03	1.12	5.58E-04	AP-42, Chapter 3.4, Table 3.4-3
Xylenes	1.93E-04	---	1.53E-03	0.77	3.83E-04	AP-42, Chapter 3.4, Table 3.4-3
Total HAPS			0.011	5.41	0.0027	

Pollutant	Emission Factor	Estimated Emissions			Source of Emissions Factors
	(kg/MMBtu)	(lb/hr)		(tpy)	
CO_2	73.96	1299	---	324.8	40 CFR Part 98, Subpart C, Table C-1
CH_4	0.003	0.053	---	0.013	40 CFR Part 98, Subpart C, Table C-2
N_2O	0.0006	0.011	---	0.0026	40 CFR Part 98, Subpart C, Table C-2
CO_2e	---	1,304	---	325.9	40 CFR Part 98, Subpart A, Table A-1

Natural Gas Fired Boiler Emissions

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

Source Information

Source Description:	Boiler	
Hours of Operation	8,760	hr/yr
Design Heat Rate	276.5	MMBtu/hr
Fuel Heat Value[1]	1,284	Btu/scf
Fuel Use	1886.4	MMscf/yr

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

Potential Emissions per Boiler

Pollutant	Emission Factor (lb/MMBtu)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
NO_X	0.036	9.95	43.60	Manufacturer Spec Sheet
CO	0.037	10.23	44.81	Manufacturer Spec Sheet
Pollutant	**Emission Factor (lb/MMscf)**	**Emissions (lb/hr)**	**Emissions (tpy)**	**Emission Factor Source**
VOC	5.5	1.88	8.22	AP-42 Ch. 1.4 Table 1.4-2
PM_{10}	7.6	2.59	11.36	AP-42 Ch. 1.4 Table 1.4-2 (Total)
$PM_{2.5}$	7.6	2.59	11.36	AP-42 Ch. 1.4 Table 1.4-2 (Total)
SO_2	0.6	0.20	0.90	AP-42 Ch. 1.4 Table 1.4-2
Lead	0.0005	0.00017	0.00075	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	0.00045	0.0020	AP-42 Ch. 1.4 Table 1.4-3
Dichlorobenzene	1.20E-03	0.00026	0.0011	AP-42 Ch. 1.4 Table 1.4-3
Formaldehyde	7.50E-02	0.016	0.071	AP-42 Ch. 1.4 Table 1.4-3
n-Hexane	1.80E+00	0.39	1.70	AP-42 Ch. 1.4 Table 1.4-3
Naphthalene	6.10E-04	0.00013	0.00058	AP-42 Ch. 1.4 Table 1.4-3
Toluene	3.40E-03	0.00073	0.0032	AP-42 Ch. 1.4 Table 1.4-3
Other HAPs	7.38E-05	0.000016	0.000070	AP-42 Ch. 1.4 Table 1.4-3-sum of minor HAPs
Total HAPs	1.88E+00	0.41	1.78	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	32,423	142,013	40 CFR Part 98, Subpart C, Table C-1
Methane	0.001	0.61	2.68	40 CFR Part 98, Subpart C, Table C-2
Nitrous Oxide	0.0001	0.061	0.27	40 CFR Part 98, Subpart C, Table C-2
CO_2e	----	32,457	142,160	40 CFR Part 98, Subpart A, Table A-1

Thermal Oxidizer Combustion Emissions

Company:	**Antero Resources Corporation**
Facility Name:	**Sandstrom Water Treatment 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] :	3.00	MMBtu/hr
Gas Heating Value[2]:	1,284	Btu/scf
Hours of Operation:	8,760	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	0.20	0.89
Carbon Monoxide (CO)	0.31	0.93	4.07

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

[2] Methane with a heating value of 1284 Btu/hr will be added to the thermal oxidizer to assist in combustion

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

NOx Emissions from Combusting Ammonia

$NOx = NH3 \times (MW_{NOx}/MW_{NH3}) \times 0.005$ where the 0.5% conversion rate is referenced from TCEQ RG-109 guidance on flares

NH3 emissions are referenced from the Waste Gas Header emissions page

Pollutant	Emissions (lbs/hr)	Emissions (tons/yr)
Nitrogen Oxides (NO_x)	0.87	3.60

Pilot Emissions

Pilot Heating Value:	1,284	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	1.44E-04	6.29E-04
Nitrogen Oxides (NO_x)	100	1.89E-03	8.27E-03
Sulfur Dioxide (SO_2)	0.6	1.13E-05	4.96E-05
Carbon Monoxide (CO)	84	1.59E-03	6.95E-03
Volatile Organic Compounds (VOC)	5.5	1.04E-04	4.55E-04
Benzene	2.10E-03	3.97E-08	1.74E-07
Toluene	3.40E-03	6.42E-08	2.81E-07
Formaldehyde	7.50E-02	1.42E-06	6.20E-06
n-Hexane	1.80E+00	3.40E-05	1.49E-04
Total HAPs[4,5]	1.88	3.55E-05	1.55E-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 Combustor Emissions

Pollutant	Total Potential Emission Rate (lbs/hr)	Total Potential Emission Rate (tons/year)
Particulate Matter ($PM/PM_{10}/PM_{2.5}$)	1.44E-04	6.29E-04
Nitrogen Oxides (NO_x)	1.08	4.50
Sulfur Dioxide (SO_2)	1.13E-05	4.96E-05
Carbon Monoxide (CO)	0.93	4.08
Volatile Organic Compounds (VOC)	1.04E-04	4.55E-04
Total HAPs	3.55E-05	1.55E-04

Greenhouse Gas Emissions

Pollutant	Emission Factor (kg/MMBtu)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
Carbon Dioxide	53.06	351.8	1,541	40 CFR Part 98, Subpart C, Table C-1
Methane	0.001	0.007	0.029	40 CFR Part 98, Subpart C, Table C-2
Nitrous Oxide	0.0001	0.0007	0.0029	40 CFR Part 98, Subpart C, Table C-2
CO_2e	----	352.2	1,542	40 CFR Part 98, Subpart A, Table A-1

Truck Unloading Emissions

Company:	**Antero Resources Corporation**
Facility Name:	**Sandstrom Water Treatment 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) = $\dfrac{L_L \text{ (lbs VOC/1000 gal)} * 42 \text{ gal/bbl} * 365 \text{ days/year} * \text{production (bbl/day)}}{1000 \text{ gal} * 2000 \text{ lbs/ton}}$

Source	S[1]	P (psia)[2]	M[3]	T (ºF)[4]	T (ºR)	L_L (lb/1000 gal)	Unloading (bbl/day)	VOC (tpy)	Benzene (tpy)	Toluene (tpy)	E-benzene (tpy)	Xylenes (tpy)	Cumene (tpy)	CO2e (tpy)
Influent Water	0.6	0.24	18	60	519.67	0.062	60,000	28.58	0.057	0.090	0.0044	0.055	0.0019	20.94

Source	S[1]	P (psia)[2]	M[3]	T (ºF)[4]	T (ºR)	L_L (lb/1000 gal)	Unloading bbl/hr	VOC (lb/hr)	Benzene (lb/hr)	Toluene (lb/hr)	E-benzene (lb/hr)	Xylenes (lb/hr)	Cumene (lb/hr)	CO2e (lb/hr)
Influent Water	0.6	0.24	18	60	519.67	0.062	12,000	31.32	0.063	0.099	0.0049	0.060	0.0021	22.95

Notes:
1. Saturation factor from AP-42, Table 5.2-1 (Submerged loading (bottom loading): dedicated normal service).
2. True vapor pressure is that of water at 60F.
3. Molecular weight liquid vapor is estimated assuming water.
4. Temperature based on the annual average temperature data for influent water (Material Balance Stream 101).
5. HAPs and CO2e calculated using influent water concentrations (Material Balance Stream 101).
6. Short term loading assumes the maximum rate of 8400 gallons per minute when all 16 bays are used.

Cooling Tower Emissions

Company:	**Antero Resources Corporation**
Facility Name:	**Sandstrom Water Treatment 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 Resources Corporation**
Facility Name:	**Sandstrom Water Treatment Facility**
Facility Location:	**Doddridge County, WV**
Source Description:	**Tanks going to the Waste Gas Header**

Uncontrolled Emissions

Pollutant	TK-1055A/B		TK-1060A/B		TK-1070		TK-2010		TK-2015		TK-2040		TK-1065	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
VOCs as oil	41.21	67.13	8.31	8.39	8.67	9.98	26.09	41.47	8.46	8.81	8.95	10.97	1.09	2.16
Ammonia	11.72	42.06	0.24	0.23	0.25	0.28	4.65	16.84	0.23	0.22	0.25	0.27	----	----
Benzene	0.089	0.17	0.091	0.088	0.092	0.10	0.045	0.090	0.017	0.017	0.019	0.023	----	----
3&4 Methylbenzene	0.00007	0.00031	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	----	----
Cumene	0.0015	0.0034	0.0065	0.0054	0.0064	0.0068	0.0006	0.0015	0.0001	0.0001	0.0001	0.0001	----	----
Ethylbenzene	0.0039	0.0090	0.0099	0.0090	0.0101	0.0113	0.0017	0.0043	0.0002	0.0002	0.0003	0.0004	----	----
Phenol	3.5E-06	1.5E-05	4.0E-07	4.3E-07	7.6E-07	2.0E-06	1.3E-06	5.9E-06	2.2E-07	2.4E-07	5.0E-07	1.5E-06	----	----
Toluene	0.11	0.22	0.17	0.16	0.17	0.19	0.050	0.11	0.010	0.010	0.011	0.014	----	----
Xylene	0.019	0.063	0.11	0.10	0.11	0.12	0.0070	0.026	0.0025	0.0026	0.0028	0.0038	----	----
Manganese	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Selenium	----	----	----	----	----	----	----	----	----	----	----	----	----	----
TOTAL HAPs	0.22	0.47	0.39	0.36	0.39	0.43	0.10	0.23	0.030	0.030	0.033	0.041	----	----
Carbon Dioxide	22.70	37.54	73.55	71.82	63.60	68.80	9.52	16.11	43.42	40.53	38.95	41.44	----	----

Pre-Thermal Oxidizer

Pollutant	TK-2020		TK-2030		TK-2160		E-2076		TK-2130		TK-2140		TOTALS	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
VOCs as oil	6.21	25.45	0.28	1.23	1.10	4.38	----	----	0.0020	0.0078	3.4E-06	1.5E-05	110.36	179.98
Ammonia	1.06	4.43	0.093	0.40	----	----	44.70	195.79	----	----	0.00037	0.00027	63.20	260.52
Benzene	0.022	0.077	0.0021	0.0092	----	----	----	----	----	----	2.3E-06	1.0E-05	0.38	0.58
3&4 Methylbenzene	8.3E-06	3.6E-05	8.2E-07	3.6E-06	----	----	----	----	----	----	----	----	1.3E-04	5.0E-04
Cumene	1.9E-04	7.9E-04	1.8E-05	7.7E-05	----	----	----	----	----	----	----	----	0.015	0.018
Ethylbenzene	0.00056	0.0023	0.000048	0.0002093	----	----	----	----	----	----	----	----	0.027	0.037
Phenol	4.0E-07	1.7E-06	4.1E-08	1.8E-07	----	----	----	----	----	----	----	----	7.2E-06	2.7E-05
Toluene	0.019	0.073	0.0017	0.0075	----	----	----	----	----	----	1.1E-06	5.0E-06	0.53	0.78
Xylene	0.00090	0.0039	0.000068	0.00030	----	----	----	----	----	----	----	----	0.26	0.32
Manganese	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Selenium	----	----	----	----	----	----	----	----	----	----	----	----	----	----
TOTAL HAPs	0.043	0.16	0.0040	0.017	----	----	----	----	----	----	3.4E-06	1.5E-05	1.21	1.74
Carbon Dioxide	2.02	5.97	2.0E-05	8.4E-05	----	----	----	----	----	----	----	----	253.76	282.21

Waste Gas Header Emission Sources

Company:	**Antero Resources Corporation**
Facility Name:	**Sandstrom Water Treatment Facility**
Facility Location:	**Doddridge County, WV**
Source Description:	**Tanks going to the Waste Gas Header**

Controlled Emissions

Pollutant	TK-1055A/B		TK-1060A/B		TK-1070		TK-2010		TK-2015		TK-2040		TK-1065	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
VOCs as oil	0.82	1.34	0.17	0.17	0.17	0.20	0.52	0.83	0.17	0.18	0.18	0.22	0.022	0.043
Ammonia	0.23	0.84	0.0048	0.0046	0.0050	0.0055	0.093	0.34	0.0047	0.0044	0.0050	0.0055	----	----
Benzene	1.8E-03	3.4E-03	1.8E-03	1.8E-03	1.8E-03	2.1E-03	9.0E-04	1.8E-03	3.5E-04	3.4E-04	3.7E-04	4.5E-04	----	----
3&4 Methylbenzene	1.4E-06	6.1E-06	9.7E-08	1.0E-07	1.4E-07	2.9E-07	5.4E-07	2.4E-06	7.8E-08	8.1E-08	1.2E-07	2.7E-07	----	----
Cumene	2.9E-05	6.9E-05	1.3E-04	1.1E-04	1.3E-04	1.4E-04	1.2E-05	3.1E-05	1.3E-06	1.3E-06	1.6E-06	2.8E-06	----	----
Ethylbenzene	7.8E-05	1.8E-04	2.0E-04	1.8E-04	2.0E-04	2.3E-04	3.4E-05	8.7E-05	4.4E-06	4.4E-06	5.3E-06	8.0E-06	----	----
Phenol	7.0E-08	3.0E-07	8.0E-09	8.7E-09	1.5E-08	4.0E-08	2.7E-08	1.2E-07	4.4E-09	4.8E-09	1.0E-08	2.9E-08	----	----
Toluene	2.1E-03	4.4E-03	3.3E-03	3.2E-03	3.3E-03	3.7E-03	1.0E-03	2.2E-03	2.1E-04	2.0E-04	2.2E-04	2.8E-04	----	----
Xylene	3.7E-04	1.3E-03	2.2E-03	2.1E-03	2.3E-03	2.4E-03	1.4E-04	5.1E-04	5.1E-05	5.1E-05	5.7E-05	7.7E-05	----	----
Manganese	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Selenium	----	----	----	----	----	----	----	----	----	----	----	----	----	----
TOTAL HAPs	0.0044	0.0093	0.0077	0.0073	0.0078	0.0086	0.0021	0.0047	0.00061	0.00060	0.00066	0.00082	----	----
Carbon Dioxide	22.70	37.54	73.55	71.82	63.60	68.80	9.52	16.11	43.42	40.53	38.95	41.44	----	----

Post-Thermal Oxidizer

Pollutant	TK-2020		TK-2030		TK-2160		E-2076		TK-2130		TK-2140		TOTALS	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
VOCs as oil	0.12	0.51	0.0057	0.025	0.022	0.088	----	----	3.9E-05	1.6E-04	6.8E-08	3.0E-07	2.21	3.60
Ammonia	0.021	0.089	0.0019	0.0081	----	----	0.89	3.92	----	----	7.4E-06	5.4E-06	1.26	5.21
Benzene	4.4E-04	1.5E-03	4.2E-05	1.8E-04	----	----	----	----	----	----	4.6E-08	2.0E-07	7.5E-03	1.2E-02
3&4 Methylbenzene	1.7E-07	7.3E-07	1.6E-08	7.2E-08	----	----	----	----	----	----	----	----	2.6E-06	1.0E-05
Cumene	3.9E-06	1.6E-05	3.5E-07	1.5E-06	----	----	----	----	----	----	----	----	3.1E-04	3.7E-04
Ethylbenzene	1.1E-05	4.5E-05	9.6E-07	4.2E-06	----	----	----	----	----	----	----	----	5.3E-04	7.4E-04
Phenol	8.0E-09	3.5E-08	8.2E-10	3.6E-09	----	----	----	----	----	----	----	----	1.4E-07	5.4E-07
Toluene	3.8E-04	1.5E-03	3.4E-05	1.5E-04	----	----	----	----	----	----	2.3E-08	1.0E-07	1.1E-02	1.6E-02
Xylene	1.8E-05	7.8E-05	1.4E-06	5.9E-06	----	----	----	----	----	----	----	----	5.1E-03	6.5E-03
Manganese	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Selenium	----	----	----	----	----	----	----	----	----	----	----	----	----	----
TOTAL HAPs	0.00086	0.0031	0.00008	0.00035	----	----	----	----	----	----	6.8E-08	3.0E-07	0.024	0.035
Carbon Dioxide	2.02	5.97	2.0E-05	8.4E-05	----	----	----	----	----	----	----	----	253.76	282.21

Waste Gas Header Emission Sources

Company:	**Antero Resources Corporation**
Facility Name:	**Sandstrom Water Treatment Facility**
Facility Location:	**Doddridge County, WV**
Source Description:	**Tanks going to the Waste Gas Header**

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, TK-2130, 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-2130 and TK-2140 emissions were calculated using Stream 283 and Stream 161 respectively and TANKS 4.0.9d.
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. Influent streams into TK-2020 is 105 and 112.
6. Influent stream into TK-2030 is 115.
7. Influent stream into TK-2160 is 270.
8. Metal HAPs are shown for completeness but stay in solution so there are no air emissions
9. Only those compounds above the detection limit are shown as otherwise emissions are not quantifiable.

Post Treatment System Tanks

Company:	**Antero Resources Corporation**
Facility Name:	**Sandstrom Water Treatment 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	0.01	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 Resources Corporation**
Facility Name:	**Sandstrom Water Treatment 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 as shown by the Material Balance Streams.
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.

Sludge and Wetcake Disposal Emissions

Company:	**Antero Resources Corporation**	
Facility Name:	**Sandstrom Water Treatment Facility**	
Facility Location:	**Doddridge County, WV**	
Source Description:	**Sludge and Wetcake Disposal Emissions**	
Emission Unit ID:	**DISP 1 and DISP 2**	

	Dewatered Sludge Disposal			Wetcake Disposal		
	7495	L/hr Average		38611	L/hr Average	
	In	Emissions[2,4]		In	Emissions[3,4]	
	mg/L	(lb/hr)	(tpy)	mg/L	(lb/hr)	(tpy)
VOCs	2917.00	4.82	21.11	13.00	0.11	0.48
Ammonia	134.00	0.22	0.97	----	----	----
Benzene	0.581	9.6E-04	4.2E-03	----	----	----
3&4 Methylbenzene	0.188	3.1E-04	1.4E-03	----	----	----
Cumene	0.0190	3.1E-05	1.4E-04	----	----	----
Ethylbenzene	0.045	7.4E-05	3.3E-04	----	----	----
Phenol	0.0180	3.0E-05	1.3E-04	----	----	----
Toluene	0.92	1.5E-03	6.6E-03	----	----	----
Xylene	0.560	9.3E-04	4.1E-03	----	----	----
TOTAL HAPs	2.329	0.0038	0.017	----	----	----
Carbon Dioxide [3]	0.002	0.000003	0.00001	----	----	----

Notes

1. Based on Material Balance Streams 114 (influent to dewatering system) vs 115 and 117 (effluent from dewatering system), there is no volatilization in the enclosed dewatering system.
2. Influent Streams for dewatered sludge is 117.
3. Influent Stream for Wetcake disposal is 274.
4. Waste is transferred to dumpsters to be taken to a landfill. Based on short term dumpster 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%. The dumpsters will be filled on location fast enough that the storage should be short term.

Atmospheric Storage Tank Working and Breathing Emissions

Company:	**Antero Resources Corporation**
Facility Name:	**Sandstrom Water Treatment Facility**
Facility Location:	**Doddridge County, WV**
Source Description:	**Atmospheric Storage Tanks**
Emission Unit IDs:	**TK-2120, TK-4115, and TK-4180**

TANK DESCRIPTION	Peak Flow (gph)	Avg Flow (gph)	VOCs		Methanol		Sulfuric Acid		Ammonia	
			(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
Process Distillate Level Tank (TK-2120)	74580	68400	-----	-----	-----	-----	-----	-----	0.29	1.18
Methanol Bulk Storage Tank (TK-4115)	76.7	30.5	0.038	0.14	0.038	0.14	-----	-----	-----	-----
Sulfuric Acid Bulk Storage Tank (TK-4180)	34.4	17.2	-----	-----	-----	-----	0.00	0.00	-----	-----
TOTAL			**0.038**	**0.14**	**0.038**	**0.14**	**0.00**	**0.00**	**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.
5. Throughput is not enough to show emissions in TANKS 4.0.9d.

Process Feeder System Particulate Matter Emissions

Company:	**Antero Resources Corporation**
Facility Name:	**Sandstrom Water Treatment 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

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	0.06	0.10	0.02	0.029	0.01	AP-42 Table 8.12-3 for Sodium Carbonate
U-4037	Sodium Sulfate Bin Discharger5	5.2	lb/ton product	0.31	0.06	0.10	0.02	0.029	0.01	AP-42 Table 8.12-3 for Sodium Carbonate
U-4038	Sodium Sulfate Bin Feeder5	5.2	lb/ton product	0.31	0.06	0.10	0.02	0.029	0.01	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:	**0.17**	ton/yr	**0.06**	ton/yr	**0.02**	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 Resources Corporation**
Facility Name:	**Sandstrom Water Treatment 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	0.12	0.22	0.04	0.061	0.01	AP-42 Table 11.17-4 for Lime Processing
U-4047A	Lime Bin Discharger A[5]	2.2	lb/ton product	0.66	0.12	0.22	0.04	0.061	0.01	AP-42 Table 11.17-4 for Lime Processing
U-4048A	Lime Bin Feeder A[5]	2.2	lb/ton product	0.66	0.12	0.22	0.04	0.061	0.01	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:	**0.36**	ton/yr	**0.12**	ton/yr	**0.03**	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	0.12	0.22	0.04	0.061	0.01	AP-42 Table 11.17-4 for Lime Processing
U-4047B	Lime Bin Discharger B[5]	2.2	lb/ton product	0.66	0.12	0.22	0.04	0.061	0.01	AP-42 Table 11.17-4 for Lime Processing
U-4048B	Lime Bin Feeder B[5]	2.2	lb/ton product	0.66	0.12	0.22	0.04	0.061	0.01	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:	**0.36**	ton/yr	**0.12**	ton/yr	**0.03**	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 Resources Corporation**
Facility Name:	**Sandstrom Water Treatment 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-4011	Sodium Bicarbonate Silo[5]	5.2	lb/ton product	0.065	0.01	0.021	0.002	0.0060	0.001	AP-42 Table 8.12-3 for Sodium Carbonate
U-4012	Sodium Bicarbonate Bin Discharger[5]	5.2	lb/ton product	0.065	0.01	0.021	0.002	0.0060	0.001	AP-42 Table 8.12-3 for Sodium Carbonate
U-4013	Sodium Bicarbonate Volumentric Feeder[5]	5.2	lb/ton product	0.065	0.01	0.021	0.002	0.0060	0.001	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:	**0.02**	ton/yr	**0.01**	ton/yr	**0.002**	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.

Fugitive Dust Emissions

Company:	**Antero Resources Corporation**
Facility Name:	**Sandstrom Water Treatment 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
Chemical Delivery Trucks	40	1,825	5	5,600	1.06	1,936
Sludge/Wetcake Trucks	40	21,900	60	2,000	0.38	8,295
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	**39.44**
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)
0.059	22	-----	1.32	-----
0.053	-----	196,602	-----	5.17

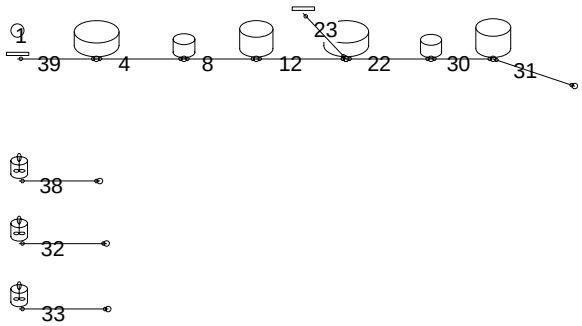
$PM_{2.5}$ Emissions

Emission Factor	Vehicle miles traveled		PM_{10} Emissions	
(lb/VMT)	(VMT/hr)	(VMT/yr)	(lb/hr)	(tons/yr)
0.014	22	-----	0.32	-----
0.013	-----	196,602	-----	1.27

Table Notes:

1. Truck weights are assumed to be empty on one leg and loaded on the other. Trucks are either 100 bbl or 5000 gallon.
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 wetcake disposal trucks are based on 203 gallons per minute of waste and 5,000 gallon trucks. Worker vehicles are based on 2 shifts per day with a maximum of 5 workers per shift.
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



No.	Name	Type	flow (l/s)
4	TK1055AB	circular clarifier	126.4
8	TK1060A	storage tank	126.4
12	TK1070	storage tank	126.4
22	TK2010	circular clarifier	133.1
23	StreamCDEF	hard piped, no headspace	6.7
30	TK2015	storage tank	133.1
31	TK2040	storage tank	133.1
32	TK2030	mix tank	9.905
33	TK2160	mix tank	44.67
38	TK2020	mix tank	11.6
39	Influent to TK1055	hard piped, no headspace	126.4

SPECIFIED UNIT PROPERTIES 07-06-2015

Project C:\WATER9\SandstromWTF_2 07:19:56

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

1 103 Total water added at the unit (l/s)	1	def.
2 104 Area of openings at unit (cm2)		0
3 105 Radius of drop pipe (cm)		0
4 106 Drop length to conduit (cm)		0
5 191 Humidity of inlet air (%)		0
6 124 Temperature of air (C)		0
7 125 Drain air velocity (ft/min)		0
8 126 manhole air velocity (ft/min)		0
9 127 Conduit air velocity (ft/min)		0
10 1 Wind speed (cm/s at 10 m)		0
11 111 distance to next unit (cm)		0
12 112 slope of underflow conduit		0
13 128 friction factor liquid		0
14 129 friction factor gas		0
15 110 radius of underflow conduit (cm)		0
16 102 Underflow T (C)		0
17 236 oscillation cycle time (min)		0
18 237 design collection velocities (ft/s)		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

1 103 Total water added at the unit (l/s)	2	def.
2 104 Area of openings at unit (cm2)		0
3 105 Radius of drop pipe (cm)		0

SPECIFIED UNIT PROPERTIES 07-06-2015

Project C:\WATER9\SandstromWTF_2 07:19:56

4	106	Drop length to conduit (cm)	0
5	191	Humidity of inlet air (%)	0
6	124	Temperature of air (C)	0
7	125	Drain air velocity (ft/min)	0
8	126	manhole air velocity (ft/min)	0
9	127	Conduit air velocity (ft/min)	0
10	1	Wind speed (cm/s at 10 m)	0
11	111	distance to next unit (cm)	0
12	112	slope of underflow conduit	0
13	128	friction factor liquid	0
14	129	friction factor gas	0
15	110	radius of underflow conduit (cm)	0
16	102	Underflow T (C)	0
17	236	oscillation cycle time (min)	0
18	237	design collection velocities (ft/s)	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

1	103	Total water added at the unit (l/s)	3 def.
2	104	Area of openings at unit (cm2)	0
3	105	Radius of drop pipe (cm)	0
4	106	Drop length to conduit (cm)	0
5	191	Humidity of inlet air (%)	0
6	124	Temperature of air (C)	0
7	125	Drain air velocity (ft/min)	0
8	126	manhole air velocity (ft/min)	0
9	127	Conduit air velocity (ft/min)	0
10	1	Wind speed (cm/s at 10 m)	0
11	111	distance to next unit (cm)	0
12	112	slope of underflow conduit	0
13	128	friction factor liquid	0
14	129	friction factor gas	0
15	110	radius of underflow conduit (cm)	0
16	102	Underflow T (C)	0
17	236	oscillation cycle time (min)	0
18	237	design collection velocities (ft/s)	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	4 TK1055AB
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

SPECIFIED UNIT PROPERTIES 07-06-2015

Project C:\WATER9\SandstromWTF_2 07:19:56

7 13 clarifier weir/circumference 0.5
8 364 Center well present, =1 0
10 366 number of identical units in parallel 2
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
1 103 Total water added at the unit (l/s) 5 def.
2 104 Area of openings at unit (cm2) 0
3 105 Radius of drop pipe (cm) 0
4 106 Drop length to conduit (cm) 0
5 191 Humidity of inlet air (%) 0
6 124 Temperature of air (C) 0
7 125 Drain air velocity (ft/min) 0
8 126 manhole air velocity (ft/min) 0
9 127 Conduit air velocity (ft/min) 0
10 1 Wind speed (cm/s at 10 m) 0
11 111 distance to next unit (cm) 0
12 112 slope of underflow conduit 0
13 128 friction factor liquid 0
14 129 friction factor gas 0
15 110 radius of underflow conduit (cm) 0
16 102 Underflow T (C) 0
17 236 oscillation cycle time (min) 0
18 237 design collection velocities (ft/s) 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
1 103 Total water added at the unit (l/s) 6 def.
2 104 Area of openings at unit (cm2) 0
3 105 Radius of drop pipe (cm) 0
4 106 Drop length to conduit (cm) 0
5 191 Humidity of inlet air (%) 0
6 124 Temperature of air (C) 0
7 125 Drain air velocity (ft/min) 0
8 126 manhole air velocity (ft/min) 0
9 127 Conduit air velocity (ft/min) 0
10 1 Wind speed (cm/s at 10 m) 0
11 111 distance to next unit (cm) 0
12 112 slope of underflow conduit 0
13 128 friction factor liquid 0
14 129 friction factor gas 0
15 110 radius of underflow conduit (cm) 0
16 102 Underflow T (C) 0
17 236 oscillation cycle time (min) 0
18 237 design collection velocities (ft/s) 0

SPECIFIED UNIT PROPERTIES 07-06-2015

Project C:\WATER9\SandstromWTF_2 07:19:56

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
1 103 Total water added at the unit (l/s) 7 def.
2 104 Area of openings at unit (cm2) 0
3 105 Radius of drop pipe (cm) 0
4 106 Drop length to conduit (cm) 0
5 191 Humidity of inlet air (%) 0
6 124 Temperature of air (C) 0
7 125 Drain air velocity (ft/min) 0
8 126 manhole air velocity (ft/min) 0
9 127 Conduit air velocity (ft/min) 0
10 1 Wind speed (cm/s at 10 m) 0
11 111 distance to next unit (cm) 0
12 112 slope of underflow conduit 0
13 128 friction factor liquid 0
14 129 friction factor gas 0
15 110 radius of underflow conduit (cm) 0
16 102 Underflow T (C) 0
17 236 oscillation cycle time (min) 0
18 237 design collection velocities (ft/s) 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 storage tank
1 101 Description of unit 8 TK1060A
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) 0.3048
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
1 103 Total water added at the unit (l/s) 9 def.
2 104 Area of openings at unit (cm2) 0
3 105 Radius of drop pipe (cm) 0

SPECIFIED UNIT PROPERTIES 07-06-2015

Project C:\WATER9\SandstromWTF_2 07:19:56

7	125 Drain air velocity (ft/min)	0
8	126 manhole air velocity (ft/min)	0
9	127 Conduit air velocity (ft/min)	0
10	1 Wind speed (cm/s at 10 m)	0
11	111 distance to next unit (cm)	0
12	112 slope of underflow conduit	0
13	128 friction factor liquid	0
14	129 friction factor gas	0
15	110 radius of underflow conduit (cm)	0
16	102 Underflow T (C)	0
17	236 oscillation cycle time (min)	0
18	237 design collection velocities (ft/s)	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 storage tank

1	101 Description of unit	12TK1070
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
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

1	103 Total water added at the unit (l/s)	13def.
2	104 Area of openings at unit (cm2)	0
3	105 Radius of drop pipe (cm)	0
4	106 Drop length to conduit (cm)	0
5	191 Humidity of inlet air (%)	0
6	124 Temperature of air (C)	0
7	125 Drain air velocity (ft/min)	0
8	126 manhole air velocity (ft/min)	0
9	127 Conduit air velocity (ft/min)	0
10	1 Wind speed (cm/s at 10 m)	0
11	111 distance to next unit (cm)	0
12	112 slope of underflow conduit	0
13	128 friction factor liquid	0
14	129 friction factor gas	0

SPECIFIED UNIT PROPERTIES 07-06-2015

Project C:\WATER9\SandstromWTF_2 07:19:56

1	103	Total water added at the unit (l/s)	20def.
2	104	Area of openings at unit (cm2)	0
3	105	Radius of drop pipe (cm)	0
4	106	Drop length to conduit (cm)	0
5	191	Humidity of inlet air (%)	0
6	124	Temperature of air (C)	0
7	125	Drain air velocity (ft/min)	0
8	126	manhole air velocity (ft/min)	0
9	127	Conduit air velocity (ft/min)	0
10	1	Wind speed (cm/s at 10 m)	0
11	111	distance to next unit (cm)	0
12	112	slope of underflow conduit	0
13	128	friction factor liquid	0
14	129	friction factor gas	0
15	110	radius of underflow conduit (cm)	0
16	102	Underflow T (C)	0
17	236	oscillation cycle time (min)	0
18	237	design collection velocities (ft/s)	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

1	103	Total water added at the unit (l/s)	21def.
2	104	Area of openings at unit (cm2)	0
3	105	Radius of drop pipe (cm)	0
4	106	Drop length to conduit (cm)	0
5	191	Humidity of inlet air (%)	0
6	124	Temperature of air (C)	0
7	125	Drain air velocity (ft/min)	0
8	126	manhole air velocity (ft/min)	0
9	127	Conduit air velocity (ft/min)	0
10	1	Wind speed (cm/s at 10 m)	0
11	111	distance to next unit (cm)	0
12	112	slope of underflow conduit	0
13	128	friction factor liquid	0
14	129	friction factor gas	0
15	110	radius of underflow conduit (cm)	0
16	102	Underflow T (C)	0
17	236	oscillation cycle time (min)	0
18	237	design collection velocities (ft/s)	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	22TK2010
2	2	Wastewater temperature (C)	25
3	35	secondary clarifier diameter (m)	20.117

SPECIFIED UNIT PROPERTIES 07-06-2015

Project C:\WATER9\SandstromWTF_2 07:19:56

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 hard piped, no headspace

1	101	Description of unit	23StreamCDEF
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 0
waste 2 added to system at unit 2
waste 3 added to system at unit 0

Type of unit is

1	103	Total water added at the unit (l/s)	24def.
2	104	Area of openings at unit (cm2)	0
3	105	Radius of drop pipe (cm)	0
4	106	Drop length to conduit (cm)	0
5	191	Humidity of inlet air (%)	0
6	124	Temperature of air (C)	0
7	125	Drain air velocity (ft/min)	0
8	126	manhole air velocity (ft/min)	0
9	127	Conduit air velocity (ft/min)	0
10	1	Wind speed (cm/s at 10 m)	0
11	111	distance to next unit (cm)	0
12	112	slope of underflow conduit	0
13	128	friction factor liquid	0
14	129	friction factor gas	0
15	110	radius of underflow conduit (cm)	0
16	102	Underflow T (C)	0
17	236	oscillation cycle time (min)	0
18	237	design collection velocities (ft/s)	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

1	103	Total water added at the unit (l/s)	25def.

SPECIFIED UNIT PROPERTIES 07-06-2015

Project C:\WATER9\SandstromWTF_2 07:19:56

8 126 manhole air velocity (ft/min) 0
9 127 Conduit air velocity (ft/min) 0
10 1 Wind speed (cm/s at 10 m) 0
11 111 distance to next unit (cm) 0
12 112 slope of underflow conduit 0
13 128 friction factor liquid 0
14 129 friction factor gas 0
15 110 radius of underflow conduit (cm) 0
16 102 Underflow T (C) 0
17 236 oscillation cycle time (min) 0
18 237 design collection velocities (ft/s) 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 storage tank
1 101 Description of unit 30TK2015
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) 0.3048
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 31TK2040
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
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

SPECIFIED UNIT PROPERTIES 07-06-2015

Project C:\WATER9\SandstromWTF_2 07:19:56

waste 3 added to system at unit 0

Type of unit is mix tank

1	101	Description of unit	32TK2030
2	2	Wastewater temperature (C)	25
3	37	length of unit (m)	2.68224
4	59	width of unit (m)	2.68224
5	38	depth of unit (m)	4.2672
6	29	Area of agitation (each aerator,m2)	4.38
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 5
waste 3 added to system at unit 0

Type of unit is mix tank

1	101	Description of unit	33TK2160
2	2	Wastewater temperature (C)	25
3	37	length of unit (m)	3.23088
4	59	width of unit (m)	3.23088
5	38	depth of unit (m)	2.71272
6	29	Area of agitation (each aerator,m2)	6.3
7	30	Total number of agitators in the unit	1
8	31	Power of agitation (each aerator,HP)	25
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 6

Type of unit is

1	103	Total water added at the unit (l/s)	34def.
2	104	Area of openings at unit (cm2)	0
3	105	Radius of drop pipe (cm)	0
4	106	Drop length to conduit (cm)	0
5	191	Humidity of inlet air (%)	0
6	124	Temperature of air (C)	0
7	125	Drain air velocity (ft/min)	0
8	126	manhole air velocity (ft/min)	0

SPECIFIED UNIT PROPERTIES 07-06-2015

Project C:\WATER9\SandstromWTF_2 07:19:56

12	112	slope of underflow conduit	0
13	128	friction factor liquid	0
14	129	friction factor gas	0
15	110	radius of underflow conduit (cm)	0
16	102	Underflow T (C)	0
17	236	oscillation cycle time (min)	0
18	237	design collection velocities (ft/s)	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

1	103	Total water added at the unit (l/s)	37def.
2	104	Area of openings at unit (cm2)	0
3	105	Radius of drop pipe (cm)	0
4	106	Drop length to conduit (cm)	0
5	191	Humidity of inlet air (%)	0
6	124	Temperature of air (C)	0
7	125	Drain air velocity (ft/min)	0
8	126	manhole air velocity (ft/min)	0
9	127	Conduit air velocity (ft/min)	0
10	1	Wind speed (cm/s at 10 m)	0
11	111	distance to next unit (cm)	0
12	112	slope of underflow conduit	0
13	128	friction factor liquid	0
14	129	friction factor gas	0
15	110	radius of underflow conduit (cm)	0
16	102	Underflow T (C)	0
17	236	oscillation cycle time (min)	0
18	237	design collection velocities (ft/s)	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	38TK2020
2	2	Wastewater temperature (C)	25
3	37	length of unit (m)	7.0104
4	59	width of unit (m)	7.0104
5	38	depth of unit (m)	7.9248
6	29	Area of agitation (each aerator,m2)	29.4
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

SPECIFIED UNIT PROPERTIES 07-06-2015

Project C:\WATER9\SandstromWTF_2 07:19:56

waste 1 added to system at unit		0	
waste 2 added to system at unit		4	
waste 3 added to system at unit		0	

Type of unit is hard piped, no headspace

1	101	Description of unit	39Influent 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	

SUMMARY FOR EMISSIONS AT 4 TK1055AB circular clarifier
7/6/2015 7:22

COMPOUND NAME		conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *		1.31E+02	0.07325	0	1.21E+02	1.21E+00
BENZENE		5.71E-01	0.0676	0	5.32E-01	4.88E-03
CHLOROFORM		3.79E+01	0.06827	0	3.53E+01	3.27E-01
CHROMIUM (TOTAL) *		4.00E-02	0.08138	0	3.67E-02	4.12E-04
1 HYDROXY 3 METHYLBENZEN	cr esol)	1.84E-01	0.00038	0	1.84E-01	8.82E-06
CUMENE (isopropylbenzene)		1.80E-02	0.04333	0	1.72E-02	9.86E-05
ETHYLBENZENE		4.40E-02	0.04668	0	4.20E-02	2.60E-04
OIL (decane as surrogate)		2.76E+02	0.05535	0	2.61E+02	1.93E+00
PHENOL		1.80E-02	0.00019	0	1.80E-02	4.39E-07
TOLUENE		9.01E-01	0.05549	0	8.51E-01	6.32E-03
XYLENE		5.49E-01	0.02631	0	5.35E-01	1.83E-03
CARBON DIOXIDE		1.08E+02	0.07939	0	9.94E+01	1.08E+00
MANGANESE		0.00E+00	0	0	0.00E+00	0.00E+00
ANTIMONY		0.00E+00	0	0	0.00E+00	0.00E+00
ARSENIC		0.00E+00	0	0	0.00E+00	0.00E+00
BERYLLIUM		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						4.57E+00

SUMMARY FOR EMISSIONS AT 8 TK1060A storage t ank
7/6/2015 7:22

COMPOUND NAME		conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *		1.21E+02	0.00043	0	1.21E+02	6.62E-03
BENZENE		5.32E-01	0.03789	0	5.12E-01	2.55E-03
CHLOROFORM		3.53E+01	0.03302	0	3.42E+01	1.47E-01
CHROMIUM (TOTAL) *		3.67E-02	1.77E-16	0	3.67E-02	8.24E-19
1 HYDROXY 3 METHYLBENZEN	cr esol)	1.84E-01	6.26E-06	0	1.84E-01	1.46E-07
CUMENE (isopropylbenzene)		1.72E-02	0.08477	0	1.58E-02	1.85E-04
ETHYLBENZENE		4.20E-02	0.05306	0	3.97E-02	2.81E-04
OIL (decane as surrogate)		2.61E+02	0.00733	0	2.59E+02	2.41E-01
PHENOL		1.80E-02	5.48E-06	0	1.80E-02	1.25E-08
TOLUENE		8.51E-01	0.04356	0	8.14E-01	4.69E-03
XYLENE		5.35E-01	0.04741	0	5.09E-01	3.20E-03
CARBON DIOXIDE		9.94E+01	0.16444	0	8.31E+01	2.07E+00
MANGANESE		0.00E+00	0	0	0.00E+00	0.00E+00
ANTIMONY		0.00E+00	0	0	0.00E+00	0.00E+00
ARSENIC		0.00E+00	0	0	0.00E+00	0.00E+00
BERYLLIUM		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						2.47E+00
SUMMARY FOR EMISSIONS AT 7/6/2015 7:22	1	2 TK1070	storage tank			
COMPOUND NAME			conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *			1.21E+02	0.00052	0	1.21E+02	7.95E-03
BENZENE			5.12E-01	0.04666	0	4.88E-01	3.02E-03
CHLOROFORM			3.42E+01	0.03918	0	3.28E+01	1.69E-01
CHROMIUM (TOTAL) *			3.67E-02	7.37E-15	0	3.67E-02	3.42E-17
1 HYDROXY 3 METHYLBENZEN cresol)			1.84E-01	1.78E-05	0	1.84E-01	4.14E-07
CUMENE (isopropylbenzene)			1.58E-02	0.11275	0	1.40E-02	2.25E-04
ETHYLBENZENE			3.97E-02	0.06953	0	3.70E-02	3.49E-04
OIL (decane as surrogate)			2.59E+02	0.00878	0	2.57E+02	2.87E-01
PHENOL			1.80E-02	2.51E-05	0	1.80E-02	5.71E-08
TOLUENE			8.14E-01	0.05321	0	7.71E-01	5.47E-03
XYLENE			5.09E-01	0.05838	0	4.80E-01	3.76E-03
CARBON DIOXIDE			8.31E+01	0.18849	0	6.74E+01	1.98E+00
MANGANESE			0.00E+00	0	0	0.00E+00	0.00E+00
ANTIMONY			0.00E+00	0	0	0.00E+00	0.00E+00
ARSENIC			0.00E+00	0	0	0.00E+00	0.00E+00
BERYLLIUM			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						2.46E+00
SUMMARY FOR EMISSIONS AT 7/6/2015 7:22	2	2 TK2010	circular	clarifier		
COMPOUND NAME			conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *			1.15E+02	0.03159	0	1.12E+02	4.84E-01
BENZENE			4.64E-01	0.04201	0	4.44E-01	2.59E-03
CHLOROFORM			3.12E+01	0.04293	0	2.98E+01	1.78E-01
CHROMIUM (TOTAL) *			3.49E-02	0.05419	0	3.30E-02	2.52E-04
1 HYDROXY 3 METHYLBENZEN cresol)			1.75E-01	0.00015	0	1.75E-01	3.38E-06
CUMENE (isopropylbenzene)			1.33E-02	0.02438	0	1.30E-02	4.31E-05
ETHYLBENZENE			3.51E-02	0.02639	0	3.42E-02	1.23E-04
OIL (decane as surrogate)			2.44E+02	0.03679	0	2.35E+02	1.19E+00
PHENOL			1.71E-02	7.45E-05	0	1.71E-02	1.70E-07
TOLUENE			7.32E-01	0.03302	0	7.08E-01	3.22E-03
XYLENE			4.55E-01	0.01205	0	4.50E-01	7.31E-04
CARBON DIOXIDE			6.40E+01	0.05439	0	6.05E+01	4.64E-01
MANGANESE			0.00E+00	0	0	0.00E+00	0.00E+00
ANTIMONY			0.00E+00	0	0	0.00E+00	0.00E+00
ARSENIC			0.00E+00	0	0	0.00E+00	0.00E+00
BERYLLIUM			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						2.33E+00

SUMMARY FOR EMISSIONS AT 3 0 TK2015 storage t ank
7/6/2015 7:22

COMPOUND NAME		conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *		1.12E+02	0.00042	0	1.12E+02	6.26E-03
BENZENE		4.44E-01	0.0082	0	4.41E-01	4.85E-04
CHLOROFORM		2.98E+01	0.00957	0	2.95E+01	3.80E-02
CHROMIUM (TOTAL) *		3.30E-02	1.26E-16	0	3.30E-02	5.52E-19
1 HYDROXY 3 METHYLBENZEN cr	esol)	1.75E-01	5.00E-06	0	1.75E-01	1.16E-07
CUMENE (isopropylbenzene)		1.30E-02	0.00104	0	1.29E-02	1.80E-06
ETHYLBENZENE		3.42E-02	0.00138	0	3.41E-02	6.29E-06
OIL (decane as surrogate)		2.35E+02	0.00811	0	2.33E+02	2.54E-01
PHENOL		1.71E-02	3.02E-06	0	1.71E-02	6.86E-09
TOLUENE		7.08E-01	0.00309	0	7.06E-01	2.91E-04
XYLENE		4.50E-01	0.00123	0	4.49E-01	7.34E-05
CARBON DIOXIDE		6.05E+01	0.14464	0	5.18E+01	1.17E+00
MANGANESE		0.00E+00	0	0	0.00E+00	0.00E+00
ANTIMONY		0.00E+00	0	0	0.00E+00	0.00E+00
ARSENIC		0.00E+00	0	0	0.00E+00	0.00E+00
BERYLLIUM		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						1.46E+00

SUMMARY FOR EMISSIONS AT 3 1 TK2040 storage t ank
7/6/2015 7:22

COMPOUND NAME		conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *		1.12E+02	0.00053	0	1.11E+02	7.90E-03
BENZENE		4.41E-01	0.01113	0	4.36E-01	6.53E-04
CHLOROFORM		2.95E+01	0.01206	0	2.92E+01	4.74E-02
CHROMIUM (TOTAL) *		3.30E-02	9.29E-15	0	3.30E-02	4.08E-17
1 HYDROXY 3 METHYLBENZEN cr	esol)	1.75E-01	1.67E-05	0	1.75E-01	3.88E-07
CUMENE (isopropylbenzene)		1.29E-02	0.00224	0	1.29E-02	3.86E-06
ETHYLBENZENE		3.41E-02	0.00252	0	3.40E-02	1.14E-05
OIL (decane as surrogate)		2.33E+02	0.01018	0	2.30E+02	3.16E-01
PHENOL		1.71E-02	1.84E-05	0	1.71E-02	4.18E-08
TOLUENE		7.06E-01	0.00429	0	7.03E-01	4.03E-04
XYLENE		4.49E-01	0.00183	0	4.49E-01	1.10E-04
CARBON DIOXIDE		5.18E+01	0.17292	0	4.28E+01	1.19E+00
MANGANESE		0.00E+00	0	0	0.00E+00	0.00E+00
ANTIMONY		0.00E+00	0	0	0.00E+00	0.00E+00
ARSENIC		0.00E+00	0	0	0.00E+00	0.00E+00

BERYLLIUM		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						1.56E+00

SUMMARY FOR EMISSIONS AT 3 2 TK2030 mix tank
7/6/2015 7:22

COMPOUND NAME		conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *		1.20E+02	0.00979	0	1.19E+02	1.16E-02
BENZENE		5.19E-01	0.05132	0	4.92E-01	2.64E-04
CHLOROFORM		4.04E-02	0.06086	0	3.79E-02	2.43E-05
CHROMIUM (TOTAL) *		4.00E-02	0.07436	0	3.70E-02	2.95E-05
1 HYDROXY 3 METHYLBENZEN	cr esol)	1.68E-01	6.24E-05	0	1.68E-01	1.04E-07
CUMENE (isopropylbenzene)		1.70E-02	0.01323	0	1.68E-02	2.23E-06
ETHYLBENZENE		4.00E-02	0.0152	0	3.94E-02	6.02E-06
OIL (decane as surrogate)		1.39E+02	0.02576	0	1.35E+02	3.55E-02
PHENOL		1.60E-02	3.24E-05	0	1.60E-02	5.14E-09
TOLUENE		8.20E-01	0.02658	0	7.98E-01	2.16E-04
XYLENE		5.00E-01	0.00172	0	4.99E-01	8.53E-06
CARBON DIOXIDE		2.00E-03	0.12268	0	1.76E-03	2.43E-06
MANGANESE		2.20E+00	1.28E-24	0	2.20E+00	2.80E-26
ANTIMONY		2.80E-02	1.28E-24	0	2.80E-02	3.56E-28
ARSENIC		3.50E-02	1.28E-24	0	3.50E-02	4.45E-28
BERYLLIUM		3.40E-02	1.28E-24	0	3.40E-02	4.32E-28
SELENIUM		3.40E-01	1.28E-24	0	3.40E-01	4.32E-27
Total rate for all compounds						4.77E-02

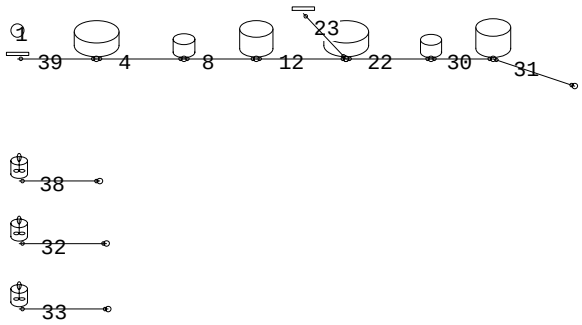
SUMMARY FOR EMISSIONS AT 3 3 TK2160 mix tank
7/6/2015 7:22

COMPOUND NAME		conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *		1.00E-20	0.0012	0	9.99E-21	5.34E-25
BENZENE		1.00E-20	0.00333	0	9.97E-21	1.49E-24
CHLOROFORM		1.00E-20	0.00407	0	9.96E-21	1.82E-24
CHROMIUM (TOTAL) *		1.00E-20	0.01281	0	9.87E-21	5.72E-24
1 HYDROXY 3 METHYLBENZEN	cr esol)	1.00E-20	4.05E-06	0	1.00E-20	1.81E-27
CUMENE (isopropylbenzene)		1.00E-20	0.00079	0	9.99E-21	3.53E-25
ETHYLBENZENE		1.00E-20	0.0009	0	9.99E-21	4.02E-25
OIL (decane as surrogate)		4.90E+01	0.05754	0	4.62E+01	1.26E-01
PHENOL		1.00E-20	1.73E-06	0	1.00E-20	7.74E-28
TOLUENE		1.00E-20	0.00161	0	9.98E-21	7.21E-25
XYLENE		1.00E-20	9.70E-05	0	1.00E-20	4.33E-26
CARBON DIOXIDE		1.00E-20	0.01253	0	9.88E-21	5.60E-24
MANGANESE		0.00E+00	0	0	0.00E+00	0.00E+00
ANTIMONY		0.00E+00	0	0	0.00E+00	0.00E+00

ARSENIC		0.00E+00	0	0	0.00E+00	0.00E+00
BERYLLIUM		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						1.26E-01

SUMMARY FOR EMISSIONS AT 3 8 TK2020 mix tank
7/6/2015 7:22

COMPOUND NAME		conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *		1.16E+02	0.09449	0	1.05E+02	1.27E-01
BENZENE		5.06E-01	0.3791	0	3.14E-01	2.23E-03
CHLOROFORM		3.79E+01	0.42307	0	2.19E+01	1.86E-01
CHROMIUM (TOTAL) *		4.00E-02	0.47469	0	2.10E-02	2.20E-04
1 HYDROXY 3 METHYLBENZEN cr	esol)	1.63E-01	0.00056	0	1.63E-01	1.05E-06
CUMENE (isopropylbenzene)		1.60E-02	0.12268	0	1.40E-02	2.28E-05
ETHYLBENZENE		3.90E-02	0.14443	0	3.34E-02	6.53E-05
OIL (decane as surrogate)		5.25E+02	0.12023	0	4.62E+02	7.32E-01
PHENOL		1.50E-02	0.00029	0	1.50E-02	5.02E-08
TOLUENE		7.78E-01	0.23283	0	5.97E-01	2.10E-03
XYLENE		4.86E-01	0.01981	0	4.76E-01	1.12E-04
CARBON DIOXIDE		2.40E+01	0.6167	0	9.20E+00	1.72E-01
MANGANESE		2.62E+00	1.22E-23	0	2.62E+00	3.71E-25
ANTIMONY		2.80E-02	1.22E-23	0	2.80E-02	3.98E-27
ARSENIC		3.50E-02	1.22E-23	0	3.50E-02	4.97E-27
BERYLLIUM		3.40E-02	1.22E-23	0	3.40E-02	4.83E-27
SELENIUM		3.22E-01	1.22E-23	0	3.22E-01	4.57E-26
Total rate for all compounds						1.22E+00



No.	Name	Type	flow (l/s)
4	TK1055AB	circular clarifier	549.7
8	TK1060A	storage tank	549.7
12	TK1070	storage tank	549.7
22	TK2010	circular clarifier	560.4
23	StreamCDEF	hard piped, no headspace	10.7
30	TK2015	storage tank	560.4
31	TK2040	storage tank	560.4
32	TK2030	mix tank	13.2
33	TK2160	mix tank	49.08
38	TK2020	mix tank	24.6
39	Influent to TK1055	hard piped, no headspace	549.7

SUMMARY FOR EMISSIONS A 4 TK1055AB circular clarifier
7/6/2015 7:25

COMPOUND NAME		conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *		1.31E+02	0.02051	0	1.28E+02	1.48E+00
BENZENE		5.71E-01	0.03567	0	5.51E-01	1.12E-02
CHLOROFORM		3.79E+01	0.03691	0	3.65E+01	7.69E-01
CHROMIUM (TOTAL) *		4.00E-02	0.04692	0	3.81E-02	1.03E-03
1 HYDROXY 3 METHYLBENZEI cr	esol)	1.84E-01	8.75E-05	0	1.84E-01	8.85E-06
CUMENE (isopropylbenzene)		1.80E-02	0.01866	0	1.77E-02	1.85E-04
ETHYLBENZENE		4.40E-02	0.02029	0	4.31E-02	4.91E-04
OIL (decane as surrogate)		2.76E+02	0.03422	0	2.67E+02	5.19E+00
PHENOL		1.80E-02	4.44E-05	0	1.80E-02	4.39E-07
TOLUENE		9.01E-01	0.02676	0	8.77E-01	1.33E-02
XYLENE		5.49E-01	0.00781	0	5.45E-01	2.36E-03
CARBON DIOXIDE		1.08E+02	0.04818	0	1.03E+02	2.86E+00
MANGANESE		0.00E+00	0	0	0.00E+00	0.00E+00
ANTIMONY		0.00E+00	0	0	0.00E+00	0.00E+00
ARSENIC		0.00E+00	0	0	0.00E+00	0.00E+00
BERYLLIUM		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						1.03E+01

SUMMARY FOR EMISSIONS A 8 TK1060A storage t ank
7/6/2015 7:25

COMPOUND NAME		conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *		1.28E+02	0.00043	0	1.28E+02	3.03E-02
BENZENE		5.51E-01	0.03773	0	5.30E-01	1.14E-02
CHLOROFORM		3.65E+01	0.03291	0	3.53E+01	6.60E-01
CHROMIUM (TOTAL) *		3.81E-02	3.94E-17	0	3.81E-02	8.26E-19
1 HYDROXY 3 METHYLBENZEI cr	esol)	1.84E-01	6.04E-06	0	1.84E-01	6.11E-07
CUMENE (isopropylbenzene)		1.77E-02	0.08425	0	1.62E-02	8.18E-04
ETHYLBENZENE		4.31E-02	0.05276	0	4.08E-02	1.25E-03
OIL (decane as surrogate)		2.67E+02	0.00714	0	2.65E+02	1.05E+00
PHENOL		1.80E-02	5.11E-06	0	1.80E-02	5.06E-08
TOLUENE		8.77E-01	0.04339	0	8.39E-01	2.09E-02
XYLENE		5.45E-01	0.04722	0	5.19E-01	1.41E-02
CARBON DIOXIDE		1.03E+02	0.164	0	8.59E+01	9.27E+00
MANGANESE		0.00E+00	0	0	0.00E+00	0.00E+00
ANTIMONY		0.00E+00	0	0	0.00E+00	0.00E+00
ARSENIC		0.00E+00	0	0	0.00E+00	0.00E+00
BERYLLIUM		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						1.11E+01
SUMMARY FOR EMISSIONS A 7/6/2015 7:25	1 2 TK1070	storage t	ank			
COMPOUND NAME		conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *		1.28E+02	0.00045	0	1.28E+02	3.17E-02
BENZENE		5.30E-01	0.03975	0	5.09E-01	1.16E-02
CHLOROFORM		3.53E+01	0.03433	0	3.41E+01	6.66E-01
CHROMIUM (TOTAL) *		3.81E-02	1.63E-15	0	3.81E-02	3.42E-17
1 HYDROXY 3 METHYLBENZEI cr	esol)	1.84E-01	8.69E-06	0	1.84E-01	8.79E-07
CUMENE (isopropylbenzene)		1.62E-02	0.09078	0	1.47E-02	8.07E-04
ETHYLBENZENE		4.08E-02	0.05657	0	3.85E-02	1.27E-03
OIL (decane as surrogate)		2.65E+02	0.00751	0	2.63E+02	1.09E+00
PHENOL		1.80E-02	9.62E-06	0	1.80E-02	9.52E-08
TOLUENE		8.39E-01	0.04561	0	8.01E-01	2.10E-02
XYLENE		5.19E-01	0.04975	0	4.93E-01	1.42E-02
CARBON DIOXIDE		8.59E+01	0.16965	0	7.14E+01	8.01E+00
MANGANESE		0.00E+00	0	0	0.00E+00	0.00E+00
ANTIMONY		0.00E+00	0	0	0.00E+00	0.00E+00
ARSENIC		0.00E+00	0	0	0.00E+00	0.00E+00
BERYLLIUM		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						9.85E+00
SUMMARY FOR EMISSIONS A 7/6/2015 7:25	2 2 TK2010	circular	clarifier			
COMPOUND NAME		conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *		1.26E+02	0.00831	0	1.25E+02	5.86E-01
BENZENE		4.99E-01	0.02035	0	4.89E-01	5.69E-03
CHLOROFORM		3.34E+01	0.02151	0	3.27E+01	4.03E-01
CHROMIUM (TOTAL) *		3.74E-02	0.02882	0	3.63E-02	6.04E-04
1 HYDROXY 3 METHYLBENZEI cr	esol)	1.81E-01	3.38E-05	0	1.81E-01	3.42E-06
CUMENE (isopropylbenzene)		1.44E-02	0.00924	0	1.43E-02	7.47E-05
ETHYLBENZENE		3.78E-02	0.0101	0	3.74E-02	2.14E-04
OIL (decane as surrogate)		2.58E+02	0.02276	0	2.52E+02	3.29E+00
PHENOL		1.77E-02	1.72E-05	0	1.77E-02	1.70E-07
TOLUENE		7.85E-01	0.01425	0	7.74E-01	6.27E-03
XYLENE		4.84E-01	0.00326	0	4.82E-01	8.85E-04
CARBON DIOXIDE		7.00E+01	0.03056	0	6.79E+01	1.20E+00
MANGANESE		0.00E+00	0	0	0.00E+00	0.00E+00
ANTIMONY		0.00E+00	0	0	0.00E+00	0.00E+00
ARSENIC		0.00E+00	0	0	0.00E+00	0.00E+00
BERYLLIUM		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						5.49E+00

SUMMARY FOR EMISSIONS A 3 0 TK2015 storage t ank
7/6/2015 7:25

COMPOUND NAME	conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *	1.25E+02	0.00042	0	1.25E+02	2.94E-02
BENZENE	4.89E-01	0.00798	0	4.85E-01	2.19E-03
CHLOROFORM	3.27E+01	0.00933	0	3.24E+01	1.71E-01
CHROMIUM (TOTAL) *	3.63E-02	2.72E-17	0	3.63E-02	5.54E-19
1 HYDROXY 3 METHYLBENZEI cr esol)	1.81E-01	4.85E-06	0	1.81E-01	4.90E-07
CUMENE (isopropylbenzene)	1.43E-02	0.001	0	1.43E-02	8.01E-06
ETHYLBENZENE	3.74E-02	0.00133	0	3.74E-02	2.79E-05
OIL (decane as surrogate)	2.52E+02	0.00755	0	2.50E+02	1.07E+00
PHENOL	1.77E-02	2.82E-06	0	1.77E-02	2.79E-08
TOLUENE	7.74E-01	0.00298	0	7.72E-01	1.30E-03
XYLENE	4.82E-01	0.00118	0	4.82E-01	3.20E-04
CARBON DIOXIDE	6.79E+01	0.14388	0	5.81E+01	5.47E+00
MANGANESE	0.00E+00	0	0	0.00E+00	0.00E+00
ANTIMONY	0.00E+00	0	0	0.00E+00	0.00E+00
ARSENIC	0.00E+00	0	0	0.00E+00	0.00E+00
BERYLLIUM	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					6.74E+00

SUMMARY FOR EMISSIONS A 3 1 TK2040 storage t ank
7/6/2015 7:25

COMPOUND NAME	conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *	1.25E+02	0.00045	0	1.25E+02	3.12E-02
BENZENE	4.85E-01	0.00865	0	4.81E-01	2.35E-03
CHLOROFORM	3.24E+01	0.00991	0	3.21E+01	1.80E-01
CHROMIUM (TOTAL) *	3.63E-02	2.00E-15	0	3.63E-02	4.08E-17
1 HYDROXY 3 METHYLBENZEI cr esol)	1.81E-01	7.59E-06	0	1.81E-01	7.68E-07
CUMENE (isopropylbenzene)	1.43E-02	0.00127	0	1.43E-02	1.02E-05
ETHYLBENZENE	3.74E-02	0.00159	0	3.73E-02	3.32E-05
OIL (decane as surrogate)	2.50E+02	0.00806	0	2.48E+02	1.13E+00
PHENOL	1.77E-02	6.40E-06	0	1.77E-02	6.33E-08
TOLUENE	7.72E-01	0.00326	0	7.69E-01	1.41E-03
XYLENE	4.82E-01	0.00132	0	4.81E-01	3.57E-04
CARBON DIOXIDE	5.81E+01	0.15073	0	4.93E+01	4.91E+00
MANGANESE	0.00E+00	0	0	0.00E+00	0.00E+00
ANTIMONY	0.00E+00	0	0	0.00E+00	0.00E+00
ARSENIC	0.00E+00	0	0	0.00E+00	0.00E+00

BERYLLIUM		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						6.25E+00

SUMMARY FOR EMISSIONS A 3 2 TK2030 mix tank
7/6/2015 7:25

COMPOUND NAME	conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *	1.20E+02	0.00736	0	1.19E+02	1.17E-02
BENZENE	5.19E-01	0.03901	0	4.99E-01	2.67E-04
CHLOROFORM	4.04E-02	0.04638	0	3.85E-02	2.47E-05
CHROMIUM (TOTAL) *	4.00E-02	0.05685	0	3.77E-02	3.00E-05
1 HYDROXY 3 METHYLBENZEI cr esol)	1.68E-01	4.68E-05	0	1.68E-01	1.04E-07
CUMENE (isopropylbenzene)	1.70E-02	0.00996	0	1.68E-02	2.24E-06
ETHYLBENZENE	4.00E-02	0.01145	0	3.95E-02	6.05E-06
OIL (decane as surrogate)	1.39E+02	0.01946	0	1.36E+02	3.57E-02
PHENOL	1.60E-02	2.43E-05	0	1.60E-02	5.14E-09
TOLUENE	8.20E-01	0.02008	0	8.04E-01	2.17E-04
XYLENE	5.00E-01	0.00129	0	4.99E-01	8.53E-06
CARBON DIOXIDE	2.00E-03	0.09496	0	1.81E-03	2.51E-06
MANGANESE	2.20E+00	9.63E-25	0	2.20E+00	2.80E-26
ANTIMONY	2.80E-02	9.63E-25	0	2.80E-02	3.56E-28
ARSENIC	3.50E-02	9.63E-25	0	3.50E-02	4.45E-28
BERYLLIUM	3.40E-02	9.63E-25	0	3.40E-02	4.32E-28
SELENIUM	3.40E-01	9.63E-25	0	3.40E-01	4.32E-27
Total rate for all compounds					4.79E-02

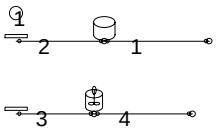
SUMMARY FOR EMISSIONS A 3 3 TK2160 mix tank
7/6/2015 7:25

COMPOUND NAME	conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *	1.00E-20	0.00109	0	9.99E-21	5.34E-25
BENZENE	1.00E-20	0.00303	0	9.97E-21	1.49E-24
CHLOROFORM	1.00E-20	0.00371	0	9.96E-21	1.82E-24
CHROMIUM (TOTAL) *	1.00E-20	0.01167	0	9.88E-21	5.73E-24
1 HYDROXY 3 METHYLBENZEI cr esol)	1.00E-20	3.69E-06	0	1.00E-20	1.81E-27
CUMENE (isopropylbenzene)	1.00E-20	0.00072	0	9.99E-21	3.53E-25
ETHYLBENZENE	1.00E-20	0.00082	0	9.99E-21	4.02E-25
OIL (decane as surrogate)	4.90E+01	0.05751	0	4.62E+01	1.38E-01
PHENOL	1.00E-20	1.58E-06	0	1.00E-20	7.74E-28
TOLUENE	1.00E-20	0.00147	0	9.99E-21	7.21E-25
XYLENE	1.00E-20	8.83E-05	0	1.00E-20	4.33E-26
CARBON DIOXIDE	1.00E-20	0.01142	0	9.89E-21	5.61E-24
MANGANESE	0.00E+00	0	0	0.00E+00	0.00E+00
ANTIMONY	0.00E+00	0	0	0.00E+00	0.00E+00

ARSENIC		0.00E+00	0	0	0.00E+00	0.00E+00
BERYLLIUM		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						1.38E-01

SUMMARY FOR EMISSIONS A 3 8 TK2020 mix tank
7/6/2015 7:25

COMPOUND NAME	conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *	1.16E+02	0.0469	0	1.11E+02	1.34E-01
BENZENE	5.06E-01	0.22355	0	3.93E-01	2.78E-03
CHLOROFORM	3.79E+01	0.25694	0	2.82E+01	2.40E-01
CHROMIUM (TOTAL) *	4.00E-02	0.29879	0	2.81E-02	2.94E-04
1 HYDROXY 3 METHYLBENZEI cr esol)	1.63E-01	0.00026	0	1.63E-01	1.05E-06
CUMENE (isopropylbenzene)	1.60E-02	0.06186	0	1.50E-02	2.44E-05
ETHYLBENZENE	3.90E-02	0.07373	0	3.61E-02	7.07E-05
OIL (decane as surrogate)	5.25E+02	0.06054	0	4.93E+02	7.82E-01
PHENOL	1.50E-02	0.00014	0	1.50E-02	5.02E-08
TOLUENE	7.78E-01	0.1252	0	6.81E-01	2.40E-03
XYLENE	4.86E-01	0.00944	0	4.81E-01	1.13E-04
CARBON DIOXIDE	2.40E+01	0.43139	0	1.37E+01	2.55E-01
MANGANESE	2.62E+00	5.77E-24	0	2.62E+00	3.71E-25
ANTIMONY	2.80E-02	5.77E-24	0	2.80E-02	3.98E-27
ARSENIC	3.50E-02	5.77E-24	0	3.50E-02	4.97E-27
BERYLLIUM	3.40E-02	5.77E-24	0	3.40E-02	4.83E-27
SELENIUM	3.22E-01	5.77E-24	0	3.22E-01	4.57E-26
Total rate for all compounds					1.42E+00



No.	Name	Type	flow (l/s)
1	TK2515	storage tank	126.
2	default hard piped	hard piped, no headspace	
3	default hard piped	hard piped, no headspace	126.
4	TK2530	mix tank	8.32

SPECIFIED UNIT PROPERTIES 07-13-2015

Project W:\20161200_Antero WV Water Facility\SandstromWTF_post 11:25:2

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 storage tank

1 101 Description of unit	1	TK2515
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)		0.3048
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 hard piped, no headspace

1 101 Description of unit	2	default hard piped
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 hard piped, no headspace

1	101 Description of unit	3	default hard piped
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	0	
	waste 2 added to system at unit	2	
	waste 3 added to system at unit	2	

Type of unit is mix tank

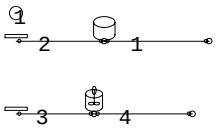
1	101 Description of unit	4	TK2530
2	2 Wastewater temperature (C)		25
3	37 length of unit (m)		1.61544
4	59 width of unit (m)		1.61544
5	38 depth of unit (m)		1.8288
6	29 Area of agitation (each aerator,m2)		1.55
7	30 Total number of agitators in the unit		1
8	31 Power of agitation (each aerator,HP)		1.5
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	

SUMMARY FOR EMIS: 1 TK2515 storage tank
7/13/2015 11:26

COMPOUND NAME		conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *		3.00E+00	0.00043	0	3.00E+00	1.63E-04
BENZENE		3.00E-03	0.03797	0	2.89E-03	1.44E-05
1 HYDROXY 3 METHYI cr	esol)	1.00E-03	6.91E-06	0	1.00E-03	8.71E-10
OIL (decane as surrogate)		1.12E+00	0.63171	0	4.13E-01	8.92E-02
TOLUENE		5.00E-03	0.04361	0	4.78E-03	2.75E-05
XYLENE		3.00E-03	0.04746	0	2.86E-03	1.79E-05
CARBON DIOXIDE		5.30E+00	0.16419	0	4.43E+00	1.10E-01
Total rate for all compounds						1.99E-01

SUMMARY FOR EMIS: 4 TK2530 mix tank
7/13/2015 11:26

COMPOUND NAME		conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *		3.00E+00	0.00451	0	2.99E+00	1.13E-04
BENZENE		3.00E-03	0.10535	0	2.68E-03	2.63E-06
1 HYDROXY 3 METHYI cr	esol)	1.00E-03	5.76E-05	0	1.00E-03	4.79E-10
OIL (decane as surrogate)		1.12E+00	0.19678	0	9.00E-01	1.83E-03
TOLUENE		5.00E-03	0.08936	0	4.55E-03	3.72E-06
XYLENE		3.00E-03	0.00827	0	2.98E-03	2.06E-07
CARBON DIOXIDE		5.30E+00	0.07699	0	4.89E+00	3.40E-03
Total rate for all compounds						5.35E-03



No.	Name	Type	flow (l/s)
1	TK2515	storage tank	138.
2	default hard piped	hard piped, no headspace	
3	default hard piped	hard piped, no headspace	
4	TK2530	mix tank	8.82

SUMMARY FOR EMISS 1 TK2515 storage tank
7/13/2015 11:29

COMPOUND NAME		conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *		3.00E+00	0.00043	0	3.00E+00	1.78E-04
BENZENE		3.00E-03	0.03795	0	2.89E-03	1.57E-05
1 HYDROXY 3 METHYL cr	esol)	1.00E-03	6.83E-06	0	1.00E-03	9.42E-10
OIL (decane as surrogate)		1.12E+00	0.63165	0	4.13E-01	9.76E-02
TOLUENE		5.00E-03	0.04359	0	4.78E-03	3.01E-05
XYLENE		3.00E-03	0.04743	0	2.86E-03	1.96E-05
CARBON DIOXIDE		5.30E+00	0.16416	0	4.43E+00	1.20E-01
Total rate for all compounds						2.18E-01

SUMMARY FOR EMISS 4 TK2530 mix tank
7/13/2015 11:29

COMPOUND NAME		conc in (ppmw)	fe air	fe bio	conc out (ppmw)	emissions (g/s)
AMMONIA *		3.00E+00	0.00426	0	2.99E+00	1.13E-04
BENZENE		3.00E-03	0.09998	0	2.70E-03	2.65E-06
1 HYDROXY 3 METHYL cr	esol)	1.00E-03	5.43E-05	0	1.00E-03	4.79E-10
OIL (decane as surrogate)		1.12E+00	0.18771	0	9.10E-01	1.85E-03
TOLUENE		5.00E-03	0.08473	0	4.58E-03	3.74E-06
XYLENE		3.00E-03	0.0078	0	2.98E-03	2.06E-07
CARBON DIOXIDE		5.30E+00	0.07295	0	4.91E+00	3.41E-03
Total rate for all compounds						5.38E-03

TANKS 4.0.9d Model Output

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

Identification

User Identification:	TK1065-avgflow
City:	
State:	Doddridge County, WV
Company:	Antero Resources
Type of Tank:	Vertical Fixed Roof Tank
Description:	TK-1065 Oil Collection Tank Sandstrom Water Treatment

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:	704.09
Net Throughput(gal/yr):	8,935,200.00
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Roof Characteristics

Type:	Dome
Height (ft)	1.00
Radius (ft) (Dome Roof)	12.00

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

TK1065-avgflow - Vertical Fixed Roof 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
Crude oil (RVP 5)	All	50.67	44.90	56.45	49.08	2.3881	2.1203	2.6825	50.0000			207.00	Option 4: RVP=5

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

TK1065-avgflow - Vertical Fixed Roof Tank

Annual Emission Calcaulations	
Standing Losses (lb):	330.0273
Vapor Space Volume (cu ft):	961.8509
Vapor Density (lb/cu ft):	0.0218
Vapor Space Expansion Factor:	0.0895
Vented Vapor Saturation Factor:	0.4816
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):	12.0000
Shell Radius (ft):	6.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0218
Vapor Molecular Weight (lb/lb-mole):	50.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.3881
Daily Avg. Liquid Surface Temp. (deg. R):	510.3429
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):	508.7483
Tank Paint Solar Absorptance (Shell):	0.1700
Tank Paint Solar Absorptance (Roof):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,193.8870
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0895
Daily Vapor Temperature Range (deg. R):	23.0949
Daily Vapor Pressure Range (psia):	0.5622
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.3881
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	2.1203
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	2.6825
Daily Avg. Liquid Surface Temp. (deg R):	510.3429
Daily Min. Liquid Surface Temp. (deg R):	504.5692
Daily Max. Liquid Surface Temp. (deg R):	516.1166
Daily Ambient Temp. Range (deg. R):	24.1833
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.4816
Vapor Pressure at Daily Average Liquid:	
Surface Temperature (psia):	2.3881
Vapor Space Outage (ft):	8.5046
Working Losses (lb):	3,987.0564
Vapor Molecular Weight (lb/lb-mole):	50.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.3881
Annual Net Throughput (gal/yr.):	8,935,200.0000
Annual Turnovers:	704.0888
Turnover Factor:	0.2093
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):	4,317.0837

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

Emissions Report for: Annual

TK1065-avgflow - Vertical Fixed Roof Tank

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Crude oil (RVP 5)	3,987.06	330.03	4,317.08

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

Identification

User Identification:	TK1065-maxflow
City:	
State:	Doddridge County, WV
Company:	Antero Resources
Type of Tank:	Vertical Fixed Roof Tank
Description:	TK-1065 Oil Collection Tank Sandstrom Water Treatment

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:	1,863.76
Net Throughput(gal/yr):	23,652,000.00
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Roof Characteristics

Type:	Dome
Height (ft)	1.00
Radius (ft) (Dome Roof)	12.00

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

TK1065-maxflow - Vertical Fixed Roof 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
Crude oil (RVP 5)	All	50.67	44.90	56.45	49.08	2.3881	2.1203	2.6825	50.0000			207.00	Option 4: RVP=5

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

TK1065-maxflow - Vertical Fixed Roof Tank

Annual Emission Calcaulations	
Standing Losses (lb):	330.0273
Vapor Space Volume (cu ft):	961.8509
Vapor Density (lb/cu ft):	0.0218
Vapor Space Expansion Factor:	0.0895
Vented Vapor Saturation Factor:	0.4816
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):	12.0000
Shell Radius (ft):	6.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0218
Vapor Molecular Weight (lb/lb-mole):	50.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.3881
Daily Avg. Liquid Surface Temp. (deg. R):	510.3429
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):	508.7483
Tank Paint Solar Absorptance (Shell):	0.1700
Tank Paint Solar Absorptance (Roof):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,193.8870
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0895
Daily Vapor Temperature Range (deg. R):	23.0949
Daily Vapor Pressure Range (psia):	0.5622
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.3881
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	2.1203
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	2.6825
Daily Avg. Liquid Surface Temp. (deg R):	510.3429
Daily Min. Liquid Surface Temp. (deg R):	504.5692
Daily Max. Liquid Surface Temp. (deg R):	516.1166
Daily Ambient Temp. Range (deg. R):	24.1833
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.4816
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	2.3881
Vapor Space Outage (ft):	8.5046
Working Losses (lb):	9,216.9521
Vapor Molecular Weight (lb/lb-mole):	50.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.3881
Annual Net Throughput (gal/yr.):	23,652,000.0000
Annual Turnovers:	1,863.7645
Turnover Factor:	0.1828
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):	9,546.9794

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

Emissions Report for: Annual

TK1065-maxflow - Vertical Fixed Roof Tank

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Crude oil (RVP 5)	9,216.95	330.03	9,546.98

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:	TK2130
City:	
State:	Doddridge County, WV
Company:	Antero Resources
Type of Tank:	Vertical Fixed Roof Tank
Description:	Barometric Condenser Hotwell Tank Sandstrom Water Treatment

Tank Dimensions

Shell Height (ft):	29.00
Diameter (ft):	25.00
Liquid Height (ft) :	27.00
Avg. Liquid Height (ft):	20.00
Volume (gallons):	99,144.10
Turnovers:	112,230.10
Net Throughput(gal/yr):	11,126,952,000.00
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Roof Characteristics

Type:	Cone
Height (ft)	1.00
Slope (ft/ft) (Cone Roof)	0.08

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

TK2130 - Vertical Fixed Roof 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
TK2130	All	50.67	44.90	56.45	49.08	0.1824	0.1467	0.2254	18.0214			18.02	
Gasoline (RVP 10)						4.3134	3.8355	4.8381	66.0000	0.0000	0.0001	92.00	Option 4: RVP=10, ASTM Slope=3
Water						0.1823	0.1467	0.2254	18.0200	1.0000	0.9999	18.02	Option 2: A=8.10765, B=1750.286, C=235

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

TK2130 - Vertical Fixed Roof Tank

Annual Emission Calcaulations	
Standing Losses (lb):	42.9227
Vapor Space Volume (cu ft):	4,581.4893
Vapor Density (lb/cu ft):	0.0006
Vapor Space Expansion Factor:	0.0466
Vented Vapor Saturation Factor:	0.9173
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	4,581.4893
Tank Diameter (ft):	25.0000
Vapor Space Outage (ft):	9.3333
Tank Shell Height (ft):	29.0000
Average Liquid Height (ft):	20.0000
Roof Outage (ft):	0.3333
Roof Outage (Cone Roof)	
Roof Outage (ft):	0.3333
Roof Height (ft):	1.0000
Roof Slope (ft/ft):	0.0800
Shell Radius (ft):	12.5000
Vapor Density	
Vapor Density (lb/cu ft):	0.0006
Vapor Molecular Weight (lb/lb-mole):	18.0214
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.1824
Daily Avg. Liquid Surface Temp. (deg. R):	510.3429
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):	508.7483
Tank Paint Solar Absorptance (Shell):	0.1700
Tank Paint Solar Absorptance (Roof):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,193.8870
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0466
Daily Vapor Temperature Range (deg. R):	23.0949
Daily Vapor Pressure Range (psia):	0.0787
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.1824
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.1467
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.2254
Daily Avg. Liquid Surface Temp. (deg R):	510.3429
Daily Min. Liquid Surface Temp. (deg R):	504.5692
Daily Max. Liquid Surface Temp. (deg R):	516.1166
Daily Ambient Temp. Range (deg. R):	24.1833
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.9173
Vapor Pressure at Daily Average Liquid:	
Surface Temperature (psia):	0.1824
Vapor Space Outage (ft):	9.3333
Working Losses (lb):	145,334.2199
Vapor Molecular Weight (lb/lb-mole):	18.0214
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.1824
Annual Net Throughput (gal/yr.):	11,126,952,000.0000
Annual Turnovers:	112,230.1014
Turnover Factor:	0.1669
Maximum Liquid Volume (gal):	99,144.0964
Maximum Liquid Height (ft):	27.0000
Tank Diameter (ft):	25.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	145,377.1426

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

Emissions Report for: Annual

TK2130 - Vertical Fixed Roof Tank

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
TK2130	145,334.22	42.92	145,377.14
Water	145,318.68	42.92	145,361.60
Gasoline (RVP 10)	15.54	0.00	15.54

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

Identification

User Identification:	TK2130 max
City:	
State:	Doddridge County, WV
Company:	Antero Resources
Type of Tank:	Vertical Fixed Roof Tank
Description:	Barometric Condenser Hotwell Tank Sandstrom Water Treatment

Tank Dimensions

Shell Height (ft):	29.00
Diameter (ft):	25.00
Liquid Height (ft) :	27.00
Avg. Liquid Height (ft):	20.00
Volume (gallons):	99,144.10
Turnovers:	123,453.11
Net Throughput(gal/yr):	12,239,647,200.00
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Roof Characteristics

Type:	Cone
Height (ft)	1.00
Slope (ft/ft) (Cone Roof)	0.08

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

TK2130 max - Vertical Fixed Roof 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
TK2130	All	50.67	44.90	56.45	49.08	0.1824	0.1467	0.2254	18.0214			18.02	
Gasoline (RVP 10)						4.3134	3.8355	4.8381	66.0000	0.0000	0.0001	92.00	Option 4: RVP=10, ASTM Slope=3
Water						0.1823	0.1467	0.2254	18.0200	1.0000	0.9999	18.02	Option 2: A=8.10765, B=1750.286, C=235

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

TK2130 max - Vertical Fixed Roof Tank

Annual Emission Calcaulations	
Standing Losses (lb):	42.9227
Vapor Space Volume (cu ft):	4,581.4893
Vapor Density (lb/cu ft):	0.0006
Vapor Space Expansion Factor:	0.0466
Vented Vapor Saturation Factor:	0.9173
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	4,581.4893
Tank Diameter (ft):	25.0000
Vapor Space Outage (ft):	9.3333
Tank Shell Height (ft):	29.0000
Average Liquid Height (ft):	20.0000
Roof Outage (ft):	0.3333
Roof Outage (Cone Roof)	
Roof Outage (ft):	0.3333
Roof Height (ft):	1.0000
Roof Slope (ft/ft):	0.0800
Shell Radius (ft):	12.5000
Vapor Density	
Vapor Density (lb/cu ft):	0.0006
Vapor Molecular Weight (lb/lb-mole):	18.0214
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.1824
Daily Avg. Liquid Surface Temp. (deg. R):	510.3429
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):	508.7483
Tank Paint Solar Absorptance (Shell):	0.1700
Tank Paint Solar Absorptance (Roof):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,193.8870
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0466
Daily Vapor Temperature Range (deg. R):	23.0949
Daily Vapor Pressure Range (psia):	0.0787
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.1824
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.1467
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.2254
Daily Avg. Liquid Surface Temp. (deg R):	510.3429
Daily Min. Liquid Surface Temp. (deg R):	504.5692
Daily Max. Liquid Surface Temp. (deg R):	516.1166
Daily Ambient Temp. Range (deg. R):	24.1833
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.9173
Vapor Pressure at Daily Average Liquid:	
Surface Temperature (psia):	0.1824
Vapor Space Outage (ft):	9.3333
Working Losses (lb):	159,844.3699
Vapor Molecular Weight (lb/lb-mole):	18.0214
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.1824
Annual Net Throughput (gal/yr.):	12,239,647,200.0000
Annual Turnovers:	123,453.1116
Turnover Factor:	0.1669
Maximum Liquid Volume (gal):	99,144.0964
Maximum Liquid Height (ft):	27.0000
Tank Diameter (ft):	25.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	159,887.2926

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

Emissions Report for: Annual

TK2130 max - Vertical Fixed Roof Tank

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
TK2130	159,844.37	42.92	159,887.29
Water	159,827.28	42.92	159,870.20
Gasoline (RVP 10)	17.09	0.00	17.09

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

Identification

User Identification:	TK2140
City:	
State:	Doddridge County, WV
Company:	Antero Resources
Type of Tank:	Vertical Fixed Roof Tank
Description:	Recovered Water Tank Sandstrom Water Treatment

Tank Dimensions

Shell Height (ft):	43.00
Diameter (ft):	30.00
Liquid Height (ft) :	42.00
Avg. Liquid Height (ft):	25.00
Volume (gallons):	222,082.78
Turnovers:	39.52
Net Throughput(gal/yr):	8,777,520.00
Is Tank Heated (y/n):	Y

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Roof Characteristics

Type:	Cone
Height (ft)	1.00
Slope (ft/ft) (Cone Roof)	0.07

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

TK2140 - Vertical Fixed Roof 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
TK2140	All	120.00	85.00	200.00	120.00	1.6930	0.5961	11.5670	18.0200			18.02	
ammonia						289.9626	168.0546	798.7771	17.0300	0.0000	0.0000	17.03	Option 2: A=7.55466, B=1002.711, C=247.885
Benzene						5.0204	2.2480	21.6824	78.1100	0.0000	0.0000	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cresol (-m)						0.0203	0.0047	0.2791	108.1000	0.0000	0.0000	108.10	Option 2: A=7.508, B=1856.36, C=199.07
Ethylbenzene						0.6720	0.2466	4.1229	106.1700	0.0000	0.0000	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Isopropyl benzene						0.3402	0.1162	2.3536	120.2000	0.0000	0.0000	120.20	Option 2: A=6.93666, B=1460.793, C=207.78
Toluene						1.6958	0.6886	8.7365	92.1300	0.0000	0.0000	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Water						1.6930	0.5961	11.5669	18.0200	1.0000	1.0000	18.02	Option 2: A=8.10765, B=1750.286, C=235
Xylenes (mixed isomers)						0.5708	0.2071	3.5859	106.1700	0.0000	0.0000	106.17	Option 2: A=7.009, B=1462.266, C=215.11

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

TK2140 - Vertical Fixed Roof Tank

Annual Emission Calcaulations	
Standing Losses (lb):	9,732.7513
Vapor Space Volume (cu ft):	12,959.0697
Vapor Density (lb/cu ft):	0.0049
Vapor Space Expansion Factor:	1.1097
Vented Vapor Saturation Factor:	0.3781
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	12,959.0697
Tank Diameter (ft):	30.0000
Vapor Space Outage (ft):	18.3333
Tank Shell Height (ft):	43.0000
Average Liquid Height (ft):	25.0000
Roof Outage (ft):	0.3333
Roof Outage (Cone Roof)	
Roof Outage (ft):	0.3333
Roof Height (ft):	1.0000
Roof Slope (ft/ft):	0.0700
Shell Radius (ft):	15.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0049
Vapor Molecular Weight (lb/lb-mole):	18.0200
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	1.6930
Daily Avg. Liquid Surface Temp. (deg. R):	579.6700
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):	579.6700
Tank Paint Solar Absorptance (Shell):	0.1700
Tank Paint Solar Absorptance (Roof):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,193.8870
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	1.1097
Daily Vapor Temperature Range (deg. R):	115.0000
Daily Vapor Pressure Range (psia):	10.9709
Breather Vent Press. Setting Range(psia):	0.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	1.6930
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.5961
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	11.5670
Daily Avg. Liquid Surface Temp. (deg R):	579.6700
Daily Min. Liquid Surface Temp. (deg R):	544.6700
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:	0.3781
Vapor Pressure at Daily Average Liquid:	
Surface Temperature (psia):	1.6930
Vapor Space Outage (ft):	18.3333
Working Losses (lb):	5,902.1454
Vapor Molecular Weight (lb/lb-mole):	18.0200
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	1.6930
Annual Net Throughput (gal/yr.):	8,777,520.0000
Annual Turnovers:	39.5236
Turnover Factor:	0.9257
Maximum Liquid Volume (gal):	222,082.7760
Maximum Liquid Height (ft):	42.0000
Tank Diameter (ft):	30.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	15,634.8967

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

Emissions Report for: Annual

TK2140 - Vertical Fixed Roof Tank

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
TK2140	5,902.15	9,732.75	15,634.90
Water	5,901.94	9,732.41	15,634.36
ammonia	0.20	0.33	0.54
Benzene	0.00	0.00	0.00
Toluene	0.00	0.00	0.00
Ethylbenzene	0.00	0.00	0.00
Xylenes (mixed isomers)	0.00	0.00	0.00
Isopropyl benzene	0.00	0.00	0.00
Cresol (-m)	0.00	0.00	0.00

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

Identification

User Identification:	TK2140
City:	
State:	Doddridge County, WV
Company:	Antero Resources
Type of Tank:	Vertical Fixed Roof Tank
Description:	Recovered Water Tank Sandstrom Water Treatment

Tank Dimensions

Shell Height (ft):	43.00
Diameter (ft):	30.00
Liquid Height (ft) :	42.00
Avg. Liquid Height (ft):	25.00
Volume (gallons):	222,082.78
Turnovers:	2,974.92
Net Throughput(gal/yr):	660,679,200.00
Is Tank Heated (y/n):	Y

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Roof Characteristics

Type:	Cone
Height (ft)	1.00
Slope (ft/ft) (Cone Roof)	0.07

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

TK2140 - Vertical Fixed Roof 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
TK2140	All	120.00	85.00	200.00	120.00	1.6930	0.5961	11.5670	18.0200			18.02	
ammonia						289.9626	168.0546	798.7771	17.0300	0.0000	0.0000	17.03	Option 2: A=7.55466, B=1002.711, C=247.885
Benzene						5.0204	2.2480	21.6824	78.1100	0.0000	0.0000	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cresol (-m)						0.0203	0.0047	0.2791	108.1000	0.0000	0.0000	108.10	Option 2: A=7.508, B=1856.36, C=199.07
Ethylbenzene						0.6720	0.2466	4.1229	106.1700	0.0000	0.0000	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Isopropyl benzene						0.3402	0.1162	2.3536	120.2000	0.0000	0.0000	120.20	Option 2: A=6.93666, B=1460.793, C=207.78
Toluene						1.6958	0.6886	8.7365	92.1300	0.0000	0.0000	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Water						1.6930	0.5961	11.5669	18.0200	1.0000	1.0000	18.02	Option 2: A=8.10765, B=1750.286, C=235
Xylenes (mixed isomers)						0.5708	0.2071	3.5859	106.1700	0.0000	0.0000	106.17	Option 2: A=7.009, B=1462.266, C=215.11

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

TK2140 - Vertical Fixed Roof Tank

Annual Emission Calcaulations	
Standing Losses (lb):	9,732.7513
Vapor Space Volume (cu ft):	12,959.0697
Vapor Density (lb/cu ft):	0.0049
Vapor Space Expansion Factor:	1.1097
Vented Vapor Saturation Factor:	0.3781
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	12,959.0697
Tank Diameter (ft):	30.0000
Vapor Space Outage (ft):	18.3333
Tank Shell Height (ft):	43.0000
Average Liquid Height (ft):	25.0000
Roof Outage (ft):	0.3333
Roof Outage (Cone Roof)	
Roof Outage (ft):	0.3333
Roof Height (ft):	1.0000
Roof Slope (ft/ft):	0.0700
Shell Radius (ft):	15.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0049
Vapor Molecular Weight (lb/lb-mole):	18.0200
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	1.6930
Daily Avg. Liquid Surface Temp. (deg. R):	579.6700
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):	579.6700
Tank Paint Solar Absorptance (Shell):	0.1700
Tank Paint Solar Absorptance (Roof):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,193.8870
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	1.1097
Daily Vapor Temperature Range (deg. R):	115.0000
Daily Vapor Pressure Range (psia):	10.9709
Breather Vent Press. Setting Range(psia):	0.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	1.6930
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.5961
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	11.5670
Daily Avg. Liquid Surface Temp. (deg R):	579.6700
Daily Min. Liquid Surface Temp. (deg R):	544.6700
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:	0.3781
Vapor Pressure at Daily Average Liquid:	
Surface Temperature (psia):	1.6930
Vapor Space Outage (ft):	18.3333
Working Losses (lb):	84,823.7345
Vapor Molecular Weight (lb/lb-mole):	18.0200
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	1.6930
Annual Net Throughput (gal/yr.):	660,679,200.0000
Annual Turnovers:	2,974.9232
Turnover Factor:	0.1768
Maximum Liquid Volume (gal):	222,082.7760
Maximum Liquid Height (ft):	42.0000
Tank Diameter (ft):	30.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	94,556.4858

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

Emissions Report for: Annual

TK2140 - Vertical Fixed Roof Tank

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
TK2140	84,823.73	9,732.75	94,556.49
Water	84,820.80	9,732.41	94,553.21
ammonia	2.91	0.33	3.24
Benzene	0.02	0.00	0.02
Toluene	0.01	0.00	0.01
Ethylbenzene	0.00	0.00	0.00
Xylenes (mixed isomers)	0.00	0.00	0.00
Isopropyl benzene	0.00	0.00	0.00
Cresol (-m)	0.00	0.00	0.00

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

Identification

User Identification:	TK-4115 - Normal Flow
City:	Bridgeport
State:	West Virginia
Company:	Antero Resouces
Type of Tank:	Vertical Fixed Roof Tank
Description:	Methanol Bulk Storage Tank 8000 gallons

Tank Dimensions

Shell Height (ft):	15.00
Diameter (ft):	9.50
Liquid Height (ft) :	14.00
Avg. Liquid Height (ft):	7.50
Volume (gallons):	7,423.32
Turnovers:	35.99
Net Throughput(gal/yr):	267,180.00
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Roof Characteristics

Type:	Dome
Height (ft)	0.50
Radius (ft) (Dome Roof)	4.75

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 - Normal 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
Methyl alcohol	All	50.67	44.90	56.45	49.08	1.0682	0.8813	1.2883	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 - Normal Flow - Vertical Fixed Roof Tank
Bridgeport, West Virginia

Annual Emission Calcaulations

Standing Losses (lb):	63.2827
Vapor Space Volume (cu ft):	549.4024
Vapor Density (lb/cu ft):	0.0062
Vapor Space Expansion Factor:	0.0727
Vented Vapor Saturation Factor:	0.6950
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	549.4024
Tank Diameter (ft):	9.5000
Vapor Space Outage (ft):	7.7509
Tank Shell Height (ft):	15.0000
Average Liquid Height (ft):	7.5000
Roof Outage (ft):	0.2509
Roof Outage (Dome Roof)	
Roof Outage (ft):	0.2509
Dome Radius (ft):	4.7500
Shell Radius (ft):	4.7500
Vapor Density	
Vapor Density (lb/cu ft):	0.0062
Vapor Molecular Weight (lb/lb-mole):	32.0400
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	1.0682
Daily Avg. Liquid Surface Temp. (deg. R):	510.3429
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):	508.7483
Tank Paint Solar Absorptance (Shell):	0.1700
Tank Paint Solar Absorptance (Roof):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,193.8870
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0727
Daily Vapor Temperature Range (deg. R):	23.0949
Daily Vapor Pressure Range (psia):	0.4070
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	1.0682
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.8813
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	1.2883
Daily Avg. Liquid Surface Temp. (deg R):	510.3429
Daily Min. Liquid Surface Temp. (deg R):	504.5692
Daily Max. Liquid Surface Temp. (deg R):	516.1166
Daily Ambient Temp. Range (deg. R):	24.1833
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.6950
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	1.0682
Vapor Space Outage (ft):	7.7509
Working Losses (lb):	217.7254
Vapor Molecular Weight (lb/lb-mole):	32.0400
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	1.0682
Annual Net Throughput (gal/yr.):	267,180.0000
Annual Turnovers:	35.9920
Turnover Factor:	1.0000
Maximum Liquid Volume (gal):	7,423.3224
Maximum Liquid Height (ft):	14.0000
Tank Diameter (ft):	9.5000
Working Loss Product Factor:	1.0000
Total Losses (lb):	281.0081

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

Emissions Report for: Annual

TK-4115 - Normal Flow - Vertical Fixed Roof Tank
Bridgeport, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Methyl alcohol	217.73	63.28	281.01

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

Identification

User Identification:	TK-4115 - Peak Flow
City:	Bridgeport
State:	West Virginia
Company:	Antero Resouces
Type of Tank:	Vertical Fixed Roof Tank
Description:	Methanol Bulk Storage Tank 8000 gallons

Tank Dimensions

Shell Height (ft):	15.00
Diameter (ft):	9.50
Liquid Height (ft) :	14.00
Avg. Liquid Height (ft):	7.50
Volume (gallons):	7,423.32
Turnovers:	90.51
Net Throughput(gal/yr):	671,892.00
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Roof Characteristics

Type:	Dome
Height (ft)	0.50
Radius (ft) (Dome Roof)	4.75

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 - 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
Methyl alcohol	All	50.67	44.90	56.45	49.08	1.0682	0.8813	1.2883	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 - Peak Flow - Vertical Fixed Roof Tank
Bridgeport, West Virginia

Annual Emission Calcaulations

Standing Losses (lb):	63.2827
Vapor Space Volume (cu ft):	549.4024
Vapor Density (lb/cu ft):	0.0062
Vapor Space Expansion Factor:	0.0727
Vented Vapor Saturation Factor:	0.6950
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	549.4024
Tank Diameter (ft):	9.5000
Vapor Space Outage (ft):	7.7509
Tank Shell Height (ft):	15.0000
Average Liquid Height (ft):	7.5000
Roof Outage (ft):	0.2509
Roof Outage (Dome Roof)	
Roof Outage (ft):	0.2509
Dome Radius (ft):	4.7500
Shell Radius (ft):	4.7500
Vapor Density	
Vapor Density (lb/cu ft):	0.0062
Vapor Molecular Weight (lb/lb-mole):	32.0400
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	1.0682
Daily Avg. Liquid Surface Temp. (deg. R):	510.3429
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):	508.7483
Tank Paint Solar Absorptance (Shell):	0.1700
Tank Paint Solar Absorptance (Roof):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,193.8870
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0727
Daily Vapor Temperature Range (deg. R):	23.0949
Daily Vapor Pressure Range (psia):	0.4070
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	1.0682
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.8813
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	1.2883
Daily Avg. Liquid Surface Temp. (deg R):	510.3429
Daily Min. Liquid Surface Temp. (deg R):	504.5692
Daily Max. Liquid Surface Temp. (deg R):	516.1166
Daily Ambient Temp. Range (deg. R):	24.1833
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.6950
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	1.0682
Vapor Space Outage (ft):	7.7509
Working Losses (lb):	272.7326
Vapor Molecular Weight (lb/lb-mole):	32.0400
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	1.0682
Annual Net Throughput (gal/yr.):	671,892.0000
Annual Turnovers:	90.5110
Turnover Factor:	0.4981
Maximum Liquid Volume (gal):	7,423.3224
Maximum Liquid Height (ft):	14.0000
Tank Diameter (ft):	9.5000
Working Loss Product Factor:	1.0000
Total Losses (lb):	336.0153

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

Emissions Report for: Annual

TK-4115 - Peak Flow - Vertical Fixed Roof Tank
Bridgeport, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Methyl alcohol	272.73	63.28	336.02

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

Identification

User Identification:	TK-4180, Sulfuric Acid - Normal Flow
City:	Elkins
State:	West Virginia
Company:	Antero Resources
Type of Tank:	Vertical Fixed Roof Tank
Description:	6,000 gallon, fixed roof Sulfuric Acid bulk storage tank

Tank Dimensions

Shell Height (ft):	16.00
Diameter (ft):	8.00
Liquid Height (ft) :	15.00
Avg. Liquid Height (ft):	8.00
Volume (gallons):	5,640.20
Turnovers:	26.71
Net Throughput(gal/yr):	150,672.00
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Roof Characteristics

Type:	Dome
Height (ft)	1.00
Radius (ft) (Dome Roof)	4.00

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-4180, Sulfuric Acid - Normal Flow - Vertical Fixed Roof Tank
Elkins, 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
Sulfuric Acid 93%	All	50.67	44.90	56.45	49.08	0.0000	0.0000	0.0000	98.0790			98.08	Option 1: VP50 = .000000309 VP60 = .000000763

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

TK-4180, Sulfuric Acid - Normal Flow - Vertical Fixed Roof Tank
Elkins, West Virginia

Annual Emission Calcaulations

Standing Losses (lb):	0.0000
Vapor Space Volume (cu ft):	427.7802
Vapor Density (lb/cu ft):	0.0000
Vapor Space Expansion Factor:	0.0409
Vented Vapor Saturation Factor:	1.0000
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	427.7802
Tank Diameter (ft):	8.0000
Vapor Space Outage (ft):	8.5104
Tank Shell Height (ft):	16.0000
Average Liquid Height (ft):	8.0000
Roof Outage (ft):	0.5104
Roof Outage (Dome Roof)	
Roof Outage (ft):	0.5104
Dome Radius (ft):	4.0000
Shell Radius (ft):	4.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0000
Vapor Molecular Weight (lb/lb-mole):	98.0790
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0000
Daily Avg. Liquid Surface Temp. (deg. R):	510.3429
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):	508.7483
Tank Paint Solar Absorptance (Shell):	0.1700
Tank Paint Solar Absorptance (Roof):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,193.8870
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0409
Daily Vapor Temperature Range (deg. R):	23.0949
Daily Vapor Pressure Range (psia):	0.0000
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0000
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0000
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0000
Daily Avg. Liquid Surface Temp. (deg R):	510.3429
Daily Min. Liquid Surface Temp. (deg R):	504.5692
Daily Max. Liquid Surface Temp. (deg R):	516.1166
Daily Ambient Temp. Range (deg. R):	24.1833
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	1.0000
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	0.0000
Vapor Space Outage (ft):	8.5104
Working Losses (lb):	0.0001
Vapor Molecular Weight (lb/lb-mole):	98.0790
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0000
Annual Net Throughput (gal/yr.):	150,672.0000
Annual Turnovers:	26.7140
Turnover Factor:	1.0000
Maximum Liquid Volume (gal):	5,640.1975
Maximum Liquid Height (ft):	15.0000
Tank Diameter (ft):	8.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	0.0002

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

Emissions Report for: Annual

TK-4180, Sulfuric Acid - Normal Flow - Vertical Fixed Roof Tank
Elkins, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Sulfuric Acid 93%	0.00	0.00	0.00

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

Identification

User Identification:	TK-4180, Sulfuric Acid - Peak Flow
City:	Elkins
State:	West Virginia
Company:	Antero Resources
Type of Tank:	Vertical Fixed Roof Tank
Description:	6,000 gallon, fixed roof Sulfuric Acid bulk storage tank

Tank Dimensions

Shell Height (ft):	16.00
Diameter (ft):	8.00
Liquid Height (ft) :	15.00
Avg. Liquid Height (ft):	8.00
Volume (gallons):	5,640.20
Turnovers:	53.43
Net Throughput(gal/yr):	301,344.00
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Roof Characteristics

Type:	Dome
Height (ft)	1.00
Radius (ft) (Dome Roof)	4.00

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-4180, Sulfuric Acid - Peak Flow - Vertical Fixed Roof Tank
Elkins, 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
Sulfuric Acid 93%	All	50.67	44.90	56.45	49.08	0.0000	0.0000	0.0000	98.0790			98.08	Option 1: VP50 = .000000309 VP60 = .000000763

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

TK-4180, Sulfuric Acid - Peak Flow - Vertical Fixed Roof Tank
Elkins, West Virginia

Annual Emission Calcaulations	
Standing Losses (lb):	0.0000
Vapor Space Volume (cu ft):	427.7802
Vapor Density (lb/cu ft):	0.0000
Vapor Space Expansion Factor:	0.0409
Vented Vapor Saturation Factor:	1.0000
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	427.7802
Tank Diameter (ft):	8.0000
Vapor Space Outage (ft):	8.5104
Tank Shell Height (ft):	16.0000
Average Liquid Height (ft):	8.0000
Roof Outage (ft):	0.5104
Roof Outage (Dome Roof)	
Roof Outage (ft):	0.5104
Dome Radius (ft):	4.0000
Shell Radius (ft):	4.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0000
Vapor Molecular Weight (lb/lb-mole):	98.0790
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0000
Daily Avg. Liquid Surface Temp. (deg. R):	510.3429
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):	508.7483
Tank Paint Solar Absorptance (Shell):	0.1700
Tank Paint Solar Absorptance (Roof):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,193.8870
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0409
Daily Vapor Temperature Range (deg. R):	23.0949
Daily Vapor Pressure Range (psia):	0.0000
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0000
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0000
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0000
Daily Avg. Liquid Surface Temp. (deg R):	510.3429
Daily Min. Liquid Surface Temp. (deg R):	504.5692
Daily Max. Liquid Surface Temp. (deg R):	516.1166
Daily Ambient Temp. Range (deg. R):	24.1833
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	1.0000
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	0.0000
Vapor Space Outage (ft):	8.5104
Working Losses (lb):	0.0002
Vapor Molecular Weight (lb/lb-mole):	98.0790
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0000
Annual Net Throughput (gal/yr.):	301,344.0000
Annual Turnovers:	53.4279
Turnover Factor:	0.7282
Maximum Liquid Volume (gal):	5,640.1975
Maximum Liquid Height (ft):	15.0000
Tank Diameter (ft):	8.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	0.0002

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

Emissions Report for: Annual

TK-4180, Sulfuric Acid - Peak Flow - Vertical Fixed Roof Tank
Elkins, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Sulfuric Acid 93%	0.00	0.00	0.00

Material Balance Streams

Antero Resources Corporation Sandstrom Water Treatment Facility
Material Balance Streams

Stream Number	101	102	105/112	114	115	117	161
Max Flow (gpm)	8,400	8,713	390	260	210	---	1,257
Avg Flow (gpm)	1,750	2,003	184	190	157	33	16.7
Manganese (ppmw)	9	8.0	2.6	2	2.2	1.7	----
Selenium (ppmw)	0.34	0.340	0.322	0.32	0.340	0.260	----
CO2 (ppmw)	222	108	24	0.002	0.002	0.001	3
Ammonia (ppmw)	140	131	116	112	120	93	2
Total Oil (ppmw)	88	77	390	396	**5**	1,924	----
GRO (ppmw)	86	81	72	69	73	57	----
DRO (ppmw)	129	118	63	57	61	48	----
Benzene (ppmw)	0.607	0.571	0.506	0.484	0.519	0.404	----
Toluene (ppmw)	0.958	0.901	0.778	0.765	0.820	0.639	----
Ethylbenzene (ppmw)	0.047	0.044	0.039	0.037	0.040	0.031	----
Xylene (ppmw)	0.584	0.549	0.486	0.486	0.500	0.389	----
Cumene (ppmw)	0.02	0.018	0.016	0.016	0.017	0.013	----
Phenol (ppmw)	0.019	0.018	0.015	0.015	0.016	0.013	----
3&4 Methylphenol (ppmw)	0.196	0.184	0.163	0.156	0.168	0.131	----

Antero Resources Corporation Sandstrom Water Treatment Facility
Material Balance Streams

Stream Number	225	226/251/261/271	270	274	282/283	407*	408*
Max Flow (gpm)	----	1,243	778	----	23,287	2,197	70
Avg Flow (gpm)	178 lb/hr	1,140	708	170	21,170	1,997	66
Manganese (ppmw)	----	----	----	----	----	----	----
Selenium (ppmw)	----	----	----	----	----	----	----
CO2 (ppmw)	----	----	----	----	----	5.3	5.3
Ammonia (ppmw)	44.7 lb/hr	131	----	----	----	3.0	3.0
Total Oil (ppmw)	----	----	----	----	----	----	----
GRO (ppmw)	----	----	49	13	6.3	0.417	0.417
DRO (ppmw)	----	----	----	----	----	0.713	0.713
Benzene (ppmw)	----	----	----	----	----	0.003	0.003
Toluene (ppmw)	----	----	----	----	----	0.005	0.005
Ethylbenzene (ppmw)	----	----	----	----	----	0.000	0.000
Xylene (ppmw)	----	----	----	----	----	0.003	0.003
Cumene (ppmw)	----	----	----	----	----	0.000	0.000
Phenol (ppmw)	----	----	----	----	----	0.000	0.000
3&4 Methylphenol (ppmw)	----	----	----	----	----	0.001	0.001

*** Streams 407 and 408 are in mg/L rather than ppmw**

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 Sandstrom Water Treatment 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 of natural gas burning equipment is 3793 MMscf/year

2. Operational Requirements

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

b. Boilers will be fueled by natural gas only at a heater rating no more than 276.5 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 3.0 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 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 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 wetcake 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 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 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 wetcake 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 60^{th} day.

Attachment P.
Public Notice

AIR QUALITY PERMIT NOTICE
Notice of Application – Sandstrom Water Treatment Facility

Notice is given that Antero Resources Corporation has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for 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: 39.26922N, 80.89310W.

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

Pollutant	Emission Rate (tons per year)
Nitrogen Oxides (NOx)	94.86
Carbon Monoxide (CO)	95.41
Volatile Organic Compounds (VOC)	78.26
Particulate Matter less than 10 µm (PM_{10})	35.17
Particulate Matter less than 2.5 µm ($PM_{2.5}$)	29.07
Sulfur Dioxide (SO_2)	1.82
Benzene	0.092
Toluene	0.14
Ethylbenzene	0.0064
Xylenes	0.078
Carbon Dioxide equivalent (CO_2e)	286,974

Startup of operation is planned to begin on or about April 2017, with construction and installation starting in 2015 and January 2016 respectively. 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 1227, during normal business hours.

Dated this the 20th day of July 2015.

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: January 23, 2015

ATTN.: Director

Corporation's / other business entity's Federal Employer I.D. Number 80-0162034

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.

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

Name of Corporation or business entity