INTERNAL PERMITTING DOCUMENT TRACKING MANIFEST

Company Name **Antero Treatment LLC - Clearwater Facility**

Permitting Action Number R13-3260A Total Days 65 DAQ Days 38

Permitting Action:

- ❍ Permit Determination
- ❍ General Permit
- ❍ Administrative Update
- ❍ Temporary
- ❍ Relocation
- ❍ Construction
- ✓ Modification
- ❍ PSD (Rule 14)
- ❍ NNSR (Rule 19)

Documents Attached:

- ✓ Engineering Evaluation/Memo
- ✓ Draft Permit
- ✓ Notice
- ❍ Denial
- ❍ Final Permit/General Permit Registration
- ❍ Completed Database Sheet
- ❍ Withdrawal
- ❍ Letter
- ❍ Other *(specify)*

Date	From	To	Action Requested
12/1/2016	Jerry	Bev	Please review and approve to go to notice.
12/6	Bev	Jerry	See comments – Addition – Go to Notice
12/6	Jerry	SANDIE	APPROVED FOR NOTICE

NOTE: Retain a copy of this manifest for your records when transmitting your document(s).

Engineer	Jerry Williams, P.E.
Email Address	jerry.williams@wv.gov
Company Name	Antero Treatment LLC
Company ID	017-00157
Facility Name	Clearwater Facility
Permit Number	R13-3260A
County	Doddridge
Newspaper	*The Herald Record, The Ritchie Gazette*
Company Email and "Attention To:"	Al Schopp aschopp@anteroresources.com
Environmental Contact Email Address	Barry Schatz (bschatz@anteroresources.com) Michele Steyskal (msteyskal@kleinfleder.com)
Regional Office (if applicable)	NA
New or Modified Source?	modified
Construction, Modification, or Relocation?	modification
Type of Facility	Water Treatment Facility
"Located" or "To Be Located"?	located
Place where I can find electronic versions of your notice, engineering evaluation, and draft permit	Q:\AIR_QUALITY\J_Willi\Permit Applications Under Review\Antero Treatment LLC\R13-3260A Clearwater Facility

AIR QUALITY PERMIT NOTICE

Notice of Intent to Approve

On September 27, 2016, Antero Treatment LLC applied to the WV Department of Environmental Protection, Division of Air Quality (DAQ) for a permit to modify a water treatment facility (Clearwater) located south of US-50, Greenwood, Doddridge County, WV at latitude 39.269226 and longitude -80.893094. A preliminary evaluation has determined that all State and Federal air quality requirements will be met by the proposed facility. The DAQ is providing notice to the public of its preliminary determination to issue the permit as R13-3260A.

The following increase in potential emissions will be authorized by this permit action: Particulate Matter less than 10 microns, 10.33 tons per year (TPY); Particulate Matter less than 2.5 microns in diameter, 6.76 TPY; Volatile Organic Compounds, 34.58 TPY; Total Hazardous Air Pollutants, 0.71 TPY.

The following decrease in potential emissions will be authorized by this permit action: Sulfur Dioxide, 0.46 TPY; Nitrogen Oxides, 2.92 TPY; Carbon Monoxide, 5.40 TPY; Greenhouse Gas (Carbon Dioxide Equivalents), 25,471 TPY.

Written comments or requests for a public meeting must be received by the DAQ before 5:00 p.m. on (Day of Week, Month, Day, Year). A public meeting may be held if the Director of the DAQ determines that significant public interest has been expressed, in writing, or when the Director deems it appropriate.

The purpose of the DAQ's permitting process is to make a preliminary determination if the proposed modification will meet all state and federal air quality requirements. The purpose of the public review process is to accept public comments on air quality issues relevant to this determination. Only written comments received at the address noted below within the specified time frame, or comments presented orally at the public meeting, will be considered prior to final action on the permit. All such comments will become part of the public record.

Jerry Williams, P.E.
WV Department of Environmental Protection
Division of Air Quality
601 57th Street, SE
Charleston, WV 25304
Telephone: 304/926-0499, ext. 1223
FAX: 304/926-0478

Additional information, including copies of the draft permit, application and all other supporting materials relevant to the permit decision may be obtained by contacting the engineer listed above. The draft permit and engineering evaluation can be downloaded at:

www.dep.wv.gov/daq/Pages/NSRPermitsforReview.aspx

west virginia department of environmental protection

Division of Air Quality
601 57th Street SE
Charleston, WV 25304
Phone (304) 926-0475 • FAX: (304) 926-0479

Earl Ray Tomblin, Governor
Randy C. Huffman, Cabinet Secretary
www.dep.wv.gov

ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Application No.:	R13-3260A
Plant ID No.:	017-00157
Applicant:	Antero Treatment LLC (Antero)
Facility Name:	Antero Clearwater Facility
Location:	Greenwood, Doddridge County
NAICS Code:	213112 (Support Activities for Oil and Gas Operations)
Application Type:	Modification
Received Date:	September 27, 2016
Engineer Assigned:	Jerry Williams, P.E.
Fee Amount:	$2,000.00
Date Received:	September 27, 2016
Complete Date:	October 24, 2016
Due Date:	January 22, 2017
Applicant Ad Date	September 30, 2016
Newspaper:	*The Doddridge Independent*
UTM's:	Easting: 509.222 km Northing: 4,346.659 km Zone: 17
Description:	Water treatment facility for oil and gas operation support.

DESCRIPTION OF PROCESS

Permit R13-3260 was issued to Antero on December 7, 2015 for the operation and construction of a water treatment facility for oil and gas operation support.

This modification application consists of:

- Modification of the emergency generator model
- Modification to the operation of the boilers to take an 89% fuel limitation from maximum and change the status of the facility to a synthetic minor
- Modification to the thermal oxidizer heat rating and operation

- Modification of operations in the thermal portion of the facility resulting in emission changes to a few tanks and the salt disposal
- Addition of a fire water pump engine
- Addition of an emergency flare for the gas blanket stream
- Addition of tanks and a change to the Pre-treatment operations at the facility
- Addition and removal of some of the chemical tanks (insignificant emissions)
- Addition of a calcium carbonate stream
- Addition of an offsite fuel conditioning skid that will support the facility

The following process description was taken from Permit Application R13-3260A:

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

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

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

Equalization Tank
Water will be pumped from the Clarifier Pump Tanks (TK-1060A and TK-1060B) to an Equalization Tank (TK-1070). The Equalization Tank (TK-1070) will include an oil removal device. Oil that is removed from the tank will also be pumped to the Oil Collection Tank (TK-1065). The Clarifier Pump Tanks (TK-1060A and TK-1060B) and Equalization Tank (TK-1070) will be covered and vented, with all off-gas being routed to the Thermal Oxidizer (U-1080).

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

Solids Contact Clarifier
The water is pumped from the Equalization Tank (TK-1070) and enters the Solids Clarifier Tank (TK-2010) where select constituents are chemically removed. Select constituent removal aids in both incremental water treatment, as well as protection and optimal water chemistry for the thermal system's equipment and process. The solids generated during pretreatment are removed from the Solids Clarifier Tank (TK-2010) and pumped to the Sludge Holding Tank (TK-2020). The clarified effluent from the Solids Clarifier Tank (TK-2010) will flow into a Clarifier Effluent Tank (TK-2015). All of the tanks in this process are covered and vented with all off-gas routed for emissions control by the Thermal Oxidizer (U-1080).

Pre-Treatment Dewatering System
The volumetric feed to the Sludge Holding Tank (TK-2020) will consist of sludge from the Solids Clarifier Tank (TK-2010) and sludge from the Grit Clarifiers (TK-1055A and TK-1055B). The sludge is continuously pumped from the Sludge Holding Tank (TK-2020) to Dewatering Equipment which is housed in a building. Recovered filtrate from dewatering equipment is then sent to the Sludge Filtrate Sump (SP-2030) for temporary storage before it is recycled to the Grit Clarifiers (TK-1055A and TK-1055B) to be retreated. The dewatered cake will be transferred to appropriate disposal containers which are filled directly on truck under a covered canopy. The dewatered cake will be transported to an appropriate landfill for disposal (DISP1). The dewatering equipment will also be operated 24 hours per day, 7 days per week.

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

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

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

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

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

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

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

Stage 1 Sludge Dewatering System
The volumetric feed to the Stage 1 Sludge Holding Tank (TK-1120) will consist of sludge from the Stage 1 Clarifier (TK-1055B) and sludge from the Grit Clarifier (TK-1055A). The sludge is intermittently pumped from the Stage 1 Sludge Holding Tank (TK-1120) to the Stage 1 Dewatering Equipment. Recovered filtrate from dewatering equipment is then sent to the Stage 1 Filtrate Tank (TK-1130) for temporary storage before it is recycled to the Stage 1 Reaction Tanks (TK-1105A and TK-1105B) to be retreated. The dewatered cake will be transferred to an appropriate landfill for disposal (DISP3).

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

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

Solids Contact Clarifier Dewatering System
The volumetric feed to the Stage 2 Sludge Holding Tank (TK-2020) will consist of sludge from the Solids Clarifier Tank (TK-2010). The sludge is continuously pumped from the Stage 2 Sludge Holding Tank (TK-2020) to the Stage 2 Dewatering Equipment. Recovered filtrate from

dewatering equipment is then sent to the Stage 2 Sludge Filtrate Sump (SP-2030) for temporary storage before it is recycled to the Grit Clarifier (TK-1055A) to be retreated. The dewatered cake will be transferred to an appropriate landfill for disposal (DISP1).

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

Thermal Process System
Thermal Feed brine is pumped from the Crystallizer Feed Tank (TK-2040) into the thermal system. Steam from two (2) natural gas-fired boilers (H-2185A and H-2185B) provides the energy to drive the thermal process. A small amount of steam is passed through the Deaerator (E-2076) counter-current to the feed brine. The vent from the Deaerator (E-2076) will include components such as ammonia and volatile organics which are sent to the thermal oxidizer (U-1080). Deaerator brine from the Deaerator is temporarily stored in the Process Distillate Level Tank (TK-2120). Slurry from the thermal process is pumped to the dewatering building where solids are removed for disposal (DISP2). Centrate from the dewatering process is returned to the thermal process after temporary storage in the Disposal Centrate Tanks (TK-2160 and TK-2460).

The vast majority of the water that enters the system leaves as clean, recovered distillate. Condensed vapors from the thermal system flow by gravity to a Barometric Condenser Hot Well (TK-2130) before being transferred to the Recovered Water Tank (TK-2140). Vapors from the Recovered Water Tank (TK-2140) are sent to the Thermal Oxidizer (U-1080). Most often, this distillate is planned to be reused in future oil and gas operations. If distillate production exceeds the need for recycled fracing water, the balance of the distillate stream may be discharged to a surface water source, but only if the chemical makeup of that distillate complies with strict water quality standards designated by appropriate government permits. This water treatment facility has been designed to meet those anticipated discharge water quality requirements. Condensate from the Thermal System is collected in a Steam Condensate Flash Tank (TK-2085) before being transferred to a Condensate Treatment System and then collected in a Boiler Feedwater Tank (TK-2180). The condensate leaves the Boiler Feedwater Tank (TK-2180) and is pumped to the Boiler Deaerator Tank (TK-2315) prior to feeding the Boiler System. Blowdown from the Boiler System is collected in the Boiler Blowdown Flash Tank (TK-2450) and recycled into the process. The Condensate Treatment Process includes an ion exchange system that needs to be regenerated with brine. The brine will be stored in the Brine Maker (TK-2149) until it is required for regeneration. Cooling water is required for various uses. Plant service water is used as make-up water to the cooling tower (CT-2335); this water is treated distillate, so it is of high quality. Blowdown from the tower will be released based on cooling water conductivity. A cooling tower treatment package is included to satisfy regulatory requirements associated with the operation of the tower. One or more biocides will be added to control biological activity and to control health risks. In the event that chemical cleaning is required in the Thermal System, the CIP Tank (TK-2320) will be used to store the cleaning solution that will be fed to the Thermal System.

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

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

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

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

Fuel Conditioning Skid
An offsite fuel conditioning skid will be used to condition the fuel gas that will be used at the Clearwater Facility. This skid will contain two (2) - 2.4 MMBtu/hr heaters (HTFUEL1 and HTFUEL2), and a pig receiver (VENT1). Other equipment located at the skid, such as a 500 gallon dry gas tank (TK-SLOP), an inlet separator, scrubber, and pressure vessel, will be in a closed loop and will not produce any emissions.

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

SITE INSPECTION

A site inspection was conducted on August 12, 2016 by the writer. I met with Conrad Baston and Bryan Radabaugh of Antero. The facility was under construction and was not operating at that time.

Latitude: 39.26922
Longitude: -80.89310

Directions to the facility are as follows:

From Greenwood: Facility located off of US-50 on access road off of Gum Run Road (50/36)

ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

Emissions associated with this facility consist of one (1) diesel-fired emergency generator (1E), two (2) natural gas-fired boilers (2E, 3E), one (1) thermal oxidizer (4E) controlling multiple process tanks, multiple storage tanks and fugitive emissions. Fugitive emissions from the facility are negligible due to the fact that most processes are in the liquid phase or are less than 1% VOC. Once the process moves to the vapor phase, the volatiles and oils have been removed, are adsorbed by the solids or otherwise consumed in the process. The following table indicates which methodology was used in the emissions determination:

Emission Point ID#	Process Equipment	Calculation Methodology
1E	2,923 HP Diesel-Fired Emergency Generator	Manufacturer's Data, EPA AP-42 Emission Factors
2E, 3E	Two (2) 275.3 MMBTU/hr NG-Fired Boilers	Manufacturer's Data, EPA AP-42 Emission Factors
4E	Thermal Oxidizer	EPA AP-42 Emission Factors, Engineering Estimate
TL	Truck Unloading Influent Water	EPA AP-42 Emission Factors
28E	Cooling Tower	EPA AP-42 Emission Factors
29E	2.2 MMBTU/hr Emergency Flare	EPA AP-42 Emission Factors, Engineering Estimate
30E	136 HP Fire Water Pump Engine	Manufacturer's Data, EPA AP-42 Emission Factors
31E, 32E	Two (2) 2.4 MMBTU/hr Fuel Skid Heaters	EPA AP-42 Emission Factors
Waste Gas Header (4E)	TK-1055A/B, TK-1060A/B, TK-1065, TK-1070, TK-1105A/B, TK-1115, TK-1120, TK-1130, TK-2010, TK-2015, TK-2020, TK-2040, TK-2130, TK-2140, TK-2160, E-2076	WATER9, TANKS 4.09d, Material Balance
Post Treatment System	TK-2500, TK-2550, TK-2555, CF-2510, TK-2520, TK-2515	Material Balance, WATER9
Sludge and Wetcake Disposal	DISP1, DISP2, DISP3	Material Balance, EPA Emission Factors
Storage Tank W&B Losses	TK-2120, TK-4115	EPA Tanks 4.09d
Sodium Sulfate Feeder	TK-4036, U-4037, U-4038	EPA AP-42 Emission Factors
Bulk Lime Feeder A	TK-4046A, U-4047A, U-4048A	EPA AP-42 Emission Factors
Bulk Lime Feeder B	TK-4046B, U-4047B, U-4048B	EPA AP-42 Emission Factors
Sodium Bicarbonate Feeder	TK-4011, U-4012, U-4013	EPA AP-42 Emission Factors
Calcium Bicarbonate Feeder	TK-4301, U-4302, U-4303	EPA AP-42 Emission Factors
Fugitive Dust	Vehicle Travel on Facility Roads	EPA AP-42 Emission Factors

The total facility PTE (including fugitives) for the Antero Clearwater Facility is shown in the following table:

Pollutant	R13-3260 PTE (tons/year)	R13-3260A PTE (tons/year)	PTE Change (tons/year)
Nitrogen Oxides	94.86	91.94	-2.92
Carbon Monoxide	95.41	90.01	-5.40
Volatile Organic Compounds	44.94	79.52	34.58
Particulate Matter-10	26.94	37.27	10.33
Particulate Matter-2.5	22.27	29.03	6.76
Sulfur Dioxide	1.82	1.36	-0.46
Total HAPs	3.90	4.61	0.71
Carbon Dioxide Equivalent	301,969	276,498	-25,471

The total non-fugitive facility PTE for the Clearwater Facility (water treatment facility and landfill) is shown in the following table:

Pollutant	R13-3260A PTE Water Treatment Facility (tons/year)	R13-3331 PTE Landfill Facility (tons/year)	Facility ID 017-00157 Total (tons/year)
Nitrogen Oxides	91.94	0.27	92.21
Carbon Monoxide	90.01	0.27	90.28
Volatile Organic Compounds	59.14	0.01	59.15
Particulate Matter-10	26.08	17.55	43.63
Particulate Matter-2.5	26.08	2.13	28.21
Sulfur Dioxide	1.36	0.07	1.43
Total HAPs	4.61	<0.01	4.61
Carbon Dioxide Equivalent	276,498	30	276,528

Fugitive particulate matter emissions associated with the Clearwater Facility consist of 6.30 tons/year of PM_{10} and 2.95 tons/year of $PM_{2.5}$. Fugitive VOC emissions associated with the Clearwater Facility are 20.39 tons/year.

Maximum detailed controlled point source emissions were calculated by Antero and checked for accuracy by the writer and are summarized in the table on the next page.

Antero Treatment LLC – Antero Clearwater Facility (R13-3260A)

Emission Point ID#	Source	NO_x		CO		VOC		PM-10		PM-2.5		SO_2		Total HAPs		CO2e
		lb/hr	ton/year	lb/hr	ton/year	lb/hr	ton/year	lb/hr	ton/year	lb/hr	ton/year	lb/hr	ton/year	lb/hr	ton/year	ton/year
1E	Emergency Generator	25.78	6.45	16.83	4.21	2.69	0.67	0.96	0.24	0.96	0.24	0.03	0.01	0.03	0.01	900
2E	Boiler	10.03	39.21	10.17	39.79	1.10	4.31	2.75	10.77	2.75	10.77	0.16	0.63	0.51	1.99	126393
3E	Boiler	10.03	39.21	10.17	39.79	1.10	4.31	2.75	10.77	2.75	10.77	0.16	0.63	0.51	1.99	126393
4E	Thermal Oxidizer (Controlled Tanks)	1.08	4.74	0.93	4.08	4.41	15.58	0.0001	0.0006	0.0001	0.0006	0.00001	0.00005	0.01	0.03	5939
TUL	Truck Unloading Influent Water	0	0	0	0	18.59	16.86	0	0	0	0	0	0	0.12	0.11	15015
TL	Truck Loading of Oil	0	0	0	0	16.70	8.72	0	0	0	0	0	0	0.28	0.15	2
28E	Cooling Tower	0	0	0	0	0	0	0.94	4.12	0.94	4.12	0	0	0	0	0
TKS	Process Tanks	0	0	0	0	1.97	7.90	0	0	0	0	0	0	0.01	0.05	483
TKS	Storage Tanks	0	0	0	0	0.07	0.25	0	0	0	0	0	0	0.07	0.25	0
29E	Emergency Flare	0.16	0.06	0.69	0.14	1.25	0.21	0.0006	0.0024	0.0006	0.0024	0.0000	0.0002	0.0001	0.001	82
30E	Fire Water Pump Engine	0.85	0.21	1.11	0.28	0.04	0.01	0.07	0.02	0.07	0.02	0.27	0.07	0.0035	0.0009	39
31E	Fuel Skid Heater	0.24	1.03	0.20	0.87	0.01	0.06	0.02	0.08	0.02	0.08	0.00	0.01	0.0045	0.02	617
32E	Fuel Skid Heater	0.24	1.03	0.20	0.87	0.01	0.06	0.02	0.08	0.02	0.08	0.00	0.01	0.0045	0.02	617
VENT1	Fuel Skid Pig Venting	0	0	0	0	7.53	0.20	0	0	0	0	0	0	0.18	0.0047	18
Total Clearwater Point Source		**48.39**	**91.94**	**40.30**	**90.01**	**55.48**	**59.14**	**7.51**	**26.08**	**7.51**	**26.08**	**0.63**	**1.36**	**1.73**	**4.61**	**276498**
FUG	Sludge and Salt Disposal	0	0	0	0	4.66	20.39	0	0	0	0	0	0	0.0008	0.0034	0
FUG	Bulk Transfer Points	0	0	0	0	0	0	2.65	5.64	0.75	1.59	0	0	0	0	0
FUG	Fugitive Dust Emissions	0	0	0	0	0	0	1.41	5.55	0.35	1.36	0	0	0	0	0
Total Clearwater Fugitive		**0**	**0**	**0**	**0**	**4.66**	**20.39**	**4.06**	**11.19**	**1.10**	**2.95**	**0**	**0**	**0.0008**	**0.0034**	**0**
Total Clearwater Sitewide		**48.39**	**91.94**	**40.30**	**90.01**	**60.15**	**79.52**	**11.57**	**37.27**	**8.61**	**29.03**	**0.63**	**1.36**	**1.73**	**4.61**	**276498**
Landfill Facility Point Source		**0.90**	**0.27**	**0.96**	**0.27**	**0.05**	**0.01**	**7.09**	**17.55**	**0.89**	**2.13**	**0.21**	**0.07**	**0.0026**	**0.0007**	**30**
Clearwater + Landfill Point Source		**49.29**	**92.21**	**41.26**	**90.28**	**55.53**	**59.15**	**14.60**	**43.63**	**8.40**	**28.21**	**0.84**	**1.43**	**1.73**	**4.61**	**276528**

REGULATORY APPLICABILITY

The following rules apply to the facility:

45CSR2 (Particulate Air Pollution from Combustion of Fuel in Indirect Heat Exchangers)

The purpose of 45CSR2 is to establish emission limitations for smoke and particulate matter which are discharged from fuel burning units. 45CSR2 states that any fuel burning unit that has a heat input under ten (10) million B.T.U.'s per hour is exempt from sections 4 (weight emission standard), 5 (control of fugitive particulate matter), 6 (registration), 8 (testing, monitoring, recordkeeping, reporting) and 9 (startups, shutdowns, malfunctions). However, failure to attain acceptable air quality in parts of some urban areas may require the mandatory control of these sources at a later date.

Antero is subject to the opacity requirements in 45CSR2, which is 10% opacity based on a six minute block average. Antero is also subject to the weight emission standard for particulate matter under 45CSR2. According to 45CSR2 Section 4.1.b, for Type 'b' fuel burning units, the product of 0.09 and the total design heat inputs for such units in million B.T.U.'s per hour. Therefore, each 275.3 MMBTU/hr natural gas fired boiler (2E, 3E), could not exceed 24.77 lb/hr of particulate matter. Each boiler (2E, 3E) has particulate matter emissions of 2.75 lb/hr. Therefore, Antero will meet this rule.

The individual heat input of the fuel conditioning skids (HTFUEL1, HTFUEL2) are below 10 MMBTU/hr. Therefore, these units are exempt from the aforementioned sections of 45CSR2.

Antero would also be subject to the opacity requirements in 45CSR2, which is 10% opacity based on a six minute block average.

45CSR6 (To Prevent and Control Air Pollution from the Combustion of Refuse)

The purpose of this rule is to prevent and control air pollution from combustion of refuse.

Antero has one (1) thermal oxidizer and one (1) emergency flare at the facility. These units are subject to section 4, emission standards for incinerators. These units have negligible hourly particulate matter emissions. Therefore, the facility's thermal oxidizer and emergency flare should demonstrate compliance with this section. The facility will demonstrate compliance by maintaining records of the amount of natural gas consumed by these units and the hours of operation. The facility will also monitor the flame of these units and record any malfunctions that may cause no flame to be present during operation.

45CSR10 (To Prevent and Control Air Pollution from the Emission of Sulfur Oxides)

The purpose of 45CSR10 is to establish emission limitations for sulfur dioxide which are discharged from fuel burning units. 45CSR10 states that any fuel burning unit that has a heat input under ten (10) million B.T.U.'s per hour is exempt from sections 3 (weight emission standard), 6 (registration), 7 (permits), and 8 (testing, monitoring,

recordkeeping, reporting). However, failure to attain acceptable air quality in parts of some urban areas may require the mandatory control of these sources at a later date.

Antero will meet the weight emission standard for sulfur dioxide set forth in 45CSR10 which is 3.1 lb/MMBtu. For each 275.3 MMBTU/hr natural gas fired boiler (2E, 3E), the weight emission standard for a Type 'b' fuel burning unit would be 853.43 lb/hr for the natural gas fired boilers. The hourly sulfur dioxide rate set forth in Permit Application R13-3260A is 0.16 lb/hr for each natural gas fired boiler. Therefore, Antero will meet this rule. Antero will demonstrate compliance with this requirement by monitoring the amount of natural gas consumed by the boilers.

The individual heat input of the fuel conditioning skids (HTFUEL1, HTFUEL2) are below 10 MMBTU/hr. Therefore, these units are exempt from the aforementioned sections of 45CSR10.

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)

A 45CSR13 modification permit applies to this source due to the fact that Antero is subject to a substantive requirement of an emission control rule (40CFR60 Subparts Db and IIII). In addition, because a limitation was placed on the maximum annual fuel consumption of the boilers to remain below major source thresholds for NO_x and CO, Antero is subject to Notice Level C (45CSR13 Section 8.5) and will be required to publish a commercial display ad (45CSR13 Section 8.4.a) and post a visible sign at their facility (45CSR13 Section 8.5.a).

Antero paid the appropriate application fee and published the required legal advertisement for a modification permit application.

45CSR16 (Standards of Performance for New Stationary Sources Pursuant to 40 CFR Part 60)

45CSR16 applies to this source by reference of 40CFR60, Subparts Db and IIII. These requirements are discussed under those rules below.

45CSR30 (Requirements for Operating Permits)

The source is a nonmajor source subject to 45CSR30, because the facility is subject to 40CFR60 Subpart Db. This facility is a deferred Title V source.

45CSR40 (Control of Ozone Season Nitrogen Oxide Emissions)

This rule establishes general provisions for nitrogen oxide emissions from various emission units. The two (2) 275.3 MMBTU/hr boilers (2E, 3E) are subject to continuous emission monitoring (CEM) requirements as part of this rule.

40CFR60 Subpart Db (Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units)

This rule applies to steam generating units with a heat input capacity greater than 100 MMBTU/hr for which construction commenced after June 19, 1984. The 275.3 MMBTU/hr boilers (2E, 3E) that Antero proposes to install will be subject to this rule. These units are subject to the New Source Performance Standards of Subpart Db since each unit will have a design heat input rating of greater than 100 MMBtu/hr. 40CFR60 Subpart Db establishes performance standards by pollutant by fuel type (i.e. coal, oil, and natural gas). For natural gas fired units, the subpart only establishes a performance standard for NO_x emissions. These units will be constructed after July 9, 1997 which makes the unit applicable to the limit in 40 CFR §60.44b(l) of 0.20 lb of NOx (expressed as NO_2) per MMBtu. These units will be equipped with a low-NOx burner with a maximum NOx rate of 0.036 lb/MMBtu. At this NO_x rating, these units would have a margin of compliance of 18% of the applicable NO_x limit.

Subpart Db requires affected sources to demonstrate compliance with the NO_x limit on a 30 day rolling average. This subpart will require the use of a NO_x continuous emission monitoring system (NO_x CEMS) with a means to measure either O_2 or CO_2 in the exhaust for demonstrating compliance with the NO_x emission standard.

40CFR60 Subpart IIII (Standards of Performance for Stationary Compression Ignition Internal Combustion Engines (CI ICE))

Subpart IIII sets forth non-methane hydrocarbon (NMHC), hydrocarbon (HC), nitrogen oxides (NO_x), carbon monoxide (CO), and particulate matter (PM) emission limits, fuel requirements, installation requirements, and monitoring requirements based on the year of installation of the subject internal combustion engine.

The 2,923 HP (2,180 kW) diesel fired generator (1E) is subject to this subpart. This unit is required to meet the emission standards for emergency engines in §60.4205. These standards are 5.89 lb/hr for NOx and 1.93 lb/hr for PM. Antero provided an EPA Certificate of Conformity which states that this engine will meet these standards.

The 136 HP (101 kW) fire water pump engine (30E) is subject to this subpart. This unit is required to meet Table 4 of 40CFR60 Subpart IIII for stationary fire pump engines. These standards are 4.0 g/kw-hr for NMHC+NO_x, 3.5 g/kw-hr for CO and 0.20 g/kw-hr for PM. Antero provided an EPA Certificate of Conformity which states that this engine will meet these standards.

40CFR63 Subpart ZZZZ (National Emission Standards for Hazardous Air Pollutants for Reciprocating Internal Combustion Engines)

Subpart ZZZZ establishes national emission limitations and operating limitations for HAPs emitted from stationary RICE located at major and area sources of HAP emissions. This subpart also establishes requirements to demonstrate initial and continuous compliance with the emission limitations and operating limitations. The generator

(1E) at the Antero Clearwater Facility is subject to the area source requirements for non-emergency compression ignition engines.

The applicability requirements for new stationary RICEs located at an area source of HAPs, is the requirement to meet the standards of 40CFR60 Subpart IIII. These requirements were outlined above. The proposed engines meet these standards.

The following rules do not apply to the facility:

45CSR14 (Permits for Construction and Major Modification of Major Stationary Sources of Air Pollutants)

45CSR19 (Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution which Cause or Contribute to Nonattainment)

The Antero Clearwater Facility is located in Doddridge County, which is an unclassified county for all criteria pollutants, therefore it is not applicable to 45CSR19.

Antero is not a major source subject to 45CSR14 or 45CSR19 review. According to 45CSR14 Section 2.43.e, fugitive emissions are included in the major source determination because it is listed as one of the source categories in Table 1 (fossil fuel boilers (or combination thereof) totaling more than 250 MMBTU/hr heat input). The NO_x emissions from the boilers are 78.42 tons per year and the CO emissions are 79.58 tons per year.

The facility wide emissions from the Clearwater Facility and Landfill are less than 45CSR14 and 45CSR19 thresholds.

40CFR60 Subpart Kb (Standards of Performance for Volatile Organic Liquid Storage Vessels)

The affected facility to which this subpart applies is each storage vessel with a capacity greater than or equal to 75 cubic meters (m^3) (19,813 gallons) that is used to store volatile organic liquids (VOL) for which construction, reconstruction, or modification is commenced after July 23, 1984. This subpart does not apply to 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 (kPa) or with a capacity greater than or equal to 75 m^3 but less than 151 m^3 storing a liquid with a maximum true vapor pressure less than 15.0 kPa. This subpart also does not apply to pressure vessels designed to operate in excess of 204.9 kPa and without emissions to the atmosphere.

The storage vessels in the following table have a maximum capacity less than 75 m^3 and/or do not contain a volatile liquid and are therefore exempt from this Subpart.

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

The Clarifier Pump Tanks A & B (TK-1060A and TK-1060B) each have a capacity between 75 m^3 and 151 m^3 with a vapor pressure less than 15 kPa (2.18 psia) and are therefore exempt from this Subpart.

The following tanks have a maximum storage capacity greater than 151 m^3 and are exempt from this Subpart since their vapor pressure will be less than 3.5 kPa.

Grit clarifier tank (TK-1055A)	Equalization tank (TK-1070)	Thermal feed tank (TK-2040)
Sludge Holding Tank (TK-2020)	Boiler Feedwater Tank (TK-2180)	Recovered Water Tank (TK-2140)
Post Treatment Tank 1 (TK-2500)	Post Treatment Tank 2 (TK-2550)	Post Treatment Tank 3 (TK-2555)
Product Water Storage Tank	Stage 1 Clarifier	Solids Clarifier Tank

(TK-2545)	(TK-1055B)	(TK-2010)
Post Treatment System Tanks (CF-2510)	Stage 1 sludge holding tank (TK-1120)	Stage 1 reaction tanks A & B (TK-1105A & TK-1105B)

As shown in the regulatory analysis above, 40 CFR60 Subpart Kb is not applicable to the storage vessels at Antero Clearwater Facility.

40CFR60 Subpart OOOO (Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution)

EPA published in the Federal Register new source performance standards (NSPS) and air toxics rules for the oil and gas sector on August 16, 2012. 40CFR60 Subpart OOOO establishes emission standards and compliance schedules for the control of volatile organic compounds (VOC) and sulfur dioxide (SO_2) emissions from affected facilities that commence construction, modification or reconstruction after August 23, 2011.

There are no affected sources located within the Antero Clearwater Facility.

40CFR60 Subpart QQQ (Standards of Performance for VOC Emissions from Petroleum Refinery Wastewater Systems)

This rule applies to facilities constructed, modified or reconstructed after May 4, 1987 that operate an oil-water separator at a petroleum refinery.

There are no affected sources located within the Antero Clearwater Facility.

40CFR63 Subpart DD (National Emission Standards for Hazardous Air Pollutants from Off-Site Waste and Recovery Operations)

This rule applies to certain provisions of wastewater treatment facilities that are a major source of HAPs. The Antero Clearwater Facility is not a major source of HAPs, therefore, this rule would not apply.

40CFR63 Subpart DDDDD (National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers and Process Heaters)

This rule applies to boilers that are a major source of HAPs. The Antero Clearwater Facility is not a major source of HAPs, therefore, this rule would not apply.

40CFR63 Subpart JJJJJJ (National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers Area Sources)

This rule applies to boilers at major and area sources of HAP emissions. The boilers (2E, 3E) are located at an area source of HAPs. These boilers will be firing natural gas only. Therefore, they meet the exemption criteria in §63.11193, therefore, this rule would not apply.

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

The majority of non-criteria regulated pollutants fall under the definition of HAPs which, with some revision since, were 188 compounds identified under Section 112(b) of the Clean Air Act (CAA) as pollutants or groups of pollutants that EPA knows or suspects may cause cancer or other serious human health effects. The following HAPs are common to this industry. The following table lists each HAP's carcinogenic risk (as based on analysis provided in the Integrated Risk Information System (IRIS)):

HAPs	Type	Known/Suspected Carcinogen	Classification
Formaldehyde	VOC	Yes	Category B1 - Probable Human Carcinogen
Benzene	VOC	Yes	Category A - Known Human Carcinogen
Ethylbenzene	VOC	No	Inadequate Data
Toluene	VOC	No	Inadequate Data
Xylenes	VOC	No	Inadequate Data
n-Hexane	VOC	No	Inadequate Data
Methanol	VOC	No	Inadequate Data

All HAPs have other non-carcinogenic chronic and acute effects. These adverse health effects may be associated with a wide range of ambient concentrations and exposure times and are influenced by source-specific characteristics such as emission rates and local meteorological conditions. Health impacts are also dependent on multiple factors that affect variability in humans such as genetics, age, health status (e.g., the presence of pre-existing disease) and lifestyle. As stated previously, *there are no federal or state ambient air quality standards for these specific chemicals*. For a complete discussion of the known health effects of each compound refer to the IRIS database located at *www.epa.gov/iris*.

AIR QUALITY IMPACT ANALYSIS

Modeling was not required of this source due to the fact that the facility is not subject to 45CSR14 (Permits for Construction and Major Modification of Major Stationary Sources of Air Pollutants) or 45CSR19 (Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution which Cause or Contribute to Nonattainment) as shown in the table listed in the Regulatory Discussion section under 45CSR14/45CSR19.

SOURCE AGGREGATION

Classifying multiple facilities as one "stationary source" under 45CSR13, 45CSR14, and 45CSR19 is based on the definition of "Building, structure, facility, or installation" as given in §45-14-2.13 and §45-19-2.12. The definition states:

"Building, Structure, Facility, or Installation" means all of the pollutant-emitting activities which belong to the same industrial grouping, are located on one or more contiguous or adjacent properties, and are under the control of the same person (or persons under common control). Pollutant-emitting activities are a part of the same industrial grouping if they belong to the same "Major Group" (i.e., which have the same two (2)-digit code) as described in the Standard Industrial Classification Manual, 1987 (United States Government Printing Office stock number GPO 1987 0-185-718:QL 3).

The Antero Landfill and Antero Clearwater Facility are under common control and share the same SIC code. Therefore, the potential classification of these facilities as one stationary source with any other facility depends on the determination if these stations are considered "contiguous or adjacent properties."

"Contiguous or Adjacent" determinations are made on a case by case basis. These determinations are proximity based, and it is important to focus on this. The terms "contiguous" or "adjacent" are not defined by USEPA. Contiguous has a dictionary definition of being in actual contact; touching along a boundary or at a point. Adjacent has a dictionary definition of not distant; nearby; or having a common endpoint or border. The Antero Landfill and Antero Clearwater Facility are located on contiguous or adjacent properties.

Because the facilities are considered to be on contiguous or adjacent properties, the emissions from these facilities should be aggregated in determining major source or PSD status.

MONITORING OF OPERATIONS

Antero will be required to perform the following monitoring and recordkeeping:

- Monitor and record the hours of operation of the generator
- Opacity observations of the thermal oxidizer and emergency flare
- Quarterly AVO (audio, visual, olfactory) inspections
- Thermal oxidizer and emergency flare flame must be continuously monitored
- Liquids unloaded throughput
- Oil loading throughput
- Sludge disposal
- Wetcake disposal
- Maintain records of the hours of operation for all engines
- Boiler fuel combustion
- Maintain records of testing conducted in accordance with the permit. Said records shall be maintained on-site or in a readily accessible off-site location
- Maintain the corresponding records specified by the on-going monitoring requirements of and testing requirements of the permit

- Maintain a record of all potential to emit (PTE) HAP calculations for the entire facility.
- Maintain records of all applicable requirements of 40CFR60 Subparts Db and IIII
- The records shall be maintained on site or in a readily available off-site location maintained by Antero for a period of five (5) years

CHANGES TO PERMIT R13-3260

Section 1.0	Modified the size of the emergency generator from 1,194 hp to 2,923 hp. Modified the size of the thermal oxidizer from 3 MMBTU/hr to 11 MMBTU/hr. Modified the name of tanks TK-1055A, TK-1055B, TK-2020, TK-2160. Modified the size of tanks TK-2130, TK-2160, E-2076. Removed tanks TK-2030, TK-4180. Added tanks TK-1105A, TK-1105B, TK-1115, TK-1130. Added emergency flare, fire water pump engine, two (2) fuel skid heaters.
Section 1.1	Added E-2076, TK-1120, TK-1105A, TK-1105B, TK-1115, TK-1130 to units being controlled by the thermal oxidizer, and removed TK-2030 from that list.
Section 5.0	Modified this section to account for the change in emergency generator.
Section 6.0	Modified this section to account for the slight change in size of the two (2) boilers.
Section 7.0	Modified this section to reflect the change in size of the thermal oxidizer.
Section 8.0	Modified this section to include oil loading from TK-1065.
Section 10.0	Modified this section to include E-2076, TK-1120, TK-1105A, TK-1105B, TK-1115, TK-1130 and change throughput sizes of other tanks.
Section 11.0	Added this section to include requirements for the fire water pump engine.
Section 12.0	Added this section to include requirements for the fuel skid heaters.
Section 13.0	Added this section to include requirements for the emergency flare control device.

RECOMMENDATION TO DIRECTOR

The information provided in the permit application indicates that Antero meets all the requirements of applicable regulations. Therefore, impact on the surrounding area should be minimized and it is recommended that the Antero Clearwater Facility should be granted a 45CSR13 modification permit for their facility.

Jerry Williams, P.E.
Engineer

Dec 1, 2016
Date

West Virginia Department of Environmental Protection

Earl Ray Tomblin
Governor

Division of Air Quality

Randy C. Huffman
Cabinet Secretary

Permit to Modify

R13-3260A

This permit is issued in accordance with the West Virginia Air Pollution Control Act (West Virginia Code §§22-5-1 et seq.) and 45 C.S.R. 13 – Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants, Notification Requirements, Temporary Permits, General Permits and Procedures for Evaluation. The permittee identified at the above-referenced facility is authorized to construct the stationary sources of air pollutants identified herein in accordance with all terms and conditions of this permit.

Issued to:

Antero Treatment LLC
Antero Clearwater Facility
017-00157

William F. Durham
Director

Issued: Draft

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This permit supersedes and replaces previously issued Permit R13-3260 issued on December 7, 2015.

Facility Location:	Greenwood, Doddridge County, West Virginia
Mailing Address:	1615 Wynkoop Street, Denver, CO 80202
Facility Description:	Water Treatment Facility
NAICS Codes:	213112
UTM Coordinates:	509.222 km Easting • 4,346.659 km Northing • Zone 17
Permit Type:	Modification
Description of Change:	Establish facility as synthetic minor by taking fuel limitation on boilers, change in emergency generator and thermal oxidizer, addition of fire pump engine, fuel condition skid and emergency flare, and other as-built changes.

Any person whose interest may be affected, including, but not necessarily limited to, the applicant and any person who participated in the public comment process, by a permit issued, modified or denied by the Secretary may appeal such action of the Secretary to the Air Quality Board pursuant to article one [§§22B-1-1 et seq.], Chapter 22B of the Code of West Virginia. West Virginia Code §§22-5-14.

This permit does not affect 45CSR30 applicability, the source is a nonmajor source subject to 45CSR30.

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1.0. Emission Units

Emission Unit ID	Emission Point ID	Emission Unit Description	Year Installed	Design Capacity	Control Device
GEN-1	1E	Emergency Generator	2016	2,923 HP	None
H-2185A	2E	Boiler	2016	275.3 MMBTU/hr	None
H-2185B	3E	Boiler	2016	275.3 MMBTU/hr	None
U-1080	4E	Thermal Oxidizer	2016	11 MMBTU/hr	NA
TK-1055A	4E	Grit Clarifier Tank	2016	562,000 gal	1C
TK-1055B	4E	Stage 1 Clarifier Tank	2016	562,000 gal	1C
TK-1060A	4E	Clarifier Pump Tank A	2016	23,000 gal	1C
TK-1060B	4E	Clarifier Pump Tank B	2016	23,000 gal	1C
TK-1065	4E	Oil Collection Tank	2016	13,500 gal	1C
TK-1070	4E	Equalization Tank	2016	1,030,000 gal	1C
TK-2010	4E	Solids Clarifier Tank	2016	435,000 gal	1C
TK-2015	4E	Clarifier Effluent Tank	2016	12,000 gal	1C
TK-2020	4E	Stage 2 Sludge Holding Tank	2016	103,000 gal	1C
TK-2040	4E	Thermal Feed Tank	2016	1,400,000 gal	1C
TK-2130	TK-2130	Barometric Condenser Hot Well	2016	18,000 gal	None
TK-2140	4E	Recovered Water Tank	2016	230,000 gal	1C
TK-2160	TK-2160	4A Disposal Centrate Tank	2016	8,100 gal	None
E-2076	4E	Deaerator Vent Condenser	2016	1,121 lb/hr	1C
TK-1120	4E	Stage 1 Sludge Holding Tank	2016	27,000 gal	1C
TK-1105A	4E	Stage 1 Reaction Tank A	2016	32,000 gal	1C
TK-1105B	4E	Stage 1 Reaction Tank B	2016	32,000 gal	1C
TK-1115	4E	Stage 1 Clarifier Pump Tank	2016	18,000 gal	1C
TK-1130	4E	Stage 1 Filtrate Tank	2016	1,700 gal	1C
TK-2120	20E	Process Distillate Level Tank	2015	5,575 gal	None
TK-2500	21E	Post Treatment Tank 1	2015	770,000 gal	None
TK-2550	22E	Post Treatment Tank 2	2015	770,000 gal	None
TK-2555	23E	Post Treatment Tank 3	2015	406,100 gal	None
TK-2515	24E	Post Treatment Effluent Tank	2015	12,000 gal	None
TK-2520	25E	Post Treatment Sludge Tank	2015	1,270 gal	None
TK-4115	26E	Methanol Bulk Storage Tank	2015	8,000 gal	None

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Emission Unit ID	Emission Point ID	Emission Unit Description	Year Installed	Design Capacity	Control Device
CT-2335	28E	Cooling Tower Basin	2015	34,5000 gpm	None
U-1090	29E	Emergency Flare	2016	2.2 MMBTU/hr	NA
ENG-2	30E	Fire Water Pump Engine	2016	136 HP	None
HTFUEL1	31E	Fuel Skid Heater 1	2016	2.4 MMBTU/hr	None
HTFUEL2	32E	Fuel Skid Heater 2	2016	2.4 MMBTU/hr	None

* All pumping units at the facility are electric-powered and have no associated emissions.

1.1. Control Devices

Emission Unit	Pollutant	Control Device	Control Efficiency
TK-1055A, TK-1055B, TK-1060A, TK-1060B, TK-1065, TK-1070, TK-2010, TK-2015, TK-2020, TK-2040, TK-2140, E-2076, TK-1120, TK-1105A, TK-1105B, TK-1115, TK-1130	Volatile Organic Compounds	Thermal Oxidizer (4E)	98 %
	Hazardous Air Pollutants		98 %
Truck Unloading Bay	Volatile Organic Compounds	Thermal Oxidizer (4E)	68.6 %
	Hazardous Air Pollutants		68.6 %

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2.0. General Conditions

2.1. Definitions

2.1.1. All references to the "West Virginia Air Pollution Control Act" or the "Air Pollution Control Act" mean those provisions contained in W.Va. Code §§ 22-5-1 to 22-5-18.

2.1.2. The "Clean Air Act" means those provisions contained in 42 U.S.C. §§ 7401 to 7671q, and regulations promulgated thereunder.

2.1.3. "Secretary" means the Secretary of the Department of Environmental Protection or such other person to whom the Secretary has delegated authority or duties pursuant to W.Va. Code §§ 22-1-6 or 22-1-8 (45CSR§30-2.12.). The Director of the Division of Air Quality is the Secretary's designated representative for the purposes of this permit.

2.2. Acronyms

CAAA	Clean Air Act Amendments
CBI	Confidential Business Information
CEM	Continuous Emission Monitor
CES	Certified Emission Statement
C.F.R. *or* CFR	Code of Federal Regulations
CO	Carbon Monoxide
C.S.R. *or* CSR	Codes of State Rules
DAQ	Division of Air Quality
DEP	Department of Environmental Protection
dscm	Dry Standard Cubic Meter
FOIA	Freedom of Information Act
HAP	Hazardous Air Pollutant
HON	Hazardous Organic NESHAP
HP	Horsepower
lbs/hr	Pounds per Hour
LDAR	Leak Detection and Repair
M	Thousand
MACT	Maximum Achievable Control Technology
MDHI	Maximum Design Heat Input
MM	Million
MMBtu/hr *or* mmbtu/hr	Million British Thermal Units per Hour
MMCF/hr *or* mmcf/hr	Million Cubic Feet per Hour
NA	Not Applicable
NAAQS	National Ambient Air Quality Standards
NESHAPS	National Emissions Standards for Hazardous Air Pollutants
NO_X	Nitrogen Oxides
NSPS	New Source Performance Standards
PM	Particulate Matter
$PM_{2.5}$	Particulate Matter less than 2.5 µm in diameter
PM_{10}	Particulate Matter less than 10µm in diameter
Ppb	Pounds per Batch
Pph	Pounds per Hour
Ppm	Parts per Million
Ppm_V or ppmv	Parts per Million by Volume
PSD	Prevention of Significant Deterioration
Psi	Pounds per Square Inch
SIC	Standard Industrial Classification
SIP	State Implementation Plan
SO_2	Sulfur Dioxide
TAP	Toxic Air Pollutant
TPY	Tons per Year
TRS	Total Reduced Sulfur
TSP	Total Suspended Particulate
USEPA	United States Environmental Protection Agency
UTM	Universal Transverse Mercator
VEE	Visual Emissions Evaluation
VOC	Volatile Organic Compounds
VOL	Volatile Organic Liquids

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2.3. Authority

This permit is issued in accordance with West Virginia Air Pollution Control Act W.Va. Code §§ 22-5-1. et seq. and the following Legislative Rules promulgated thereunder:

2.3.1. 45CSR13 – *Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants, Notification Requirements, Temporary Permits, General Permits and Procedures for Evaluation*;

2.4. Term and Renewal

2.4.1. This permit supersedes and replaces previously issued Permit R13-3260 issued on December 7, 2015. This Permit shall remain valid, continuous and in effect unless it is revised, suspended, revoked or otherwise changed under an applicable provision of 45CSR13 or any other applicable legislative rule;

2.5. Duty to Comply

2.5.1. The permitted facility shall be constructed and operated in accordance with the plans and specifications filed in Permit Applications R13-3260, R13-3260A and any modifications, administrative updates, or amendments thereto. The Secretary may suspend or revoke a permit if the plans and specifications upon which the approval was based are not adhered to; **[45CSR§§13-5.11 and 10.3.]**

2.5.2. The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the West Virginia Code and the Clean Air Act and is grounds for enforcement action by the Secretary or USEPA;

2.5.3. Violations of any of the conditions contained in this permit, or incorporated herein by reference, may subject the permittee to civil and/or criminal penalties for each violation and further action or remedies as provided by West Virginia Code 22-5-6 and 22-5-7;

2.5.4. Approval of this permit does not relieve the permittee herein of the responsibility to apply for and obtain all other permits, licenses, and/or approvals from other agencies; i.e., local, state, and federal, which may have jurisdiction over the construction and/or operation of the source(s) and/or facility herein permitted.

2.6. Duty to Provide Information

The permittee shall furnish to the Secretary within a reasonable time any information the Secretary may request in writing to determine whether cause exists for administratively updating, modifying, revoking, or terminating the permit or to determine compliance with the permit. Upon request, the permittee shall also furnish to the Secretary copies of records to be kept by the permittee. For information claimed to be confidential, the permittee shall furnish such records to the Secretary along with a claim of confidentiality in accordance with 45CSR31. If confidential information is to be sent to USEPA, the permittee shall directly provide such information to USEPA along with a claim of confidentiality in accordance with 40 C.F.R. Part 2.

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2.7. Duty to Supplement and Correct Information

Upon becoming aware of a failure to submit any relevant facts or a submittal of incorrect information in any permit application, the permittee shall promptly submit to the Secretary such supplemental facts or corrected information.

2.8. Administrative Update

The permittee may request an administrative update to this permit as defined in and according to the procedures specified in 45CSR13.
[45CSR§13-4.]

2.9. Permit Modification

The permittee may request a minor modification to this permit as defined in and according to the procedures specified in 45CSR13.
[45CSR§13-5.4.]

2.10 Major Permit Modification

The permittee may request a major modification as defined in and according to the procedures specified in 45CSR14 or 45CSR19, as appropriate.
[45CSR§13-5.1]

2.11. Inspection and Entry

The permittee shall allow any authorized representative of the Secretary, upon the presentation of credentials and other documents as may be required by law, to perform the following:

a. At all reasonable times (including all times in which the facility is in operation) enter upon the permittee's premises where a source is located or emissions related activity is conducted, or where records must be kept under the conditions of this permit;

b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

c. Inspect at reasonable times (including all times in which the facility is in operation) any facilities, equipment (including monitoring and air pollution control equipment), practices, or operations regulated or required under the permit; and

d. Sample or monitor at reasonable times substances or parameters to determine compliance with the permit or applicable requirements or ascertain the amounts and types of air pollutants discharged.

2.12. Emergency

2.12.1. An "emergency" means any situation arising from sudden and reasonable unforeseeable events beyond the control of the source, including acts of God, which situation requires immediate corrective action to restore normal operation, and that causes the source to exceed a technology-based emission limitation under the permit, due to unavoidable increases in emissions attributable to the emergency. An emergency shall not include noncompliance to the extent caused by

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improperly designed equipment, lack of preventative maintenance, careless or improper operation, or operator error.

2.12.2. Effect of any emergency. An emergency constitutes an affirmative defense to an action brought for noncompliance with such technology-based emission limitations if the conditions of Section 2.12.3 are met.

2.12.3. The affirmative defense of emergency shall be demonstrated through properly signed, contemporaneous operating logs, or other relevant evidence that:

a. An emergency occurred and that the permittee can identify the cause(s) of the emergency;

b. The permitted facility was at the time being properly operated;

c. During the period of the emergency the permittee took all reasonable steps to minimize levels of emissions that exceeded the emission standards, or other requirements in the permit; and

d. The permittee submitted notice of the emergency to the Secretary within one (1) working day of the time when emission limitations were exceeded due to the emergency and made a request for variance, and as applicable rules provide. This notice must contain a detailed description of the emergency, any steps taken to mitigate emissions, and corrective actions taken.

2.12.4. In any enforcement proceeding, the permittee seeking to establish the occurrence of an emergency has the burden of proof.

2.12.5 The provisions of this section are in addition to any emergency or upset provision contained in any applicable requirement.

2.13. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for a permittee in an enforcement action that it should have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit. However, nothing in this paragraph shall be construed as precluding consideration of a need to halt or reduce activity as a mitigating factor in determining penalties for noncompliance if the health, safety, or environmental impacts of halting or reducing operations would be more serious than the impacts of continued operations.

2.14. Suspension of Activities

In the event the permittee should deem it necessary to suspend, for a period in excess of sixty (60) consecutive calendar days, the operations authorized by this permit, the permittee shall notify the Secretary, in writing, within two (2) calendar weeks of the passing of the sixtieth (60) day of the suspension period.

2.15. Property Rights

This permit does not convey any property rights of any sort or any exclusive privilege.

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2.16. Severability

The provisions of this permit are severable and should any provision(s) be declared by a court of competent jurisdiction to be invalid or unenforceable, all other provisions shall remain in full force and effect.

2.17. Transferability

This permit is transferable in accordance with the requirements outlined in Section 10.1 of 45CSR13. **[45CSR§13-10.1.]**

2.18. Notification Requirements

The permittee shall notify the Secretary, in writing, no later than thirty (30) calendar days after the actual startup of the operations authorized under this permit.

2.19. Credible Evidence

Nothing in this permit shall alter or affect the ability of any person to establish compliance with, or a violation of, any applicable requirement through the use of credible evidence to the extent authorized by law. Nothing in this permit shall be construed to waive any defense otherwise available to the permittee including, but not limited to, any challenge to the credible evidence rule in the context of any future proceeding.

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3.0. Facility-Wide Requirements

3.1. Limitations and Standards

3.1.1. **Open burning.** The open burning of refuse by any person, firm, corporation, association or public agency is prohibited except as noted in 45CSR§6-3.1.
[45CSR§6-3.1.]

3.1.2. **Open burning exemptions.** The exemptions listed in 45CSR§6-3.1 are subject to the following stipulation: Upon notification by the Secretary, no person shall cause, suffer, allow or permit any form of open burning during existing or predicted periods of atmospheric stagnation. Notification shall be made by such means as the Secretary may deem necessary and feasible.
[45CSR§6-3.2.]

3.1.3. **Asbestos.** The permittee is responsible for thoroughly inspecting the facility, or part of the facility, prior to commencement of demolition or renovation for the presence of asbestos and complying with 40 C.F.R. § 61.145, 40 C.F.R. § 61.148, and 40 C.F.R. § 61.150. The permittee, owner, or operator must notify the Secretary at least ten (10) working days prior to the commencement of any asbestos removal on the forms prescribed by the Secretary if the permittee is subject to the notification requirements of 40 C.F.R. § 61.145(b)(3)(i). The USEPA, the Division of Waste Management, and the Bureau for Public Health - Environmental Health require a copy of this notice to be sent to them.
[40CFR§61.145(b) and 45CSR§34]

3.1.4. **Odor.** No person shall cause, suffer, allow or permit the discharge of air pollutants which cause or contribute to an objectionable odor at any location occupied by the public.
[45CSR§4-3.1] ***[State Enforceable Only]***

3.1.5. **Permanent shutdown.** A source which has not operated at least 500 hours in one 12-month period within the previous five (5) year time period may be considered permanently shutdown, unless such source can provide to the Secretary, with reasonable specificity, information to the contrary. All permits may be modified or revoked and/or reapplication or application for new permits may be required for any source determined to be permanently shutdown.
[45CSR§13-10.5.]

3.1.6. **Standby plan for reducing emissions.** When requested by the Secretary, the permittee shall prepare standby plans for reducing the emissions of air pollutants in accordance with the objectives set forth in Tables I, II, and III of 45CSR11.
[45CSR§11-5.2.]

3.2. Monitoring Requirements

[Reserved]

3.3. Testing Requirements

3.3.1. **Stack testing.** As per provisions set forth in this permit or as otherwise required by the Secretary, in accordance with the West Virginia Code, underlying regulations, permits and orders, the permittee shall conduct test(s) to determine compliance with the emission limitations set forth in this permit and/or established or set forth in underlying documents. The Secretary, or his duly authorized representative, may at his option witness or conduct such test(s). Should the Secretary exercise his option to conduct such test(s), the operator shall provide all necessary sampling

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connections and sampling ports to be located in such manner as the Secretary may require, power for test equipment and the required safety equipment, such as scaffolding, railings and ladders, to comply with generally accepted good safety practices. Such tests shall be conducted in accordance with the methods and procedures set forth in this permit or as otherwise approved or specified by the Secretary in accordance with the following:

a. The Secretary may on a source-specific basis approve or specify additional testing or alternative testing to the test methods specified in the permit for demonstrating compliance with 40 C.F.R. Parts 60, 61, and 63 in accordance with the Secretary's delegated authority and any established equivalency determination methods which are applicable. If a testing method is specified or approved which effectively replaces a test method specified in the permit, the permit may be revised in accordance with 45CSR§13-4. or 45CSR§13-5.4 as applicable.

b. The Secretary may on a source-specific basis approve or specify additional testing or alternative testing to the test methods specified in the permit for demonstrating compliance with applicable requirements which do not involve federal delegation. In specifying or approving such alternative testing to the test methods, the Secretary, to the extent possible, shall utilize the same equivalency criteria as would be used in approving such changes under Section 3.3.1.a. of this permit. If a testing method is specified or approved which effectively replaces a test method specified in the permit, the permit may be revised in accordance with 45CSR§13-4. or 45CSR§13-5.4 as applicable.

c. All periodic tests to determine mass emission limits from or air pollutant concentrations in discharge stacks and such other tests as specified in this permit shall be conducted in accordance with an approved test protocol. Unless previously approved, such protocols shall be submitted to the Secretary in writing at least thirty (30) days prior to any testing and shall contain the information set forth by the Secretary. In addition, the permittee shall notify the Secretary at least fifteen (15) days prior to any testing so the Secretary may have the opportunity to observe such tests. This notification shall include the actual date and time during which the test will be conducted and, if appropriate, verification that the tests will fully conform to a referenced protocol previously approved by the Secretary.

d. The permittee shall submit a report of the results of the stack test within sixty (60) days of completion of the test. The test report shall provide the information necessary to document the objectives of the test and to determine whether proper procedures were used to accomplish these objectives. The report shall include the following: the certification described in paragraph 3.5.1.; a statement of compliance status, also signed by a responsible official; and, a summary of conditions which form the basis for the compliance status evaluation. The summary of conditions shall include the following:

    1. The permit or rule evaluated, with the citation number and language;
    2. The result of the test for each permit or rule condition; and,
    3. A statement of compliance or noncompliance with each permit or rule condition.

[WV Code § 22-5-4(a)(14-15) and 45CSR13]

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3.4. Recordkeeping Requirements

3.4.1. **Retention of records.** The permittee shall maintain records of all information (including monitoring data, support information, reports, and notifications) required by this permit recorded in a form suitable and readily available for expeditious inspection and review. Support information includes all calibration and maintenance records and all original strip-chart recordings for continuous monitoring instrumentation. The files shall be maintained for at least five (5) years following the date of each occurrence, measurement, maintenance, corrective action, report, or record. At a minimum, the most recent two (2) years of data shall be maintained on site. The remaining three (3) years of data may be maintained off site, but must remain accessible within a reasonable time. Where appropriate, the permittee may maintain records electronically (on a computer, on computer floppy disks, CDs, DVDs, or magnetic tape disks), on microfilm, or on microfiche.

3.4.2. **Odors.** For the purposes of 45CSR4, the permittee shall maintain a record of all odor complaints received, any investigation performed in response to such a complaint, and any responsive action(s) taken.
[45CSR§4. *State Enforceable Only.*]

3.5. Reporting Requirements

3.5.1. **Responsible official.** Any application form, report, or compliance certification required by this permit to be submitted to the DAQ and/or USEPA shall contain a certification by the responsible official that states that, based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.

3.5.2. **Confidential information.** A permittee may request confidential treatment for the submission of reporting required by this permit pursuant to the limitations and procedures of W.Va. Code § 22-5-10 and 45CSR31.

3.5.3. **Correspondence.** All notices, requests, demands, submissions and other communications required or permitted to be made to the Secretary of DEP and/or USEPA shall be made in writing and shall be deemed to have been duly given when delivered by hand, or mailed first class with postage prepaid to the address(es) set forth below or to such other person or address as the Secretary of the Department of Environmental Protection may designate:

If to the DAQ:
Director
WVDEP
Division of Air Quality
601 57th Street
Charleston, WV 25304-2345

If to the US EPA:
Associate Director
Office of Air Enforcement and Compliance Assistance
(3AP20)
U.S. Environmental Protection Agency
Region III
1650 Arch Street
Philadelphia, PA 19103-2029

3.5.4. Operating Fee

3.5.4.1. In accordance with 45CSR30 – Operating Permit Program, the permittee shall submit a certified emissions statement and pay fees on an annual basis in accordance with the submittal requirements of the Division of Air Quality. A receipt for the appropriate fee shall be maintained on the premises for which the receipt has been issued, and shall be made

immediately available for inspection by the Secretary or his/her duly authorized representative.

3.5.5. **Emission inventory.** At such time(s) as the Secretary may designate, the permittee herein shall prepare and submit an emission inventory for the previous year, addressing the emissions from the facility and/or process(es) authorized herein, in accordance with the emission inventory submittal requirements of the Division of Air Quality. After the initial submittal, the Secretary may, based upon the type and quantity of the pollutants emitted, establish a frequency other than on an annual basis.

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4.0. Source-Specific Requirements

4.1.1. **Record of Monitoring.** The permittee shall keep records of monitoring information that include the following:

a. The date, place as defined in this permit, and time of sampling or measurements;
b. The date(s) analyses were performed;
c. The company or entity that performed the analyses;
d. The analytical techniques or methods used;
e. The results of the analyses; and
f. The operating conditions existing at the time of sampling or measurement.

4.1.2. **Minor Source of Hazardous Air Pollutants (HAP).** HAP emissions from the facility shall be less than 10 tons/year of any single HAP or 25 tons/year of any combination of HAPs. Compliance with this Section shall ensure that the facility is a minor HAP source.

4.1.3. **Operation and Maintenance of Air Pollution Control Equipment.** The permittee shall, to the extent practicable, install, maintain, and operate all pollution control equipment listed in Section 1.0 and associated monitoring equipment in a manner consistent with safety and good air pollution control practices for minimizing emissions, or comply with any more stringent limits set forth in this permit or as set forth by any State rule, Federal regulation, or alternative control plan approved by the Secretary.
[45CSR§13-5.11.]

4.1.4. **Record of Malfunctions of Air Pollution Control Equipment.** For all air pollution control equipment listed in Section 1.0, the permittee shall maintain records of the occurrence and duration of any malfunction or operational shutdown of the air pollution control equipment during which excess emissions occur. For each such case, the following information shall be recorded:

a. The equipment involved.
b. Steps taken to minimize emissions during the event.
c. The duration of the event.
d. The estimated increase in emissions during the event.

For each such case associated with an equipment malfunction, the additional information shall also be recorded:

e. The cause of the malfunction.
f. Steps taken to correct the malfunction.
g. Any changes or modifications to equipment or procedures that would help prevent future recurrences of the malfunction.

4.1.5. The permittee shall install, maintain, and operate all above-ground piping, valves, pumps, etc. that service lines in the transport of potential sources of regulated air pollutants to minimize any fugitive escape of regulated air pollutants (leak). Any above-ground piping, valves, pumps, etc. that shows signs of excess wear and that have a reasonable potential for fugitive emissions of regulated air pollutants shall be replaced.

4.1.6. The permittee shall monitor and maintain quarterly records (calendar year) for each facility component that was inspected for fugitive escape of regulated air pollutants. Each component shall operate with no detectable emissions, as determined using audio-visual-olfactory (AVO) inspections, USEPA 40CFR60 Method 21, USEPA alternative work practice to detect leaks from equipment using optical gas imaging (OGI) camera (ex. FLIR camera), or some combination thereof. AVO inspections shall include, but not limited to, defects as visible cracks, holes, or gaps

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in piping; loose connections; liquid leaks; or broken or missing caps or other closure devices. If permittee uses USEPA Method 21, then no detectable emissions is defined as less than 500 ppm in accordance with Method 21. If permittee uses an OGI camera, then no detectable emissions is defined as no visible leaks detected in accordance with USEPA alternative OGI work practices.

If any leak is detected, the permittee shall repair the leak as soon as possible. The first attempt at repair must be made within five (5) calendar days of discovering the leak, and the final repair must be made within fifteen (15) calendar days of discovering the leak. The permittee shall record each leak detected and the associated repair. The leak will not be considered repaired until the same monitoring method or a more detailed instrument determines the leak is repaired.

Delay of repair of a closed vent system for which leaks or defects have been detected is allowed if the repair is technically infeasible without a shutdown, or if you determine that emissions resulting from immediate repair would be greater than the fugitive emissions likely to result from delay of repair. You must complete repair of such equipment by the end of the next shutdown. **[45CSR§13-5.11.]**

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5.0. Source-Specific Requirements (Emergency Generator, 1E)

5.1. Limitations and Standards

5.1.1. Maximum emissions from the 2,923 hp diesel fired emergency generator, Mitsubishi S16R-Y2PTAW2-1 (1E) shall not exceed the following limits:

Pollutant	Maximum Hourly Emissions (lb/hr)	Maximum Annual Emissions (ton/year)
Nitrogen Oxides	25.78	6.45
Carbon Monoxide	16.83	4.21
Volatile Organic Compounds	2.69	0.67

5.1.2. **Maximum Yearly Operation Limitation.** The maximum yearly hours of operation for the 2,923 hp diesel fired emergency generator, Mitsubishi S16R-Y2PTAW2-1 (1E) shall not exceed 500 hours per year. Compliance with the Maximum Yearly Operation Limitation shall be determined using a twelve month rolling total. A twelve month rolling total shall mean the sum of the hours of operation at any given time during the previous twelve consecutive calendar months.

5.1.3. Owners and operators of 2007 model year and later emergency stationary CI ICE with a displacement of less than 30 liters per cylinder that are not fire pump engines must comply with the emission standards for new nonroad CI engines in §60.4202, for all pollutants, for the same model year and maximum engine power for their 2007 model year and later emergency stationary CI ICE.
[40CFR§60.4205(b)]

5.1.4. Stationary CI internal combustion engine manufacturers must certify their 2007 model year and later emergency stationary CI ICE with a maximum engine power less than or equal to 2,237 KW (3,000 HP) and a displacement of less than 10 liters per cylinder that are not fire pump engines to the emission standards specified in paragraphs (a)(1) through (2) of this section.

(1) NA

(2) For engines with a maximum engine power greater than or equal to 37 KW (50 HP), the certification emission standards for new nonroad CI engines for the same model year and maximum engine power in 40 CFR 89.112 and 40 CFR 89.113 for all pollutants beginning in model year 2007.
[40CFR§60.4202(a)]

5.1.5. Beginning October 1, 2010, owners and operators of stationary CI ICE subject to this subpart with a displacement of less than 30 liters per cylinder that use diesel fuel must purchase diesel fuel that meets the requirements of 40 CFR 80.510(b) for nonroad diesel fuel.
[40CFR§60.4207(b)]

5.1.6. Owners and operators of stationary CI ICE must operate and maintain stationary CI ICE that achieve the emission standards as required in §§60.4204 and 60.4205 over the entire life of the engine.
[40CFR§60.4206]

5.1.7. If you are an owner or operator of a 2007 model year and later stationary CI internal combustion engine and must comply with the emission standards specified in §60.4204(b) or §60.4205(b), or if you are an owner or operator of a CI fire pump engine that is manufactured during or after the model year that applies to your fire pump engine power rating in table 3 to this subpart and must

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comply with the emission standards specified in §60.4205(c), you must comply by purchasing an engine certified to the emission standards in §60.4204(b), or §60.4205(b) or (c), as applicable, for the same model year and maximum (or in the case of fire pumps, NFPA nameplate) engine power. The engine must be installed and configured according to the manufacturer's emission-related specifications, except as permitted in paragraph (g) of this section.
[40CFR§60.4211(c)]

5.1.8. If you are an owner or operator of a stationary CI internal combustion engine greater than 500 HP, you must keep a maintenance plan and records of conducted maintenance and must, to the extent practicable, maintain and operate the engine in a manner consistent with good air pollution control practice for minimizing emissions. In addition, you must conduct an initial performance test to demonstrate compliance with the applicable emission standards within 1 year of startup, or within 1 year after an engine and control device is no longer installed, configured, operated, and maintained in accordance with the manufacturer's emission-related written instructions, or within 1 year after you change emission-related settings in a way that is not permitted by the manufacturer. You must conduct subsequent performance testing every 8,760 hours of engine operation or 3 years, whichever comes first, thereafter to demonstrate compliance with the applicable emission standards.
[40CFR§60.4211(g)(3)]

5.1.9. If you are an owner or operator of an emergency stationary CI internal combustion engine that does not meet the standards applicable to non-emergency engines, you must install a non-resettable hour meter prior to startup of the engine.
[40CFR§60.4209(a)]

5.1.10. If you are an owner or operator of a stationary CI internal combustion engine equipped with a diesel particulate filter to comply with the emission standards in §60.4204, the diesel particulate filter must be installed with a backpressure monitor that notifies the owner or operator when the high backpressure limit of the engine is approached.
[40CFR§60.4209(b)]

5.1.11. If you own or operate an emergency stationary ICE, you must operate the emergency stationary ICE according to the requirements in paragraphs (f)(1) through (3) of this section. In order for the engine to be considered an emergency stationary ICE under this subpart, any operation other than emergency operation, maintenance and testing, emergency demand response, and operation in non-emergency situations for 50 hours per year, as described in paragraphs (f)(1) through (3) of this section, is prohibited. If you do not operate the engine according to the requirements in paragraphs (f)(1) through (3) of this section, the engine will not be considered an emergency engine under this subpart and must meet all requirements for non-emergency engines.

(1) There is no time limit on the use of emergency stationary ICE in emergency situations.

(2) You may operate your emergency stationary ICE for any combination of the purposes specified in paragraphs (f)(2)(i) through (iii) of this section for a maximum of 100 hours per calendar year. Any operation for non-emergency situations as allowed by paragraph (f)(3) of this section counts as part of the 100 hours per calendar year allowed by this paragraph (f)(2).

(i) Emergency stationary ICE may be operated for maintenance checks and readiness testing, provided that the tests are recommended by federal, state or local government, the manufacturer, the vendor, the regional transmission organization or equivalent balancing authority and transmission operator, or the insurance company associated with the engine. The owner or operator may petition the Administrator for approval of additional hours to be used for maintenance checks and readiness testing, but a petition is not required if the owner or operator maintains records indicating that federal, state, or local standards require maintenance and testing of emergency ICE beyond 100 hours per calendar year.

Note: On May 1, 2015, the U.S. Court of Appeals for the District of Columbia Circuit issued a decision vacating paragraphs 40 CFR 60.4211(f)(2)(ii)-(iii)
[40CFR§60.4211(f)]

5.2. Recordkeeping Requirements

5.2.1. To demonstrate compliance with permit conditions 5.1.1 – 5.1.2, the permittee shall maintain records of the hours of operation of the 2,923 hp diesel fired emergency generator, Mitsubishi S16R-Y2PTAW2-1 (1E). Said records shall be maintained on site or in a readily accessible off-site location maintained by the permittee for a period of five (5) years. Said records shall be readily available to the Director of the Division of Air Quality or his/her duly authorized representative for expeditious inspection and review. Any records submitted to the agency pursuant to a requirement of this permit or upon request by the Director shall be certified by a responsible official.

5.3. Testing Requirements

5.3.1. Owners and operators of stationary CI ICE with a displacement of less than 30 liters per cylinder who conduct performance tests pursuant to this subpart must do so according to paragraphs (a) through (e) of this section.
[40CFR§60.4212]

5.4. Reporting Requirements

5.4.1. See Facility-Wide Reporting Requirements Section 3.5 and 40CFR60 Subpart IIII.

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6.0. Source-Specific Requirements (Boilers, 2E, 3E)

6.1. Limitations and Standards

6.1.1. Each boiler (2E, 3E) shall be designed or constructed with a maximum design heat input of no greater than 275.3 MMBtu/hr. Compliance with this limit for each boiler (2E, 3E) shall be satisfied by limiting the annual consumption of natural gas to 1794.6 MM cubic feet, measured as a 12 month rolling total.
[45CSR§2A-3.1.a., 45CSR§10-10.3., and 45CSR§10A-3.1.b.]

6.1.2. Maximum emissions from each boiler (2E, 3E) shall not exceed the following limits:

Pollutant	Maximum Hourly Emissions (lb/hr)	Maximum Annual Emissions (ton/year)
Nitrogen Oxides	10.03	39.21
Carbon Monoxide	10.17	39.79
Volatile Organic Compounds	1.10	4.31
Particulate Matter-10/2.5	2.75	10.77

6.1.3. NOx emissions emitted to the atmosphere from each boiler (2E, 3E) shall not exceed 0.036 pounds per MMBtu. Compliance with this limit shall be determined on a continuous basis through the use of a 30-day rolling average emission rate. A new 30-day rolling average emission rate is calculated each steam generating unit operating day as the average of all of the hourly NOx emission data for the preceding 30 steam generating unit operating days. This limit applies at all times including periods of startup, shutdown, or malfunction.
[40 CFR §60.44b(a), (h), and (i); 40 CFR §60.46b(e)(3)]

6.1.4. Each boiler shall only be fired with pipeline quality natural gas. This condition satisfies compliance with the limitations of 45CSR§2-3.1., 45CSR§2-4.1.b., and 45CSR§10-3.1.e.

6.1.5. No person shall cause, suffer, allow or permit emission of smoke and/or particulate matter into the open air from any fuel burning unit which is greater than ten (10) percent opacity based on a six minute block average.
[45CSR§2-3.1.]

6.2. Monitoring Requirements

6.2.1. At such reasonable times as the Secretary may designate, the permittee shall conduct Method 9 emission observations for the purpose of demonstrating compliance with permit condition 6.1.5. Method 9 shall be conducted in accordance with 40 CFR 60 Appendix A.

6.2.2. The permittee shall record and maintain records of the amount of natural gas consumed by each boiler (2E, 3E) during each day and calculate the annual capacity factor for the reporting period. The annual capacity factor is determined on a 12-month rolling average basis with a new annual capacity calculated at the end of each calendar month. Such records shall be maintained in accordance with Condition 3.4.1. of this permit.
[40 CFR §60.49b(d)(1)]

6.2.3. For each boiler (2E, 3E), the permittee shall install, operate, certify and maintain a continuous emission monitoring system (CEMS) for measuring NO_x, and diluent gas (CO_2 or O_2) from the exhaust of each boiler in accordance with the applicable Performance Specifications under

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Appendix B to Part 60 of Chapter 40 or a NO_X CEMS that meets the requirements of Part 75 of Chapter 40 of the Code of Federal Regulations. A NO_x CEMS installed, operated, maintained and continuing to meet the ongoing requirements of Part 75 of the Chapter 40, may be used for the purpose of demonstrating compliance with the NO_x in Condition 6.1.2, except that the permittee shall also meet the requirements of §60.49b. Such monitor system shall include an automated data acquisition and handling system (DAHS). All required certification tests of the monitoring system must be completed no later than 90 unit operating days or 180 calendar days (whichever is sooner) after initial start-up of each boiler.

The procedures under §60.13 shall be followed for installation, evaluation, and operation of the continuous monitoring systems. The span value for NO_x shall be 500 ppm or the value determined according to Section 2.1.2. in Appendix A to Part 75 of Chapter 40.

The CEMS required under this condition shall be operated and data recorded during all periods of operation of the respected boiler except for CEMS breakdowns and repairs. Data is recorded during calibration checks, and zero and span adjustments.

The 1-hour average NO_x emission rates measured by the continuous NO_X monitor required by this condition and required under 40 CFR §60.13(h) shall be expressed in lb/MMBtu heat input and shall be used to calculate the average emission rates under permit Condition 6.1.2. The 1-hour averages shall be calculated using the data points required under §60.13(h)(2).

When NO_X emission data are not obtained because of CEMS breakdowns, repairs, calibration checks and zero and span adjustments, emission data will be obtained by using standby monitoring systems, Method 7 of appendix A of this part, Method 7A of Appendix A of this part, or other approved reference methods to provide emission data for a minimum of 75 percent of the operating hours in each steam generating unit operating day, in at least 22 out of 30 successive steam generating unit operating days.

CEMS unit conforming to the specifications of 40 CFR Part 75 shall use unbiased, un-substituted data to demonstrate compliance with the limits as specified in this permit.

For purposes of calculating data averages, the permittee cannot use data recorded during periods of monitoring malfunctions, associated repairs, out of control periods, required quality assurance or control activities. The permittee must use all the data collected during all other periods in assessing compliance with the emission limit permitted in permit condition 6.1.2. Any periods for which the monitoring system is out of control and data are not available for required calculations constitute a deviation from the monitoring requirements. Records of all data collected, calibrations, calibration checks, relative accuracy tests, maintenance preformed, and malfunctions of the CEMS shall be maintained in accordance with Condition 3.4.1 of this permit.
[40 CFR §§60.48b(b) though (f), 45 CSR §40 and 40 CFR §75]

6.3. Testing Requirements

6.3.1. Within 180 days after start-up and a satisfactory performance evaluation of the NOx CEMs, the permittee shall conduct initial performance testing for each boiler (2E, 3E) to demonstrate initial compliance with the hourly CO rate in permit condition 6.1.2. The test shall be conducted at 90 percent or greater of each unit's maximum design heat input, in accordance with Test Method 10B from Appendix A to 40 CFR Part 60, and permit condition 6.1.2. In the test report, the permittee shall include the NO_x measurement from the NO_x CEM for each test run of each test. Records of this testing shall be maintained in accordance with Condition 3.4.1.

6.3.2. To determine initial compliance with the emission limits for NO_x required under 40 CFR §60.44b and permit condition 6.1.2, the permittee shall conduct the performance test for each boiler (2E, 3E) as required under 40 CFR §60.8 using the continuous system for monitoring NO_x (NO_x CEMS) under Condition 6.2.3. Such testing shall be conducted within 60 days after achieving the maximum production rate at which the affected unit will be operated, but not later than 180 days after initial startup of the boiler.

NO_x emissions from the steam generating unit are to be monitored for 30 successive steam generating unit operating days and the 30-day average emission rate is used to determine compliance with the NOx emission standards under permit condition 6.1.2 and 40 CFR §60.44b. The 30-day average emission rate is calculated as the average of all hourly emissions data recorded by the monitoring system during the 30-day test period. Such testing shall be conducted in accordance with permit condition 3.3.1 and 40 CFR §60.46b. Records of this testing shall be maintained in accordance with permit condition 3.4.1.
[40 CFR §60.8, §60.46b(c) & (e)(1)]

6.3.3. Compliance with the visible emission requirements of permit condition 6.1.5 shall be determined in accordance with 40 CFR Part 60, Appendix A, Method 9 or by using measurements from continuous opacity monitoring systems approved by the Director. The Director may require the installation, calibration, maintenance and operation of continuous opacity monitoring systems and may establish policies for the evaluation of continuous opacity monitoring results and the determination of compliance with the visible emission requirements of permit condition 6.1.2. Continuous opacity monitors shall not be required on fuel burning units which employ wet scrubbing systems for emission control.
[45CSR§2-3.2.]

6.4. Recordkeeping Requirements

6.4.1. The permittee shall maintain records of all monitoring data required by permit condition 6.2.1 documenting the date and time of each visible emission check, the emission point or equipment/source identification number, the name or means of identification of the observer, the results of the check(s), whether the visible emissions are normal for the process, and, if applicable, all corrective measures taken or planned. The permittee shall also record the general weather conditions (i.e. sunny, approximately 80°F, 6 - 10 mph NE wind) during the visual emission check(s). Should a visible emission observation be required to be performed per the requirements specified in Method 9, the data records of each observation shall be maintained per the requirements of Method 9.

6.4.2. The permittee shall maintain records of the following information for each steam generating unit operating day of each boiler (2E, 3E):

a. Calendar date;

b. The average hourly NO_x emission rates (expressed as NO_2) (lb/MMBtu heat input) measured or predicted;

c. The 30-day average NO_x emission rates (lb/MMBtu heat input) calculated at the end of each steam generating unit operating day from the measured or predicted hourly nitrogen oxide emission rates for the preceding 30 steam generating unit operating days;

d. Identification of the steam generating unit operating days when the calculated 30-day average NO_x emission rates are in excess of the NO_x emissions standards under §60.44b, with the reasons for such excess emissions as well as a description of corrective actions taken;

e. Identification of the steam generating unit operating days for which pollutant data have not been obtained, including reasons for not obtaining sufficient data and a description of corrective actions taken;

f. Identification of the times when emission data have been excluded from the calculation of average emission rates and the reasons for excluding data;

g. Identification of "F" factor used for calculations, method of determination, and type of fuel combusted;

h. Identification of the times when the pollutant concentration exceeded full span of the CEMS;

i. Description of any modifications to the CEMS that could affect the ability of the CEMS to comply with Performance Specification 2 or 3; and

j. Results of daily CEMS drift tests and quarterly accuracy assessments as required under appendix F, Procedure 1 of Part 60.

Such records shall be maintained in accordance with Condition 3.4.1. of this permit.
[40 CFR §60.49b(g)]

6.5. Reporting Requirements

6.5.1. Any deviation(s) from the allowable visible emission requirement for any emission source discovered during observations using 40CFR Part 60, Appendix A, Method 9 or 22 shall be reported in writing to the Director of the Division of Air Quality as soon as practicable, but in any case within ten (10) calendar days of the occurrence and shall include at least the following information: the results of the visible determination of opacity of emissions, the cause or suspected cause of the violation(s), and any corrective measures taken or planned.

6.5.2. The permittee shall submit to the Director within 60 days of completion of NO_x CEMS performance evaluation for each boiler (2E, 3E). Two copies of the performance evaluation report for each unit of satisfy Part 60 notification requirements for certifying the NO_x CEMS. A copy of the NO_x CMS Certification Application required by 45 CSR §40-74.3 and 40 CFR §75.63(a)(1) provisions shall be submitted to the Administrator and Director within 45 days of completion of all CEM certification tests, which shall include the information as prescribed in 40 CFR §75.63(b).
[45 CSR §40-73.1., 45 CSR §40-74.3, 40 CFR §60.13(c)(2), 40 CFR §60.49b(b), and 40 CFR §75.63.(a)(1)]

6.5.3. The permittee shall submit semiannual and annual reports to the Director for each boiler (2E, 3E). The reporting period for these reports shall be January 1st through June 30th and July 1st through December 31st. These reports shall contain the recorded information as required in permit condition 6.4.2.
[40 CFR §60.49b(g), (i), & (w)]

6.5.4. The permittee shall operate certified continuous emission monitor systems necessary to attribute ozone season NO_X mass emissions to each unit, in accordance with 40 CFR Part 75, Subpart H. NO_X mass emissions measurements recorded and reported in accordance with 40 CFR Part 75, Subpart H shall be used to determine a unit's compliance with the ozone season NO_X emission limitation.
[45CSR§13-5.11.]

7.0. Source-Specific Requirements (Thermal Oxidizer, 4E)

7.1. Limitations and Standards

7.1.1. The thermal oxidizer (4E) shall be designed or constructed with a maximum design heat input of no greater than 11 MMBtu/hr.

7.1.2. The emission units listed in the following table shall vent to the thermal oxidizer (4E) prior to release to the atmosphere during all operations:

Emission Unit ID	Emission Unit Description	Design Capacity
TK-1055A	Grit Clarifier Tank	562,000 gal
TK-1055B	Stage 1 Clarifier Tank	562,000 gal
TK-1060A	Clarifier Pump Tank A	23,000 gal
TK-1060B	Clarifier Pump Tank B	23,000 gal
TK-1065	Oil Collection Tank	13,500 gal
TK-1070	Equalization Tank	1,030,000 gal
TK-2010	Solids Clarifier Tank	435,000 gal
TK-2015	Clarifier Effluent Tank	12,000 gal
TK-2020	Sludge Holding Tank	103,000 gal
TK-2040	Thermal Feed Tank	1,400,000 gal
TK-2140	Recovered Water Tank	230,000 gal
E-2076	Deaerator Vent Condenser	1,121 lb/hr
TK-1120	Stage 1 Sludge Holding Tank	27,000 gal
TK-1105A	Stage 1 Reaction Tank A	32,000 gal
TK-1105B	Stage 1 Reaction Tank B	32,000 gal
TK-1115	Stage 1 Clarifier Pump Tank	18,000 gal
TK-1130	Stage 1 Filtrate Tank	1,700 gal

7.1.3. The Thermal Oxidizer (4E) shall be designed with a minimum residence time of 1 second and a minimum combustion chamber temperature of 1,650° F on a three (3) hour rolling average. The monitored compliance minimum combustion chamber temperature will be established during the initial compliance testing in accordance with permit condition 7.3.1. Thereafter, this permit shall be administratively updated to insert the compliance value for the monitored minimum combustion chamber temperature into this permit term.

7.1.4. The Thermal Oxidizer (4E) shall be designed and operated to achieve a minimum guaranteed overall control efficiency of 98% for VOC and HAP emissions.

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7.1.5. Emissions from the Thermal Oxidizer (4E) shall not exceed the following limits:

Pollutant	Maximum Hourly Emissions (lb/hr)	Maximum Annual Emissions (ton/year)
Nitrogen Oxides	1.08	4.74
Carbon Monoxide	0.93	4.08
Volatile Organic Compounds	4.41	15.58

Compliance with the annual emission limits shall be determined using a rolling 12 month total. A rolling 12 month total shall mean the sum of the current month's production and the previous eleven (11) consecutive months.

7.1.6. The thermal oxidizer (4E) shall be designed for and operated with no visible emissions.

7.2. Monitoring Requirements

7.2.1. In order to demonstrate compliance with the opacity requirements of 7.1.6, the permittee shall conduct a Method 22 opacity test for at least two hours. This test shall demonstrate no visible emissions are observed for more than a total of 5 minutes during any 2 consecutive hour period using 40CFR60 Appendix A Method 22. The permittee shall conduct this test within one (1) year of permit issuance or initial startup whichever is later. The visible emission checks shall determine the presence or absence of visible emissions. At a minimum, the observer must be trained and knowledgeable regarding the effects of background contrast, ambient lighting, observer position relative to lighting, wind, and the presence of uncombined water (condensing water vapor) on the visibility of emissions. This training may be obtained from written materials found in the References 1 and 2 from 40 CFR part 60, appendix A, Method 22 or from the lecture portion of 40 CFR part 60, appendix A, Method 9 certification course.

7.2.2. The permittee shall monitor the presence or absence of a pilot flame using a thermocouple or any other equivalent device, except during SSM events.

7.3. Testing Requirements

7.3.1. For the purposes of establishing a different minimum combustion chamber temperature for the Thermal Oxidizer (4E), the permittee shall conduct performance testing to establish the compliance value for the monitored minimum combustion chamber temperature of the Thermal Oxidizer (4E). This initial compliance test shall be conducted within 60 days after achieving the maximum production rate at which the facility will be operated, or within 180 days of start-up, whichever is later.

7.3.2. For the purposes of determining compliance with permit condition 7.1.4, the permittee shall conduct performance testing to show compliance with the destruction efficiency of the Thermal Oxidizer (4E) is at or greater than 98% for total organic compounds. This initial compliance test shall be conducted within 180 days of issuance of permit R13-3260A.

7.3.3. Compliance with the visible emission requirements of permit condition 7.2.1 shall be determined in accordance with 40 CFR Part 60, Appendix A, Method 9 or by using measurements from continuous opacity monitoring systems approved by the Director. The Director may require the installation, calibration, maintenance and operation of continuous opacity monitoring systems and

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may establish policies for the evaluation of continuous opacity monitoring results and the determination of compliance with the visible emission requirements of permit condition 7.1.6. Continuous opacity monitors shall not be required on fuel burning units which employ wet scrubbing systems for emission control.
[45CSR§4]

7.4. Recordkeeping Requirements

7.4.1. For the purpose of demonstrating compliance with permit condition 7.1.3, the permittee shall maintain a record of the Thermal Oxidizer (4E) design evaluation. The design evaluation shall include, but not limited to, net heat value calculations, residence time calculations, capture system pressure loss, destruction removal calculations and all supporting concentration calculations.

7.4.2. In order to demonstrate compliance with the temperature requirements of permit condition 7.1.3 the permittee shall monitor and record the combustion chamber temperature in four equally spaced periods per each hour the Thermal Oxidizer (4E) are operated. Said records shall be maintained as required in Section 3.4.1. Said records shall be readily available to the Director of the Division of Air Quality or his/her duly authorized representative for expeditious inspection and review. Any records submitted to the agency pursuant to a requirement of this permit or upon request by the Director shall be certified by a responsible official.

7.4.3. The permittee shall maintain a copy of all test report(s) as conducted in permit condition 7.3.1 and all calculation(s) used to establish a new operating temperature for the Thermal Oxidizer (4E) in accordance with permit condition 3.4.1 with the exception of retention of such records. Thus, such records shall be retained in accordance with permit condition 3.4.1 or until a new temperature is established in accordance with permit condition 5.3.1 whichever is later.

7.4.4. All records required under Section 5.4 shall be maintained as required in permit condition 3.4.1. Said records shall be readily available to the Director of the Division of Air Quality or his/her duly authorized representative for expeditious inspection and review. Any records submitted to the agency pursuant to a requirement of this permit or upon request by the Director shall be certified by a responsible official.

7.4.5. The permittee shall maintain records of all monitoring data required by permit condition 7.2.1 documenting the date and time of each visible emission check, the emission point or equipment/source identification number, the name or means of identification of the observer, the results of the check(s), whether the visible emissions are normal for the process, and, if applicable, all corrective measures taken or planned. The permittee shall also record the general weather conditions (i.e. sunny, approximately 80°F, 6 - 10 mph NE wind) during the visual emission check(s). Should a visible emission observation be required to be performed per the requirements specified in Method 9, the data records of each observation shall be maintained per the requirements of Method 9.

7.4.6. For the purpose of demonstrating compliance with permit condition 7.2.2, the permittee shall maintain records of the times and duration of all periods which the pilot flame was absent.

7.5. Reporting Requirements

7.5.1. Any deviation(s) from the thermal oxidizer design and/or operation criteria in permit condition 7.1.3 shall be recorded in a log that is available for inspection by the Department at any time. A summary of such deviations shall be reported in writing to the Director on a monthly basis summarizing any deviations that occurred during the previous month.

7.5.2. The permittee shall submit a written report of the results of testing required in Section 7.3 of this permit before the close of business on the 60th day following the completion of such testing to the

Director. Such report(s) shall include all records of the opacity observations or temperatures readings taken during such testing, whichever is appropriate for the required report.

7.5.3. Any deviation(s) from the allowable visible emission requirement for any emission source discovered during observations using 40CFR Part 60, Appendix A, Method 9 or 22 shall be reported in writing to the Director of the Division of Air Quality as soon as practicable, but in any case within ten (10) calendar days of the occurrence and shall include at least the following information: the results of the visible determination of opacity of emissions, the cause or suspected cause of the violation(s), and any corrective measures taken or planned.

8.0. Source-Specific Requirements (Truck Unloading Rack (Influent Water), Oil Loading from TK-1065)

8.1. Limitations and Standards

8.1.1. The maximum quantity of influent water that shall be loaded (submerged loading) shall not exceed 60,000 barrels per day (2,520,000 gallons per day). Compliance with the Maximum Yearly Operation Limitation shall be determined using a twelve month rolling total. A twelve month rolling total shall mean the sum of the hours of operation at any given time during the previous twelve consecutive calendar months.

8.1.2. The maximum quantity of oil that shall be loaded (submerged loading) shall not exceed 515 barrels per day (21,630 gallons per day). Compliance with the Maximum Yearly Operation Limitation shall be determined using a twelve month rolling total. A twelve month rolling total shall mean the sum of the hours of operation at any given time during the previous twelve consecutive calendar months.

8.1.2. The truck unloading rack shall be operated in accordance with the plans and specifications filed in Permit Application R13-3260A and in accordance with permit conditions 4.1.5 and 4.1.6.

8.2. Recordkeeping Requirements

8.2.1. To demonstrate compliance with permit conditions 8.1.1 and 8.1.2, the permittee shall maintain a record of the aggregate throughput for the truck unloading rack and oil loading on a monthly and rolling twelve month total. Said records shall be maintained on site or in a readily accessible off-site location maintained by the registrant for a period of five (5) years. Said records shall be readily available to the Director of the Division of Air Quality or his/her duly authorized representative for expeditious inspection and review. Any records submitted to the agency pursuant to a requirement of this permit or upon request by the Director shall be certified by a responsible official.

8.2.2 All records required under Section 8.2 shall be maintained on site or in a readily accessible off-site location maintained by the permittee for a period of five (5) years. Said records shall be readily available to the Director of the Division of Air Quality or his/her duly authorized representative for expeditious inspection and review. Any records submitted to the agency pursuant to a requirement of this permit or upon request by the Director shall be certified by a responsible official.

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9.0. Source-Specific Requirements (Cooling Tower Basin (28E), Sludge and Salt Disposal)

9.1. Limitations and Standards

9.1.1. The maximum quantity of water processed through the Cooling Tower Basin (28E) shall not exceed 34,500 gallons per minute. Compliance with the Maximum Yearly Operation Limitation shall be determined using a twelve month rolling total. A twelve month rolling total shall mean the sum of the hours of operation at any given time during the previous twelve consecutive calendar months.

9.1.2. The Cooling Tower Basin (28E) shall be operated in accordance with the plans and specifications filed in Permit Application R13-3260A.

9.2. Recordkeeping Requirements

9.2.1. To demonstrate compliance with permit condition 9.1.2, the permittee shall maintain a record of the aggregate throughput for the cooling tower basin on a monthly and rolling twelve month total. Said records shall be maintained on site or in a readily accessible off-site location maintained by the registrant for a period of five (5) years. Said records shall be readily available to the Director of the Division of Air Quality or his/her duly authorized representative for expeditious inspection and review. Any records submitted to the agency pursuant to a requirement of this permit or upon request by the Director shall be certified by a responsible official.

9.2.2. The permittee shall maintain a record of the sludge disposal on a monthly and rolling twelve month total. Said records shall be maintained on site or in a readily accessible off-site location maintained by the registrant for a period of five (5) years. Said records shall be readily available to the Director of the Division of Air Quality or his/her duly authorized representative for expeditious inspection and review. Any records submitted to the agency pursuant to a requirement of this permit or upon request by the Director shall be certified by a responsible official.

9.2.3. The permittee shall maintain a record of the salt disposal on a monthly and rolling twelve month total. Said records shall be maintained on site or in a readily accessible off-site location maintained by the registrant for a period of five (5) years. Said records shall be readily available to the Director of the Division of Air Quality or his/her duly authorized representative for expeditious inspection and review. Any records submitted to the agency pursuant to a requirement of this permit or upon request by the Director shall be certified by a responsible official.

9.2.4 All records required under Section 9.2 shall be maintained on site or in a readily accessible off-site location maintained by the permittee for a period of five (5) years. Said records shall be readily available to the Director of the Division of Air Quality or his/her duly authorized representative for expeditious inspection and review. Any records submitted to the agency pursuant to a requirement of this permit or upon request by the Director shall be certified by a responsible official.

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10.0. Source-Specific Requirements (Storage Tanks, TK-1055A, TK-1055B, TK-1060A, TK-1060B, TK-1065, TK-1070, TK-2010, TK-2015, TK-2020, TK-2040, TK-2140, E-2076, TK-1120, TK-1105A, TK-1105B, TK-1115, TK-1130)

10.1. Limitations and Standards

10.1.1. The permittee shall route all VOC and HAP emissions from the Storage Tanks (TK-1055A, TK-1055B, TK-1060A, TK-1060B, TK-1065, TK-1070, TK-2010, TK-2015, TK-2020, TK-2040, TK-2140, E-2076, TK-1120, TK-1105A, TK-1105B, TK-1115, TK-1130) to the thermal oxidizer (4E) listed in Section 7.0 of this permit, prior to release to the atmosphere. The thermal oxidizer (4E) shall be designed to achieve a minimum guaranteed control efficiency of 98% for volatile organic compound (VOC) and hazardous air pollutants (HAP) emissions.

10.1.2. The maximum annual throughput of product to the storage tanks shall not exceed the following:

Storage Tank ID	Storage Tank Description	Maximum Annual Throughput (gal/yr)
TK-1055A	Grit Clarifier Tank	984,974,400
TK-1055B	Stage 1 Clarifier Tank	1,132,142,400
TK-1060A/B	Clarifier Pump Tanks A/B	969,206,400 (combined)
TK-1065	Oil Collection Tank	6,832,800
TK-1070	Equalization Tank	969,206,400
TK-2010	Solids Clarifier Tank	1,058,558,400
TK-2015	Clarifier Effluent Tank	994,960,800
TK-2020	Sludge Holding Tank	44,150,400
TK-2040	Thermal Feed Tank	994,960,800
TK-2140	Recovered Water Tank	8,777,250
TK-1120	Stage 1 Sludge Holding Tank	28,908,000
TK-1105A/B	Stage 1 Reaction Tanks A/B	964,476,000 (combined)
TK-1115	Stage 1 Clarifier Pump Tank	969,206,400
TK-1130	Stage 1 Filtrate Tank	12,088,800

10.1.3. Emissions from the Storage Tanks (TK-1055A, TK-1055B, TK-1060A, TK-1060B, TK-1065, TK-1070, TK-2010, TK-2015, TK-2020, TK-2040, TK-2140, E-2076, TK-1120, TK-1105A, TK-1105B, TK-1115, TK-1130) that are recovered and routed to the thermal oxidizer (4E) shall be designed and operated as specified in the paragraphs (a) through (c).

a. The cover and all openings on the cover (e.g., access hatches, sampling ports, pressure relief valves and gauge wells) shall form a continuous impermeable barrier over the entire surface area of the liquid in the storage vessel.

b. Each cover opening shall be secured in a closed, sealed position (e.g., covered by a gasketed lid or cap) whenever material is in the unit on which the cover is installed except during those times when it is necessary to use an opening as follows:

(i) To add material to, or remove material from the unit (this includes openings necessary to equalize or balance the internal pressure of the unit following changes in the level of the material in the unit);

(ii) To inspect or sample the material in the unit;

(iii) To inspect, maintain, repair, or replace equipment located inside the unit; or

(iv) To vent liquids, gases, or fumes from the unit through a closed-vent system designed and operated in accordance with the requirements 8.1.7 of this section to a control device.

c. Each Storage Tank (TK-1055A, TK-1055B, TK-1060A, TK-1060B, TK-1065, TK-1070, TK-2010, TK-2015, TK-2020, TK-2040, TK-2140, E-2076, TK-1120, TK-1105A, TK-1105B, TK-1115, TK-1130) thief hatch shall be weighted and properly seated. You must select gasket material for the hatch based on composition of the fluid in the storage vessel and weather conditions.
[45CSR§13-5.11]

10.1.4. The facility shall comply with the closed vent system requirements for the Storage Tanks (TK-1055A, TK-1055B, TK-1060A, TK-1060B, TK-1065, TK-1070, TK-2010, TK-2015, TK-2020, TK-2040, TK-2130, TK-2140, TK-2160, E-2076, TK-1120, TK-1105A, TK-1105B, TK-1115, TK-1130) as noted below.

a. You must design the closed vent system to route all gases, vapors, and fumes emitted from the material in the Storage Tanks (TK-1055A, TK-1055B, TK-1060A, TK-1060B, TK-1065, TK-1070, TK-2010, TK-2015, TK-2020, TK-2040, TK-2140, E-2076, TK-1120, TK-1105A, TK-1105B, TK-1115, TK-1130) to the thermal oxidizer (4E).

b. You must design and operate a closed vent system with no detectable emissions, as determined using olfactory, visual and auditory inspections.

c. You must meet the requirements specified in paragraphs (i) and (ii) of this section if the closed vent system contains one or more bypass devices that could be used to divert all or a portion of the gases, vapors, or fumes from entering the control device or to a process.

(i) Except as provided in paragraph (ii) of this section, you must comply with either paragraph (A) or (B) of this section for each bypass device.

A. You must properly install, calibrate, maintain, and operate a flow indicator at the inlet to the bypass device that could divert the stream away from the control device or process to the atmosphere that sounds an alarm, or initiates notification via remote alarm to the nearest field office, when the bypass device is open such that the stream is being, or could be diverted away from the control device or process to the atmosphere.

B. You must secure the bypass device valve installed at the inlet to the bypass device in the non-diverting position using a car-seal or a lock-and-key type configuration.

(ii) Low leg drains, high point bleeds, analyzer vents, open-ended valves or lines, and safety devices are not subject to the requirements of paragraph (i) of this section.
[45CSR§13-5.11]

10.2. Monitoring Requirements

10.2.1. To demonstrate compliance with the closed vent system requirements of permit conditions 10.1.3 and 10.1.4, the permittee shall:

a. Initial requirements. Conduct an initial visual, olfactory, and auditory inspection for defects that could result in air emissions within 180 days of start-up. Defects include, but are not

limited to, visible cracks, holes, or gaps in piping; loose connections; liquid leaks; or broken or missing caps or other closure devices.

i. The annual inspection shall include the bypass inspection, conducted according to paragraph (c) of this section.

ii. In the event that a leak or defect is detected, you must repair the leak or defect as soon as practicable. Grease or another applicable substance must be applied to deteriorating or cracked gaskets to improve the seal while awaiting repair.

iii. Delay of repair of a closed vent system for which leaks or defects have been detected is allowed if the repair is technically infeasible without a shutdown, or if you determine that emissions resulting from immediate repair would be greater than the fugitive emission likely to result from delay of repair. You must complete repair of such equipment by the end of the next shutdown.

b. Continuous requirements. Conduct an annual visual, olfactory, and auditory inspection for defects that could result in air emissions. Defect include, but are not limited to, visible cracks, holes, or gaps in piping, loose connections; liquid leaks; or broken or missing caps or other closure devices.

i. The annual inspection shall be conducted within 365 calendar days from the date of the previous inspection or earlier.
ii. The annual inspection shall include the bypass inspection, conducted according to paragraph (c) of this section.

c. Bypass inspection. Visually inspect the bypass valve during the initial and annual inspection for the presence of the car seal or lock-and-key type configuration to verify that the valve is maintained in the non-diverting position to ensure that the vent stream is not diverted through the bypass device. If an alternative method is used, conduct the inspection of the bypass as described in the operating procedures.

d. Unsafe to inspect requirements. You may designate any parts of the closed vent system as unsafe to inspect if the requirements in paragraphs (i) and (ii) of this section are met. Unsafe to inspect parts are exempt from the inspection requirements of paragraphs (a) and (b) of this section.

i. You determine that the equipment is unsafe to inspect because inspecting personnel would be exposed to an imminent or potential danger as a consequence of complying with the requirements.

ii. You have a written plan that requires inspection of the equipment as frequently as practicable during safe-to-inspect times.

e. Difficult to inspect requirements. You may designate any parts of the closed vent system as difficult to inspect, if the requirements in paragraphs (i) and (ii) of this section are met. Difficult to inspect parts are exempt from the inspection requirements of paragraphs (a) and (b) of this section.

i. You determine that the equipment cannot be inspected without elevating the inspecting personnel more than 2 meters above a support surface.

ii. You have a written plan that requires inspection of the equipment at least once every 5 years.

[45CSR§13-5.11]

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10.3. Recordkeeping Requirements

10.3.1. All records required under Section 10.3 shall be maintained on site or in a readily accessible off-site location maintained by the permittee for a period of five (5) years. Said records shall be readily available to the Director of the Division of Air Quality or his/her duly authorized representative for expeditious inspection and review. Any records submitted to the agency pursuant to a requirement of this permit or upon request by the Director shall be certified by a responsible official.

10.3.2. To demonstrate compliance with permit condition 10.1.2, the permittee shall maintain a record of the aggregate throughput for the storage tanks on a monthly and rolling twelve month total. Said records shall be maintained on site or in a readily accessible off-site location maintained by the registrant for a period of five (5) years. Said records shall be readily available to the Director of the Division of Air Quality or his/her duly authorized representative for expeditious inspection and review. Any records submitted to the agency pursuant to a requirement of this permit or upon request by the Director shall be certified by a responsible official.

10.3.3. The permittee shall maintain a copy all design records of the process, maintenance records of equipment and any downtime hours associated with the thermal oxidizer (4E).

10.3.4. To demonstrate compliance with the closed vent monitoring requirements, the following records shall be maintained.

i. The initial compliance requirements;

ii. Each annual visual inspection conducted to demonstrate continuous compliance, including records of any repairs that were made as results of the inspection;

iii. Bypass requirements.

a. Each inspection or each time the key is checked out or a record each time the alarm is sounded;

b. Each occurrence that the control device was bypassed. If the device was bypassed, the records shall include the date, time, and duration of the event and shall provide the reason the event occurred. The record shall also include the estimate of emissions that were released to the environment as a result of the bypass.

iv. Any part of the system that has been designated as "unsafe to inspect" in accordance with 10.2.1.d or "difficult to inspect" in accordance with 10.2.1.e.

[45CSR§13-5.11]

10.4. Reporting Requirements

10.4.1. The permittee shall notify the Director of any downtime of the thermal oxidizer in excess of 2%, based on the 12 month rolling total, in writing to the Director of the Division of Air Quality as soon as practicable, but within ten (10) calendar days of the discovery and shall include, at a minimum, the following information: the dates and durations of each downtime event, the cause or suspected causes for each downtime event, any corrective measures taken or planned for each downtime event.

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11.0. Source-Specific Requirements (Fire Water Pump Engine, 30E)

11.1. Limitations and Standards

11.1.1. Maximum emissions from the 136 hp diesel fired fire water pump engine, John Deere 4045HFC28E (30E) shall not exceed the following limits:

Pollutant	Maximum Hourly Emissions (lb/hr)	Maximum Annual Emissions (ton/year)
Nitrogen Oxides	0.85	0.21
Carbon Monoxide	1.11	0.28
Volatile Organic Compounds	0.05	0.01

11.1.2. **Maximum Yearly Operation Limitation.** The maximum yearly hours of operation for the 136 hp diesel fired fire water pump engine, John Deere 4045HFC28E (30E) shall not exceed 500 hours per year. Compliance with the Maximum Yearly Operation Limitation shall be determined using a twelve month rolling total. A twelve month rolling total shall mean the sum of the hours of operation at any given time during the previous twelve consecutive calendar months.

11.1.3. Owners and operators of fire pump engines with a displacement of less than 30 liters per cylinder must comply with the emission standards in table 4 to this subpart, for all pollutants.
[40CFR§60.4205(c)]

11.1.4. Beginning October 1, 2010, owners and operators of stationary CI ICE subject to this subpart with a displacement of less than 30 liters per cylinder that use diesel fuel must purchase diesel fuel that meets the requirements of 40 CFR 80.510(b) for nonroad diesel fuel.
[40CFR§60.4207(b)]

11.1.5. If you are an owner or operator of an emergency stationary CI internal combustion engine that does not meet the standards applicable to non-emergency engines, you must install a non-resettable hour meter prior to startup of the engine.
[40CFR§60.4209(a)]

11.1.6. If you are an owner or operator of a stationary CI internal combustion engine equipped with a diesel particulate filter to comply with the emission standards in §60.4204, the diesel particulate filter must be installed with a backpressure monitor that notifies the owner or operator when the high backpressure limit of the engine is approached.
[40CFR§60.4209(b)]

11.1.7. Owners and operators of stationary CI ICE must operate and maintain stationary CI ICE that achieve the emission standards as required in §§60.4204 and 60.4205 over the entire life of the engine.
[40CFR§60.4206]

11.1.8. If you are an owner or operator of a 2007 model year and later stationary CI internal combustion engine and must comply with the emission standards specified in §60.4204(b) or §60.4205(b), or if you are an owner or operator of a CI fire pump engine that is manufactured during or after the model year that applies to your fire pump engine power rating in table 3 to this subpart and must comply with the emission standards specified in §60.4205(c), you must comply by purchasing an engine certified to the emission standards in §60.4204(b), or §60.4205(b) or (c), as applicable, for the same model year and maximum (or in the case of fire pumps, NFPA nameplate) engine power.

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The engine must be installed and configured according to the manufacturer's emission-related specifications, except as permitted in paragraph (g) of this section.
[40CFR§60.4211(c)]

11.1.9. If you own or operate an emergency stationary ICE, you must operate the emergency stationary ICE according to the requirements in paragraphs (f)(1) through (3) of this section. In order for the engine to be considered an emergency stationary ICE under this subpart, any operation other than emergency operation, maintenance and testing, emergency demand response, and operation in non-emergency situations for 50 hours per year, as described in paragraphs (f)(1) through (3) of this section, is prohibited. If you do not operate the engine according to the requirements in paragraphs (f)(1) through (3) of this section, the engine will not be considered an emergency engine under this subpart and must meet all requirements for non-emergency engines.

(3) There is no time limit on the use of emergency stationary ICE in emergency situations.

(4) You may operate your emergency stationary ICE for any combination of the purposes specified in paragraphs (f)(2)(i) through (iii) of this section for a maximum of 100 hours per calendar year. Any operation for non-emergency situations as allowed by paragraph (f)(3) of this section counts as part of the 100 hours per calendar year allowed by this paragraph (f)(2).

(ii) Emergency stationary ICE may be operated for maintenance checks and readiness testing, provided that the tests are recommended by federal, state or local government, the manufacturer, the vendor, the regional transmission organization or equivalent balancing authority and transmission operator, or the insurance company associated with the engine. The owner or operator may petition the Administrator for approval of additional hours to be used for maintenance checks and readiness testing, but a petition is not required if the owner or operator maintains records indicating that federal, state, or local standards require maintenance and testing of emergency ICE beyond 100 hours per calendar year.

Note: On May 1, 2015, the U.S. Court of Appeals for the District of Columbia Circuit issued a decision vacating paragraphs 40 CFR 60.4211(f)(2)(ii)-(iii)

[40CFR§60.4211(f)]

11.2. Recordkeeping Requirements

11.2.1. To demonstrate compliance with permit conditions 11.1.1 – 11.1.2, the permittee shall maintain records of the hours of operation of the 136 hp diesel fired fire water pump engine, John Deere 4045HFC28E (30E). Said records shall be maintained on site or in a readily accessible off-site location maintained by the permittee for a period of five (5) years. Said records shall be readily available to the Director of the Division of Air Quality or his/her duly authorized representative for expeditious inspection and review. Any records submitted to the agency pursuant to a requirement of this permit or upon request by the Director shall be certified by a responsible official.

11.3. Testing Requirements

11.3.1. Owners and operators of stationary CI ICE with a displacement of less than 30 liters per cylinder who conduct performance tests pursuant to this subpart must do so according to paragraphs (a) through (e) of this section.
[40CFR§60.4212]

11.4. Reporting Requirements

11.4.1. See Facility-Wide Reporting Requirements Section 3.5 and 40CFR60 Subpart IIII.

12.0. Source-Specific Requirements (Fuel Skid Heaters (31E, 32E))

12.1. Limitations and Standards

12.1.1. Maximum Design Heat Input. The maximum design heat input (MDHI) shall not exceed the following:

Emission Unit ID#	Emission Unit Description	MDHI (MMBTU/hr)
HTFUEL1	Fuel Skid Heater	2.4
HTFUEL2	Fuel Skid Heater	2.4

12.1.2. No person shall cause, suffer, allow or permit emission of smoke and/or particulate matter into the open air from any fuel burning unit which is greater than ten (10) percent opacity based on a six minute block average.
[45CSR§2-3.1.]

12.2. Monitoring Requirements

12.2.1. At such reasonable times as the Secretary may designate, the permittee shall conduct Method 9 emission observations for the purpose of demonstrating compliance with permit condition 12.1.2. Method 9 shall be conducted in accordance with 40 CFR 60 Appendix A.

12.3. Testing Requirements

12.3.1. Compliance with the visible emission requirements of permit condition 12.1.2 shall be determined in accordance with 40 CFR Part 60, Appendix A, Method 9 or by using measurements from continuous opacity monitoring systems approved by the Director. The Director may require the installation, calibration, maintenance and operation of continuous opacity monitoring systems and may establish policies for the evaluation of continuous opacity monitoring results and the determination of compliance with the visible emission requirements of permit condition 12.1.2. Continuous opacity monitors shall not be required on fuel burning units which employ wet scrubbing systems for emission control.
[45CSR§2-3.2.]

12.4. Recordkeeping Requirements

12.4.1. The permittee shall maintain records of all monitoring data required by permit condition 12.2.1 documenting the date and time of each visible emission check, the emission point or equipment/source identification number, the name or means of identification of the observer, the results of the check(s), whether the visible emissions are normal for the process, and, if applicable, all corrective measures taken or planned. The permittee shall also record the general weather conditions (i.e. sunny, approximately 80°F, 6 - 10 mph NE wind) during the visual emission check(s). Should a visible emission observation be required to be performed per the requirements specified in Method 9, the data records of each observation shall be maintained per the requirements of Method 9.

12.5. Reporting Requirements

12.5.1. Any deviation(s) from the allowable visible emission requirement for any emission source discovered during observations using 40CFR Part 60, Appendix A, Method 9 or 22 shall be reported in writing to the Director of the Division of Air Quality as soon as practicable, but in any case within ten (10) calendar days of the occurrence and shall include at least the following

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information: the results of the visible determination of opacity of emissions, the cause or suspected cause of the violation(s), and any corrective measures taken or planned.

13.0. Source-Specific Requirements (Emergency Flare Control Device, 29E)

13.1. Limitations and Standards

13.1.1. The permittee shall install an emergency flare (29E) to control VOC emissions from the gas blanket (waste gas header) bleed stream when the thermal oxidizer is down for maintenance. To demonstrate compliance with permit condition 13.1.2, the maximum annual hours of operation of the emergency flare (29E) shall not exceed 336 hours per year. Compliance with the flare gas throughput limit shall be demonstrated using a rolling 12-month total.

13.1.2. Maximum emissions from the flare (29E) shall not exceed the following limits:

Pollutant	Maximum Hourly Emissions (lb/hr)	Maximum Annual Emissions (ton/year)
Volatile Organic Compounds	1.25	0.21
Nitrogen Oxides	0.16	0.06
Carbon Monoxide	0.69	0.14

13.1.3. Flare subject to this section shall be designed and operated in accordance with the following:

a Flare 29E shall be air-assisted.

b. Flare 29E shall be designed for and operated with no visible emissions, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours.

c. Flare 29E shall be operated, with a flame present at all times whenever emissions may be vented to them, except during SSM (Startup, Shutdown, Malfunctions) events.

d. A flare shall be used only where the net heating value of the gas being combusted is 11.2 MJ/scm (300 Btu/scf) or greater if the flare is steam-assisted or air-assisted; or where the net heating value of the gas being combusted is 7.45 MJ/scm (200 Btu/scf) or greater if the flares are non-assisted. The net heating value of the gas being combusted in a flare shall be calculated using the following equation:

$$H_T = K\sum_{i=1}^{n} C_i H_i$$

Where:

H_T=Net heating value of the sample, MJ/scm; where the net enthalpy per mole of off gas is based on combustion at 25 °C and 760 mm Hg, but the standard temperature for determining the volume corresponding to one mole is 20 °C.

K=Constant=

$$1.740\times10^{-7}\left(\frac{1}{ppmv}\right)\left(\frac{\text{g-mole}}{\text{scm}}\right)\left(\frac{\text{MJ}}{\text{kcal}}\right)$$

where the standard temperature for (g-mole/scm) is 20 °C.

C_i=Concentration of sample component i in ppmv on a wet basis, which may be measured for organics by Test Method 18, but is not required to be measured using Method 18 (unless designated by the Director).
H_i=Net heat of combustion of sample component i, kcal/g-mole at 25 °C and 760 mm Hg. The heats of combustion may be determined using ASTM D2382–76 or 88 or D4809–95 if published values are not available or cannot be calculated.
n=Number of sample components.

e. Air-assisted flares shall be designed and operated with an exit velocity less than the velocity V_{max}. The maximum permitted velocity, V_{max}, for air-assisted flares shall be determined by the following equation:

$$V_{max}=8.71 + 0.708(H_T)$$

Where:

V_{max}=Maximum permitted velocity, m/sec.
8.71=Constant.
0.708=Constant.
H_T=The net heating value as determined in 13.1.3.d of this section.

13.1.4. The permittee is not required to conduct a flare compliance assessment for concentration of sample (i.e. Method 18) and tip velocity (i.e. Method 2) until such time as the Director requests a flare compliance assessment to be conducted in accordance with permit condition 13.3.1, but the permittee is required to conduct a flare design evaluation in accordance with permit condition 13.4.2. Alternatively, the permittee may elect to demonstrate compliance with the flare design criteria requirements of permit condition 13.1.3 by complying with the compliance assessment testing requirements of permit condition 13.3.1.

13.1.5. Visible particulate matter emissions from the flare (29E) shall not exceed twenty (20%) percent opacity
[45CSR§6-4.3.]

13.1.6. The provisions of permit condition 13.1.5 shall not apply to smoke which is less than forty (40%) percent opacity, for a period or periods aggregating no more than eight (8) minutes per start-up.
[45CSR§6-4.4.]

13.1.7. The flare (29E) including all associated equipment and grounds, shall be designed, operated and maintained so as to prevent the emission of objectionable odors.
[45CSR§6-4.6.]

13.1.8 No person shall cause or allow particulate matter to be discharged from any incinerator into the open air in excess of the quantity determined by use of the following formula:

Emissions (lb/hr) = F x Incinerator Capacity (tons/hr)

Where, the factor, F, is as indicated in Table I below:

Table I: Factor, F, for Determining Maximum Allowable Particulate Emissions.

Incinerator Capacity	Factor F
A. Less than 15,000 lbs/hr	5.43
B. 15,000 lbs/hr or greater	2.72

[45CSR§6-4.1.]

13.1.9. The permittee will comply with the requirements of Section 2.12 of this permit during emergency operation of the flare (29E).

13.2. Monitoring Requirements

13.2.1. In order to demonstrate compliance with the requirements of 13.1.3.c, the permittee shall monitor the presence or absence of a flare pilot flame using a thermocouple or any other equivalent device, except during SSM events.

13.2.2. The permittee shall monitor the hours of operation of the flare (29E) on a monthly basis.

13.3. Testing Requirements

13.3.1. The Director may require the permittee to conduct a flare compliance assessment. This compliance assessment testing shall be conducted in accordance with Test Method 18 for organics and Test Method 2, 2A, 2C, or 2D in appendix A to 40 CFR part 60, as appropriate, or other equivalent testing approved in writing by the Director. Also, Test Method 18 may require the permittee to conduct Test Method 4 in conjunction with Test Method 18.

13.4. Recordkeeping Requirements

13.4.1. For the purpose of demonstrating compliance with permit conditions 13.1.3.c and 13.2.1, the permittee shall maintain records of the times and duration of all periods which the pilot flame was absent.

13.4.2 For the purpose of demonstrating compliance with permit conditions 13.1.3 and 13.3.1, the permittee shall maintain a record of the flare design evaluation. The flare design evaluation shall include, net heat value calculations, exit (tip) velocity calculations, and all supporting concentration calculations and other related information requested by the Director.

13.4.3. For the purpose of demonstrating compliance with permit condition 13.1.3.b, the permittee shall maintain records of the visible emission opacity tests conducted per permit condition 13.3.1.

13.4.4. All records required under Section 13.4 shall be maintained on site or in a readily accessible off-site location maintained by the permittee for a period of five (5) years. Said records shall be readily available to the Director of the Division of Air Quality or his/her duly authorized representative for expeditious inspection and review. Any records submitted to the agency pursuant to a requirement of this permit or upon request by the Director shall be certified by a responsible official.

13.4.5. For the purpose of demonstrating compliance with permit condition 13.1.1, the permittee shall maintain a monthly record of the hours of operation for the flare control device (29E). Said records shall be maintained for a period of five (5) years on site or in a readily accessible off-site location maintained by the permittee. Said records shall be readily available to the Director of the Division of Air Quality or his/her duly authorized representative for expeditious inspection and review. Any records submitted to the agency pursuant to a requirement of this permit or upon request by the Director shall be certified by a responsible official.

13.5. Reporting Requirements

13.5.1 If the permittee is required by the Director to demonstrate compliance with permit condition 13.3.1, then the permittee shall submit a testing protocol at least thirty (30) days prior to testing and shall submit a notification of the testing date at least fifteen (15) days prior to testing. The

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permittee shall submit the testing results within sixty (60) days of testing and provide all supporting calculations and testing data.

13.5.2. Any deviation(s) from the allowable visible emission requirement for any emission source discovered during observations using 40CFR Part 60, Appendix A, Method 9 or 22 shall be reported in writing to the Director of the Division of Air Quality as soon as practicable, but in any case within ten (10) calendar days of the occurrence and shall include at least the following information: the results of the visible determination of opacity of emissions, the cause or suspected cause of the violation(s), and any corrective measures taken or planned.

13.5.3. Any deviation(s) from the flare design and operation criteria in permit condition 13.1.3 shall be reported in writing to the Director of the Division of Air Quality as soon as practicable, but in any case within ten (10) calendar days of discovery of such deviation.

13.5.4. The permittee shall report to the Director, the time, cause of event, estimate of emissions and corrective actions taken when the flare was used for an emergency at the facility.

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CERTIFICATION OF DATA ACCURACY

I, the undersigned, hereby certify that, based on information and belief formed after reasonable inquiry, all information contained in the attached _____, representing the period beginning _____ and ending _____, and any supporting documents appended hereto, is true, accurate, and complete.

Signature[1] (please use blue ink) _____ Responsible Official or Authorized Representative _____ Date

Name & Title (please print or type) _____ Name _____ Title

Telephone No. _____ Fax No. _____

---

[1] This form shall be signed by a "Responsible Official." "Responsible Official" means one of the following:

a. For a corporation: The president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation, or a duly authorized representative of such person if the representative is responsible for the overall operation of one or more manufacturing, production, or operating facilities applying for or subject to a permit and either:

   (i) the facilities employ more than 250 persons or have a gross annual sales or expenditures exceeding $25 million (in second quarter 1980 dollars), or

   (ii) the delegation of authority to such representative is approved in advance by the Director;

b. For a partnership or sole proprietorship: a general partner or the proprietor, respectively;

c. For a municipality, State, Federal, or other public entity: either a principal executive officer or ranking elected official. For the purposes of this part, a principal executive officer of a Federal agency includes the chief executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., a Regional Administrator of U.S. EPA); or

d. The designated representative delegated with such authority and approved in advance by the Director.

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Williams, Jerry

From: Michele Steyskal <MSteyskal@kleinfelder.com>
Sent: Wednesday, November 16, 2016 11:51 AM
To: Williams, Jerry
Cc: Barry Schatz (bschatz@anteroresources.com)
Subject: RE: Clearwater Facility Emergency Flare Hours of Operation
Attachments: Emissions - Clearwater_R5.pdf

Hi Jerry,

Here is the next revision to the Clearwater Facility emissions showing the increased hours per year for the emergency flare. Let me know if you need anything else. These calculations show the annual hours of operation increased from 120 hours/year to 336 hours/year.

Michele

From: Michele Steyskal
Sent: Monday, November 07, 2016 12:04 PM
To: 'Williams, Jerry' <Jerry.Williams@wv.gov>
Cc: Barry Schatz (bschatz@anteroresources.com) <bschatz@anteroresources.com>
Subject: Clearwater Facility Truck Loading

Hi Jerry,

Attached are the updated emission calculations and form that show HAPs and GHG from the Oil Truck Loading (OILLOAD) (R13-3260 / 017-00157). The update is shown on the individual calculation tab as well as in the emissions totals. Let me know if you have any questions.

Michele

Michele Steyskal
Air Quality Professional
4815 List Drive, Unit 115
Colorado Springs, Colorado 80919
o| 719.632.3593
c| 719.313.7292
f| 719.632.2648

KLEINFELDER
Bright People. Right Solutions.

ID # 017-00157
Reg R13-3260A
Company ANTERO TREATMENT
Facility CLEARWATER Initials JW

NON-CONFIDENTIAL

Antero Treatment LLC - Antero Clearwater Facility
Equipment Summary and Emissions

ACCESS ROADS				
PROAD	Paved Facility Roads	AP-42 Section 13.2.1 Paved Roads, Final Section, January 2011.	Paved roads to the facility and inside facility	Oil truck traffic added
TRUCK OFF-LOADING STATION				
P-1051	Influent water unloading	AP-42 Section 5.2 Equation 1	Influent water is trucked in. Effluent oil is piped. Effluent water is piped and is treated.	Not modified
TRUCK OIL LOADING STATION				
OILLOAD	Oil Offloading	AP-42 Section 5.2 Equation 1	Oil from TK-1065 is trucked out of the facility	New emission source
PRE-TREATMENT				
TK-1055A	Grit Clarifier Tank	WATER9 program. Material Balance Stream 102 as influent water.	Covered and controlled by thermal oxidizer. 75' D x 17' H - 560,000 gallons working volume	Modified emissions due to process change and material balance
TK-1055B	Stage 1 Clarifier Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 75' D x 17' H - 560,000 gallons working volume	Modified emissions due to change in operation
TK-1060A/TK-1060B	Clarifier Pump Tank A and B	WATER9 program.	Covered and controlled by thermal oxidizer. 14' D x 20' H - 21,000 gallons working volume	Modified emissions due to process change and material balance
TK-1070	Equalization Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 56' D x 56' H - 900,000 gallons working volume	Modified emissions due to process change and material balance
TK-1065	Oil Collection Tank	TANKS 4.0.9d. Assume all crude to be conservative.	Covered and controlled by thermal oxidizer. 12' D x 16' H - 12,000 gallons working volume	Modified emissions due to change in throughput
TK-2010	Solids Clarifier Tank	WATER9 program. Solids recycle added in.	Covered and controlled by thermal oxidizer. 66' D x 17' H 385,000 gallons working volume	Modified emissions due to process change and material balance
TK-2015	Clarifier Effluent Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 12' D x 14' H - 10,000 gallons working volume	Modified emissions due to process change and material balance
TK-2040	Thermal Feed Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 62' D x 62' H - 1,240,000 gallons working volume	Modified emissions due to process change and material balance
TK-1120	Stage 1 Sludge Holding Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 14' D x 24' H - 20,000 gallons working volume. Mixed Tank.	New emission source
TK-1105A/TK-1105B	Stage 1 Reaction Tanks	WATER9 program. Solids recycle added in.	Covered and controlled by thermal oxidizer. 14' D x 28' H - 30,000 gallons working volume. Mixed Tank.	New emission sources
TK-1115	Stage 1 Clarifier Pump Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 14' D x 15.5' H - 10,000 gallons working volume.	New emission source
TK-1130	Stage 1 Filtrate Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 6' D x 8' H - 1,000 gallons working volume. Mixed Tank.	New emission source
TK-2020	Stage 2 Sludge Holding Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 26' D x 26' H - 90,000 gallons working volume. Mixed Tank	Modified emissions due to process change and material balance
	Stage 1 Sludge Dewatering	No emissions from the enclosed dewatering system. Emissions are calculated upon disposal however.		New, but no emissions
	Stage 2 Sludge Dewatering	No emissions from the enclosed dewatering system. Emissions are calculated upon disposal however.		Not modified
TK-2030	Sludge Filtrate Tank	Tank has been removed from facility		Tank physically removed from facility
DISP1	Dewatered Stage 2 Sludge Disposal	Mass Balance of Stream 126 and assumed short term storage. 10% volatilize based on EPA-453/R-94-080A Section 9		Modified emissions due to throughput change and operation change
DISP3	Dewatered Stage 1 Sludge Disposal	Mass Balance of Stream 118 and assumed short term storage. 10% volatilize based on EPA-453/R-94-080A Section 9		New emission source

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Antero Treatment LLC - Antero Clearwater Facility
Equipment Summary and Emissions

THERMAL PROCESS SYSTEM				
	Thermal System	No emissions. Steam from the boiler is used as a heat source. Also contains heat exchangers.		
TK-2320	CIP Tank	Flat cover tank. No emissions. Contains mild acid solution for descaling (dilute hydrochloric or citric)	1,950 gallons	Not modified
E-2076	Deaerator Vent Condenser	Mass Balance Stream 225	Vents to thermal oxidizer	Modified emissions due to process change and material balance
TK-2085	Steam Condensate Flash Tank	Incoming and outgoing streams show only water with no organics. No emissions.	4,800 gallons - non-pressurized bullet tank	Not modified
TK-2180	Boiler Feedwater Tank	Only water with no organics. No emissions.	17.5' D x 17.5' H - 54,200 gallons	Not modified
TK-2149	Brine Maker Tank	Based on surrounding material streams only water without organics. No emissions		Not modified
TK-2120	Process Distillate Level Tank	Influent - Material Balance Streams 226, 251, 261, 271. TANKS 4.0.9d	5,575 gallons - non-pressurized bullet tank	Not modified
TK-2130	Barometric Condenser Hot Well	Due to change in process, VOCs are vented prior to this tank or condensed out and vented downstream in TK-2140. No Emissions	Size is 7,580 working gallon or 18,000 gallons design and vented to atmosphere. Was 100,000 gallon tank working volume and vented to thermal oxidizer	Modified emissions due to process change and material balance. Change in tank size and not vented to thermal oxidizer anymore.
TK-2160	4A Disposal Centrate Tank	Updated material balance shows no VOC vapor emissions from this tank.	Covered - 7,560 gallons working volume - 10' D x 13' 9" H Mixed tank	Modified emissions due to process change and material balance. No longer connected to the thermal oxidizer since there are no VOC emissions from the tank.
DISP2	Salt Disposal	Mass Balance Stream 269 and 283. Assumed 100% of GROs volatilize.	Comprised of streams 4A and 4B	Modified emissions due to process change and material balance
TK-2140	Recovered Water Tank	Material Balance Stream 263	230,000 gallons - Vents to thermal oxidizer	Not modified
TK-2315	Boiler Deaerator Tank	Incoming stream shows only water and no organics. No emissions -pressurized.	Bullet type tank - 15 psi - 9,942 gallons	Not modified
TK-2450	Boiler Blowdown Flash Tank	Based on influent stream to tank, only water without organics. No emissions	1,000 gallons - 7' D x 8.5' H	New tank, but no emissions
TK-2460	4B Disposal Centrate Tank	Updated material balance shows no VOC vapor emissions from this tank.	7,560 gallons working volume - 10' D x 13' 9" H	New tank, but no emissions
CT-2335	Cooling Tower Basin	AP-42 Chapter 13.4 and manufacturer data	Three fans	Not modified
H-2185A/B	Boiler A/B	AP-42 Chapter 1.4 and manufacturer spec sheet		Modified due to synthetic minor fuel limitation of 89% of maximum or 3589.2 MMscf/year
	Boiler Chemical Treatment A/B	DeMinimis Source #9 from 45CSR13 Table 45-13B - Boiler water treatment operations		Not modified
POST TREATMENT SYSTEM				
TK-2500	Post Treatment Tank 1	Material Balance Streams 402, 405. Material Balance. See notes on emission tab	Open top -726,500 gal - 64' D x 32'	Not modified
TK-2550 and TK-2555	Post Treatment Tank 2 and 3	Material Balance Stream 403. See notes on emission tab	open top - 726,500 gal - 64' D x 32'. Aerated tank open top - 363,300 gal - 48' D x 30' Aerated tank	Not modified
CF-2510	Post Treatment Clarifier	Mass Balance Streams 406. Open top tanks and mixed. See notes on emission tab		Not modified
TK-2515	Post Treatment Effulent Tank	Mass Balance Stream 407. WATER9	Closed top - 10,000 gal - 12' D x 14'	Not modified
TK-2520	Post Treatment Sludge Tank	Mass Balance Stream 408 - Mixed tank. WATER9	Open top - 750 gal - 6' D x 6'	Not modified
TK-2545	Product Water Storage Tank	DeMinimis Source #15 from 45CSR13 Table 45-13B - demineralized water tank	Covered 22' D x 24' H - 60,000 gallons	Not modified

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Antero Treatment LLC - Antero Clearwater Facility
Equipment Summary and Emissions

CHEMICAL FEED				
TK-4175	Clarifier Polymer Aging Tank	Tank has been removed from facility		Tank physically removed from facility
TK-2800	Breakpoint Chlorination Frac Tank	New Tank - Mobile unit. No emissions of VOC or ammonia.	17,850 gallon tank. 43' L x 8' W x 11'9" H	New tank, but no emissions
TK-4036	Sodium Sulfate Silo	AP-42 8.12 for Sodium Carbonate	90 ton - 2,200 ft^3	Not modified
U-4037/U-4038	Sodium Sulfate Bin Discharger and Feeder	AP-42 8.12 for Sodium Carbonate	200-2000 lbs/hr	Not modified
TK-4039	Sodium Sulfate Day Tank	Inorganic material and wet process - Insignificant emissions	2,200 gallons - was 1,500 gallons in previous version	Tank size change
TK-4046A/TK-4046B	Lime Silo A/B	AP-42 11.17	160 ton - 9,000 ft^3	Not modified
TK-4049A/TK-4049B	Lime Slurry Premix Tank A/B	Tanks have been removed from facility		Tank physically removed from facility
U-4047A/U-4047B	Lime Bin Discharger A/B	AP-42 11.17	1,500 - 8,000 lb/hr	Not modified
TK-4049A/TK-4049B	Lime Slurry Tank A/B	Inorganic material and wet process - no emissions	5,000 gallons each - was 15,000 gallons in previous version	Tank size change
TK-4160	Solids Clarifier Polymer System Aging Tank	Tank has been removed from facility		Tank physically removed from facility
TK-4165	Dewatering Polymer System Aging Tank	Tank has been removed from facility		Tank physically removed from facility
TK-4011	Sodium Bicarbonate Silo	AP-42 8.12 for Sodium Carbonate		Not modified
U-4012/U-4013	Sodium Bicarbonate Bin Discharger and Feeder	AP-42 8.12 for Sodium Carbonate		Not modified
TK-4017	Sodium Bicarbonate Day Tank	Mixed Tank - Inorganic material and wet process - no emissions	950 gallons - was 1,000 gallons in previous version	Tank size change
TK-4170	Post Treatment Polymer System Aging Tank	Insignificant emissions - Polymer contains no volatiles or other components of concern.	Closed top - 75 gallons	Not modified
U-4075	CO2 Feeder System	CO2 is pressurized and dissolved in water. No emissions from the feeder system due to pressurizing.		Not modified
TK-4000	Ferric Chloride Storage Tank	Inorganic material and wet process - Insignificant emissions	Closed top - 6,000 gallons	Not modified
TK-4020	Caustic Bulk Storage Tank	Sodium hydroxide in dilute solution - Insignificant emissions	Closed top - 7,000 gallons	Not modified
TK-4115	Methanol Bulk Storage Tank	TANKS 4.0.9	Closed top - 8,000 gallons	Emissions change due to change in throughput
TK-4180	Sulfuric Acid Bulk Storage Tank	Tank has been removed from facility		Tank physically removed from facility
TK-4025	Hydrogen Peroxide Tank	Insignificant emissions- inorganic material	6,000 gallons - was 320 gallons in previous version	Tank size change
TK-4080	Sodium Bisulfite Tank	Insignificant emissions- inorganic material	5,400 gallons - was 320 gallons in previous version	Tank size change
TK-4054/4057/4120 /4155	Polymer Totes	Insignificant emissions - Polymer contains no volatiles or other components of concern.	320 gallons	Not modified
TK-4015	Antifoam Tote	Insignificant emissions - Antifoam contains no volatiles or other components of concern.	320 gallons	Not modified

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Antero Treatment LLC - Antero Clearwater Facility
Equipment Summary and Emissions

TK-4125	Phosphoric Acid Tote	Insignificant emissions - small tank, inogranic, stable liquid, low vapor pressure	320 gallons	Not modified
TK-4150	Micronutrient Tote	Insignificant Emissions - Micro Stimulant blend of micronutrients, trace minerals, amio acids and vitamins	320 gallons	Not modified
TK-4065	Urea Tote	Insignificant Emissions - small tank, insignificant volatility, 50/50 mix water and urea	320 gallons	Not modified
TK-4185	Sodium Hypochlorite Tote	Insignificant emissions - small tank, inorganic material, < 15% solution	320 gallons	Not modified
TK-4190	Hydrex 2252 Tote	Insignificant emissions - small tank, no constituents of concern	320 gallons	Not modified
TK-4200	Calcium Chloride Bulk Tank	Inorganic material and wet process - Insignificant emissions	6,000 gallons	New tank, but no emissions
TK-4210	Hydrex 2233 Totes	Insignificant emissions - small tank, no constituents of concern	320 gallons	New tank, but no emissions
TK-4220	Hydrex 1425 Totes	Insignificant emissions - small tank, no constituents of concern	320 gallons	New tank, but no emissions
TK-4230	Hydrex 1317 Totes	Insignificant emissions - small tank, no constituents of concern	320 gallons	New tank, but no emissions
TK-4240	Hydrex 1565 Totes	Insignificant emissions - small tank, no constituents of concern	320 gallons	New tank, but no emissions
TK-4250	Hydrex 1605 Totes	Insignificant emissions - small tank, no constituents of concern	320 gallons	New tank, but no emissions
TK-4260	Demulsifier Tote	Insignificant emissions - small tank, no constituents of concern	320 gallons	New tank, but no emissions
TK-4270	Crystallizer Antifoam Tote	Insignificant emissions - small tank, no constituents of concern	320 gallons	New tank, but no emissions
TK-4301	Calcium Carbonate Silo	AP-42 8.12 for Sodium Carbonate	36 ton - 1,200 ft^3	New emission source
TK-4309	Calcium Carbonate Hopper	AP-42 8.12 for Sodium Carbonate	25 ft^3	New emission source
TK-4310	Stage 1 Clarifier Polymer Tote	Insignificant emissions - small tank, no constituents of concern	320 gallons	New tank, but no emissions
TK-4255	Antiscalant Tote	Insignificant emissions - small tank, no constituents of concern	320 gallons	New tank, but no emissions
TK-4500	Breakpoint Chlorination Sodium Hypochlorite Tank	Insignificant emissions- inorganic material	4,000 gallons	New tank, but no emissions

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Antero Treatment LLC - Antero Clearwater Facility
Equipment Summary and Emissions

GENERAL				
	Fugitive Component Leaks	DeMinimis emissions. Most processes are in liquid phase or have <1% VOCs. Once process is in vapor phase, volatiles and oils have been removed or get adsorbed by the solids or otherwise consumed in the		Not modified
U-1080	Thermal Oxidizer	11 MMBtu/hr	Controls gas from waste gas header	Modified equipment - increased capacity
GEN-1	Emergency Generator	EPA Tier 2 emission factors and AP-42 Section 3.3		Modified equipment - increased horsepower and true emergency status per Quad I
U-1090	Emergency Flare	Meant to handle gas blanket bleed system while thermal oxidizer is down for maintenance		New emission source
ENG-2	Fire Water Pump Engine	EPA certified. Will meet 40 CFR Part 60, Subpart IIII emission limits. AP-42 for HAPs		New emission source
VENT1	Fuel Skid Pig Venting	6" receiver expected to operate at 1100 psi with 1025 cubic foot volume at standard conditions		New emission source
TK-SLOP	Fuel Skid Slop Tank	No liquids stored in tank - just dry gas running through. No emissions as it is a closed system.	500 gallons	New tank, but no emissions
HTFUEL1	Fuel Skid Heater 1	2.4 MMBtu/hr natural gas heater - AP-42 Section 1.4 Emission Factors		New emission source
HTFUEL2	Fuel Skid Heater 2	2.4 MMBtu/hr natural gas heater - AP-42 Section 1.4 Emission Factors		New emission source
	Fuel Skid	Will also contain inlet separator, measurement skid, fuel gas scrubber, and pressure vessel - no emissions as closed loop		New equipment, but no emissions

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Emissions Summary Total

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

UNCONTROLLED POTENTIAL EMISSION SUMMARY

Source	NOx		CO		VOC		SO_2		PM-10		PM-2.5		HAPs		CO_2e
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	tpy
Engines															
Emergency Generator	25.78	6.44	16.83	4.21	2.69	0.67	0.03	0.008	0.96	0.240	0.96	0.240	0.030	0.0075	900
Fire Pump Engine	0.85	0.21	1.11	0.28	0.045	0.011	0.27	0.069	0.066	0.016	0.066	0.016	0.0035	0.00087	38.7
Boilers															
Boiler 1	10.03	39.21	10.17	39.79	1.10	4.31	0.16	0.63	2.75	10.77	2.75	10.77	0.51	1.99	126,393
Boiler 2	10.03	39.21	10.17	39.79	1.10	4.31	0.16	0.63	2.75	10.77	2.75	10.77	0.51	1.99	126,393
Thermal Oxidizer															
Oxidizer, Pilot and Waste Gas-controlled Process Tanks	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Emergency Flare	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Truck Unloading															
Truck Unloading Influent Water	---	---	---	---	59.22	54.04	---	---	---	---	---	---	0.40	0.36	47,820
Truck Loading of Oil	---	---	---	---	16.70	8.72	---	---	---	---	---	---	0.28	0.15	1.80
Cooling Tower															
Cooling Tower	---	---	---	---	---	---	---	---	0.94	4.12	0.94	4.12	---	---	---
Tanks															
Process Tanks	---	---	---	---	222.62	787.11	---	---	---	---	---	---	0.49	1.39	758
Storage Tanks	---	---	---	---	0.067	0.25	---	---	---	---	---	---	0.067	0.25	---
Heaters															
Fuel Skid Heaters	0.47	2.06	0.40	1.73	0.026	0.11	0.0028	0.012	0.036	0.16	0.036	0.16	0.0089	0.039	1,234
Fugitive Emissions															
Sludge and Salt Disposal	---	---	---	---	4.66	20.39	---	---	---	---	---	---	0.00077	0.0034	0.032
Bulk Transfer Points	---	---	---	---	---	---	---	---	2.65	5.64	0.75	1.59	---	---	---
Fugitive Dust Emissions	---	---	---	---	---	---	---	---	1.41	5.55	0.35	1.36	---	---	---
Fuel Skid Pig Venting	---	---	---	---	7.53	0.20	---	---	---	---	---	---	0.18	0.0047	18
Facility PTE =	**47.15**	**87.14**	**38.68**	**85.79**	**315.75**	**880.11**	**0.63**	**1.36**	**11.57**	**37.26**	**8.60**	**29.03**	**2.47**	**6.18**	**303,556**

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Emissions Summary Total

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

CONTROLLED POTENTIAL EMISSION SUMMARY

Source	NOx		CO		VOC		SO_2		PM-10		PM-2.5		HAPs		CO_2e
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	tpy
Engines															
Emergency Generator	25.78	6.44	16.83	4.21	2.69	0.67	0.03	0.008	0.96	0.240	0.96	0.240	0.030	0.0075	900
Fire Pump Engine	0.85	0.21	1.11	0.28	0.045	0.011	0.27	0.069	0.066	0.016	0.066	0.016	0.0035	0.00087	38.7
Boilers															
Boiler 1	10.03	39.21	10.17	39.79	1.10	4.31	0.16	0.63	2.75	10.77	2.75	10.77	0.51	1.99	126,393
Boiler 2	10.03	39.21	10.17	39.79	1.10	4.31	0.16	0.63	2.75	10.77	2.75	10.77	0.51	1.99	126,393
Thermal Oxidizer															
Oxidizer, Pilot and Waste Gas-controlled Process Tanks	1.08	4.74	0.93	4.08	4.41	15.58	1.06E-05	4.64E-05	1.34E-04	5.87E-04	1.34E-04	5.87E-04	9.49E-03	2.69E-02	5,939
Emergency Flare	0.16	0.057	0.69	0.141	1.25	0.21	4.38E-05	1.92E-04	5.54E-04	2.43E-03	5.54E-04	2.43E-03	1.37E-04	6.01E-04	82
Truck Unloading															
Truck Unloading Influent Water	---	---	---	---	18.59	16.86	---	---	---	---	---	---	0.12	0.11	15,015
Truck Loading of Oil	---	---	---	---	16.70	8.72	---	---	---	---	---	---	0.28	0.15	1.80
Cooling Tower															
Cooling Tower	---	---	---	---	---	---	---	---	0.94	4.12	0.94	4.12	---	---	---
Tanks															
Process Tanks	---	---	---	---	1.97	7.90	---	---	---	---	---	---	0.013	0.052	483
Storage Tanks	---	---	---	---	0.067	0.25	---	---	---	---	---	---	0.067	0.25	---
Heaters															
Fuel Skid Heaters	0.47	2.06	0.40	1.73	0.026	0.11	0.0028	0.012	0.036	0.16	0.036	0.16	0.0089	0.039	1234
Fugitive Emissions															
Sludge and Salt Disposal	---	---	---	---	4.66	20.39	---	---	---	---	---	---	0.00077	0.0034	3.18E-02
Bulk Transfer Points	---	---	---	---	---	---	---	---	2.65	5.64	0.75	1.59	---	---	---
Fugitive Dust Emissions	---	---	---	---	---	---	---	---	1.41	5.55	0.35	1.36	---	---	---
Fuel Skid Pig Venting	---	---	---	---	7.53	0.20	---	---	---	---	---	---	0.18	0.0047	18
Facility PTE =	**48.39**	**91.94**	**40.30**	**90.01**	**60.15**	**79.52**	**0.63**	**1.36**	**11.57**	**37.27**	**8.61**	**29.03**	**1.73**	**4.61**	**276,498**

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Emissions Summary Total

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

SPECIATED HAPS UNCONTROLLED POTENTIAL EMISSION SUMMARY

Source	BENZENE		TOLUENE		ETHYLBENZENE		XYLENES		FORMALDEHYDE		n-HEXANE		METHANOL		AMMONIA*	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Engines																
Emergency Generator	1.70E-02	4.26E-03	6.16E-03	1.54E-03	---	---	4.23E-03	1.06E-03	1.73E-03	4.33E-04	---	---	---	---	---	---
Fire Pump Engine	8.82E-04	2.20E-04	3.86E-04	9.66E-05	---	---	2.69E-04	6.73E-05	1.12E-03	2.79E-04	---	---	---	---	---	---
Boilers																
Boiler 1	5.67E-04	2.22E-03	9.18E-04	3.59E-03	---	---	---	---	2.02E-02	7.92E-02	4.86E-01	1.90E+00	---	---	---	---
Boiler 2	5.67E-04	2.22E-03	9.18E-04	3.59E-03	---	---	---	---	2.02E-02	7.92E-02	4.86E-01	1.90E+00	---	---	---	---
Thermal Oxidizer																
Oxidizer, Pilot and Waste Gas-controlled Process Tanks	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Emergency Flare	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Truck Unloading																
Truck Unloading Influent Water	2.89E-01	2.64E-01	2.25E-02	2.05E-02	1.48E-02	1.35E-02	7.01E-02	6.40E-02	---	---	1.70E-04	1.55E-04	---	---	---	---
Truck Loading of Oil	7.05E-03	3.68E-03	1.16E-02	6.04E-03	4.67E-03	2.44E-03	1.04E-02	5.45E-03	---	---	2.48E-01	1.29E-01	---	---	---	---
Cooling Tower																
Cooling Tower	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Tanks																
Process Tanks	2.24E-01	5.86E-01	2.15E-01	6.40E-01	7.31E-03	2.35E-02	3.84E-02	1.36E-01	---	---	---	---	---	---	59.65	251.90
Storage Tanks	---	---	---	---	---	---	---	---	---	---	---	---	6.67E-02	2.46E-01	0.29	1.18
Heaters																
Fuel Skid Heaters	---	---	---	---	---	---	---	---	3.53E-04	1.55E-03	---	---	---	---	---	---
Fugitive Emissions																
Sludge and Wetcake Disposal	3.94E-04	1.73E-03	2.27E-04	9.96E-04	1.10E-05	4.83E-05	1.38E-04	6.06E-04	---	---	---	---	---	---	0.071	0.31
Bulk Transfer Points	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Fugitive Dust Emissions	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Fuel Skid Pig Venting	5.37E-03	1.40E-04	1.51E-02	3.92E-04	3.22E-03	8.37E-05	2.79E-03	7.25E-05	---	---	1.53E-01	3.99E-03	---	---	---	---
Facility PTE =	**0.55**	**0.86**	**0.27**	**0.68**	**0.030**	**0.040**	**0.13**	**0.21**	**0.044**	**0.16**	**1.37**	**3.93**	**0.067**	**0.25**	**60.0**	**253.4**

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

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Emissions Summary Total

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

SPECIATED HAPS CONTROLLED POTENTIAL EMISSION SUMMARY

Source	BENZENE		TOLUENE		ETHYLBENZENE		XYLENES		FORMALDEHYDE		n-HEXANE		METHANOL		AMMONIA*	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Engines																
Emergency Generator	1.70E-02	4.26E-03	6.16E-03	1.54E-03	---	---	4.23E-03	1.06E-03	1.73E-03	4.33E-04	---	---	---	---	---	---
Fire Pump Engine	8.82E-04	2.20E-04	3.86E-04	9.66E-05	---	---	2.69E-04	6.73E-05	1.12E-03	2.79E-04	---	---	---	---	---	---
Boilers																
Boiler 1	5.67E-04	2.22E-03	9.18E-04	3.59E-03	---	---	---	---	2.02E-02	7.92E-02	4.86E-01	1.90E+00	---	---	---	---
Boiler 2	5.67E-04	2.22E-03	9.18E-04	3.59E-03	---	---	---	---	2.02E-02	7.92E-02	4.86E-01	1.90E+00	---	---	---	---
Thermal Oxidizer																
Oxidizer, Pilot and Waste Gas-controlled Process Tanks	4.42E-03	1.15E-02	4.20E-03	1.24E-02	1.42E-04	4.52E-04	7.06E-04	2.48E-03	1.32E-06	5.80E-06	3.18E-05	1.39E-04	---	---	1.15	4.88
Emergency Flare	1.53E-07	6.71E-07	2.48E-07	1.09E-06	---	---	---	---	5.47E-06	2.40E-05	1.31E-04	5.75E-04	---	---	---	---
Truck Unloading																
Truck Unloading Influent Water	9.08E-02	8.24E-02	7.06E-03	6.40E-03	4.65E-03	4.22E-03	2.20E-02	2.00E-02	---	---	5.34E-05	4.85E-05	---	---	---	---
Truck Loading of Oil	7.05E-03	3.68E-03	1.16E-02	6.04E-03	4.67E-03	2.44E-03	1.04E-02	5.45E-03	---	---	2.48E-01	1.29E-01	---	---	---	---
Cooling Tower																
Cooling Tower	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Tanks																
Process Tanks	3.29E-03	1.32E-02	5.20E-03	2.08E-02	2.24E-04	8.98E-04	3.07E-03	1.23E-02	---	---	---	---	---	---	1.97	7.88
Storage Tanks	---	---	---	---	---	---	---	---	---	---	---	---	6.67E-02	2.46E-01	0.29	1.18
Heaters																
Fuel Skid Heaters	---	---	---	---	---	---	---	---	3.53E-04	1.55E-03	---	---	---	---	---	---
Fugitive Emissions																
Sludge and Wetcake Disposal	3.94E-04	1.73E-03	2.27E-04	9.96E-04	1.10E-05	4.83E-05	1.38E-04	6.06E-04	---	---	---	---	---	---	0.071	0.31
Bulk Transfer Points	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Fugitive Dust Emissions	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Fuel Skid Pig Venting	5.37E-03	1.40E-04	1.51E-02	3.92E-04	3.22E-03	8.37E-05	2.79E-03	7.25E-05	---	---	1.53E-01	3.99E-03	---	---	---	---
Facility PTE =	**0.13**	**0.12**	**0.052**	**0.056**	**0.013**	**0.0081**	**0.044**	**0.042**	**0.044**	**0.16**	**1.37**	**3.93**	**0.067**	**0.25**	**3.49**	**14.25**

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

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Emergency Generator Emission Calculations

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

Source Information - Per Engine

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

Notes:

1) Calculated

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

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

Potential Emissions per Generator

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

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

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

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

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Fire Water Pump Engine

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

Source Information - Per Engine

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

Notes:

1) Calculated

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

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

Potential Emissions per Engine

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

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

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Natural Gas Fired Boiler Emissions

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

Source Information

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

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

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

Potential Emissions per Boiler [1]

Pollutant	Emission Factor (lb/MMBtu)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
NO_X	0.036	10.03	39.21	Manufacturer Spec Sheet (converted from ppmw)
CO	0.037	10.17	39.79	Manufacturer Spec Sheet (converted from ppmw)
VOC	0.004	1.10	4.31	Manufacturer Spec Sheet
PM_{10}	0.010	2.75	10.77	Manufacturer Spec Sheet
$PM_{2.5}$	0.010	2.75	10.77	Manufacturer Spec Sheet
Pollutant	**Emission Factor (lb/MMscf)**	**Emissions (lb/hr)**	**Emissions (tpy)**	**Emission Factor Source**
SO_2	0.6	0.16	0.63	AP-42 Ch. 1.4 Table 1.4-2
Lead	0.0005	0.00013	0.00053	AP-42 Ch. 1.4 Table 1.4-2
Pollutant	**Emission Factor (lb/MMscf)**	**Emissions (lb/hr)**	**Emissions (tpy)**	**Emission Factor Source**
Benzene	2.10E-03	0.00057	0.0022	AP-42 Ch. 1.4 Table 1.4-3
Dichlorobenzene	1.20E-03	0.00032	0.0013	AP-42 Ch. 1.4 Table 1.4-3
Formaldehyde	7.50E-02	0.020	0.079	AP-42 Ch. 1.4 Table 1.4-3
n-Hexane	1.80E+00	0.49	1.90	AP-42 Ch. 1.4 Table 1.4-3
Naphthalene	6.10E-04	0.00016	0.00064	AP-42 Ch. 1.4 Table 1.4-3
Toluene	3.40E-03	0.00092	0.0036	AP-42 Ch. 1.4 Table 1.4-3
Other HAPs	8.82E-05	0.000024	0.000093	AP-42 Ch. 1.4 Table 1.4-3-sum of minor HAPs
Total HAPs	1.88E+00	0.51	1.99	AP-42 Ch. 1.4 Table 1.4-3
Pollutant	**Emission Factor (kg/MMBtu)**	**Emissions (lb/hr)**	**Emissions (tpy)**	**Emission Factor Source**
Carbon Dioxide	53.06	32,282	126,263	40 CFR Part 98, Subpart C, Table C-1
Methane	0.001	0.61	2.38	40 CFR Part 98, Subpart C, Table C-2
Nitrous Oxide	0.0001	0.061	0.24	40 CFR Part 98, Subpart C, Table C-2
CO_2e	----	32,316	126,393	40 CFR Part 98, Subpart A, Table A-1

Notes

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

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Thermal Oxidizer Combustion Emissions

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

Combustion Emissions

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

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

[1] Maximum heat input is used to calculate emissions, so as to be conservative.
[2] Methane with a heating value of 1200 Btu/hr will be added to the thermal oxidizer to assist in combustion.
[3] Emissions from manufacturer data.

NOx Emissions from Combusting Ammonia

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

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

Pilot Emissions

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

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

[4] Emission Factors from AP-42 Tables 1.4-1, 1.4-2, 1.4-3, and 1.4-4 (7/98).
[5] Sum of Emissions Factors published for pollutants classified as "HAPS" under AP-42 Table 1.4-3.
[6] Typical pilot gas usage

Total Thermal Oxidizer Emissions

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

Greenhouse Gas Emissions

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

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Emergency Flare Combustion Emissions

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

Combustion Emissions - Maintenance Use

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

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

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

[2] Typical heating value of gas at facility

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

Pilot Emissions - Continuous Use

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

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

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

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

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

Total Flare Emissions

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

Greenhouse Gas Emissions

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

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Truck Unloading Emissions

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

AP - 42, Chapter 5.2 $L_L = 12.46 \times S \times P \times M / T$

L_L = Loading Loss Emission Factor (lbs VOC/1000 gal loaded)

S = Saturation Factor

P = True Vapor Pressure of the Loaded Liquid (psia)

M = Vapor Molecular Weight of the Loaded Liquid (lbs/lbmol)

T = Temperature of Loaded Liquid (ºR)

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

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

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

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

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

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

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Truck Loading Emissions

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

AP - 42, Chapter 5.2 $L_L = 12.46 \times S \times P \times M / T$

L_L = Loading Loss Emission Factor (lbs VOC/1000 gal loaded)

S = Saturation Factor

P = True Vapor Pressure of the Loaded Liquid (psia)

M = Vapor Molecular Weight of the Loaded Liquid (lbs/lbmol)

T = Temperature of Loaded Liquid (ºR)

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

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

Notes:

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

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Cooling Tower Emissions

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

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

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

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Waste Gas Header Emission Sources

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

Uncontrolled Emissions

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

Pollutant	TK-2040		TK-1065		TK-1120		TK-1130		TK-2020		TK-2140		E-2076		TOTALS	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
VOCs	2.78	10.30	0.91	2.18	1.13	4.14	0.43	1.67	3.84	13.80	38.80	169.94	86.90	380.62	220.64	779.21
Ammonia	0.071	0.27	----	----	0.34	1.33	0.044	0.19	1.47	5.67	5.37	23.52	33.60	147.17	57.68	244.03
Benzene	0.0060	0.022	----	----	0.0081	0.024	0.0018	0.0072	0.025	0.073	----	----	----	----	0.22	0.57
Ethylbenzene	0.00011	0.00041	----	----	0.00019	0.00070	5.43E-24	2.30E-23	0.00074	0.0027	----	----	----	----	0.0071	0.023
Toluene	0.0036	0.014	----	----	0.0067	0.023	9.49E-24	3.91E-23	0.024	0.081	----	----	----	----	0.21	0.62
Xylene	0.0010	0.0039	----	----	0.00030	0.0012	5.93E-25	2.59E-24	0.0014	0.0058	----	----	----	----	0.035	0.12
Manganese	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Selenium	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
TOTAL HAPs	0.011	0.040	----	----	0.015	0.049	0.0018	0.0072	0.051	0.16	----	----	----	----	0.47	1.34
Carbon Dioxide	6.95	26.45	----	----	2.36	5.60	0.11	0.36	3.44	8.84	----	----	----	----	167.68	274.41

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Waste Gas Header Emission Sources

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

Controlled Emissions

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

Pollutant	TK-2040		TK-1065		TK-1120		TK-1130		TK-2020		TK-2140		E-2076		TOTALS	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
VOCs	0.056	0.21	0.018	0.044	0.023	0.083	0.0086	0.033	0.077	0.28	0.78	3.40	1.74	7.61	4.41	15.58
Ammonia	0.0014	0.0053	----	----	0.0069	0.027	0.00088	0.0038	0.029	0.11	0.11	0.47	0.67	2.94	1.15	4.88
Benzene	1.2E-04	4.4E-04	----	----	1.6E-04	4.7E-04	3.7E-05	1.4E-04	5.0E-04	1.5E-03	----	----	----	----	4.42E-03	1.15E-02
Ethylbenzene	2.1E-06	8.3E-06	----	----	3.8E-06	1.4E-05	1.1E-25	4.6E-25	1.5E-05	5.4E-05	----	----	----	----	1.42E-04	4.52E-04
Toluene	7.2E-05	2.8E-04	----	----	1.3E-04	4.6E-04	1.9E-25	7.8E-25	4.7E-04	1.6E-03	----	----	----	----	4.20E-03	1.24E-02
Xylene	2.0E-05	7.9E-05	----	----	5.9E-06	2.4E-05	1.2E-26	5.2E-26	2.7E-05	1.2E-04	----	----	----	----	7.06E-04	2.48E-03
Manganese	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Selenium	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
TOTAL HAPs	0.00021	0.00080	----	----	0.00030	0.0010	0.000037	0.00014	0.0010	0.0032	----	----	----	----	9.46E-03	2.68E-02
Carbon Dioxide	6.95	26.45	----	----	2.36	5.60	0.11	0.36	3.44	8.84	----	----	----	----	167.68	274.41

Notes:

1. Waste Gas Header is controlled by a thermal oxidizer with a control efficiency of at least 98 %
2. EPA's WATER9 program was used to calculate the emissions of all the emission points shown except for TK-1065, E-2076, and TK-2140. TK-1065 was assumed all crude to be conservative and emissions were calculated using TANKS 4.09d. E-2076 emissions were from Material Balance Stream 225. TK-2140 emissions were calculated using Stream 263.
   E-2076 has VOCs in the stream whereas it did not during the initial application. The process changed such that most of the VOCs will be vented through this point from the thermal system.
   The process has also changed such that the VOCs in the liquid in TK-2130 will stay in solution and ultimately be vented from TK-2140, which emits much more VOC than previously.
   TK-2130 is no longer connected to the waste gas header and thermal oxidizer.
3. Emissions from TK-1055A/B and TK-2010 are likely less than shown. WATER9 does not allow for covered clarifiers so more emissions are likely generated in the model due to air flow over the tanks.
4. Influent stream into TK-1055A/B is Material Balance Stream 102. Pound per hour emissions are calculated using peak flow and annual emissions use the average flow.
5. Metal HAPs are shown for completeness but stay in solution so there are no air emissions.
6. Only those compounds above the detection limit are shown as otherwise emissions are not quantifiable.
7. TK-2160 and TK-2460 do not have VOCs being vented due to process change. Neither tank is hooked up to the waste gas header or thermal oxidizer.

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Post Treatment System Tanks

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

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

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Post Treatment System Tanks

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

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

Notes

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

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Atmospheric Storage Tank Working and Breathing Emissions

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

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

Notes:

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

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Sludge and Salt Disposal Emissions

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

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

Notes

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

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Process Feeder System Particulate Matter Emissions

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

Feed Rates into the Water Treatment System

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

Emissions Multiplier Ratio

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

Sodium Sulfate Feeder System

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

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

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

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

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

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

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Process Feeder System Particulate Matter Emissions

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

Bulk Lime Feeder System A

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

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

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

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

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

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

Bulk Lime Feeder System B

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

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

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

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

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

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

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Process Feeder System Particulate Matter Emissions

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

Sodium Bicarbonate Feeder System

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

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

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

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

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

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

Calcium Carbonate Feeder System

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

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

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

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

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

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

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Natural Gas Fueled Fuel Conditioning Skid Heater Emissions

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

Source Information

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

Emission Calculations for all Heaters

Pollutant	Emission Factor (lb/MMscf)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
NO_X	100	0.47	2.06	AP-42 Ch. 1.4 Table 1.4-1
CO	84	0.40	1.73	AP-42 Ch. 1.4 Table 1.4-1
VOC	5.5	0.026	0.11	AP-42 Ch. 1.4 Table 1.4-2
$PM_{10}/PM_{2.5}$	7.6	0.036	0.16	AP-42 Ch. 1.4 Table 1.4-2
SO_2	0.6	0.0028	0.012	AP-42 Ch. 1.4 Table 1.4-2
Formaldehyde	0.075	0.00035	0.0015	AP-42 Ch. 1.4 Table 1.4-3
Total HAPs (including HCHO)[1]	1.9	0.0089	0.039	AP-42 Ch. 1.4 Table 1.4-3
Pollutant	**Emission Factor (kg/MMBtu)**	**Emissions (lb/hr)**	**Emissions (tpy)**	**Emission Factor Source**
Carbon Dioxide	53.06	281.43	1,232.7	40 CFR Part 98, Subpart C, Table C-1
Methane	0.001	0.0053	0.023	40 CFR Part 98, Subpart C, Table C-2
Nitrous Oxide	0.0001	0.00053	0.0023	40 CFR Part 98, Subpart C, Table C-2
CO_2e	----	281.72	1,233.9	40 CFR Part 98, Subpart A, Table A-1

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

Sample Calculations:

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

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

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Fugitive Emissions From Venting Episodes

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

VOC Venting Emissions

Type of Event[1]	Number Of Events (event/yr)	Amount Vented per Event (scf/event)	Molecular Weight of Vented Gas (lb/lb-mol)	Total Emissions (ton/yr)	VOC Weight Fraction[3]	VOC Emissions (ton/yr)
Pigging Venting (VENT1)	52	767	19.17	1.01	0.19	0.20
Total Emissions (tons/yr)						**0.20**

HAPs Venting Emissions

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

GHG Venting Emissions

Type of Event[1]	Number Of Events (event/yr)	Amount Vented per Event (scf/event)	Molecular Weight of Vented Gas (lb/lb-mol)	CH_4 Weight Fraction[3]	CO_2 Weight Fraction[3]	CH_4 Emissions (ton/yr)	CO_2 Emissions (ton/yr)	CO_2e Emissions (tpy)
Pigging Venting (VENT1)	52	767	19.17	0.73	0.0056	0.74	0.0056	18.47
Total Emissions (tons/yr)						**0.74**	**0.0056**	**18.47**

1) Estimated number of events from engineering based on other facilities
2) Amount vented is based on the 10.25 cubic foot cylinder adjusted from standard conditions to 1100 psia expected operating condition
3) Weight Fraction is from a gas analysis that will be typical for the facility

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Fugitive Dust Emissions

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

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

Equation Parameter	Value
Eext, annual size-specific emission factor for PM_{10} & $PM_{2.5}$ (paved roads) extrapolated for natural mitigation	**see table below**
k, Particle size multiplier for particle size range (PM_{10}), (lb/VMT) (Source: AP-42 Table 13.2.1-1)	**0.0022**
k, Particle size multiplier for particle size range ($PM_{2.5}$), (lb/VMT) (Source: AP-42 Table 13.2.2-2)	**0.00054**
sL, surface material silt content, (g/m^2) (Source: AP-42 Table 13.2.1-2)[4]	**0.6**
W, mean weight (tons) of the vehicles traveling the road	**41.62**
P, number of "wet" days with at least 0.254 mm (0.01 in) of precipitation during the averaging period, based on AP-42 Figure 13.2.1-2.	**150**

Annual:

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

Hourly:

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

Source of Equations: AP-42 Section 13.2.1

PM_{10} Emissions

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

$PM_{2.5}$ Emissions

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

Table Notes:

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

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Williams, Jerry

From: Michele Steyskal <MSteyskal@kleinfelder.com>
Sent: Monday, November 7, 2016 2:04 PM
To: Williams, Jerry
Cc: Barry Schatz (bschatz@anteroresources.com)
Subject: Clearwater Facility Truck Loading
Attachments: Emissions - Clearwater_R4.pdf; Att K-Fugitive Emissions Data Summary Sheet_R1.pdf

Hi Jerry,

Attached are the updated emission calculations and form that show HAPs and GHG from the Oil Truck Loading (OILLOAD) (R13-3260 / 017-00157). The update is shown on the individual calculation tab as well as in the emissions totals. Let me know if you have any questions.

Michele

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Reg R13-3260A
Company ANTERO TREATMENT
Facility CLEARWATER Initials LW

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Antero Treatment LLC - Antero Clearwater Facility
Equipment Summary and Emissions

ACCESS ROADS				
PROAD	Paved Facility Roads	AP-42 Section 13.2.1 Paved Roads, Final Section, January 2011.	Paved roads to the facility and inside facility	Oil truck traffic added
TRUCK OFF-LOADING STATION				
P-1051	Influent water unloading	AP-42 Section 5.2 Equation 1	Influent water is trucked in. Effluent oil is piped. Effluent water is piped and is treated.	Not modified
TRUCK OIL LOADING STATION				
OILLOAD	Oil Offloading	AP-42 Section 5.2 Equation 1	Oil from TK-1065 is trucked out of the facility	New emission source
PRE-TREATMENT				
TK-1055A	Grit Clarifier Tank	WATER9 program. Material Balance Stream 102 as influent water.	Covered and controlled by thermal oxidizer. 75' D x 17' H - 560,000 gallons working volume	Modified emissions due to process change and material balance
TK-1055B	Stage 1 Clarifier Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 75' D x 17' H - 560,000 gallons working volume	Modified emissions due to change in operation
TK-1060A/TK-1060B	Clarifier Pump Tank A and B	WATER9 program.	Covered and controlled by thermal oxidizer. 14' D x 20' H - 21,000 gallons working volume	Modified emissions due to process change and material balance
TK-1070	Equalization Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 56' D x 56' H - 900,000 gallons working volume	Modified emissions due to process change and material balance
TK-1065	Oil Collection Tank	TANKS 4.0.9d. Assume all crude to be conservative.	Covered and controlled by thermal oxidizer. 12' D x 16' H - 12,000 gallons working volume	Modified emissions due to change in throughput
TK-2010	Solids Clarifier Tank	WATER9 program. Solids recycle added in.	Covered and controlled by thermal oxidizer. 66' D x 17' H 385,000 gallons working volume	Modified emissions due to process change and material balance
TK-2015	Clarifier Effluent Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 12' D x 14' H - 10,000 gallons working volume	Modified emissions due to process change and material balance
TK-2040	Thermal Feed Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 62' D x 62' H - 1,240,000 gallons working volume	Modified emissions due to process change and material balance
TK-1120	Stage 1 Sludge Holding Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 14' D x 24' H - 20,000 gallons working volume. Mixed Tank.	New emission source
TK-1105A/TK-1105B	Stage 1 Reaction Tanks	WATER9 program. Solids recycle added in.	Covered and controlled by thermal oxidizer. 14' D x 28' H - 30,000 gallons working volume. Mixed Tank.	New emission sources
TK-1115	Stage 1 Clarifier Pump Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 14' D x 15.5' H - 10,000 gallons working volume.	New emission source
TK-1130	Stage 1 Filtrate Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 6' D x 8' H - 1,000 gallons working volume. Mixed Tank.	New emission source
TK-2020	Stage 2 Sludge Holding Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 26' D x 26' H - 90,000 gallons working volume. Mixed Tank	Modified emissions due to process change and material balance
	Stage 1 Sludge Dewatering	No emissions from the enclosed dewatering system. Emissions are calculated upon disposal however.		New, but no emissions
	Stage 2 Sludge Dewatering	No emissions from the enclosed dewatering system. Emissions are calculated upon disposal however.		Not modified

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Antero Treatment LLC - Antero Clearwater Facility
Equipment Summary and Emissions

TK-2030	Sludge Filtrate Tank	Tank has been removed from facility		Tank physically removed from facility
DISP1	Dewatered Stage 2 Sludge Disposal	Mass Balance of Stream 126 and assumed short term storage. 10% volatilize based on EPA-453/R-94-080A Section 9		Modified emissions due to throughput change and operation change
DISP3	Dewatered Stage 1 Sludge Disposal	Mass Balance of Stream 118 and assumed short term storage. 10% volatilize based on EPA-453/R-94-080A Section 9		New emission source
THERMAL PROCESS SYSTEM				
	Thermal System	No emissions. Steam from the boiler is used as a heat source. Also contains heat exchangers.		
TK-2320	CIP Tank	Flat cover tank. No emissions. Contains mild acid solution for descaling (dilute hydrochloric or citric)	1,950 gallons	Not modified
E-2076	Deaerator Vent Condenser	Mass Balance Stream 225	Vents to thermal oxidizer	Modified emissions due to process change and material balance
TK-2085	Steam Condensate Flash Tank	Incoming and outgoing streams show only water with no organics. No emissions.	4,800 gallons - non-pressurized bullet tank	Not modified
TK-2180	Boiler Feedwater Tank	Only water with no organics. No emissions.	17.5' D x 17.5' H - 54,200 gallons	Not modified
TK-2149	Brine Maker Tank	Based on surrounding material streams only water without organics. No emissions		Not modified
TK-2120	Process Distillate Level Tank	Influent - Material Balance Streams 226, 251, 261, 271. TANKS 4.0.9d	5,575 gallons - non-pressurized bullet tank	Not modified
TK-2130	Barometric Condenser Hot Well	Due to change in process, VOCs are vented prior to this tank or condensed out and vented downstream in TK-2140. No Emissions	Size is 7,580 working gallon or 18,000 gallons design and vented to atmosphere. Was 100,000 gallon tank working volume and vented to thermal oxidizer	Modified emissions due to process change and material balance. Change in tank size and not vented to thermal oxidizer anymore.
TK-2160	4A Disposal Centrate Tank	Updated material balance shows no VOC vapor emissions from this tank.	Covered - 7,560 gallons working volume - 10' D x 13' 9" H Mixed tank	Modified emissions due to process change and material balance. No longer connected to the thermal oxidizer since there are no VOC emissions from the tank.
DISP2	Salt Disposal	Mass Balance Stream 269 and 283. Assumed 100% of GROs volatilize.	Comprised of streams 4A and 4B	Modified emissions due to process change and material balance
TK-2140	Recovered Water Tank	Material Balance Stream 263	230,000 gallons - Vents to thermal oxidizer	Not modified
TK-2315	Boiler Deaerator Tank	Incoming stream shows only water and no organics. No emissions -pressurized.	Bullet type tank - 15 psi - 9,942 gallons	Not modified
TK-2450	Boiler Blowdown Flash Tank	Based on influent stream to tank, only water without organics. No emissions	1,000 gallons - 7' D x 8.5' H	New tank, but no emissions
TK-2460	4B Disposal Centrate Tank	Updated material balance shows no VOC vapor emissions from this tank.	7,560 gallons working volume - 10' D x 13' 9" H	New tank, but no emissions
CT-2335	Cooling Tower Basin	AP-42 Chapter 13.4 and manufacturer data	Three fans	Not modified

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Antero Treatment LLC - Antero Clearwater Facility
Equipment Summary and Emissions

H-2185A/B	Boiler A/B	AP-42 Chapter 1.4 and manufacturer spec sheet		Modified due to synthetic minor fuel limitation of 89% of maximum or 3589.2 MMscf/year
	Boiler Chemical Treatment A/B	DeMinimis Source #9 from 45CSR13 Table 45-13B - Boiler water treatment operations		Not modified
POST TREATMENT SYSTEM				
TK-2500	Post Treatment Tank 1	Material Balance Streams 402, 405. Material Balance. See notes on emission tab	Open top -726,500 gal - 64' D x 32'	Not modified
TK-2550 and TK-2555	Post Treatment Tank 2 and 3	Material Balance Stream 403. See notes on emission tab	open top - 726,500 gal - 64' D x 32'. Aerated tank open top - 363,300 gal - 48' D x 30' Aerated tank	Not modified
CF-2510	Post Treatment Clarifier	Mass Balance Streams 406. Open top tanks and mixed. See notes on emission tab		Not modified
TK-2515	Post Treatment Effulent Tank	Mass Balance Stream 407. WATER9	Closed top - 10,000 gal - 12' D x 14'	Not modified
TK-2520	Post Treatment Sludge Tank	Mass Balance Stream 408 - Mixed tank. WATER9	Open top - 750 gal - 6' D x 6'	Not modified
TK-2545	Product Water Storage Tank	DeMinimis Source #15 from 45CSR13 Table 45-13B - demineralized water tank	Covered 22' D x 24' H - 60,000 gallons	Not modified
CHEMICAL FEED				
TK-4175	Clarifier Polymer Aging Tank	Tank has been removed from facility		Tank physically removed from facility
TK-2800	Breakpoint Chlorination Frac Tank	New Tank - Mobile unit. No emissions of VOC or ammonia.	17,850 gallon tank. 43' L x 8' W x 11'9" H	New tank, but no emissions
TK-4036	Sodium Sulfate Silo	AP-42 8.12 for Sodium Carbonate	90 ton - 2,200 ft^3	Not modified
U-4037/U-4038	Sodium Sulfate Bin Discharger and Feeder	AP-42 8.12 for Sodium Carbonate	200-2000 lbs/hr	Not modified
TK-4039	Sodium Sulfate Day Tank	Inorganic material and wet process - Insignificant emissions	2,200 gallons - was 1,500 gallons in previous version	Tank size change
TK-4046A/TK-4046B	Lime Silo A/B	AP-42 11.17	160 ton - 9,000 ft^3	Not modified
TK-4049A/TK-4049B	Lime Slurry Premix Tank A/B	Tanks have been removed from facility		Tank physically removed from facility
U-4047A/U-4047B	Lime Bin Discharger A/B	AP-42 11.17	1,500 - 8,000 lb/hr	Not modified
TK-4049A/TK-4049B	Lime Slurry Tank A/B	Inorganic material and wet process - no emissions	5,000 gallons each - was 15,000 gallons in previous version	Tank size change
TK-4160	Solids Clarifier Polymer System Aging Tank	Tank has been removed from facility		Tank physically removed from facility
TK-4165	Dewatering Polymer System Aging Tank	Tank has been removed from facility		Tank physically removed from facility
TK-4011	Sodium Bicarbonate Silo	AP-42 8.12 for Sodium Carbonate		Not modified
U-4012/U-4013	Sodium Bicarbonate Bin Discharger and Feeder	AP-42 8.12 for Sodium Carbonate		Not modified
TK-4017	Sodium Bicarbonate Day Tank	Mixed Tank - Inorganic material and wet process - no emissions	950 gallons - was 1,000 gallons in previous version	Tank size change

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Antero Treatment LLC - Antero Clearwater Facility
Equipment Summary and Emissions

TK-4170	Post Treatment Polymer System Aging Tank	Insignificant emissions - Polymer contains no volatiles or other components of concern.	Closed top - 75 gallons	Not modified
U-4075	CO2 Feeder System	CO2 is pressurized and dissolved in water. No emissions from the feeder system due to pressurizing.		Not modified
TK-4000	Ferric Chloride Storage Tank	Inorganic material and wet process - Insignificant emissions	Closed top - 6,000 gallons	Not modified
TK-4020	Caustic Bulk Storage Tank	Sodium hydroxide in dilute solution - Insignificant emissions	Closed top - 7,000 gallons	Not modified
TK-4115	Methanol Bulk Storage Tank	TANKS 4.0.9	Closed top - 8,000 gallons	Emissions change due to change in throughput
TK-4180	Sulfuric Acid Bulk Storage Tank	Tank has been removed from facility		Tank physically removed from facility
TK-4025	Hydrogen Peroxide Tank	Insignificant emissions- inorganic material	6,000 gallons - was 320 gallons in previous version	Tank size change
TK-4080	Sodium Bisulfite Tank	Insignificant emissions- inorganic material	5,400 gallons - was 320 gallons in previous version	Tank size change
TK-4054/4057/4120 /4155	Polymer Totes	Insignificant emissions - Polymer contains no volatiles or other components of concern.	320 gallons	Not modified
TK-4015	Antifoam Tote	Insignificant emissions - Antifoam contains no volatiles or other components of concern.	320 gallons	Not modified
TK-4125	Phosphoric Acid Tote	Insignificant emissions - small tank, inogranic, stable liquid, low vapor pressure	320 gallons	Not modified
TK-4150	Micronutrient Tote	Insignificant Emissions - Micro Stimulant blend of micronutrients, trace minerals, amio acids and	320 gallons	Not modified
TK-4065	Urea Tote	Insignificant Emissions - small tank, insignificant volatility, 50/50 mix water and urea	320 gallons	Not modified
TK-4185	Sodium Hypochlorite Tote	Insignificant emissions - small tank, inorganic material, < 15% solution	320 gallons	Not modified
TK-4190	Hydrex 2252 Tote	Insignificant emissions - small tank, no constituents of concern	320 gallons	Not modified
TK-4200	Calcium Chloride Bulk Tank	Inorganic material and wet process - Insignificant emissions	6,000 gallons	New tank, but no emissions
TK-4210	Hydrex 2233 Totes	Insignificant emissions - small tank, no constituents of concern	320 gallons	New tank, but no emissions
TK-4220	Hydrex 1425 Totes	Insignificant emissions - small tank, no constituents of concern	320 gallons	New tank, but no emissions
TK-4230	Hydrex 1317 Totes	Insignificant emissions - small tank, no constituents of concern	320 gallons	New tank, but no emissions
TK-4240	Hydrex 1565 Totes	Insignificant emissions - small tank, no constituents of concern	320 gallons	New tank, but no emissions
TK-4250	Hydrex 1605 Totes	Insignificant emissions - small tank, no constituents of concern	320 gallons	New tank, but no emissions
TK-4260	Demulsifier Tote	Insignificant emissions - small tank, no constituents of concern	320 gallons	New tank, but no emissions
TK-4270	Crystallizer Antifoam Tote	Insignificant emissions - small tank, no constituents of concern	320 gallons	New tank, but no emissions

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Antero Treatment LLC - Antero Clearwater Facility
Equipment Summary and Emissions

TK-4301	Calcium Carbonate Silo	AP-42 8.12 for Sodium Carbonate	36 ton - 1,200 ft^3	New emission source
TK-4309	Calcium Carbonate Hopper	AP-42 8.12 for Sodium Carbonate	25 ft^3	New emission source
TK-4310	Stage 1 Clarifier Polymer Tote	Insignificant emissions - small tank, no constituents of concern	320 gallons	New tank, but no emissions
TK-4255	Antiscalant Tote	Insignificant emissions - small tank, no constituents of concern	320 gallons	New tank, but no emissions
TK-4500	Breakpoint Chlorination Sodium Hypochlorite Tank	Insignificant emissions- inorganic material	4,000 gallons	New tank, but no emissions
GENERAL				
	Fugitive Component Leaks	DeMinimis emissions. Most processes are in liquid phase or have <1% VOCs. Once process is in vapor phase, volatiles and oils have been removed or get adsorbed by the solids or otherwise consumed in the		Not modified
U-1080	Thermal Oxidizer	11 MMBtu/hr	Controls gas from waste gas header	Modified equipment - increased capacity
GEN-1	Emergency Generator	EPA Tier 2 emission factors and AP-42 Section 3.3		Modified equipment - increased horsepower and true emergency status per Quad I
U-1090	Emergency Flare	Meant to handle gas blanket bleed system while thermal oxidizer is down for maintenance		New emission source
ENG-2	Fire Water Pump Engine	EPA certified. Will meet 40 CFR Part 60, Subpart IIII emission limits. AP-42 for HAPs		New emission source
VENT1	Fuel Skid Pig Venting	6" receiver expected to operate at 1100 psi with 1025 cubic foot volume at standard conditions		New emission source
TK-SLOP	Fuel Skid Slop Tank	No liquids stored in tank - just dry gas running through. No emissions as it is a closed system.	500 gallons	New tank, but no emissions
HTFUEL1	Fuel Skid Heater 1	2.4 MMBtu/hr natural gas heater - AP-42 Section 1.4 Emission Factors		New emission source
HTFUEL2	Fuel Skid Heater 2	2.4 MMBtu/hr natural gas heater - AP-42 Section 1.4 Emission Factors		New emission source
	Fuel Skid	Will also contain inlet separator, measurement skid, fuel gas scrubber, and pressure vessel - no emissions as closed loop		New equipment, but no emissions

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Emissions Summary Total

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

UNCONTROLLED POTENTIAL EMISSION SUMMARY

Source	NOx		CO		VOC		SO_2		PM-10		PM-2.5		HAPs		CO_2e
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	tpy
Engines															
Emergency Generator	25.78	6.44	16.83	4.21	2.69	0.67	0.03	0.008	0.96	0.240	0.96	0.240	0.030	0.0075	900
Fire Pump Engine	0.85	0.21	1.11	0.28	0.045	0.011	0.27	0.069	0.066	0.016	0.066	0.016	0.0035	0.00087	38.7
Boilers															
Boiler 1	10.03	39.21	10.17	39.79	1.10	4.31	0.16	0.63	2.75	10.77	2.75	10.77	0.51	1.99	126,393
Boiler 2	10.03	39.21	10.17	39.79	1.10	4.31	0.16	0.63	2.75	10.77	2.75	10.77	0.51	1.99	126,393
Thermal Oxidizer															
Oxidizer, Pilot and Waste Gas-controlled Process Tanks	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Emergency Flare	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Truck Unloading															
Truck Unloading Influent Water	---	---	---	---	59.22	54.04	---	---	---	---	---	---	0.40	0.36	47,820
Truck Loading of Oil	---	---	---	---	16.70	8.72	---	---	---	---	---	---	0.28	0.15	1.80
Cooling Tower															
Cooling Tower	---	---	---	---	---	---	---	---	0.94	4.12	0.94	4.12	---	---	---
Tanks															
Process Tanks	---	---	---	---	222.62	787.11	---	---	---	---	---	---	0.49	1.39	758
Storage Tanks	---	---	---	---	0.067	0.25	---	---	---	---	---	---	0.067	0.25	---
Heaters															
Fuel Skid Heaters	0.47	2.06	0.40	1.73	0.026	0.11	0.0028	0.012	0.036	0.16	0.036	0.16	0.0089	0.039	1,234
Fugitive Emissions															
Sludge and Salt Disposal	---	---	---	---	4.66	20.39	---	---	---	---	---	---	0.00077	0.0034	0.032
Bulk Transfer Points	---	---	---	---	---	---	---	---	2.65	5.64	0.75	1.59	---	---	---
Fugitive Dust Emissions	---	---	---	---	---	---	---	---	1.41	5.55	0.35	1.36	---	---	---
Fuel Skid Pig Venting	---	---	---	---	7.53	0.20	---	---	---	---	---	---	0.18	0.0047	18
Facility PTE =	**47.15**	**87.14**	**38.68**	**85.79**	**315.75**	**880.11**	**0.63**	**1.36**	**11.57**	**37.26**	**8.60**	**29.03**	**2.47**	**6.18**	**303,556**

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Emissions Summary Total

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

CONTROLLED POTENTIAL EMISSION SUMMARY

Source	NOx		CO		VOC		SO_2		PM-10		PM-2.5		HAPs		CO_2e
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	tpy
Engines															
Emergency Generator	25.78	6.44	16.83	4.21	2.69	0.67	0.03	0.008	0.96	0.240	0.96	0.240	0.030	0.0075	900
Fire Pump Engine	0.85	0.21	1.11	0.28	0.045	0.011	0.27	0.069	0.066	0.016	0.066	0.016	0.0035	0.00087	38.7
Boilers															
Boiler 1	10.03	39.21	10.17	39.79	1.10	4.31	0.16	0.63	2.75	10.77	2.75	10.77	0.51	1.99	126,393
Boiler 2	10.03	39.21	10.17	39.79	1.10	4.31	0.16	0.63	2.75	10.77	2.75	10.77	0.51	1.99	126,393
Thermal Oxidizer															
Oxidizer, Pilot and Waste Gas-controlled Process Tanks	1.08	4.74	0.93	4.08	4.41	15.58	1.06E-05	4.64E-05	1.34E-04	5.87E-04	1.34E-04	5.87E-04	9.49E-03	2.69E-02	5,939
Emergency Flare	0.16	0.041	0.69	0.068	0.00040	0.0018	4.38E-05	1.92E-04	5.54E-04	2.43E-03	5.54E-04	2.43E-03	1.37E-04	6.01E-04	54
Truck Unloading															
Truck Unloading Influent Water	---	---	---	---	18.59	16.86	---	---	---	---	---	---	0.12	0.11	15,015
Truck Loading of Oil	---	---	---	---	16.70	8.72	---	---	---	---	---	---	0.28	0.15	1.80
Cooling Tower															
Cooling Tower	---	---	---	---	---	---	---	---	0.94	4.12	0.94	4.12	---	---	---
Tanks															
Process Tanks	---	---	---	---	1.97	7.90	---	---	---	---	---	---	0.013	0.052	483
Storage Tanks	---	---	---	---	0.067	0.25	---	---	---	---	---	---	0.067	0.25	---
Heaters															
Fuel Skid Heaters	0.47	2.06	0.40	1.73	0.026	0.11	0.0028	0.012	0.036	0.16	0.036	0.16	0.0089	0.039	1234
Fugitive Emissions															
Sludge and Salt Disposal	---	---	---	---	4.66	20.39	---	---	---	---	---	---	0.00077	0.0034	3.18E-02
Bulk Transfer Points	---	---	---	---	---	---	---	---	2.65	5.64	0.75	1.59	---	---	---
Fugitive Dust Emissions	---	---	---	---	---	---	---	---	1.41	5.55	0.35	1.36	---	---	---
Fuel Skid Pig Venting	---	---	---	---	7.53	0.20	---	---	---	---	---	---	0.18	0.0047	18
Facility PTE =	**48.39**	**91.92**	**40.30**	**89.94**	**58.90**	**79.31**	**0.63**	**1.36**	**11.57**	**37.27**	**8.61**	**29.03**	**1.73**	**4.61**	**276,470**

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Emissions Summary Total

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

SPECIATED HAPS UNCONTROLLED POTENTIAL EMISSION SUMMARY

Source	BENZENE		TOLUENE		ETHYLBENZENE		XYLENES		FORMALDEHYDE		n-HEXANE		METHANOL		AMMONIA*	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Engines																
Emergency Generator	1.70E-02	4.26E-03	6.16E-03	1.54E-03	---	---	4.23E-03	1.06E-03	1.73E-03	4.33E-04	---	---	---	---	---	---
Fire Pump Engine	8.82E-04	2.20E-04	3.86E-04	9.66E-05	---	---	2.69E-04	6.73E-05	1.12E-03	2.79E-04	---	---	---	---	---	---
Boilers																
Boiler 1	5.67E-04	2.22E-03	9.18E-04	3.59E-03	---	---	---	---	2.02E-02	7.92E-02	4.86E-01	1.90E+00	---	---	---	---
Boiler 2	5.67E-04	2.22E-03	9.18E-04	3.59E-03	---	---	---	---	2.02E-02	7.92E-02	4.86E-01	1.90E+00	---	---	---	---
Thermal Oxidizer																
Oxidizer, Pilot and Waste Gas-controlled Process Tanks	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Emergency Flare	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Truck Unloading																
Truck Unloading Influent Water	2.89E-01	2.64E-01	2.25E-02	2.05E-02	1.48E-02	1.35E-02	7.01E-02	6.40E-02	---	---	1.70E-04	1.55E-04	---	---	---	---
Truck Loading of Oil	7.05E-03	3.68E-03	1.16E-02	6.04E-03	4.67E-03	2.44E-03	1.04E-02	5.45E-03	---	---	2.48E-01	1.29E-01	---	---	---	---
Cooling Tower																
Cooling Tower	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Tanks																
Process Tanks	2.24E-01	5.86E-01	2.15E-01	6.40E-01	7.31E-03	2.35E-02	3.84E-02	1.36E-01	---	---	---	---	---	---	59.65	251.90
Storage Tanks	---	---	---	---	---	---	---	---	---	---	---	---	6.67E-02	2.46E-01	0.29	1.18
Heaters																
Fuel Skid Heaters	---	---	---	---	---	---	---	---	3.53E-04	1.55E-03	---	---	---	---	---	---
Fugitive Emissions																
Sludge and Wetcake Disposal	3.94E-04	1.73E-03	2.27E-04	9.96E-04	1.10E-05	4.83E-05	1.38E-04	6.06E-04	---	---	---	---	---	---	0.071	0.31
Bulk Transfer Points	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Fugitive Dust Emissions	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Fuel Skid Pig Venting	5.37E-03	1.40E-04	1.51E-02	3.92E-04	3.22E-03	8.37E-05	2.79E-03	7.25E-05	---	---	1.53E-01	3.99E-03	---	---	---	---
Facility PTE =	**0.55**	**0.86**	**0.27**	**0.68**	**0.030**	**0.040**	**0.13**	**0.21**	**0.044**	**0.16**	**1.37**	**3.93**	**0.067**	**0.25**	**60.0**	**253.4**

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

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Emissions Summary Total

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

SPECIATED HAPS CONTROLLED POTENTIAL EMISSION SUMMARY

Source	BENZENE		TOLUENE		ETHYLBENZENE		XYLENES		FORMALDEHYDE		n-HEXANE		METHANOL		AMMONIA*	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Engines																
Emergency Generator	1.70E-02	4.26E-03	6.16E-03	1.54E-03	---	---	4.23E-03	1.06E-03	1.73E-03	4.33E-04	---	---	---	---	---	---
Fire Pump Engine	8.82E-04	2.20E-04	3.86E-04	9.66E-05	---	---	2.69E-04	6.73E-05	1.12E-03	2.79E-04	---	---	---	---	---	---
Boilers																
Boiler 1	5.67E-04	2.22E-03	9.18E-04	3.59E-03	---	---	---	---	2.02E-02	7.92E-02	4.86E-01	1.90E+00	---	---	---	---
Boiler 2	5.67E-04	2.22E-03	9.18E-04	3.59E-03	---	---	---	---	2.02E-02	7.92E-02	4.86E-01	1.90E+00	---	---	---	---
Thermal Oxidizer																
Oxidizer, Pilot and Waste Gas-controlled Process Tanks	4.42E-03	1.15E-02	4.20E-03	1.24E-02	1.42E-04	4.52E-04	7.06E-04	2.48E-03	1.32E-06	5.80E-06	3.18E-05	1.39E-04	---	---	1.15	4.88
Emergency Flare	1.53E-07	6.71E-07	2.48E-07	1.09E-06	---	---	---	---	5.47E-06	2.40E-05	1.31E-04	5.75E-04	---	---	---	---
Truck Unloading																
Truck Unloading Influent Water	9.08E-02	8.24E-02	7.06E-03	6.40E-03	4.65E-03	4.22E-03	2.20E-02	2.00E-02	---	---	5.34E-05	4.85E-05	---	---	---	---
Truck Loading of Oil	7.05E-03	3.68E-03	1.16E-02	6.04E-03	4.67E-03	2.44E-03	1.04E-02	5.45E-03	---	---	2.48E-01	1.29E-01	---	---	---	---
Cooling Tower																
Cooling Tower	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Tanks																
Process Tanks	3.29E-03	1.32E-02	5.20E-03	2.08E-02	2.24E-04	8.98E-04	3.07E-03	1.23E-02	---	---	---	---	---	---	1.97	7.88
Storage Tanks	---	---	---	---	---	---	---	---	---	---	---	---	6.67E-02	2.46E-01	0.29	1.18
Heaters																
Fuel Skid Heaters	---	---	---	---	---	---	---	---	3.53E-04	1.55E-03	---	---	---	---	---	---
Fugitive Emissions																
Sludge and Wetcake Disposal	3.94E-04	1.73E-03	2.27E-04	9.96E-04	1.10E-05	4.83E-05	1.38E-04	6.06E-04	---	---	---	---	---	---	0.071	0.31
Bulk Transfer Points	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Fugitive Dust Emissions	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Fuel Skid Pig Venting	5.37E-03	1.40E-04	1.51E-02	3.92E-04	3.22E-03	8.37E-05	2.79E-03	7.25E-05	---	---	1.53E-01	3.99E-03	---	---	---	---
Facility PTE =	**0.13**	**0.12**	**0.052**	**0.056**	**0.013**	**0.0081**	**0.044**	**0.042**	**0.044**	**0.16**	**1.37**	**3.93**	**0.067**	**0.25**	**3.49**	**14.25**

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

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Emergency Generator Emission Calculations

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

Source Information - Per Engine

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

Notes:

1) Calculated

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

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

Potential Emissions per Generator

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

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

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

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

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Fire Water Pump Engine

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

Source Information - Per Engine

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

Notes:

1) Calculated

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

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

Potential Emissions per Engine

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

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

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Natural Gas Fired Boiler Emissions

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

Source Information

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

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

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

Potential Emissions per Boiler [1]

Pollutant	Emission Factor (lb/MMBtu)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
NO_X	0.036	10.03	39.21	Manufacturer Spec Sheet (converted from ppmw)
CO	0.037	10.17	39.79	Manufacturer Spec Sheet (converted from ppmw)
VOC	0.004	1.10	4.31	Manufacturer Spec Sheet
PM_{10}	0.010	2.75	10.77	Manufacturer Spec Sheet
$PM_{2.5}$	0.010	2.75	10.77	Manufacturer Spec Sheet
Pollutant	**Emission Factor (lb/MMscf)**	**Emissions (lb/hr)**	**Emissions (tpy)**	**Emission Factor Source**
SO_2	0.6	0.16	0.63	AP-42 Ch. 1.4 Table 1.4-2
Lead	0.0005	0.00013	0.00053	AP-42 Ch. 1.4 Table 1.4-2
Pollutant	**Emission Factor (lb/MMscf)**	**Emissions (lb/hr)**	**Emissions (tpy)**	**Emission Factor Source**
Benzene	2.10E-03	0.00057	0.0022	AP-42 Ch. 1.4 Table 1.4-3
Dichlorobenzene	1.20E-03	0.00032	0.0013	AP-42 Ch. 1.4 Table 1.4-3
Formaldehyde	7.50E-02	0.020	0.079	AP-42 Ch. 1.4 Table 1.4-3
n-Hexane	1.80E+00	0.49	1.90	AP-42 Ch. 1.4 Table 1.4-3
Naphthalene	6.10E-04	0.00016	0.00064	AP-42 Ch. 1.4 Table 1.4-3
Toluene	3.40E-03	0.00092	0.0036	AP-42 Ch. 1.4 Table 1.4-3
Other HAPs	8.82E-05	0.000024	0.000093	AP-42 Ch. 1.4 Table 1.4-3-sum of minor HAPs
Total HAPs	1.88E+00	0.51	1.99	AP-42 Ch. 1.4 Table 1.4-3
Pollutant	**Emission Factor (kg/MMBtu)**	**Emissions (lb/hr)**	**Emissions (tpy)**	**Emission Factor Source**
Carbon Dioxide	53.06	32,282	126,263	40 CFR Part 98, Subpart C, Table C-1
Methane	0.001	0.61	2.38	40 CFR Part 98, Subpart C, Table C-2
Nitrous Oxide	0.0001	0.061	0.24	40 CFR Part 98, Subpart C, Table C-2
CO_2e	----	32,316	126,393	40 CFR Part 98, Subpart A, Table A-1

Notes

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

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Thermal Oxidizer Combustion Emissions

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

Combustion Emissions

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

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

[1] Maximum heat input is used to calculate emissions, so as to be conservative.
[2] Methane with a heating value of 1200 Btu/hr will be added to the thermal oxidizer to assist in combustion.
[3] Emissions from manufacturer data.

NOx Emissions from Combusting Ammonia

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

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

Pilot Emissions

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

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

[4] Emission Factors from AP-42 Tables 1.4-1, 1.4-2, 1.4-3, and 1.4-4 (7/98).
[5] Sum of Emissions Factors published for pollutants classified as "HAPS" under AP-42 Table 1.4-3.
[6] Typical pilot gas usage

Total Thermal Oxidizer Emissions

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

Greenhouse Gas Emissions

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

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Emergency Flare Combustion Emissions

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

Combustion Emissions - Maintenance Use

Flare Rating[1] :	2.20	MMBtu/hr
Gas Heating Value[2]:	1,200	Btu/scf
Hours of Operation[1]:	120	hr/yr

Pollutant	Emission Factor[3] (lb/MMBtu)	Emissions (lbs/hr)	Emissions (tons/yr)
Particulate Matter ($PM/PM_{10}/PM_{2.5}$)	N/A - Smokeless Design		
Sulfur Dioxide (SO_2)	N/A - Combusted Gas has no Sulfur		
Nitrogen Oxides (NO_x)	0.068	0.15	0.0090
Carbon Monoxide (CO)	0.31	0.68	0.041

[1] Flare will be used for 5 days of annual maintenance during shutdown for gas blanket bleed system. Bleed system is rated at 2.2 MMBtu/hr.
[2] Typical heating value of gas at facility
[3] Emission Factors from Table 13.5-1 and 13.5-2 of AP-42 Section 13.5 (April 2015)

Pilot Emissions - Continuous Use

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

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

[4] Emission Factors from AP-42 Tables 1.4-1, 1.4-2, 1.4-3, and 1.4-4 (7/98).
[5] Sum of Emissions Factors published for pollutants classified as "HAPS" under AP-42 Table 1.4-3.
[6] Pilot gas usage from manufacturer specification. Assumed the pilot would be used continuously.

Total Flare Emissions

Pollutant	Total Potential Emission Rate (lbs/hr)	Total Potential Emission Rate (tons/year)
Particulate Matter ($PM/PM_{10}/PM_{2.5}$)	5.54E-04	2.43E-03
Nitrogen Oxides (NO_x)	0.16	0.041
Sulfur Dioxide (SO_2)	4.38E-05	1.92E-04
Carbon Monoxide (CO)	0.69	0.068
Volatile Organic Compounds (VOC)	4.01E-04	1.76E-03
Total HAPs	1.37E-04	6.01E-04

Greenhouse Gas Emissions

Pollutant	Emission Factor (kg/MMBtu)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
Carbon Dioxide	53.06	266.7	53.69	40 CFR Part 98, Subpart C, Table C-1
Methane	0.001	0.0050	0.0010	40 CFR Part 98, Subpart C, Table C-2
Nitrous Oxide	0.0001	0.00050	0.00010	40 CFR Part 98, Subpart C, Table C-2
CO_2e	----	12.3	53.75	40 CFR Part 98, Subpart A, Table A-1

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Truck Unloading Emissions

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

AP - 42, Chapter 5.2 $L_L = 12.46 \times S \times P \times M / T$

L_L = Loading Loss Emission Factor (lbs VOC/1000 gal loaded)
S = Saturation Factor
P = True Vapor Pressure of the Loaded Liquid (psia)
M = Vapor Molecular Weight of the Loaded Liquid (lbs/lbmol)
T = Temperature of Loaded Liquid (ºR)

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

UNCONTROLLED

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

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

CONTROLLED

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

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

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

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Truck Loading Emissions

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

AP - 42, Chapter 5.2 $L_L = 12.46 \times S \times P \times M / T$

L_L = Loading Loss Emission Factor (lbs VOC/1000 gal loaded)

S = Saturation Factor

P = True Vapor Pressure of the Loaded Liquid (psia)

M = Vapor Molecular Weight of the Loaded Liquid (lbs/lbmol)

T = Temperature of Loaded Liquid (ºR)

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

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

Notes:

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

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Cooling Tower Emissions

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

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

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

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

Circulation Water Quality (based on 10 COC)

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

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

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Waste Gas Header Emission Sources

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

Uncontrolled Emissions

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

Pollutant	TK-2040		TK-1065		TK-1120		TK-1130		TK-2020		TK-2140		E-2076		TOTALS	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
VOCs	2.78	10.30	0.91	2.18	1.13	4.14	0.43	1.67	3.84	13.80	38.80	169.94	86.90	380.62	220.64	779.21
Ammonia	0.071	0.27	----	----	0.34	1.33	0.044	0.19	1.47	5.67	5.37	23.52	33.60	147.17	57.68	244.03
Benzene	0.0060	0.022	----	----	0.0081	0.024	0.0018	0.0072	0.025	0.073	----	----	----	----	0.22	0.57
Ethylbenzene	0.00011	0.00041	----	----	0.00019	0.00070	5.43E-24	2.30E-23	0.00074	0.0027	----	----	----	----	0.0071	0.023
Toluene	0.0036	0.014	----	----	0.0067	0.023	9.49E-24	3.91E-23	0.024	0.081	----	----	----	----	0.21	0.62
Xylene	0.0010	0.0039	----	----	0.00030	0.0012	5.93E-25	2.59E-24	0.0014	0.0058	----	----	----	----	0.035	0.12
Manganese	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Selenium	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
TOTAL HAPs	0.011	0.040	----	----	0.015	0.049	0.0018	0.0072	0.051	0.16	----	----	----	----	0.47	1.34
Carbon Dioxide	6.95	26.45	----	----	2.36	5.60	0.11	0.36	3.44	8.84	----	----	----	----	167.68	274.41

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Waste Gas Header Emission Sources

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

Controlled Emissions

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

Pollutant	TK-2040		TK-1065		TK-1120		TK-1130		TK-2020		TK-2140		E-2076		TOTALS	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
VOCs	0.056	0.21	0.018	0.044	0.023	0.083	0.0086	0.033	0.077	0.28	0.78	3.40	1.74	7.61	4.41	15.58
Ammonia	0.0014	0.0053	----	----	0.0069	0.027	0.00088	0.0038	0.029	0.11	0.11	0.47	0.67	2.94	1.15	4.88
Benzene	1.2E-04	4.4E-04	----	----	1.6E-04	4.7E-04	3.7E-05	1.4E-04	5.0E-04	1.5E-03	----	----	----	----	4.42E-03	1.15E-02
Ethylbenzene	2.1E-06	8.3E-06	----	----	3.8E-06	1.4E-05	1.1E-25	4.6E-25	1.5E-05	5.4E-05	----	----	----	----	1.42E-04	4.52E-04
Toluene	7.2E-05	2.8E-04	----	----	1.3E-04	4.6E-04	1.9E-25	7.8E-25	4.7E-04	1.6E-03	----	----	----	----	4.20E-03	1.24E-02
Xylene	2.0E-05	7.9E-05	----	----	5.9E-06	2.4E-05	1.2E-26	5.2E-26	2.7E-05	1.2E-04	----	----	----	----	7.06E-04	2.48E-03
Manganese	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Selenium	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
TOTAL HAPs	0.00021	0.00080	----	----	0.00030	0.0010	0.000037	0.00014	0.0010	0.0032	----	----	----	----	9.46E-03	2.68E-02
Carbon Dioxide	6.95	26.45	----	----	2.36	5.60	0.11	0.36	3.44	8.84	----	----	----	----	167.68	274.41

Notes:

1. Waste Gas Header is controlled by a thermal oxidizer with a control efficiency of at least 98 %
2. EPA's WATER9 program was used to calculate the emissions of all the emission points shown except for TK-1065, E-2076, and TK-2140. TK-1065 was assumed all crude to be conservative and emissions were calculated using TANKS 4.09d. E-2076 emissions were from Material Balance Stream 225. TK-2140 emissions were calculated using Stream 263.
   E-2076 has VOCs in the stream whereas it did not during the initial application. The process changed such that most of the VOCs will be vented through this point from the thermal system.
   The process has also changed such that the VOCs in the liquid in TK-2130 will stay in solution and ultimately be vented from TK-2140, which emits much more VOC than previously.
   TK-2130 is no longer connected to the waste gas header and thermal oxidizer.
3. Emissions from TK-1055A/B and TK-2010 are likely less than shown. WATER9 does not allow for covered clarifiers so more emissions are likely generated in the model due to air flow over the tanks.
4. Influent stream into TK-1055A/B is Material Balance Stream 102. Pound per hour emissions are calculated using peak flow and annual emissions use the average flow.
5. Metal HAPs are shown for completeness but stay in solution so there are no air emissions.
6. Only those compounds above the detection limit are shown as otherwise emissions are not quantifiable.
7. TK-2160 and TK-2460 do not have VOCs being vented due to process change. Neither tank is hooked up to the waste gas header or thermal oxidizer.

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Post Treatment System Tanks

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

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

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Post Treatment System Tanks

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

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

Notes

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

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Atmospheric Storage Tank Working and Breathing Emissions

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

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

Notes:

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

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Sludge and Salt Disposal Emissions

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

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

Notes

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

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Process Feeder System Particulate Matter Emissions

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

Feed Rates into the Water Treatment System

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

Emissions Multiplier Ratio

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

Sodium Sulfate Feeder System

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

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

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

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

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

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

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Process Feeder System Particulate Matter Emissions

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

Bulk Lime Feeder System A

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

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

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

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

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

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

Bulk Lime Feeder System B

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

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

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

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

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

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

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Process Feeder System Particulate Matter Emissions

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

Sodium Bicarbonate Feeder System

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

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

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

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

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

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

Calcium Carbonate Feeder System

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

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

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

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

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

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

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Natural Gas Fueled Fuel Conditioning Skid Heater Emissions

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

Source Information

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

Emission Calculations for all Heaters

Pollutant	Emission Factor (lb/MMscf)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
NO_X	100	0.47	2.06	AP-42 Ch. 1.4 Table 1.4-1
CO	84	0.40	1.73	AP-42 Ch. 1.4 Table 1.4-1
VOC	5.5	0.026	0.11	AP-42 Ch. 1.4 Table 1.4-2
$PM_{10}/PM_{2.5}$	7.6	0.036	0.16	AP-42 Ch. 1.4 Table 1.4-2
SO_2	0.6	0.0028	0.012	AP-42 Ch. 1.4 Table 1.4-2
Formaldehyde	0.075	0.00035	0.0015	AP-42 Ch. 1.4 Table 1.4-3
Total HAPs (including HCHO)[1]	1.9	0.0089	0.039	AP-42 Ch. 1.4 Table 1.4-3
Pollutant	**Emission Factor (kg/MMBtu)**	**Emissions (lb/hr)**	**Emissions (tpy)**	**Emission Factor Source**
Carbon Dioxide	53.06	281.43	1,232.7	40 CFR Part 98, Subpart C, Table C-1
Methane	0.001	0.0053	0.023	40 CFR Part 98, Subpart C, Table C-2
Nitrous Oxide	0.0001	0.00053	0.0023	40 CFR Part 98, Subpart C, Table C-2
CO_2e	----	281.72	1,233.9	40 CFR Part 98, Subpart A, Table A-1

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

Sample Calculations:

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

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

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Fugitive Emissions From Venting Episodes

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

VOC Venting Emissions						
Type of Event[1]	**Number Of Events (event/yr)**	**Amount Vented per Event (scf/event)**	**Molecular Weight of Vented Gas (lb/lb-mol)**	**Total Emissions (ton/yr)**	**VOC Weight Fraction[3]**	**VOC Emissions (ton/yr)**
Pigging Venting (VENT1)	52	767	19.17	1.01	0.19	0.20
Total Emissions (tons/yr)						**0.20**

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

GHG Venting Emissions								
Type of Event[1]	**Number Of Events (event/yr)**	**Amount Vented per Event (scf/event)**	**Molecular Weight of Vented Gas (lb/lb-mol)**	**CH_4 Weight Fraction[3]**	**CO_2 Weight Fraction[3]**	**CH_4 Emissions (ton/yr)**	**CO_2 Emissions (ton/yr)**	**CO_2e Emissions (tpy)**
Pigging Venting (VENT1)	52	767	19.17	0.73	0.0056	0.74	0.0056	18.47
Total Emissions (tons/yr)						**0.74**	**0.0056**	**18.47**

1) Estimated number of events from engineering based on other facilities
2) Amount vented is based on the 10.25 cubic foot cylinder adjusted from standard conditions to 1100 psia expected operating condition
3) Weight Fraction is from a gas analysis that will be typical for the facility

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Fugitive Dust Emissions

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

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

Equation Parameter	Value
Eext, annual size-specific emission factor for PM_{10} & $PM_{2.5}$ (paved roads) extrapolated for natural mitigation	**see table below**
k, Particle size multiplier for particle size range (PM_{10}), (lb/VMT) (Source: AP-42 Table 13.2.1-1)	**0.0022**
k, Particle size multiplier for particle size range ($PM_{2.5}$), (lb/VMT) (Source: AP-42 Table 13.2.2-2)	**0.00054**
sL, surface material silt content, (g/m^2) (Source: AP-42 Table 13.2.1-2)[4]	**0.6**
W, mean weight (tons) of the vehicles traveling the road	**41.62**
P, number of "wet" days with at least 0.254 mm (0.01 in) of precipitation during the averaging period, based on AP-42 Figure 13.2.1-2.	**150**

Annual:

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

Hourly:

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

Source of Equations: AP-42 Section 13.2.1

PM_{10} Emissions

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

$PM_{2.5}$ Emissions

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

Table Notes:

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

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Attachment K

FUGITIVE EMISSIONS DATA SUMMARY SHEET

The FUGITIVE EMISSIONS SUMMARY SHEET provides a summation of fugitive emissions. Fugitive emissions are those emissions which could not reasonably pass through a stack, chimney, vent or other functionally equivalent opening. Note that uncaptured process emissions are not typically considered to be fugitive, and must be accounted for on the appropriate EMISSIONS UNIT DATA SHEET and on the EMISSION POINTS DATA SUMMARY SHEET.

Please note that total emissions from the source are equal to all vented emissions, all fugitive emissions, plus all other emissions (e.g. uncaptured emissions).

APPLICATION FORMS CHECKLIST - FUGITIVE EMISSIONS
1.) Will there be haul road activities? ☒ Yes ☐ No ☒ If YES, then complete the HAUL ROAD EMISSIONS UNIT DATA SHEET.
2.) Will there be Storage Piles? ☐ Yes ☒ No ☐ If YES, complete Table 1 of the NONMETALLIC MINERALS PROCESSING EMISSIONS UNIT DATA SHEET.
3.) Will there be Liquid Loading/Unloading Operations? ☒ Yes ☐ No ☒ If YES, complete the BULK LIQUID TRANSFER OPERATIONS EMISSIONS UNIT DATA SHEET.
4.) Will there be emissions of air pollutants from Wastewater Treatment Evaporation? ☒ Yes ☐ No ☒ If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET.
5.) Will there be Equipment Leaks (e.g. leaks from pumps, compressors, in-line process valves, pressure relief devices, open-ended valves, sampling connections, flanges, agitators, cooling towers, etc.)? ☐ Yes ☒ No ☐ If YES, complete the LEAK SOURCE DATA SHEET section of the CHEMICAL PROCESSES EMISSIONS UNIT DATA SHEET.
6.) Will there be General Clean-up VOC Operations? ☐ Yes ☒ No ☐ If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET.
7.) Will there be any other activities that generate fugitive emissions? ☒ Yes ☐ No ☒ If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET or the most appropriate form.
If you answered "NO" to all of the items above, it is not necessary to complete the following table, "Fugitive Emissions Summary."

FUGITIVE EMISSIONS SUMMARY	All Regulated Pollutants - Chemical Name/CAS [1]	Maximum Potential Uncontrolled Emissions [2]		Maximum Potential Controlled Emissions [3]		Est. Method Used [4]
		lb/hr	ton/yr	lb/hr	ton/yr	
Haul Road/Road Dust Emissions Paved Haul Roads						
Paved Haul Roads (PROAD)	PM-10 PM-2.5	1.41 0.35	5.55 1.36	1.41 0.35	5.55 1.36	EE
Storage Pile Emissions						
Loading/Unloading Operations (P-1051, OILLOAD)	VOCs Total HAPs CO2e	75.91 0.68 52,409	62.76 0.51 47,822	35.29 0.41 16,459	25.58 0.26 15,017	EE
Wastewater Treatment Evaporation & Operations (DISP1, DISP2,and DISP3)	VOCs Total HAPs CO2e NH3	4.66 0.00077 0.0073 0.071	20.39 0.0034 0.032 0.31	4.66 0.00077 0.0073 0.071	20.39 0.0034 0.032 0.31	MB
Equipment Leaks						
General Clean-up VOC Emissions						
Other - Venting from Pigging Operations (VENT1)	VOCs Total HAPs CO2e	7.53 0.18 710.3	0.20 0.0047 18.47	7.53 0.18 710.3	0.20 0.0047 18.47	EE
Other all Transfer Points (TK-4036, U-4037, U-4038, TK-4046A/B, U-4047A/B, U-4048A/B, TK-4012, U-4012, U-4013, TK-4301, U-4302, U-4303)	PM-10 PM-2.5	2.65 0.75	5.64 1.59	2.65 0.75	5.64 1.59	EE

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

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

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

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

Williams, Jerry

From: Barry Schatz <bschatz@anteroresources.com>
Sent: Monday, November 7, 2016 11:16 AM
To: Williams, Jerry
Subject: FW: Clearwater - Jerry Williams Data Requests

From: Barry Schatz [mailto:bschatz@anteroresources.com]
Sent: Wednesday, November 02, 2016 2:08 PM
To: Michele Steyskal <MSteyskal@kleinfelder.com>
Cc: Elizabeth McLaughlin <emclaughlin@anteroresources.com>
Subject: Clearwater - Jerry Williams Data Requests

Talked to Jerry Williams today about Clearwater he had the following data requests:

1) Requested the boiler emissions in lb./MMBTU. The Db permit limit is .02 lb./MMBTU.

In the emissions spreadsheet, I converted the NOx and CO factors from the spec sheet from ppm to lb/MMBtu. We can confirm that Jerry saw these in the emission spreadsheet

2) Requested HAP and GHG emissions for truck loading

Adding these based on the data from Betsy yesterday

3) Requested VOC and HAP emissions for the emergency flare.

In the emissions spreadsheet, we do have the VOC and HAPs from combustion of the pilot gas. I'm not sure if he means the VOC and HAPs if there were an emergency situation, but mostly this flare is used for the bleed system gas. Maybe he wanted 2% of the VOC and HAP left over from the bleed gas?

4) For these tanks:

- TK-1055B
- TK-1060A
- TK-1060B
- TK-1070
- TK-2010
- TK-2015
- TK-2040
- TK-1105A
- TK-1105B
- TK-1115
- TK-1130
- TK-2140

ID # 017-00157
Reg R13-3260A
Company ANTERO TREATMENT
Facility CLEARWATER Initials IW

On page 4 of 5 of attachment "L" questions 39d &e we list the molecular weight of the liquids in the tank as 18. Jerry wanted to know if it really was 18 for each tank, as some of the tanks my contain residual hydrocarbon. I know for the most part the hydrocarbons have already flashed from the water. Can we give him a more detailed molecular weight or is the hydrocarbon content so low as to be insignificant? If so we should state that this is the case.

The way the WATER9 program works, it takes a balance of water at a MW of 18 and then adds in all the other components at their concentration and MW. So the MW of all those tanks will be higher than 18, but it would take a lot of work to calculate in a spreadsheet, but we could if necessary. We know the range will be between 22.56 (our influent water MW) and 18 of pure water. We can see if he really needs details and then I can calculate. We can confirm that the tank emissions are calculated using the MW of water and each component in the water so that's the important part. I'll call you to discuss

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Barry Schatz
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Antero Resources
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(303) 357-7276 (O)
(719) 351-4198 (C)

Williams, Jerry

From: Michele Steyskal <MSteyskal@kleinfelder.com>
Sent: Monday, October 31, 2016 12:42 PM
To: Williams, Jerry
Cc: Barry Schatz (bschatz@anteroresources.com)
Subject: RE: Clearwater emergency Generator
Attachments: Att J - Emission Point Summary_R1.pdf; Att L_Emergency Generator_R1.pdf; Emissions - Clearwater_R3.pdf

Hi Jerry,

Attached are the updated emission calculations and forms for the emergency generator at the Antero Clearwater Facility (R13-3260 / 017-00157). The update reflects an increase in the permitted emergency generator hours from 100 hours/year to 500 hours/year. Let me know if you have any other questions.

Michele

From: Michele Steyskal
Sent: Friday, October 28, 2016 11:38 AM
To: Barry Schatz (bschatz@anteroresources.com) <bschatz@anteroresources.com>
Cc: 'Williams, Jerry' <Jerry.Williams@wv.gov>
Subject: Clearwater emergency Generator

Hi Barry,

Jerry and I just talked in detail regarding the emergency generator for the Clearwater Facility. We came to the conclusion that it still will be an emergency status engine limited to all the requirements in Quad I for an emergency engine (100 hr/year of maintenance and testing, etc), but he would like to see the hours of operation back up to 500 hrs/year to account for emissions when used in an emergency. So Antero can still install the Tier 2 engine because it will be an emergency engine, but we will account for the extra emissions. I told him I would send him updated emissions, Attachment J and Attachment L form on Monday. Please respond and let us know if this is an acceptable plan for the engine. Call me if you'd like to review the emergency requirements.

Michele

Michele Steyskal
Air Quality Professional
4815 List Drive, Unit 115
Colorado Springs, Colorado 80919
o| 719.632.3593
c| 719.313.7292
f| 719.632.2648

ID # 017-00157
Reg R13-3260A
Company ANTERO TREATMENT
Facility CLEARWATER Initials dw

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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	25.78	6.44	25.78	6.44	Gas/Vapor	EE	
								CO	16.83	4.21	16.83	4.21			
								VOC	2.69	0.67	2.69	0.67			
								PM10	0.96	0.24	0.96	0.24			
								SO2	0.033	0.0083	0.033	0.0083			
								Total HAPs	0.03	0.0075	0.03	0.0075			
								CO2e	3598	899.5	3598	899.5			
2E	Upward vertical stack	H-2185A	Boiler 1			C	8,760	NOx	10.03	39.21	10.03	39.21	Gas/Vapor	EE	
								CO	10.17	39.79	10.17	39.79			
								VOC	1.10	4.31	1.10	4.31			
								PM10	2.75	10.77	2.75	10.77			
								SO2	0.16	0.63	0.16	0.63			
								Total HAPs	0.51	1.99	0.51	1.99			
								CO2e	32316	126393	32316	126393			
3E	Upward vertical stack	H-2185B	Boiler 2			C	8,760	NOx	10.03	39.21	10.03	39.21	Gas/Vapor	EE	
								CO	10.17	39.79	10.17	39.79			
								VOC	1.10	4.31	1.10	4.31			
								PM10	2.75	10.77	2.75	10.77			
								SO2	0.16	0.63	0.16	0.63			
								Total HAPs	0.51	1.99	0.51	1.99			
								CO2e	32316	126393	32316	126393			

4E	Upward vertical stack	U-1080 (TK-1055A/B, TK-1060A/B, TK-1070 TK-1105A/B, TK-1115 TK-2010, TK-2015, TK-2040, TK-1065 TK-1120, TK-1130, TK-2020, TK-2140, E-2076)	Thermal oxidizer	1C	Thermal oxidizer	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Ammonia CO2e	--- --- 220.64 --- --- 0.47 57.68 167.68	--- --- 779.21 --- --- 1.34 244.03 274.41	1.08 0.93 4.41 1.3e-4 1.1e-5 9.5e-3 1.15 1461	4.74 4.08 15.58 5.9e-4 4.6e-5 2.7e-2 4.88 5939.2	Gas/Vapor	EE	
20E	Upward vertical stack	TK-2120	Process Distillate Level Tank			C	8,760	Ammonia	0.29	1.18	0.29	1.18	Gas/Vapor	EE	
21E	Open Top tank	TK-2500	Post Treatment Tank 1			C	8,760	VOC Total HAPs Ammonia	1.18 0.012 1.96	4.74 0.049 7.87	1.18 0.012 1.96	4.74 0.049 7.87	Gas/Vapor	EE	
22E	Open Top tank	TK-2550	Post Treatment Tank 2			C	8,760	CO2e	60.18	239.62	60.18	239.62	Gas/Vapor	EE	
23E	Open Top tank	TK-2555	Post Treatment Tank 3			C	8,760	CO2e	60.18	239.62	60.18	239.62	Gas/Vapor	EE	
24E	Upward vertical stack	TK-2515	Post Treatment Effluent Tank			C	8,760	VOC Total HAPs Ammonia CO2e	0.77 0.0005 0.0014 0.95	3.10 0.0021 0.0057 3.81	0.77 0.0005 0.0014 0.95	3.10 0.0021 0.0057 3.81	Gas/Vapor	EE	

25E	Open Top tank	TK-2520	Post Treatment Sludge Tank			C	8,760	VOC Total HAPs Ammonia CO2e	0.015 5.0E-5 0.0009 0.027	0.064 0.00023 0.0039 0.12	0.015 5.0E-5 0.0009 0.027	0.064 0.00023 0.0039 0.12	Gas/Vapor	EE	
26E	Upward vertical stack	TK-4115	Methanol Bulk Storage Tank			C	8,760	VOC Total HAPs	0.067 0.067	0.25 0.25	0.067 0.067	0.25 0.25	Gas/Vapor	EE	
28E	Upward vertical stack	CT-2335	Cooling Tower Basin			C	8,760	PM10 PM2.5	0.94 0.94	4.12 4.12	0.94 0.94	4.12 4.12	Gas/Vapor	EE	
29E	Upward vertical stack	U-1090	Emergency Flare			Emergency use	120 (pilot 8760)	NOx CO VOC PM10 SO2 Total HAPs CO2e	--- --- --- --- --- --- ---	--- --- --- --- --- --- ---	0.16 0.69 4.0e-4 5.5e-4 4.4e-5 1.4e-4 12.3	0.041 0.068 1.7e-3 2.4e-3 1.9e-4 6.0-4 53.75	Gas/Vapor	EE	
30E	Upward vertical stack	ENG-2	Fire Water Pump Engine			Emergency use	500	NOx CO VOC PM10 SO2 Total HAPs CO2e	0.85 1.11 0.045 0.066 0.27 0.0035 155	0.21 0.28 0.011 0.016 0.069 0.0009 38.75	0.85 1.11 0.045 0.066 0.27 0.004 155	0.21 0.28 0.011 0.016 0.069 0.0009 38.75	Gas/Vapor	EE	
31E	Upward vertical stack	HTFUEL1	Fuel Skid Heater 1			C	8,760	NOx CO VOC PM10 SO2 Total HAPs CO2e	0.24 0.20 0.013 0.018 0.0014 0.0044 140.86	1.03 0.87 0.057 0.078 0.0062 0.019 616.97	0.24 0.20 0.013 0.018 0.0014 0.0044 140.9	1.03 0.87 0.057 0.078 0.0062 0.019 616.97	Gas/Vapor	EE	

32E	Upward vertical stack	HTFUEL2	Fuel Skid Heater 2			C	8,760	NOx CO VOC PM10 SO2 Total HAPs CO2e	0.24 0.20 0.013 0.018 0.0014 0.0044 140.86	1.03 0.87 0.057 0.078 0.0062 0.019 616.97	0.24 0.20 0.013 0.018 0.0014 0.0044 140.9	1.03 0.87 0.057 0.078 0.0062 0.019 616.97	Gas/Vapor	EE	

The EMISSION POINTS DATA SUMMARY SHEET provides a summation of emissions by emission unit. Note that uncaptured process emission unit emissions are not typically considered to be fugitive and must be accounted for on the appropriate EMISSIONS UNIT DATA SHEET and on the EMISSION POINTS DATA SUMMARY SHEET. Please note that total emissions from the source are equal to all vented emissions, all fugitive emissions, plus all other emissions (e.g. uncaptured emissions). Please complete the FUGITIVE EMISSIONS DATA SUMMARY SHEET for fugitive emission activities.

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

[2] Indicate by "C" if venting is continuous. Otherwise, specify the average short-term venting rate with units, for intermittent venting (ie., 15 min/hr). Indicate as many rates as needed to clarify frequency of venting (e.g., 5 min/day, 2 days/wk).

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

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

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

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

[7] Provide for all pollutant emissions. Typically, the units of parts per million by volume (ppmv) are used. If the emission is a mineral acid (sulfuric, nitric, hydrochloric or phosphoric) use units of milligram per dry cubic meter (mg/m^3) at standard conditions (68 °F and 29.92 inches Hg) (see 45CSR7). If the pollutant is SO_2, use units of ppmv (See 45CSR10).

Attachment J
EMISSION POINTS DATA SUMMARY SHEET

Table 2: Release Parameter Data								
Emission Point ID No.	Inner Diameter (ft.)	Exit Gas			Emission Point Elevation (ft)		UTM Coordinates (km)	
		Temp. (°F)	Volumetric Flow [1] (acfm) *at operating conditions*	Velocity (fps)	Ground Level *(Height above mean sea level)*	Stack Height [2]	Northing	Easting
1E	1.17	979	19209	149 dual exhaust	1029	17	TBD	TBD
2E	5.5	322	68799	48	1029	50	4346.745	509.333
3E	5.5	322	68799	48	1029	50	4346.753	509.333
4E	2.7	872	9727	28.3	1029	63.5	4346.718	509.276
20E	0.17	144	unknown	unknown	1029	10	4346.742	509.318
21E	Open tanks	80-90	unknown	unknown	1029	N/A	4346.701	509.324
22E	Open tanks	80-90	unknown	unknown	1029	N/A	4346.701	509.301
23E	Open tanks	80-90	unknown	unknown	1029	N/A	4346.719	509.312
24E	0.17	80-90	unknown	unknown	1029	0.17	4346.715	509.341
25E	Open tank	80-90	unknown	unknown	1029	N/A	4346.715	509.337
26E	0.17	atmospheric	unknown	unknown	1029	10	4346.658	509.349
28E	unknown	unknown	unknown	unknown	1029	38.84	4346.788	509.340
29E	1	unknown	unknown	unknown	1029	60	4346.718	509.276
30E	unknown	unknown	unknown	unknown	1029	TBD	4346.816	509.344
31E	1.25	300	unknown	unknown	1029	18	TBD	TBD
32E	1.25	300	unknown	unknown	1029	18	TBD	TBD

[1] Give at operating conditions. Include inerts. [2] Release height of emissions above ground level.

GENERATOR ENGINE DATA SHEET

Source Identification Number[1]		GEN-1 / 1E					
Engine Manufacturer and Model		Mitsubishi S16R-Y2PTAW2-1					
Manufacturer's Rated bhp/rpm		2,923					
Source Status[2]		MS					
Date Installed/Modified/Removed[3]		December 2016					
Engine Manufactured/Reconstruction Date[4]		2016					
Is this a Certified Stationary Spark Ignition Engine according to 40CFR60 Subpart JJJJ? (Yes or No)[5]		Yes – Certified to Subpart JJJJ					
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	2180					
	BSFC (gal/hr)	160.1					
	Fuel throughput (gal/hr)	160.1					
	Fuel throughput (gal/yr)	80,050					
	Operation (hrs/yr)	500					
Reference[9]	Potential Emissions[10]	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
OT	NO_X	25.78	6.44				
OT	CO	16.83	4.21				
OT	VOC	2.69	0.67				
AP	SO_2	0.033	0.0083				
OT	PM_{10}	0.96	0.24				
AP	Formaldehyde	0.0017	4.33e-4				
OT	$PM_{2.5}$	0.96	0.24				

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:

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.*

Antero Treatment LLC - Antero Clearwater Facility
Equipment Summary and Emissions

ACCESS ROADS				
PROAD	Paved Facility Roads	AP-42 Section 13.2.1 Paved Roads, Final Section, January 2011.	Paved roads to the facility and inside facility	Oil truck traffic added
TRUCK OFF-LOADING STATION				
P-1051	Influent water unloading	AP-42 Section 5.2 Equation 1	Influent water is trucked in. Effluent oil is piped. Effluent water is piped and is treated.	Not modified
TRUCK OIL LOADING STATION				
OILLOAD	Oil Offloading	AP-42 Section 5.2 Equation 1	Oil from TK-1065 is trucked out of the facility	New emission source
PRE-TREATMENT				
TK-1055A	Grit Clarifier Tank	WATER9 program. Material Balance Stream 102 as influent water.	Covered and controlled by thermal oxidizer. 75' D x 17' H - 560,000 gallons working volume	Modified emissions due to process change and material balance
TK-1055B	Stage 1 Clarifier Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 75' D x 17' H - 560,000 gallons working volume	Modified emissions due to change in operation
TK-1060A/TK-1060B	Clarifier Pump Tank A and B	WATER9 program.	Covered and controlled by thermal oxidizer. 14' D x 20' H - 21,000 gallons working volume	Modified emissions due to process change and material balance
TK-1070	Equalization Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 56' D x 56' H - 900,000 gallons working volume	Modified emissions due to process change and material balance
TK-1065	Oil Collection Tank	TANKS 4.0.9d. Assume all crude to be conservative.	Covered and controlled by thermal oxidizer. 12' D x 16' H - 12,000 gallons working volume	Modified emissions due to change in throughput
TK-2010	Solids Clarifier Tank	WATER9 program. Solids recycle added in.	Covered and controlled by thermal oxidizer. 66' D x 17' H 385,000 gallons working volume	Modified emissions due to process change and material balance
TK-2015	Clarifier Effluent Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 12' D x 14' H - 10,000 gallons working volume	Modified emissions due to process change and material balance
TK-2040	Thermal Feed Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 62' D x 62' H - 1,240,000 gallons working volume	Modified emissions due to process change and material balance
TK-1120	Stage 1 Sludge Holding Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 14' D x 24' H - 20,000 gallons working volume. Mixed Tank.	New emission source
TK-1105A/TK-1105B	Stage 1 Reaction Tanks	WATER9 program. Solids recycle added in.	Covered and controlled by thermal oxidizer. 14' D x 28' H - 30,000 gallons working volume. Mixed Tank.	New emission sources
TK-1115	Stage 1 Clarifier Pump Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 14' D x 15.5' H - 10,000 gallons working volume.	New emission source
TK-1130	Stage 1 Filtrate Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 6' D x 8' H - 1,000 gallons working volume. Mixed Tank.	New emission source
TK-2020	Stage 2 Sludge Holding Tank	WATER9 program.	Covered and controlled by thermal oxidizer. 26' D x 26' H - 90,000 gallons working volume. Mixed Tank	Modified emissions due to process change and material balance
	Stage 1 Sludge Dewatering	No emissions from the enclosed dewatering system. Emissions are calculated upon disposal however.		New, but no emissions
	Stage 2 Sludge Dewatering	No emissions from the enclosed dewatering system. Emissions are calculated upon disposal however.		Not modified

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Equipment Summary and Emissions

TK-2030	Sludge Filtrate Tank	Tank has been removed from facility		Tank physically removed from facility
DISP1	Dewatered Stage 2 Sludge Disposal	Mass Balance of Stream 126 and assumed short term storage. 10% volatilize based on EPA-453/R-94-080A Section 9		Modified emissions due to throughput change and operation change
DISP3	Dewatered Stage 1 Sludge Disposal	Mass Balance of Stream 118 and assumed short term storage. 10% volatilize based on EPA-453/R-94-080A Section 9		New emission source
THERMAL PROCESS SYSTEM				
	Thermal System	No emissions. Steam from the boiler is used as a heat source. Also contains heat exchangers.		
TK-2320	CIP Tank	Flat cover tank. No emissions. Contains mild acid solution for descaling (dilute hydrochloric or citric)	1,950 gallons	Not modified
E-2076	Deaerator Vent Condenser	Mass Balance Stream 225	Vents to thermal oxidizer	Modified emissions due to process change and material balance
TK-2085	Steam Condensate Flash Tank	Incoming and outgoing streams show only water with no organics. No emissions.	4,800 gallons - non-pressurized bullet tank	Not modified
TK-2180	Boiler Feedwater Tank	Only water with no organics. No emissions.	17.5' D x 17.5' H - 54,200 gallons	Not modified
TK-2149	Brine Maker Tank	Based on surrounding material streams only water without organics. No emissions		Not modified
TK-2120	Process Distillate Level Tank	Influent - Material Balance Streams 226, 251, 261, 271. TANKS 4.0.9d	5,575 gallons - non-pressurized bullet tank	Not modified
TK-2130	Barometric Condenser Hot Well	Due to change in process, VOCs are vented prior to this tank or condensed out and vented downstream in TK-2140. No Emissions	Size is 7,580 working gallon or 18,000 gallons design and vented to atmosphere. Was 100,000 gallon tank working volume and vented to thermal oxidizer	Modified emissions due to process change and material balance. Change in tank size and not vented to thermal oxidizer anymore.
TK-2160	4A Disposal Centrate Tank	Updated material balance shows no VOC vapor emissions from this tank.	Covered - 7,560 gallons working volume - 10' D x 13' 9" H Mixed tank	Modified emissions due to process change and material balance. No longer connected to the thermal oxidizer since there are no VOC emissions from the tank.
DISP2	Salt Disposal	Mass Balance Stream 269 and 283. Assumed 100% of GROs volatilize.	Comprised of streams 4A and 4B	Modified emissions due to process change and material balance
TK-2140	Recovered Water Tank	Material Balance Stream 263	230,000 gallons - Vents to thermal oxidizer	Not modified
TK-2315	Boiler Deaerator Tank	Incoming stream shows only water and no organics. No emissions -pressurized.	Bullet type tank - 15 psi - 9,942 gallons	Not modified
TK-2450	Boiler Blowdown Flash Tank	Based on influent stream to tank, only water without organics. No emissions	1,000 gallons - 7' D x 8.5' H	New tank, but no emissions
TK-2460	4B Disposal Centrate Tank	Updated material balance shows no VOC vapor emissions from this tank.	7,560 gallons working volume - 10' D x 13' 9" H	New tank, but no emissions
CT-2335	Cooling Tower Basin	AP-42 Chapter 13.4 and manufacturer data	Three fans	Not modified

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Antero Treatment LLC - Antero Clearwater Facility
Equipment Summary and Emissions

H-2185A/B	Boiler A/B	AP-42 Chapter 1.4 and manufacturer spec sheet		Modified due to synthetic minor fuel limitation of 89% of maximum or 3589.2 MMscf/year
	Boiler Chemical Treatment A/B	DeMinimis Source #9 from 45CSR13 Table 45-13B - Boiler water treatment operations		Not modified
POST TREATMENT SYSTEM				
TK-2500	Post Treatment Tank 1	Material Balance Streams 402, 405. Material Balance. See notes on emission tab	Open top -726,500 gal - 64' D x 32'	Not modified
TK-2550 and TK-2555	Post Treatment Tank 2 and 3	Material Balance Stream 403. See notes on emission tab	open top - 726,500 gal - 64' D x 32'. Aerated tank open top - 363,300 gal - 48' D x 30' Aerated tank	Not modified
CF-2510	Post Treatment Clarifier	Mass Balance Streams 406. Open top tanks and mixed. See notes on emission tab		Not modified
TK-2515	Post Treatment Effulent Tank	Mass Balance Stream 407. WATER9	Closed top - 10,000 gal - 12' D x 14'	Not modified
TK-2520	Post Treatment Sludge Tank	Mass Balance Stream 408 - Mixed tank. WATER9	Open top - 750 gal - 6' D x 6'	Not modified
TK-2545	Product Water Storage Tank	DeMinimis Source #15 from 45CSR13 Table 45-13B - demineralized water tank	Covered 22' D x 24' H - 60,000 gallons	Not modified
CHEMICAL FEED				
TK-4175	Clarifier Polymer Aging Tank	Tank has been removed from facility		Tank physically removed from facility
TK-2800	Breakpoint Chlorination Frac Tank	New Tank - Mobile unit. No emissions of VOC or ammonia.	17,850 gallon tank. 43' L x 8' W x 11'9" H	New tank, but no emissions
TK-4036	Sodium Sulfate Silo	AP-42 8.12 for Sodium Carbonate	90 ton - 2,200 ft^3	Not modified
U-4037/U-4038	Sodium Sulfate Bin Discharger and Feeder	AP-42 8.12 for Sodium Carbonate	200-2000 lbs/hr	Not modified
TK-4039	Sodium Sulfate Day Tank	Inorganic material and wet process - Insignificant emissions	2,200 gallons - was 1,500 gallons in previous version	Tank size change
TK-4046A/TK-4046B	Lime Silo A/B	AP-42 11.17	160 ton - 9,000 ft^3	Not modified
TK-4049A/TK-4049B	Lime Slurry Premix Tank A/B	Tanks have been removed from facility		Tank physically removed from facility
U-4047A/U-4047B	Lime Bin Discharger A/B	AP-42 11.17	1,500 - 8,000 lb/hr	Not modified
TK-4049A/TK-4049B	Lime Slurry Tank A/B	Inorganic material and wet process - no emissions	5,000 gallons each - was 15,000 gallons in previous version	Tank size change
TK-4160	Solids Clarifier Polymer System Aging Tank	Tank has been removed from facility		Tank physically removed from facility
TK-4165	Dewatering Polymer System Aging Tank	Tank has been removed from facility		Tank physically removed from facility
TK-4011	Sodium Bicarbonate Silo	AP-42 8.12 for Sodium Carbonate		Not modified
U-4012/U-4013	Sodium Bicarbonate Bin Discharger and Feeder	AP-42 8.12 for Sodium Carbonate		Not modified
TK-4017	Sodium Bicarbonate Day Tank	Mixed Tank - Inorganic material and wet process - no emissions	950 gallons - was 1,000 gallons in previous version	Tank size change

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Antero Treatment LLC - Antero Clearwater Facility
Equipment Summary and Emissions

TK-4170	Post Treatment Polymer System Aging Tank	Insignificant emissions - Polymer contains no volatiles or other components of concern.	Closed top - 75 gallons	Not modified
U-4075	CO2 Feeder System	CO2 is pressurized and dissolved in water. No emissions from the feeder system due to pressurizing.		Not modified
TK-4000	Ferric Chloride Storage Tank	Inorganic material and wet process - Insignificant emissions	Closed top - 6,000 gallons	Not modified
TK-4020	Caustic Bulk Storage Tank	Sodium hydroxide in dilute solution - Insignificant emissions	Closed top - 7,000 gallons	Not modified
TK-4115	Methanol Bulk Storage Tank	TANKS 4.0.9	Closed top - 8,000 gallons	Emissions change due to change in throughput
TK-4180	Sulfuric Acid Bulk Storage Tank	Tank has been removed from facility		Tank physically removed from facility
TK-4025	Hydrogen Peroxide Tank	Insignificant emissions- inorganic material	6,000 gallons - was 320 gallons in previous version	Tank size change
TK-4080	Sodium Bisulfite Tank	Insignificant emissions- inorganic material	5,400 gallons - was 320 gallons in previous version	Tank size change
TK-4054/4057/4120 /4155	Polymer Totes	Insignificant emissions - Polymer contains no volatiles or other components of concern.	320 gallons	Not modified
TK-4015	Antifoam Tote	Insignificant emissions - Antifoam contains no volatiles or other components of concern.	320 gallons	Not modified
TK-4125	Phosphoric Acid Tote	Insignificant emissions - small tank, inogranic, stable liquid, low vapor pressure	320 gallons	Not modified
TK-4150	Micronutrient Tote	Insignificant Emissions - Micro Stimulant blend of micronutrients, trace minerals, amio acids and	320 gallons	Not modified
TK-4065	Urea Tote	Insignificant Emissions - small tank, insignificant volatility, 50/50 mix water and urea	320 gallons	Not modified
TK-4185	Sodium Hypochlorite Tote	Insignificant emissions - small tank, inorganic material, < 15% solution	320 gallons	Not modified
TK-4190	Hydrex 2252 Tote	Insignificant emissions - small tank, no constituents of concern	320 gallons	Not modified
TK-4200	Calcium Chloride Bulk Tank	Inorganic material and wet process - Insignificant emissions	6,000 gallons	New tank, but no emissions
TK-4210	Hydrex 2233 Totes	Insignificant emissions - small tank, no constituents of concern	320 gallons	New tank, but no emissions
TK-4220	Hydrex 1425 Totes	Insignificant emissions - small tank, no constituents of concern	320 gallons	New tank, but no emissions
TK-4230	Hydrex 1317 Totes	Insignificant emissions - small tank, no constituents of concern	320 gallons	New tank, but no emissions
TK-4240	Hydrex 1565 Totes	Insignificant emissions - small tank, no constituents of concern	320 gallons	New tank, but no emissions
TK-4250	Hydrex 1605 Totes	Insignificant emissions - small tank, no constituents of concern	320 gallons	New tank, but no emissions
TK-4260	Demulsifier Tote	Insignificant emissions - small tank, no constituents of concern	320 gallons	New tank, but no emissions
TK-4270	Crystallizer Antifoam Tote	Insignificant emissions - small tank, no constituents of concern	320 gallons	New tank, but no emissions

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Antero Treatment LLC - Antero Clearwater Facility
Equipment Summary and Emissions

TK-4301	Calcium Carbonate Silo	AP-42 8.12 for Sodium Carbonate	36 ton - 1,200 ft^3	New emission source
TK-4309	Calcium Carbonate Hopper	AP-42 8.12 for Sodium Carbonate	25 ft^3	New emission source
TK-4310	Stage 1 Clarifier Polymer Tote	Insignificant emissions - small tank, no constituents of concern	320 gallons	New tank, but no emissions
TK-4255	Antiscalant Tote	Insignificant emissions - small tank, no constituents of concern	320 gallons	New tank, but no emissions
TK-4500	Breakpoint Chlorination Sodium Hypochlorite Tank	Insignificant emissions- inorganic material	4,000 gallons	New tank, but no emissions
GENERAL				
	Fugitive Component Leaks	DeMinimis emissions. Most processes are in liquid phase or have <1% VOCs. Once process is in vapor phase, volatiles and oils have been removed or get adsorbed by the solids or otherwise consumed in the		Not modified
U-1080	Thermal Oxidizer	11 MMBtu/hr	Controls gas from waste gas header	Modified equipment - increased capacity
GEN-1	Emergency Generator	EPA Tier 2 emission factors and AP-42 Section 3.3		Modified equipment - increased horsepower and true emergency status per Quad I
U-1090	Emergency Flare	Meant to handle gas blanket bleed system while thermal oxidizer is down for maintenance		New emission source
ENG-2	Fire Water Pump Engine	EPA certified. Will meet 40 CFR Part 60, Subpart IIII emission limits. AP-42 for HAPs		New emission source
VENT1	Fuel Skid Pig Venting	6" receiver expected to operate at 1100 psi with 1025 cubic foot volume at standard conditions		New emission source
TK-SLOP	Fuel Skid Slop Tank	No liquids stored in tank - just dry gas running through. No emissions as it is a closed system.	500 gallons	New tank, but no emissions
HTFUEL1	Fuel Skid Heater 1	2.4 MMBtu/hr natural gas heater - AP-42 Section 1.4 Emission Factors		New emission source
HTFUEL2	Fuel Skid Heater 2	2.4 MMBtu/hr natural gas heater - AP-42 Section 1.4 Emission Factors		New emission source
	Fuel Skid	Will also contain inlet separator, measurement skid, fuel gas scrubber, and pressure vessel - no emissions as closed loop		New equipment, but no emissions

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Emissions Summary Total

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

UNCONTROLLED POTENTIAL EMISSION SUMMARY

Source	NOx		CO		VOC		SO_2		PM-10		PM-2.5		HAPs		CO_2e
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	tpy
Engines															
Emergency Generator	25.78	6.44	16.83	4.21	2.69	0.67	0.03	0.008	0.96	0.240	0.96	0.240	0.030	0.0075	900
Fire Pump Engine	0.85	0.21	1.11	0.28	0.045	0.011	0.27	0.069	0.066	0.016	0.066	0.016	0.0035	0.00087	38.7
Boilers															
Boiler 1	10.03	39.21	10.17	39.79	1.10	4.31	0.16	0.63	2.75	10.77	2.75	10.77	0.51	1.99	126,393
Boiler 2	10.03	39.21	10.17	39.79	1.10	4.31	0.16	0.63	2.75	10.77	2.75	10.77	0.51	1.99	126,393
Thermal Oxidizer															
Oxidizer, Pilot and Waste Gas-controlled Process Tanks	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Emergency Flare	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Truck Unloading															
Truck Unloading Influent Water	---	---	---	---	59.22	54.04	---	---	---	---	---	---	0.40	0.36	47,820
Truck Loading of Oil	---	---	---	---	16.70	8.72	---	---	---	---	---	---	---	---	---
Cooling Tower															
Cooling Tower	---	---	---	---	---	---	---	---	0.94	4.12	0.94	4.12	---	---	---
Tanks															
Process Tanks	---	---	---	---	222.62	787.11	---	---	---	---	---	---	0.49	1.39	758
Storage Tanks	---	---	---	---	0.067	0.25	---	---	---	---	---	---	0.067	0.25	---
Heaters															
Fuel Skid Heaters	0.47	2.06	0.40	1.73	0.026	0.11	0.0028	0.012	0.036	0.16	0.036	0.16	0.0089	0.039	1,234
Fugitive Emissions															
Sludge and Salt Disposal	---	---	---	---	4.66	20.39	---	---	---	---	---	---	0.00077	0.0034	0.032
Bulk Transfer Points	---	---	---	---	---	---	---	---	2.65	5.64	0.75	1.59	---	---	---
Fugitive Dust Emissions	---	---	---	---	---	---	---	---	1.41	5.55	0.35	1.36	---	---	---
Fuel Skid Pig Venting	---	---	---	---	7.53	0.20	---	---	---	---	---	---	0.18	0.0047	18
Facility PTE =	**47.15**	**87.14**	**38.68**	**85.79**	**315.75**	**880.11**	**0.63**	**1.36**	**11.57**	**37.26**	**8.60**	**29.03**	**2.19**	**6.03**	**303,554**

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Emissions Summary Total

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

CONTROLLED POTENTIAL EMISSION SUMMARY

Source	NOx		CO		VOC		SO_2		PM-10		PM-2.5		HAPs		CO_2e
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	tpy
Engines															
Emergency Generator	25.78	6.44	16.83	4.21	2.69	0.67	0.03	0.008	0.96	0.240	0.96	0.240	0.030	0.0075	900
Fire Pump Engine	0.85	0.21	1.11	0.28	0.045	0.011	0.27	0.069	0.066	0.016	0.066	0.016	0.0035	0.00087	38.7
Boilers															
Boiler 1	10.03	39.21	10.17	39.79	1.10	4.31	0.16	0.63	2.75	10.77	2.75	10.77	0.51	1.99	126,393
Boiler 2	10.03	39.21	10.17	39.79	1.10	4.31	0.16	0.63	2.75	10.77	2.75	10.77	0.51	1.99	126,393
Thermal Oxidizer															
Oxidizer, Pilot and Waste Gas-controlled Process Tanks	1.08	4.74	0.93	4.08	4.41	15.58	1.06E-05	4.64E-05	1.34E-04	5.87E-04	1.34E-04	5.87E-04	9.49E-03	2.69E-02	5,939
Emergency Flare	0.16	0.041	0.69	0.068	0.00040	0.0018	4.38E-05	1.92E-04	5.54E-04	2.43E-03	5.54E-04	2.43E-03	1.37E-04	6.01E-04	54
Truck Unloading															
Truck Unloading Influent Water	---	---	---	---	18.59	16.86	---	---	---	---	---	---	0.12	0.11	15,015
Truck Loading of Oil	---	---	---	---	16.70	8.72	---	---	---	---	---	---	---	---	---
Cooling Tower															
Cooling Tower	---	---	---	---	---	---	---	---	0.94	4.12	0.94	4.12	---	---	---
Tanks															
Process Tanks	---	---	---	---	1.97	7.90	---	---	---	---	---	---	0.013	0.052	483
Storage Tanks	---	---	---	---	0.067	0.25	---	---	---	---	---	---	0.067	0.25	---
Heaters															
Fuel Skid Heaters	0.47	2.06	0.40	1.73	0.026	0.11	0.0028	0.012	0.036	0.16	0.036	0.16	0.0089	0.039	1234
Fugitive Emissions															
Sludge and Salt Disposal	---	---	---	---	4.66	20.39	---	---	---	---	---	---	0.00077	0.0034	3.18E-02
Bulk Transfer Points	---	---	---	---	---	---	---	---	2.65	5.64	0.75	1.59	---	---	---
Fugitive Dust Emissions	---	---	---	---	---	---	---	---	1.41	5.55	0.35	1.36	---	---	---
Fuel Skid Pig Venting	---	---	---	---	7.53	0.20	---	---	---	---	---	---	0.18	0.0047	18
Facility PTE =	**48.39**	**91.92**	**40.30**	**89.94**	**58.90**	**79.31**	**0.63**	**1.36**	**11.57**	**37.27**	**8.61**	**29.03**	**1.45**	**4.47**	**276,468**

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Emissions Summary Total

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

SPECIATED HAPS UNCONTROLLED POTENTIAL EMISSION SUMMARY

Source	BENZENE		TOLUENE		ETHYLBENZENE		XYLENES		FORMALDEHYDE		n-HEXANE		METHANOL		AMMONIA*	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Engines																
Emergency Generator	1.70E-02	4.26E-03	6.16E-03	1.54E-03	---	---	4.23E-03	1.06E-03	1.73E-03	4.33E-04	---	---	---	---	---	---
Fire Pump Engine	8.82E-04	2.20E-04	3.86E-04	9.66E-05	---	---	2.69E-04	6.73E-05	1.12E-03	2.79E-04	---	---	---	---	---	---
Boilers																
Boiler 1	5.67E-04	2.22E-03	9.18E-04	3.59E-03	---	---	---	---	2.02E-02	7.92E-02	4.86E-01	1.90E+00	---	---	---	---
Boiler 2	5.67E-04	2.22E-03	9.18E-04	3.59E-03	---	---	---	---	2.02E-02	7.92E-02	4.86E-01	1.90E+00	---	---	---	---
Thermal Oxidizer																
Oxidizer, Pilot and Waste Gas-controlled Process Tanks	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Emergency Flare	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Truck Unloading																
Truck Unloading Influent Water	2.89E-01	2.64E-01	2.25E-02	2.05E-02	1.48E-02	1.35E-02	7.01E-02	6.40E-02	---	---	1.70E-04	1.55E-04	---	---	---	---
Truck Loading of Oil	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Cooling Tower																
Cooling Tower	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Tanks																
Process Tanks	2.24E-01	5.86E-01	2.15E-01	6.40E-01	7.31E-03	2.35E-02	3.84E-02	1.36E-01	---	---	---	---	---	---	59.65	251.90
Storage Tanks	---	---	---	---	---	---	---	---	---	---	---	---	6.67E-02	2.46E-01	0.29	1.18
Heaters																
Fuel Skid Heaters	---	---	---	---	---	---	---	---	3.53E-04	1.55E-03	---	---	---	---	---	---
Fugitive Emissions																
Sludge and Wetcake Disposal	3.94E-04	1.73E-03	2.27E-04	9.96E-04	1.10E-05	4.83E-05	1.38E-04	6.06E-04	---	---	---	---	---	---	0.071	0.31
Bulk Transfer Points	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Fugitive Dust Emissions	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Fuel Skid Pig Venting	5.37E-03	1.40E-04	1.51E-02	3.92E-04	3.22E-03	8.37E-05	2.79E-03	7.25E-05	---	---	1.53E-01	3.99E-03	---	---	---	---
Facility PTE =	**0.54**	**0.86**	**0.26**	**0.67**	**0.025**	**0.037**	**0.12**	**0.20**	**0.044**	**0.16**	**1.13**	**3.80**	**0.067**	**0.25**	**60.0**	**253.4**

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

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Emissions Summary Total

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

SPECIATED HAPS CONTROLLED POTENTIAL EMISSION SUMMARY

Source	BENZENE		TOLUENE		ETHYLBENZENE		XYLENES		FORMALDEHYDE		n-HEXANE		METHANOL		AMMONIA*	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Engines																
Emergency Generator	1.70E-02	4.26E-03	6.16E-03	1.54E-03	---	---	4.23E-03	1.06E-03	1.73E-03	4.33E-04	---	---	---	---	---	---
Fire Pump Engine	8.82E-04	2.20E-04	3.86E-04	9.66E-05	---	---	2.69E-04	6.73E-05	1.12E-03	2.79E-04	---	---	---	---	---	---
Boilers																
Boiler 1	5.67E-04	2.22E-03	9.18E-04	3.59E-03	---	---	---	---	2.02E-02	7.92E-02	4.86E-01	1.90E+00	---	---	---	---
Boiler 2	5.67E-04	2.22E-03	9.18E-04	3.59E-03	---	---	---	---	2.02E-02	7.92E-02	4.86E-01	1.90E+00	---	---	---	---
Thermal Oxidizer																
Oxidizer, Pilot and Waste Gas-controlled Process Tanks	4.42E-03	1.15E-02	4.20E-03	1.24E-02	1.42E-04	4.52E-04	7.06E-04	2.48E-03	1.32E-06	5.80E-06	3.18E-05	1.39E-04	---	---	1.15	4.88
Emergency Flare	1.53E-07	6.71E-07	2.48E-07	1.09E-06	---	---	---	---	5.47E-06	2.40E-05	1.31E-04	5.75E-04	---	---	---	---
Truck Unloading																
Truck Unloading Influent Water	9.08E-02	8.24E-02	7.06E-03	6.40E-03	4.65E-03	4.22E-03	2.20E-02	2.00E-02	---	---	5.34E-05	4.85E-05	---	---	---	---
Truck Loading of Oil	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Cooling Tower																
Cooling Tower	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Tanks																
Process Tanks	3.29E-03	1.32E-02	5.20E-03	2.08E-02	2.24E-04	8.98E-04	3.07E-03	1.23E-02	---	---	---	---	---	---	1.97	7.88
Storage Tanks	---	---	---	---	---	---	---	---	---	---	---	---	6.67E-02	2.46E-01	0.29	1.18
Heaters																
Fuel Skid Heaters	---	---	---	---	---	---	---	---	3.53E-04	1.55E-03	---	---	---	---	---	---
Fugitive Emissions																
Sludge and Wetcake Disposal	3.94E-04	1.73E-03	2.27E-04	9.96E-04	1.10E-05	4.83E-05	1.38E-04	6.06E-04	---	---	---	---	---	---	0.071	0.31
Bulk Transfer Points	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Fugitive Dust Emissions	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Fuel Skid Pig Venting	5.37E-03	1.40E-04	1.51E-02	3.92E-04	3.22E-03	8.37E-05	2.79E-03	7.25E-05	---	---	1.53E-01	3.99E-03	---	---	---	---
Facility PTE =	**0.12**	**0.12**	**0.040**	**0.050**	**0.0082**	**0.0057**	**0.033**	**0.037**	**0.044**	**0.16**	**1.13**	**3.81**	**0.067**	**0.25**	**3.49**	**14.25**

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

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Emergency Generator Emission Calculations

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

Source Information - Per Engine

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

Notes:

1) Calculated

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

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

Potential Emissions per Generator

Pollutant	Emission Factor[4]		Estimated Emissions			Source of Emissions Factors
	(lb/MMBtu)	(g/bhp-hr)	(lb/hr)	(lb/yr)	(tpy)	
NOx	---	4.0	25.78	---	6.44	EPA Certification data
CO	---	2.6	16.83	---	4.21	EPA Tier 2 Nonroad Diesel Engine Emission Factor per Quad I
VOC	---	0.42	2.69	---	0.67	EPA Certification data for Total Hydrocarbons
SO_2	1.52E-03	---	0.033	---	0.0083	AP-42, Chapter 3.4, Table 3.4-1; 15 ppm sulfur
PM_{10}	---	0.15	0.96	---	0.240	EPA Tier 2 Nonroad Diesel Engine Emission Factor per Quad I
$PM_{2.5}$	---	0.15	0.96	---	0.240	EPA Tier 2 Nonroad Diesel Engine Emission Factor per Quad I
Acetaldehyde	2.52E-05	---	5.53E-04	0.276	1.38E-04	AP-42, Chapter 3.4, Table 3.4-3
Acrolein	7.88E-06	---	1.73E-04	0.086	4.32E-05	AP-42, Chapter 3.4, Table 3.4-3
Benzene	7.76E-04	---	1.70E-02	8.51	4.26E-03	AP-42, Chapter 3.4, Table 3.4-3
Formaldehyde	7.89E-05	---	1.73E-03	0.87	4.33E-04	AP-42, Chapter 3.4, Table 3.4-3
Toluene	2.81E-04	---	6.16E-03	3.08	1.54E-03	AP-42, Chapter 3.4, Table 3.4-3
Xylenes	1.93E-04	---	4.23E-03	2.12	1.06E-03	AP-42, Chapter 3.4, Table 3.4-3
Total HAPS			0.030	14.94	0.0075	

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

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

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

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Fire Water Pump Engine

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

Source Information - Per Engine

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

Notes:

1) Calculated

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

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

Potential Emissions per Engine

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

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

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Natural Gas Fired Boiler Emissions

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

Source Information

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

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

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

Potential Emissions per Boiler [1]

Pollutant	Emission Factor (lb/MMBtu)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
NO_X	0.036	10.03	39.21	Manufacturer Spec Sheet (converted from ppmw)
CO	0.037	10.17	39.79	Manufacturer Spec Sheet (converted from ppmw)
VOC	0.004	1.10	4.31	Manufacturer Spec Sheet
PM_{10}	0.010	2.75	10.77	Manufacturer Spec Sheet
$PM_{2.5}$	0.010	2.75	10.77	Manufacturer Spec Sheet
Pollutant	**Emission Factor (lb/MMscf)**	**Emissions (lb/hr)**	**Emissions (tpy)**	**Emission Factor Source**
SO_2	0.6	0.16	0.63	AP-42 Ch. 1.4 Table 1.4-2
Lead	0.0005	0.00013	0.00053	AP-42 Ch. 1.4 Table 1.4-2
Pollutant	**Emission Factor (lb/MMscf)**	**Emissions (lb/hr)**	**Emissions (tpy)**	**Emission Factor Source**
Benzene	2.10E-03	0.00057	0.0022	AP-42 Ch. 1.4 Table 1.4-3
Dichlorobenzene	1.20E-03	0.00032	0.0013	AP-42 Ch. 1.4 Table 1.4-3
Formaldehyde	7.50E-02	0.020	0.079	AP-42 Ch. 1.4 Table 1.4-3
n-Hexane	1.80E+00	0.49	1.90	AP-42 Ch. 1.4 Table 1.4-3
Naphthalene	6.10E-04	0.00016	0.00064	AP-42 Ch. 1.4 Table 1.4-3
Toluene	3.40E-03	0.00092	0.0036	AP-42 Ch. 1.4 Table 1.4-3
Other HAPs	8.82E-05	0.000024	0.000093	AP-42 Ch. 1.4 Table 1.4-3-sum of minor HAPs
Total HAPs	1.88E+00	0.51	1.99	AP-42 Ch. 1.4 Table 1.4-3
Pollutant	**Emission Factor (kg/MMBtu)**	**Emissions (lb/hr)**	**Emissions (tpy)**	**Emission Factor Source**
Carbon Dioxide	53.06	32,282	126,263	40 CFR Part 98, Subpart C, Table C-1
Methane	0.001	0.61	2.38	40 CFR Part 98, Subpart C, Table C-2
Nitrous Oxide	0.0001	0.061	0.24	40 CFR Part 98, Subpart C, Table C-2
CO_2e	----	32,316	126,393	40 CFR Part 98, Subpart A, Table A-1

Notes

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

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Thermal Oxidizer Combustion Emissions

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

Combustion Emissions

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

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

[1] Maximum heat input is used to calculate emissions, so as to be conservative.
[2] Methane with a heating value of 1200 Btu/hr will be added to the thermal oxidizer to assist in combustion.
[3] Emissions from manufacturer data.

NOx Emissions from Combusting Ammonia

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

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

Pilot Emissions

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

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

[4] Emission Factors from AP-42 Tables 1.4-1, 1.4-2, 1.4-3, and 1.4-4 (7/98).
[5] Sum of Emissions Factors published for pollutants classified as "HAPS" under AP-42 Table 1.4-3.
[6] Typical pilot gas usage

Total Thermal Oxidizer Emissions

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

Greenhouse Gas Emissions

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

Emergency Flare Combustion Emissions

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

Combustion Emissions - Maintenance Use

Flare Rating[1] :	2.20	MMBtu/hr
Gas Heating Value[2]:	1,200	Btu/scf
Hours of Operation[1]:	120	hr/yr

Pollutant	Emission Factor[3] (lb/MMBtu)	Emissions (lbs/hr)	Emissions (tons/yr)
Particulate Matter ($PM/PM_{10}/PM_{2.5}$)	N/A - Smokeless Design		
Sulfur Dioxide (SO_2)	N/A - Combusted Gas has no Sulfur		
Nitrogen Oxides (NO_x)	0.068	0.15	0.0090
Carbon Monoxide (CO)	0.31	0.68	0.041

[1] Flare will be used for 5 days of annual maintenance during shutdown for gas blanket bleed system. Bleed system is rated at 2.2 MMBtu/hr.
[2] Typical heating value of gas at facility
[3] Emission Factors from Table 13.5-1 and 13.5-2 of AP-42 Section 13.5 (April 2015)

Pilot Emissions - Continuous Use

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

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

[4] Emission Factors from AP-42 Tables 1.4-1, 1.4-2, 1.4-3, and 1.4-4 (7/98).
[5] Sum of Emissions Factors published for pollutants classified as "HAPS" under AP-42 Table 1.4-3.
[6] Pilot gas usage from manufacturer specification. Assumed the pilot would be used continuously.

Total Flare Emissions

Pollutant	Total Potential Emission Rate (lbs/hr)	Total Potential Emission Rate (tons/year)
Particulate Matter ($PM/PM_{10}/PM_{2.5}$)	5.54E-04	2.43E-03
Nitrogen Oxides (NO_x)	0.16	0.041
Sulfur Dioxide (SO_2)	4.38E-05	1.92E-04
Carbon Monoxide (CO)	0.69	0.068
Volatile Organic Compounds (VOC)	4.01E-04	1.76E-03
Total HAPs	1.37E-04	6.01E-04

Greenhouse Gas Emissions

Pollutant	Emission Factor (kg/MMBtu)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
Carbon Dioxide	53.06	266.7	53.69	40 CFR Part 98, Subpart C, Table C-1
Methane	0.001	0.0050	0.0010	40 CFR Part 98, Subpart C, Table C-2
Nitrous Oxide	0.0001	0.00050	0.00010	40 CFR Part 98, Subpart C, Table C-2
CO_2e	----	12.3	53.75	40 CFR Part 98, Subpart A, Table A-1

Truck Unloading Emissions

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

AP - 42, Chapter 5.2 $L_L = 12.46 \times S \times P \times M / T$

L_L = Loading Loss Emission Factor (lbs VOC/1000 gal loaded)

S = Saturation Factor

P = True Vapor Pressure of the Loaded Liquid (psia)

M = Vapor Molecular Weight of the Loaded Liquid (lbs/lbmol)

T = Temperature of Loaded Liquid (ºR)

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

UNCONTROLLED

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

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

CONTROLLED

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

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

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

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Truck Loading Emissions

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

AP - 42, Chapter 5.2 $L_L = 12.46 \times S \times P \times M / T$

L_L = Loading Loss Emission Factor (lbs VOC/1000 gal loaded)

S = Saturation Factor

P = True Vapor Pressure of the Loaded Liquid (psia)

M = Vapor Molecular Weight of the Loaded Liquid (lbs/lbmol)

T = Temperature of Loaded Liquid (ºR)

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Source	S[1]	P (psia)[2]	M[3]	T (ºF)[4]	L_L (lb/1000 gal)	Loading (bbl/day)	VOC (tpy)
Oil from TK-1065	0.6	3.10	50.00	65.0	2.21	515	8.72

Source	S[1]	P (psia)[2]	M[3]	T (ºF)[4]	L_L (lb/1000 gal)	Loading[5] (bbl/hr)	VOC (lb/hr)
Oil from TK-1065	0.6	3.10	50.00	65.0	2.21	180	16.70

Notes:

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

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Cooling Tower Emissions

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

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

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

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

Circulation Water Quality (based on 10 COC)

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

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

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Waste Gas Header Emission Sources

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

Uncontrolled Emissions

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

Pollutant	TK-2040		TK-1065		TK-1120		TK-1130		TK-2020		TK-2140		E-2076		TOTALS	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
VOCs	2.78	10.30	0.91	2.18	1.13	4.14	0.43	1.67	3.84	13.80	38.80	169.94	86.90	380.62	220.64	779.21
Ammonia	0.071	0.27	----	----	0.34	1.33	0.044	0.19	1.47	5.67	5.37	23.52	33.60	147.17	57.68	244.03
Benzene	0.0060	0.022	----	----	0.0081	0.024	0.0018	0.0072	0.025	0.073	----	----	----	----	0.22	0.57
Ethylbenzene	0.00011	0.00041	----	----	0.00019	0.00070	5.43E-24	2.30E-23	0.00074	0.0027	----	----	----	----	0.0071	0.023
Toluene	0.0036	0.014	----	----	0.0067	0.023	9.49E-24	3.91E-23	0.024	0.081	----	----	----	----	0.21	0.62
Xylene	0.0010	0.0039	----	----	0.00030	0.0012	5.93E-25	2.59E-24	0.0014	0.0058	----	----	----	----	0.035	0.12
Manganese	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Selenium	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
TOTAL HAPs	0.011	0.040	----	----	0.015	0.049	0.0018	0.0072	0.051	0.16	----	----	----	----	0.47	1.34
Carbon Dioxide	6.95	26.45	----	----	2.36	5.60	0.11	0.36	3.44	8.84	----	----	----	----	167.68	274.41

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Waste Gas Header Emission Sources

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

Controlled Emissions

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

Pollutant	TK-2040		TK-1065		TK-1120		TK-1130		TK-2020		TK-2140		E-2076		TOTALS	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
VOCs	0.056	0.21	0.018	0.044	0.023	0.083	0.0086	0.033	0.077	0.28	0.78	3.40	1.74	7.61	4.41	15.58
Ammonia	0.0014	0.0053	----	----	0.0069	0.027	0.00088	0.0038	0.029	0.11	0.11	0.47	0.67	2.94	1.15	4.88
Benzene	1.2E-04	4.4E-04	----	----	1.6E-04	4.7E-04	3.7E-05	1.4E-04	5.0E-04	1.5E-03	----	----	----	----	4.42E-03	1.15E-02
Ethylbenzene	2.1E-06	8.3E-06	----	----	3.8E-06	1.4E-05	1.1E-25	4.6E-25	1.5E-05	5.4E-05	----	----	----	----	1.42E-04	4.52E-04
Toluene	7.2E-05	2.8E-04	----	----	1.3E-04	4.6E-04	1.9E-25	7.8E-25	4.7E-04	1.6E-03	----	----	----	----	4.20E-03	1.24E-02
Xylene	2.0E-05	7.9E-05	----	----	5.9E-06	2.4E-05	1.2E-26	5.2E-26	2.7E-05	1.2E-04	----	----	----	----	7.06E-04	2.48E-03
Manganese	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Selenium	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
TOTAL HAPs	0.00021	0.00080	----	----	0.00030	0.0010	0.000037	0.00014	0.0010	0.0032	----	----	----	----	9.46E-03	2.68E-02
Carbon Dioxide	6.95	26.45	----	----	2.36	5.60	0.11	0.36	3.44	8.84	----	----	----	----	167.68	274.41

Notes:

1. Waste Gas Header is controlled by a thermal oxidizer with a control efficiency of at least 98 %
2. EPA's WATER9 program was used to calculate the emissions of all the emission points shown except for TK-1065, E-2076, and TK-2140. TK-1065 was assumed all crude to be conservative and emissions were calculated using TANKS 4.09d. E-2076 emissions were from Material Balance Stream 225. TK-2140 emissions were calculated using Stream 263.
   E-2076 has VOCs in the stream whereas it did not during the initial application. The process changed such that most of the VOCs will be vented through this point from the thermal system.
   The process has also changed such that the VOCs in the liquid in TK-2130 will stay in solution and ultimately be vented from TK-2140, which emits much more VOC than previously.
   TK-2130 is no longer connected to the waste gas header and thermal oxidizer.
3. Emissions from TK-1055A/B and TK-2010 are likely less than shown. WATER9 does not allow for covered clarifiers so more emissions are likely generated in the model due to air flow over the tanks.
4. Influent stream into TK-1055A/B is Material Balance Stream 102. Pound per hour emissions are calculated using peak flow and annual emissions use the average flow.
5. Metal HAPs are shown for completeness but stay in solution so there are no air emissions.
6. Only those compounds above the detection limit are shown as otherwise emissions are not quantifiable.
7. TK-2160 and TK-2460 do not have VOCs being vented due to process change. Neither tank is hooked up to the waste gas header or thermal oxidizer.

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Post Treatment System Tanks

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

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

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Post Treatment System Tanks

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

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

Notes

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

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Atmospheric Storage Tank Working and Breathing Emissions

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

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

Notes:

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

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Sludge and Salt Disposal Emissions

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

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

Notes

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

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Process Feeder System Particulate Matter Emissions

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

Feed Rates into the Water Treatment System

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

Emissions Multiplier Ratio

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

Sodium Sulfate Feeder System

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

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

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

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

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

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

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Process Feeder System Particulate Matter Emissions

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

Bulk Lime Feeder System A

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

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

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

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

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

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

Bulk Lime Feeder System B

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

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

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

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

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

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

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Process Feeder System Particulate Matter Emissions

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

Sodium Bicarbonate Feeder System

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

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

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

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

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

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

Calcium Carbonate Feeder System

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

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

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

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

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

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

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Natural Gas Fueled Fuel Conditioning Skid Heater Emissions

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

Source Information

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

Emission Calculations for all Heaters

Pollutant	Emission Factor (lb/MMscf)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
NO_X	100	0.47	2.06	AP-42 Ch. 1.4 Table 1.4-1
CO	84	0.40	1.73	AP-42 Ch. 1.4 Table 1.4-1
VOC	5.5	0.026	0.11	AP-42 Ch. 1.4 Table 1.4-2
$PM_{10}/PM_{2.5}$	7.6	0.036	0.16	AP-42 Ch. 1.4 Table 1.4-2
SO_2	0.6	0.0028	0.012	AP-42 Ch. 1.4 Table 1.4-2
Formaldehyde	0.075	0.00035	0.0015	AP-42 Ch. 1.4 Table 1.4-3
Total HAPs (including HCHO)[1]	1.9	0.0089	0.039	AP-42 Ch. 1.4 Table 1.4-3
Pollutant	**Emission Factor (kg/MMBtu)**	**Emissions (lb/hr)**	**Emissions (tpy)**	**Emission Factor Source**
Carbon Dioxide	53.06	281.43	1,232.7	40 CFR Part 98, Subpart C, Table C-1
Methane	0.001	0.0053	0.023	40 CFR Part 98, Subpart C, Table C-2
Nitrous Oxide	0.0001	0.00053	0.0023	40 CFR Part 98, Subpart C, Table C-2
CO_2e	----	281.72	1,233.9	40 CFR Part 98, Subpart A, Table A-1

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

Sample Calculations:

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

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

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Fugitive Emissions From Venting Episodes

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

VOC Venting Emissions						
Type of Event[1]	**Number Of Events (event/yr)**	**Amount Vented per Event (scf/event)**	**Molecular Weight of Vented Gas (lb/lb-mol)**	**Total Emissions (ton/yr)**	**VOC Weight Fraction[3]**	**VOC Emissions (ton/yr)**
Pigging Venting (VENT1)	52	767	19.17	1.01	0.19	0.20
Total Emissions (tons/yr)						**0.20**

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

GHG Venting Emissions								
Type of Event[1]	**Number Of Events (event/yr)**	**Amount Vented per Event (scf/event)**	**Molecular Weight of Vented Gas (lb/lb-mol)**	**CH_4 Weight Fraction[3]**	**CO_2 Weight Fraction[3]**	**CH_4 Emissions (ton/yr)**	**CO_2 Emissions (ton/yr)**	**CO_2e Emissions (tpy)**
Pigging Venting (VENT1)	52	767	19.17	0.73	0.0056	0.74	0.0056	18.47
Total Emissions (tons/yr)						**0.74**	**0.0056**	**18.47**

1) Estimated number of events from engineering based on other facilities
2) Amount vented is based on the 10.25 cubic foot cylinder adjusted from standard conditions to 1100 psia expected operating condition
3) Weight Fraction is from a gas analysis that will be typical for the facility

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Fugitive Dust Emissions

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

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

Equation Parameter	Value
Eext, annual size-specific emission factor for PM_{10} & $PM_{2.5}$ (paved roads) extrapolated for natural mitigation	**see table below**
k, Particle size multiplier for particle size range (PM_{10}), (lb/VMT) (Source: AP-42 Table 13.2.1-1)	**0.0022**
k, Particle size multiplier for particle size range ($PM_{2.5}$), (lb/VMT) (Source: AP-42 Table 13.2.2-2)	**0.00054**
sL, surface material silt content, (g/m^2) (Source: AP-42 Table 13.2.1-2)[4]	**0.6**
W, mean weight (tons) of the vehicles traveling the road	**41.62**
P, number of "wet" days with at least 0.254 mm (0.01 in) of precipitation during the averaging period, based on AP-42 Figure 13.2.1-2.	**150**

Annual:

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

Hourly:

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

Source of Equations: AP-42 Section 13.2.1

PM_{10} Emissions

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

$PM_{2.5}$ Emissions

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

Table Notes:

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

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Williams, Jerry

From: Williams, Jerry
Sent: Monday, October 24, 2016 1:41 PM
To: 'aschopp@anteroresources.com'
Cc: McKeone, Beverly D; Barry Schatz; Michele Steyskal
Subject: WV DAQ NSR Permit Application Complete for Antero Treatment LLC - Clearwater Facility

RE: Application Status: Complete
Antero Treatment LLC - Clearwater Facility
Permit Application R13-3260A
Plant ID No. 017-00157

Mr. Schopp,

Your application for a modification permit for the Clearwater Facility was received by this Division on September 27, 2016 and assigned to the writer for review. Upon review of said application, it was determined that the application was incomplete and additional information was requested. The requested information has been received, therefore, the statutory review period commenced on October 24, 2016.

In the case of this application, the agency believes it will take approximately 90 days to make a final permit determination.

This determination of completeness shall not relieve the permit applicant of the requirement to subsequently submit, in a timely manner, any additional or corrected information deemed necessary for a final permit determination.

Should you have any questions, please contact Jerry Williams at (304) 926-0499 ext. 1223 or reply to this email.

Jerry Williams, P.E.
Engineer
WVDEP – Division of Air Quality
601 57th Street, SE
Charleston, WV 25304
(304) 926-0499 ext. 1223
jerry.williams@wv.gov

Please consider the environment before printing this email.

NON-CONFIDENTIAL

October 20, 2016

Antero Resources
1615 Wynkoop Street
Denver, CO 80202
Office 303.357.7310
Fax 303.357.7315

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

RECEIVED
OCT 21 2016
DIVISION OF AIR QUALITY

Dear Mr. Williams:

Re: Original Affidavit of Publication
Antero Clearwater Facility – Permit No. R13-3260A

Antero Treatment would like to submit the Original Affidavit of Publications from *The Doddridge Independent*. This is being submitted in accordance with a permit application requirement for a water treatment facility.

Sincerely,

Barry Schatz

Barry Schatz
Senior Environmental and Regulatory Manager

Encl.

ID # 017-00157
Reg R13-3260A
Company ANTERO TREATMENT
Facility CLEARWATER Initials

NON-CONFIDENTIAL

The Doddridge Independent

The Doddridge Independent

PUBLISHER'S CERTIFICATE

I, Michael D. Zorn, Publisher of The Doddridge Independent, A newspaper of general circulation published in the town of West Union, Doddridge County, West Virginia, do hereby certify that:

Air Quality Permit Notice
Notice of Modification Application – Antero Clearwater Facility

Notice is given that Antero Treatment LLC has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a modification to a 45CSR13 Construction Permit for a water treatment facility located south of US-50 near Greenwood, in Doddridge County, West Virginia. The latitude and longitude coordinates are: 39.26922N, 80.8930W.

was published in The Doddridge Independent
1 time commencing on Friday, September 30, 2016 and
Ending on Friday, September 30, 2016 at the request of:

Antero Treatment LLC
Barry Schatz

Given under my hand this Wednesday, October 5, 2016

The publisher's fee for said publication is:

$ 36.10 1st Run/$ 0 Subsequent Runs
This Legal Ad Total: $ 36.01

Michael D. Zorn
Publisher of The Doddridge Independent

Subscribed to and sworn to before me on
this date: 10 / 5 / 2014

Notary Public in and for Doddridge County

My Commission expires on
The 17th day of MAY 2019

OFFICIAL SEAL
NOTARY PUBLIC
STATE OF WEST VIRGINIA
PAMELA R. STINSPRING
P.O. BOX 61
WEST UNION, WV 26456
My commission expires May 17, 2019

LEGAL ADVERTISEMENT

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

Regulated Air Pollutant	Modified Potential Emissions (tons/yr)
Nitrogen Oxides (NOx)	-8.09
Carbon Monoxide (CO)	-8.84
Volatile Organic Compounds (VOC)	12.24
Particulate Matter less than 10 µm (PM10)	1.90
Particulate Matter less than 2.5 µm (PM2.5)	-0.23
Sulfur Dioxide (SO2)	-0.47
Total Hazardous Air Pollutants (HAPs)	0.55
Carbon Dioxide Equivalent (CO2e)	-26,220

Startup of operation is planned to begin on or about March 2017, with construction starting in December 2016. Written comments will be received by the West Virginia Department of Environmental Protection, Division of Air Quality, 601 57th Street, SE, Charleston, WV 25304, for at least 30 calendar days from the date of publication of this notice.

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

Dated this the 26th day of September 2016.

By: Antero Resources Corporation
Barry Schatz
Senior Environmental & Regulatory Manager
1615 Wynkoop Street
Denver, CO 80202

09/30

Williams, Jerry

From: Elizabeth McLaughlin <emclaughlin@anteroresources.com>
Sent: Thursday, October 20, 2016 4:46 PM
To: Williams, Jerry
Cc: Barry Schatz; Colette Van Straaten
Subject: Antero Treatment- Clearwater Treatment Facility Affidavit
Attachments: Antero Treatment- Clearwater Affidavit.pdf

Dear Mr. Williams:

Re: Original Affidavit of Publication
Clearwater Treatment Facility- Permit No. R13-3260A

Antero Treatment would like to submit the Original Affidavit of Publication (original sent via FedEx) from *The Doddridge Independent*. This is being submitted in accordance with a permit application requirement.

Thanks,

Betsy McLaughlin
Air Quality Specialist

1615 Wynkoop Street
Denver, CO 80202
O: 303.357.6839
C: 303.396.9465

ID # 017 - 00157
Reg R13 - 3260A
Company ANTERO TREATMENT
Facility CLEARWATER Initials h

NON-CONFIDENTIAL

October 20, 2016

Antero Resources
1615 Wynkoop Street
Denver, CO 80202
Office 303.357.7310
Fax 303.357.7315

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

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Senior Environmental and Regulatory Manager

Encl.

The Doddridge Independent

The Doddridge Independent
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Barry Schatz

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This Legal Ad Total: $ 36.01

Michael D. Zorn
Publisher of The Doddridge Independent

Subscribed to and sworn to before me on
this date: 10 / 5 / 2014

Pamela R. Stemple
Notary Public in and for Doddridge County

My Commission expires on
The 17th day of May 2019

LEGAL ADVERTISEMENT

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By: Antero Resources Corporation
Barry Schatz
Senior Environmental & Regulatory Manager
1615 Wynkoop Street
Denver, CO 80202

09/30

Adkins, Sandra K

From: Adkins, Sandra K
Sent: Tuesday, September 27, 2016 3:39 PM
To: 'aschopp@anteroresources.com'; 'bschatz@anteroresources.com'; 'msteyskal@kleinfelder.com'
Cc: McKeone, Beverly D; Williams, Jerry
Subject: WV DAQ Permit Application Status for Antero Treatment LLC; Antero Clearwater Facility

RE: Application Status
Antero Treatment LLC
Antero Clearwater Facility
Facility ID No. 017-00157
Application No. R13-3260A

Mr. Schopp,

Your application for a modification permit for the Antero Clearwater Facility was received by this Division on September 27, 2016, and was assigned to Jerry Williams. The following item was not included in the initial application submittal:

Original affidavit for Class I legal advertisement not submitted.

This item is necessary for the assigned permit writer to continue the 30-day completeness review.

Within 30 days, you should receive a letter from Jerry stating the status of the permit application and, if complete, given an estimated time frame for the agency's final action on the permit.

Any determination of completeness shall not relieve the permit applicant of the requirement to subsequently submit, in a timely manner, any additional or corrected information deemed necessary for a final permit decision.

Should you have any questions, please contact the assigned engineer, Jerry Williams, at 304-926-0499, extension 1223.

NON-CONFIDENTIAL

R13-3260A
017-00157

Deny
Modification

45CSR13 Administrative Update, Construction, Modification, Relocation, Temporary Permit or General Permit Registration Incomplete Application

A complete application is demonstrated when all of the information required below is properly prepared, completed and attached. The items listed below are required information which must be submitted with a 45CSR13 permit application. Any submittal will be considered incomplete if the required information is not included. The applicant must submit a complete application in order to receive a 45CSR13 permit.

- ☒ Class I legal advertisement not published in a newspaper certified to accept legal advertisements and original affidavit submitted.
- ☐ Application fee AND/OR additional application fees not included:
  - ☐ $250 Class I General Permit
  - ☐ $300 Class II Administrative Update
  - ☐ $1,000 Construction, Modification, Relocation or Temporary Permit
  - ☐ $500 Class II General Permit
  - ☐ $1,000 NSPS
  - ☐ $2,500 NESHAP
  - ☐ $2,500 45CSR27 Pollutant
  - ☐ $5,000 Major Modification
  - ☐ $10,000 Major Construction
- ☐ Original and two (2) copies of the application not submitted.
- ☐ File organization – application pages are not numbered or in correct order, application is not bound in some way, etc.
- ☐ Confidential Business Information is not properly identified.
- ☐ General application forms not completed and signed by a responsible official.
- ☐ Authority of Corporation form not included – required if application is signed by someone other than a responsible official.
- ☐ Applicant is not registered with the West Virginia Secretary of State's Office.
- ☐ Copy of current Business Registration Certificate not included.
- ☐ Process description, including equipment and emission point identification numbers, not submitted.
- ☐ Process flow diagram, including equipment and emission point identification numbers, not submitted.
- ☐ Plot plan, including equipment and emission point identification numbers, not submitted.
- ☐ Applicable technical forms not completed and submitted:
  - ☐ Emission Point Data Summary Sheets
  - ☐ Emission Unit Data Sheets
  - ☐ Air Pollution Control Device Sheets
  - ☐ Equipment List Form
- ☐ Emission calculations not included – emission factors, references, source identification numbers, etc.
- ☐ Electronic submittal diskette not included.

Williams, Jerry

From: Ward, Beth A
Sent: Wednesday, September 28, 2016 12:12 PM
To: Williams, Jerry
Subject: ANTERO TREATMENT LLC PERMIT APPLICATION FEE

This is the receipt for payment received from:

ANTERO TREATMENT LLC, ANTERO CLEARWATER FACILITY, CHECK NUMBER 1494, CHECK DATE 08/23/2016, $2,000.00
R13-3260A ID# 017-00157

OASIS Deposit CR 1700034197

Thank You!

Beth Ward

WV DEPARTMENT OF ENVIRONMENTAL PROTECTION
BTO FISCAL
601 57TH STREET SE
CHARLESTON, WV 25304
(304) 926-0499 EXT 1846
beth.a.ward@wv.gov

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