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August 4, 2017
(Via Federal Express)

Beverly McKeone
New Source Review Program Manager
Division of Air Quality
West Virginia Department of Environmental Protection
601 57th Street SE
Charleston, WV 25304-2345

Subject: Application for G35-D General Permit Registration
Appalachia Midstream Services, LLC
Pioneer Compression Facility
Ohio County, West Virginia

Dear Ms. McKeone:

Appalachia Midstream Services, LLC is submitting an Application for G35-D General Permit Registration for the proposed Pioneer Compression Facility to be located approximately 1.9 Miles South-Southeast of West Liberty in Ohio County, West Virginia.

This application for G35-D General Permit Registration has been prepared and submitted to provide for the construction and operation of the following equipment at the subject facility:

• Four (4) 5,000 bhp CAT G3616LE Compressor Engines	CE-01 thru -04
• Compressor Rod Packing	CRP
• Startup/Shutdown/Maintenance (including Blowdown)	SSM
• Two (2) 125 MMscfd TEG Dehydrator Flash Tanks	DFT-01 thru -02
• Two (2) 125 MMscfd TEG Dehydrator Still Vents	DSV-01 thru -02
• One (1) Thermal Oxidizer (Control for Dehys/Tanks/TLO)	TO-01
• Two (2) 2.0 MMBtu/hr Reboilers	RBV-01 thru -02
• One (1) Process Flare (Control for SSM)	FLR-01
• Six (6) Stabilized Condensate Storage Tanks (2,400 bbl Total)	T-01 thru T-06
• Two (2) Produced Water Storage Tanks (800 bbl Total)	T-07 thru T-08
• Stabilized Condensate/Produced Water Truck Load-Out	TLO
• Piping and Equipment Fugitives (Gas and Light Oil)	FUG-G and FUG-L
• Engine Crankcase Emissions	ECC

The facility qualifies as a Minor Source under Non-Attainment New Source Review (NNSR), Prevention of Significant Deterioration (PSD), and Title V Operating Permits. The facility is also an Area Source for Hazardous Air Pollutants (HAP) under the National Emission Standards for Hazardous Air Pollutants (NESHAP) regulations.

If you have any questions concerning this submittal or need additional information, please contact me at (412) 787-4197 or joe.mccay@williams.com.

Sincerely,

Joseph R. McCay
Environmental Specialist

Enclosures:

Application for G35-D General Permit Registration
Attachments A through W
Check for Application Fee

APPLICATION FOR
G35-D GENERAL PERMIT REGISTRATION

For the:

Appalachia Midstream Services, LLC

PIONEER COMPRESSION FACILITY

Wheeling, Ohio County, West Virginia

Submitted to:

WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF AIR QUALITY

Submitted by:

Appalachia Midstream Services, LLC
Park Place Corporate Center 2
2000 Commerce Drive
Pittsburgh, PA 15275

Prepared by:

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August 2017

APPLICATION FOR
G35-D GENERAL PERMIT REGISTRATION

Appalachia Midstream Services, LLC
PIONEER COMPRESSION FACILITY

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APPLICATION SUPPLEMENT

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Appalachia Midstream Services, LLC

PIONEER COMPRESSION FACILITY

Application for G35-D General Permit Registration

APPLICATION SUPPLEMENT

A. Introduction

A new station called the Pioneer Compression Facility is being added to the Panhandle Gas Gathering System to supplement the existing Buffalo and Battle Run compression facilities. This design will include inlet liquid handling capabilities, compression and dehydration capacity, supporting piping and electrical infrastructure and instrument air systems. This application for G35-D General Permit Registration has been prepared and submitted to provide for the following equipment and operations at the subject facility:

• Four (4) 5,000 bhp CAT G3616LE Compressor Engines	CE-01 thru -04
• Compressor Rod Packing	CRP
• Startup/Shutdown/Maintenance (including Blowdown)	SSM
• Two (2) 125 MMscfd TEG Dehydrator Flash Tanks	DFT-01 thru -02
• Two (2) 125 MMscfd TEG Dehydrator Still Vents	DSV-01 thru -02
• One (1) Thermal Oxidizer (Control for Dehys/Tanks/TLO)	TO-01
• Two (2) 2.0 MMBtu/hr Reboilers	RBV-01 thru -02
• One (1) Process Flare (Control for SSM)	FLR-01
• Six (6) Stabilized Condensate Storage Tanks (2,400 bbl Total)	T-01 thru T-06
• Two (2) Produced Water Storage Tanks (800 bbl Total)	T-07 thru T-08
• Stabilized Condensate/Produced Water Truck Load-Out	TLO
• Piping and Equipment Fugitives (Gas and Light Oil)	FUG-G and FUG-L
• Engine Crankcase Emissions	ECC

B. Potential to Emit (PTE)

The facility qualifies as a synthetic minor source for criteria pollutants and as an area source of HAPs, as summarized below:

Appalachia Midstream Services, LLC

PIONEER COMPRESSION FACILITY

Application for G35-D General Permit Registration

Controlled PTE in TPY[1]

Unit ID	Description	Criteria Pollutants			HAP		GHG
		NOX	CO	VOC[2]	HCHO[3]	Tot HAP[4]	CO2e[5]
CE-01	Compressor Engine - CAT G3616 A4	19.31	11.32	8.63	1.22	1.72	23,656
CE-02	Compressor Engine - CAT G3616 A4	19.31	11.32	8.63	1.22	1.72	23,656
CE-03	Compressor Engine - CAT G3616 A4	19.31	11.32	8.63	1.22	1.72	23,656
CE-04	Compressor Engine - CAT G3616 A4	19.31	11.32	8.63	1.22	1.72	23,656
CRP	Compressor Rod Packing	---	---	27.60	---	0.72	1,538
SSM	Startup/Shutdown/Maintenance (Blowdown)	---	---	4.27	---	0.11	11,896
DFT-01	TEG Dehydrator - Flash Tank	---	---	4.09	---	0.06	73
DSV-01	TEG Dehydrator - Still Vent	---	---	5.37	---	1.29	4
DFT-02	TEG Dehydrator - Flash Tank	---	---	4.09	---	0.06	73
DSV-02	TEG Dehydrator - Still Vent	---	---	5.37	---	1.29	4
TO-01	Dehys/Tanks/TLO Thermal Oxidizer	3.98	12.58	[A]	3.0E-03	3.1E-03	4,799
RBV-01	TEG Dehydrator - Reboiler Vent	0.86	0.72	0.05	6.4E-04	0.02	1,037
RBV-02	TEG Dehydrator - Reboiler Vent	0.86	0.72	0.05	6.4E-04	0.02	1,037
FLR-01	SSM Flare	2.55	8.07	[A]	1.9E-03	2.0E-03	3,079
T-01	Storage Tank - Stabilized Condensate	---	---	0.06	---	0.01	---
T-02	Storage Tank - Stabilized Condensate	---	---	0.06	---	0.01	---
T-03	Storage Tank - Stabilized Condensate	---	---	0.06	---	0.01	---
T-04	Storage Tank - Stabilized Condensate	---	---	0.06	---	0.01	---
T-05	Storage Tank - Stabilized Condensate	---	---	0.06	---	0.01	---
T-06	Storage Tank - Stabilized Condensate	---	---	0.06	---	0.01	---
T-07	Storage Tank - Produced Water	---	---	0.02	---	0.00	---
T-08	Storage Tank - Produced Water	---	---	0.02	---	0.00	---
TLO	Truck Load-Out - Stabilized Condensate	---	---	7.04	---	2.11	---
	Truck Load-Out - Produced Water	---	---	0.11	---	0.03	---
TOTAL POINT SOURCE PTE:		**85.50**	**67.36**	**92.99**	**4.87**	**12.61**	**118,166**
Title V Operating Permit Thresholds:		100	100	100	10	25	na
FUG-G	Process Piping Fugitives - Gas	---	---	3.72	---	0.10	207
FUG-L	Process Piping Fugitives - Light Oil	---	---	5.97	---	0.90	---
ECC	Engine Crankcase Emissions	0.21	1.51	0.57	0.07	0.11	252
TOTAL FUGITIVE SOURCE PTE:		0.21	1.51	10.26	0.07	1.10	459
TOTAL PTE:		**85.70**	**68.86**	**103.25**	**4.94**	**13.71**	**118,625**

Notes: [A] - Refer to sources being controlled.

1 - Emissions are based on operation at 100% of rated load for 8,760 hrs/yr, except SSM and TLO which are intermittent

2 - VOC is volatile organic compounds, as defined by EPA, and includes HCHO (formaldehyde).

3 - HCHO is formaldehyde and is the individual HAP with the highest PTE.

4 - Total HAP includes, but not limited to, HCHO (formaldehyde), n-hexane, BTEX (benzene, toluene, ethylbenzene, xylene), 2,2,4-TMP (i-octane), acetaldehyde, acrolein, and MeOH.

5 - CO2e is aggregated Greenhouse Gas (GHG), comprised of carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O), as adjusted for Global Warming Potential (GWP).

C. Applicability of New Source Review (NSR) Regulations

The following New Source Review (NSR) regulations are potentially applicable to natural gas production facilities. Applicability to the subject facility has been determined as follows:

1. Prevention of Significant Deterioration (PSD) [Not Applicable]

This rule does not apply. The facility is a "PSD Synthetic Minor Source" for each regulated pollutant, as follows:

- NOx: PSD Natural Minor Source with Pre-Controlled PTE < 250 tpy
- CO: PSD Synthetic Minor Source with Controlled PTE < 250 tpy
- VOC: PSD Synthetic Minor Source with Controlled PTE < 250 tpy
- SO2: PSD Natural Minor Source with Pre-Controlled PTE < 250 tpy
- PM10/2.5: PSD Natural Minor Source with Pre-Controlled PTE < 250 tpy
- CO2e: Not Applicable - Facility is NOT PSD Major for any other pollutant

2. Nonattainment New Source Review (NNSR) [Not Applicable]

This rule does not apply. The facility location is designated as either "Maintenance" or "Attainment/Unclassified" for all criteria pollutants.

3. Major Source of Hazardous Air Pollutants (HAPs) [Not Applicable]

This rule does not apply. The facility is a "HAP Area Source" as follows:

- Each HAP: HAP Area Source with Controlled Each Individual HAP PTE < 10 tpy
- Total HAPs: HAP Area Source with Controlled Total of All HAPs PTE < 25 tpy

4. Title V Operating Permit (TVOP) [Not Applicable]

This rule does not apply. The facility is a "Title V Synthetic Minor Source" as follows:

- NOx: Title V Natural Minor Source with Pre-Controlled PTE < 100 tpy
- CO: Title V Synthetic Minor Source with Controlled PTE < 100 tpy
- VOC: Title V Synthetic Minor Source with Controlled PTE < 100 tpy
- SO2: Title V Natural Minor Source with Pre-Controlled PTE < 100 tpy
- PM10/2.5: Title V Natural Minor Source with Pre-Controlled PTE < 100 tpy
- Each HAP: Title V Synthetic Minor Source with Controlled PTE < 10 tpy
- Total HAPs: Title V Synthetic Minor Source with Controlled PTE < 25 tpy

D. Applicability of Federal Regulations

The following federal regulations are potentially applicable to natural gas production facilities. Applicability to the facility has been determined as follows:

1. NSPS A, General Provisions

40CFR§60.1-§60.19 [Applicable]

This rule does apply to all sources subject to an NSPS (unless a specific provision is excluded within the source NSPS). Requirements may include:

a. Notification (§60.7)
b. Recordkeeping and Reporting (§60.7)
c. Source Testing (§60.8, §60.11)

2. NSPS Dc, Steam Generating Units

40CFR§60.40c-§60.48c [Not Applicable]

This rule does not apply because there is no steam generating unit at the facility with a maximum design heat input capacity ≥ 10 MMBtu/hr (§60.40c(a)).

3. NSPS Kb, Volatile Organic Liquid (VOL) Storage Vessels

40CFR§60.110b-§60.117b [Not Applicable]

This rule does not apply because each tank that is used to store volatile organic liquids (VOL) has a design capacity < 75 m3 (19,800 gals, 471 bbl) (§60.110b(a)).

4. NSPS GG, Stationary Gas Turbines

40CFR§60.330-§60.335 [Not Applicable]

This rule does not apply because there is no stationary gas turbine at the facility (§60.330).

5. NSPS KKK, Leaks from Natural Gas Processing Plants

40CFR§60.630-§60.636 [Not Applicable]

This rule does not apply because the facility is not located at a natural gas processing plant that is engaged in the extraction of natural gas liquids from field gas (§60.630(e)).

6. NSPS LLL, Onshore Natural Gas Processing: SO2 Emissions

40CFR§60.640-§60.648 [Not Applicable]

This rule does not apply because there is no gas sweetening unit at the facility (§60.640(a)).

7. NSPS IIII, Compression Ignition Reciprocating Internal Combustion Engines

CFR§60.4200-§60.4219 [Not Applicable]

This rule does not apply because there is no stationary compression ignition engine at the facility (§60.4200(a)).

8. NSPS JJJJ, Stationary Spark Ignition (SI) Internal Combustion Engines (ICE)

40CFR§60.4230-§60.4248 [Applicable]

This rule does apply to the four new 5,000 bhp CAT G3616LE Compressor Engines (CE-01 thru -04) because they were each constructed ("ordered"), modified or reconstructed after 06/12/06 (§60.4230(a)(5)), are lean burn with ≥ 1,350 bhp, and were manufactured on or after 07/01/07 (§60.4230(a)(4)(i)).

Requirements include NOx, CO, and VOC emission limits (§60.4233(e-f)); operating limits (§60.4243); performance testing (§60.4244); and notification and recordkeeping requirements (§60.4245).

9. NSPS KKKK, Stationary Combustion Turbines

40CFR§60.4300-§60.4420 [Not Applicable]

This rule does not apply because there is no stationary combustion turbine at the facility (§60.4300).

10. NSPS OOOO, Crude Oil and Natural Gas Production

40CFR§60.5360-§60.5430 [Not Applicable]

This rule does not apply to the new reciprocating compressors because they were constructed after 09/18/15 (§60.5365).

This rule does not apply to the new storage vessels (tanks) because they were constructed after 09/18/15 (§60.5365).

This rule does not apply as instrument air is used in lieu of natural gas pneumatic controllers (§60.5365).

11. NSPS OOOOa, Crude Oil and Natural Gas Production

40CFR§60.5360a-§60.5499a [Applicable]

This rule does apply to the new reciprocating compressors (driven by CE-01 thru -04) because they were constructed after September 18, 2015 (§60.5360a and §60.5365a(c)). Requirements include replacing rod-packing systems on a specified schedule (§60.5385a(a)); also monitoring, recordkeeping and reporting requirements.

This rule does not apply to the new 400 bbl stabilized condensate and produced water storage vessels (tanks) because they do not have the potential to emit > 6 tpy of VOC (§60.5365a(e)(3)). However, there is a requirement to maintain documentation that the VOC emission rate is < 6 tpy per tank (§60.5420(c)(5)(ii)).

This rule does not apply as instrument air is used in lieu of natural gas pneumatic controllers (§60.5365a).

This rule does apply to the collection of fugitive emissions components at a compressor station (§60.5365a(j)). The new process piping components installed as part of the project will be subject to the equipment leak standards specified in §60.5397a.

12. NESHAP A, General Provisions (aka MACT)

40CFR§63.1-§63.16 [Applicable]

This rule does apply to all sources subject to a NESHAP, including the dehydrators (DEHY-01 thru DEHY-02) and compressor engines (CE-01 thru CE-04). Requirements include notification, monitoring and recordkeeping.

13. NESHAP HH, Oil and Natural Gas Production Facilities

40CFR§63.760-§63.779 [Applicable]

This rule does apply to the TEG dehydrators. However, because each dehydrator has an actual average benzene emission rate < 0.90 megagram (1.00 ton) per year they are exempt

from all requirements except to maintain records of actual benzene emissions to demonstrate continuing exemption status (§63.764(e)(1)).

14. NESHAP HHH, Natural Gas Transmission and Storage Facilities

40CFR§63.1270-§63.1289 [Not Applicable]

This rule does not apply because the facility is not a natural gas transmission or storage facility transporting or storing natural gas prior to local distribution (§63.1270(a)).

15. NESHAP YYYY, Stationary Combustion Turbines

40CFR§63.6080-§63.6175 [Not Applicable]

This rule does not apply because there is no stationary combustion turbine at the facility (§63.6080).

16. NESHAP ZZZZ, Stationary Reciprocating Internal Combustion Engines (RICE)

40CFR§63.6580-§63.6675 [Applicable]

This rule does apply to the compressor engines. However, because each compressor engine is "new"; i.e., commenced construction or reconstruction on or after 06/12/06 (§63.6590(a)(2)(iii)), the only requirement is compliance with 40CFR§60.4230 thru §60.4248 (NSPS JJJJ) for Spark Ignition Internal Combustion Engines.

17. NESHAP DDDDD, Industrial, Commercial, and Institutional Boilers and Process Heaters – Major Sources

40CFR§63.7480 – §63.7575 [Not Applicable]

This rule does not apply to the gas-fired reboilers (RBV-01 thru RBV-02) because the facility is not a major source of HAP (§63.7485).

18. NESHAP JJJJJJ, Industrial, Commercial, and Institutional Boilers – Area Sources

40CFR§63.11193 – §63.11237 [Not Applicable]

This rule does not apply because the gas-fired reboilers (RBV-01 thru RBV-02) do not meet the definition of "boiler" in §63.11237. Specifically, "boiler" is defined as an enclosed device using controlled flame combustion in which water is heated to recover thermal energy in the form of steam and/or hot water. Furthermore, waste heat boilers, process heaters, and autoclaves are excluded from the definition of "boiler".

19. Compliance Assurance Monitoring (CAM)

40CFR§64.1-§64.10 [Not Applicable]

This rule does not apply because the subject facility is not a major source required to obtain a Title V Operating Permit (§64.2(a)).

20. Mandatory Greenhouse Gases (GHG) Reporting

40CFR§98.1-§98.9 (See Attachment D-4) [Potentially Applicable]

This rule potentially applies. The facility is not subject to a listed source category; however, this rule potentially applies because the aggregate maximum heat input capacity of the stationary fuel combustion units is ≥ 30 MMBtu/hr and the facility has the potential to emit ≥ 25,000 metric ton/yr (27,558 tpy) of Carbon Dioxide Equivalent (CO_2e) emissions from all stationary fuel combustion sources combined (§98.2(a)).

Records must be kept of actual CO2, CH4, and N2O emissions to determine the actual CO2e emissions. If the actual CO2e emissions exceed the 25,000 metric ton/yr threshold then an annual report must be submitted no later than March 31 of each calendar year thereafter.

E. Applicability of State Regulations

The following State regulations are potentially applicable to natural gas production facilities. Applicability to the facility has been determined as follows:

1. **Particulate Air Pollution from Combustion of Fuel in Indirect Heat Exchangers**
   45CSR2 [Applicable]

   This rule does apply; however, because each dehydrator reboiler (RBV-01 and RBV-02) has a maximum design heat input (MDHI) rating < 10 MMBtu/hr, the only requirement is to limit visible emissions to < 10% opacity during normal operations (§45-02-3.1). The dehydrator reboilers and stabilized condensate heater combust only natural gas which inherently conforms to the visible emission standards.

2. **Prevent and Control the Discharge of Air Pollutants into the Open Air which Causes or Contributes to an Objectionable Odor or Odors**
   45CSR4 [Applicable]

   This rule does apply and states that an objectionable odor is an odor that is deemed objectionable when in the opinion of a duly authorized representative of the Air Pollution Control Commission (Division of Air Quality), based upon their investigations and complaints, such odor is objectionable. No odors have been deemed objectionable.

3. **Control of Air Pollution from Combustion of Refuse**
   45CSR6 [Applicable]

   The rule does apply as 45CSR6 establishes emission standards for particulate matter and requirements for activities involving incineration of refuse. As the flare (FLR-01) and thermal oxidizer (TO-01) are required to be smokeless except for periods not to exceed a total of 5 minutes during any 2 consecutive hours, particulate matter emissions should be negligible and the equipment will comply with the applicable emission standard. The facility will monitor the flare and thermal oxidizer pilot flame and record any malfunctions that may cause no flame to be present during facility operation.

4. **Prevent and Control Air Pollution from the Emission of Sulfur Oxides**
   45CSR10 [Not Applicable]

   This rule does not apply because each “fuel burning unit” at the facility has a Maximum Design Heat Input (MDHI) rating < 10 MMBtu/hr.

5. **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**
   45CSR13 [Applicable]

   This rule does apply. Appalachia Midstream Services, LLC is applying for a G35-D Class II General Permit and has published the required Class I legal advertisement notifying the public of this application to construct and operate the facility.

6. Permits for Construction and Major Modification of Major Stationary Sources of Air Pollutants

45CSR14 [Not Applicable]

The rule does not apply because the facility is not a major source of air pollutants.

7. Standards of Performance for New Stationary Sources Pursuant to 40 CFR Part 60

45CSR16 [Applicable]

The rule does apply to this source by reference of §40CFR60, Subparts JJJJ and OOOOa. Appalachia Midstream Services, LLC is subject to the monitoring and recordkeeping requirements of these Subparts.

8. Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution which Cause or Contribute to Nonattainment

45CSR19 [Not Applicable]

This rule does not apply because the facility is a minor (or "deferred") source of all regulated pollutants.

9. Requirements for Operating Permits

45CSR30 [Not Applicable]

This rule does not apply because the facility is a minor (or "deferred") source of all regulated pollutants.

10. Air Quality Management Fees Program

45CSR22 [Applicable]

This rule does apply. It establishes a program to collect fees for certificates to operate and for permits to construct, modify or relocate sources of air pollution.

11. Prevent and Control Emissions of Toxic Air Pollutants

45CSR27 [Not Applicable]

This rule does not apply because equipment used in the production and distribution of petroleum products is exempt, provided that the product contains no more than 5% benzene by weight (§45-22-2.4).

12. Air Pollution Emissions Banking and Trading

45CSR28 [Not Applicable]

This rule does not apply. The facility does not choose to participate in the voluntarily statewide air pollutant emissions trading program.

13. Emission Statements for VOC and NOX

45CSR29 [Not Applicable]

This rule does not apply because the subject facility is not located in Putnam, Kanawha, Cabell, Wayne, Wood, or Greenbrier Counties (§45-29-1).

14. Requirements for Operating Permits

45CSR30 [Not Applicable]

This rule does not apply because the subject facility is a non-major "deferred" source of all regulated pollutants.

Pursuant to the authority granted in West Virginia 45CSR§30-3.2 and 45CSR§30A-3.1, the DAQ is extending the deferral, which was set to expire December 15, 2000, of non-major sources subject to West Virginia 45CSR30 (Title V Program) from the obligation to submit an operating permit application.

15. Emission Standards for Hazardous Air Pollutants (HAP)

45CSR34 [Not Applicable]

This rule does not apply because the provisions under Subpart HH of 40 CFR Part 63 which apply to non-major area sources of hazardous air pollutants are excluded.

APPLICATION FOR PERMIT

G35-D General Permit Registration

dep	**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 www.dep.wv.gov

G35-D GENERAL PERMIT REGISTRATION APPLICATION

PREVENTION AND CONTROL OF AIR POLLUTION IN REGARD TO THE CONSTRUCTION, MODIFICATION, RELOCATION, ADMINISTRATIVE UPDATE AND OPERATION OF NATURAL GAS COMPRESSOR AND/OR DEHYDRATION FACILITIES

☒CONSTRUCTION
☐MODIFICATION
☐RELOCATION
☐CLASS I ADMINISTRATIVE UPDATE
☐CLASS II ADMINISTRATIVE UPDATE

SECTION 1. GENERAL INFORMATION

Name of Applicant (as registered with the WV Secretary of State's Office): **Appalachia Midstream Services, LLC**

Federal Employer ID No. (FEIN): **26-3678972**

Applicant's Mailing Address: **Park Place Corporate Center 2, 2000 Commerce Drive**

City: **Pittsburgh**	State: **PA**	ZIP Code: **15275**

Facility Name: **Pioneer Compression Facility**

Operating Site Physical Address: **300 Elysian Lane, Wheeling, West Virginia 26003**
If none available, list road, city or town and zip of facility.

City: **Wheeling**	Zip Code: **WV**	County: **Ohio**

Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits):
Latitude: **40.14333°N**
Longitude: **80.59156°W**

SIC Code: **1389** NAICS Code: **213112**	DAQ Facility ID No. (For existing facilities) **NA**

CERTIFICATION OF INFORMATION

This G35-D General Permit Registration Application shall be signed below by a Responsible Official. A Responsible Official is a President, Vice President, Secretary, Treasurer, General Partner, General Manager, a member of the Board of Directors, or Owner, depending on business structure. A business may certify an Authorized Representative who shall have authority to bind the Corporation, Partnership, Limited Liability Company, Association, Joint Venture or Sole Proprietorship. Required records of daily throughput, hours of operation and maintenance, general correspondence, compliance certifications and all required notifications must be signed by a Responsible Official or an Authorized Representative. If a business wishes to certify an Authorized Representative, the official agreement below shall be checked off and the appropriate names and signatures entered. **Any administratively incomplete or improperly signed or unsigned G35-D Registration Application will be returned to the applicant. Furthermore, if the G35-D forms are not utilized, the application will be returned to the applicant. No substitution of forms is allowed.**

I hereby certify that **Paul Hunter** is an Authorized Representative and in that capacity shall represent the interest of the business (e.g., Corporation, Partnership, Limited Liability Company, Association Joint Venture or Sole Proprietorship) and may obligate and legally bind the business. If the business changes its Authorized Representative, a Responsible Official shall notify the Director of the Division of Air Quality immediately.

I hereby certify that all information contained in this G35-D General Permit Registration Application and any supporting documents appended hereto is, to the best of my knowledge, true, accurate and complete, and that all reasonable efforts have been made to provide the most comprehensive information possible.

Responsible Official Signature: Paul V. Hunter
Name and Title: **Paul Hunter - Vice President, Northeast Operating Area** Phone: **(412) 787-5561** Fax: **(412) 787-6002**
Email: **paulv.hunter@williams.com** Date: 8/1/2017

If applicable: NA
Authorized Representative Signature: _____
Name and Title: Phone: Fax:
Email: Date:

If applicable:
Environmental Contact
Name and Title: **Joseph R. McCay, Environmental Specialist** Phone: **(412) 787-7300** Fax: **(412) 787-6002**
Email: **joe.mccay@williams.com** Date:

OPERATING SITE INFORMATION	
Briefly describe the proposed new operation and/or any change(s) to the facility: The Pioneer Compression Facility will be constructed and operated to compress and dehydrate natural gas.	
Directions to the facility: Directions from Van Meter Way in West Liberty: a. Head east toward Apple Pie Ridge ~ 0.2 mi; b. Turn right on Harvey Rd ~ 2.0 mi; c. Sharp right onto Weidman Run Rd ~ 0.3 mi; d. Turn left onto Harvey's Rd ~ 0.3 mi; e. Entrance to site is on the left.	
ATTACHMENTS AND SUPPORTING DOCUMENTS	
I have enclosed the following required documents:	
Check payable to WVDEP – Division of Air Quality with the appropriate application fee (per 45CSR13 and 45CSR22). ☒ Check attached to front of application. ☐ I wish to pay by electronic transfer. Contact for payment (incl. name and email address): ☐ I wish to pay by credit card. Contact for payment (incl. name and email address): ☒$500 (Construction, Modification, and Relocation) ☐$300 (Class II Administrative Update) ☒$1,000 NSPS fee for 40 CFR60, Subpart IIII, JJJJ and/or OOOO and/or OOOOa [1] ☒$2,500 NESHAP fee for 40 CFR63, Subpart ZZZZ and/or HH [2] [1] Only one NSPS fee will apply. [2] Only one NESHAP fee will apply. The Subpart ZZZZ NESHAP fee will be waived for new engines that satisfy requirements by complying with NSPS, Subparts IIII and/or JJJJ. *NSPS and NESHAP fees apply to new construction or if the source is being modified.*	
☒ Responsible Official or Authorized Representative Signature (if applicable)	
☒ Single Source Determination Form **(must be completed in its entirety)** – Attachment A	
☒ Siting Criteria Waiver (if applicable) – Attachment B	☒ Current Business Certificate – Attachment C
☒ Process Flow Diagram – Attachment D	☒ Process Description – Attachment E
☒ Plot Plan – Attachment F	☒ Area Map – Attachment G
☒ G35-D Section Applicability Form – Attachment H	☒ Emission Units/ERD Table – Attachment I
☒ Fugitive Emissions Summary Sheet – Attachment J	
☒ Storage Vessel(s) Data Sheet (include gas sample data, USEPA Tanks, simulation software (e.g. ProMax, E&P Tanks, HYSYS, etc.), etc. where applicable) – Attachment K	
☒ Natural Gas Fired Fuel Burning Unit(s) Data Sheet (GPUs, Heater Treaters, In-Line Heaters if applicable) – Attachment L	
☒ Internal Combustion Engine Data Sheet(s) (include manufacturer performance data sheet(s) if applicable) – Attachment M	
☒ Tanker Truck Loading Data Sheet (if applicable) – Attachment N	
☒ Glycol Dehydration Unit Data Sheet(s) (include wet gas analysis, GRI- GLYCalc™ input and output reports and information on reboiler if applicable) – Attachment O	
☒ Pneumatic Controllers Data Sheet – Attachment P	
☒ Centrifugal Compressor Data Sheet – Attachment Q	
☒ Reciprocating Compressor Data Sheet – Attachment R	
☒ Blowdown and Pigging Operations Data Sheet – Attachment S	
☒ Air Pollution Control Device/Emission Reduction Device(s) Sheet(s) (include manufacturer performance data sheet(s) if applicable) – Attachment T	
☒ Emission Calculations (please be specific and include all calculation methodologies used) – Attachment U	
☒ Facility-wide Emission Summary Sheet(s) – Attachment V	
☒ Class I Legal Advertisement – Attachment W	
☒ One (1) paper copy and two (2) copies of CD or DVD with pdf copy of application and attachments	

All attachments must be identified by name, divided into sections, and submitted in order.

ATTACHMENT A

Single Source Determination Form

G35-D General Permit Registration

ATTACHMENT A - SINGLE SOURCE DETERMINATION FORM

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 Source Determination Rule for the oil and gas industry was published in the Federal Register on June 3, 2016 and will become effective on August 2, 2016. EPA defined the term "adjacent" and stated that equipment and activities in the oil and gas sector that are under common control will be considered part of the same source if they are located on the same site or on sites that share equipment and are within ¼ mile of each other.

Is there equipment and activities in the same industrial grouping (defined by SIC code)?
Yes ☒ No ☐

(The upstream well(s) and subject facility share the same two-digit major SIC code of 13.)

Is there equipment and activities under the control of the same person/people?
Yes ☐ No ☒

(Facility receives natural gas from wells owned by other companies)

Is there equipment and activities located on the same site or on sites that share equipment and are within ¼ mile of each other?
Yes ☐ No ☒

(The closest Appalachia Midstream Services, LLC owned facility to the subject facility is the Pleasants Compressor Station located approximately 3.8 miles away.)

ATTACHMENT B

Siting Criteria Waiver (If Applicable)

G35-D General Permit Registration

ATTACHMENT B - SITING CRITERIA WAIVER – *NOT APPLICABLE*
If applicable, please complete this form and it must be notarized.

G35-D General Permit
Siting Criteria Waiver

WV Division of Air Quality 300' Waiver

I _____ hereby
Print Name

acknowledge and agree that _____ will
General Permit Applicant's Name

construct an emission unit(s) at a natural gas compressor and/or dehydration facility that will be located within 300' of my dwelling and/or business.

.

I hereby offer this waiver of siting criteria to the West Virginia Department of Environmental Protection Division of Air Quality as permission to construct, install and operate in such location.

Signed:

_____
Signature Date

_____
Signature Date

Taken, subscribed and sworn before me this _____ day of

_____, 20_____.

My commission expires: _____

SEAL_____
Notary Public

ATTACHMENT C

Current Business Certificate

G35-D General Permit Registration

WEST VIRGINIA
STATE TAX DEPARTMENT
BUSINESS REGISTRATION CERTIFICATE

ISSUED TO:
APPALACHIA MIDSTREAM SERVICES, L.L.C.
900 PENNSYLVANIA AVE
CHARLESTON, WV 25302-3548

BUSINESS REGISTRATION ACCOUNT NUMBER: **2222-3681**

This certificate is issued on: **06/30/2010**

This certificate is issued by
the West Virginia State Tax Commissioner
in accordance with W.Va. Code § 11-12.

The person or organization identified on this certificate is registered to conduct business in the State of West Virginia at the location above.

This certificate is not transferrable and must be displayed at the location for which issued.

This certificate shall be permanent until cessation of the business for which the certificate of registration was granted or until it is suspended, revoked or cancelled by the Tax Commissioner.

Change in name or change of location shall be considered a cessation of the business and a new certificate shall be required.

TRAVELING/STREET VENDORS: Must carry a copy of this certificate in every vehicle operated by them. CONTRACTORS, DRILLING OPERATORS, TIMBER/LOGGING OPERATIONS: Must have a copy of this certificate displayed at every job site within West Virginia.

atL006 v.1
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ATTACHMENT D

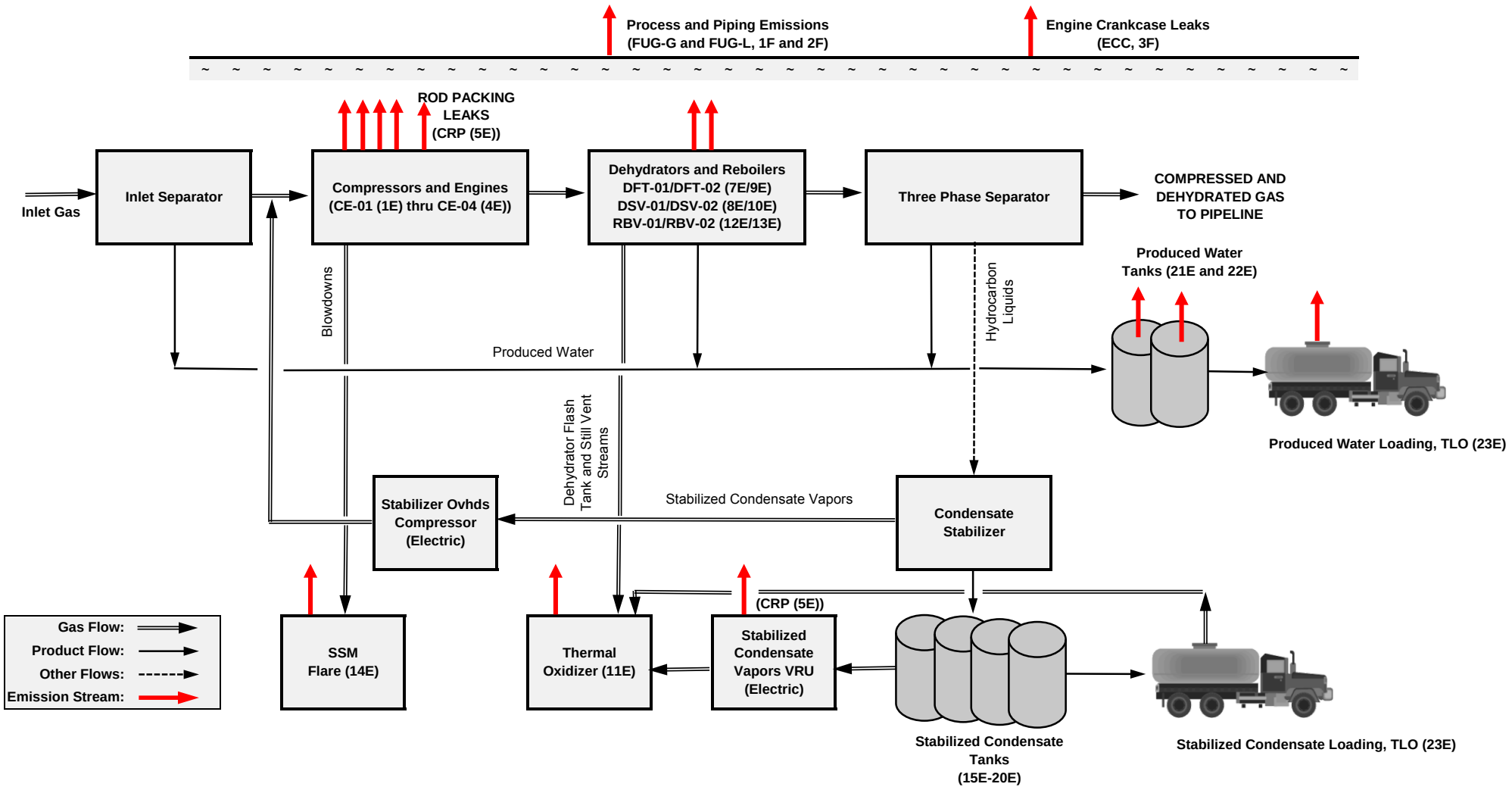
Process Flow Diagram

G35-D General Permit Registration

Appalachia Midstream Services, LLC

PIONEER COMPRESSION FACILITY

PROCESS FLOW DIAGRAM (PFD)



ATTACHMENT E

Process Description

G35-D General Permit Registration

A. Project Overview

Appalachia Midstream Services, LLC owns and operates the Pioneer Compression Facility located approximately 1.9 Miles South-Southeast of West Liberty in Ohio County, West Virginia (See Attachment G – Site Location Map). The facility receives natural gas from local production wells then compresses and dehydrates the gas for delivery to a gathering pipeline. Additionally, raw field condensate is received at the site, stabilized and then sent offsite via tanker trucks.

B. Reciprocating Engines

Four (4) natural gas-fueled reciprocating engines are utilized at the facility. These engines drive a natural gas compressor to increase the pressure of the natural gas. Emissions result from the combustion of natural gas fuel.

C. Compressor Rod Packing Leaks

The reciprocating compressor operations result in emissions from the wear of mechanical seals around the piston rods over time.

D. Startup/Shutdown/Maintenance

As part of facility operation, the compressor engines will undergo periods of startup and shutdown. When an engine is shutdown, the natural gas contained within the compressor and associated piping must be evacuated and the blowdown gas is routed to a flare for destruction. Additionally, there will be other infrequent emissions from various maintenance activities at the facility that are not associated with compressor blowdowns such as pigging activities.

E. Tri-Ethylene Glycol (TEG) Dehydrators

Two (2) Triethylene Glycol (TEG) Dehydrators are utilized at the facility. Each dehydrator is comprised of a Contactor/Absorber Tower (no vented emissions), a Flash Tank, and a Regenerator/Still Vent.

The TEG Dehydrators are used to remove water vapor from the inlet wet gas stream to meet pipeline specifications. In the dehydration process, the wet inlet gas stream flows through a contactor tower where the gas is contacted with lean glycol. The lean glycol absorbs the water in the gas stream and becomes rich glycol laden with water and trace amounts of hydrocarbons.

The rich glycol is then routed to a flash tank where the glycol pressure is reduced to liberate the lighter end hydrocarbons (especially methane). The lighter end hydrocarbons are routed from the flash tank to the Reboiler for use as fuel with the excess hydrocarbons vented to a thermal oxidizer.

The rich glycol is then sent from the flash tank to the regenerator/still where the TEG is heated to drive off the water vapor and any remaining hydrocarbons. The off-gases from the regenerator/still are vented to a thermal oxidizer.

After regeneration, the glycol is returned to a lean state and used again in the process.

F. Tri-Ethylene Glycol (TEG) Reboilers

Tri-Ethylene Glycol (TEG) Reboilers are utilized to supply heat for the Triethylene Glycol (TEG) Regenerator/Stills.

G. Thermal Oxidizer

One thermal oxidizer with 98% VOC/HAPs destruction efficiency is used to control the dehydrator's flash gas and still vent vapor streams, stabilized condensate tank emissions and stabilized condensate truck loading losses.

H. Process Flare

One process flare with 98% VOC/HAPs destruction efficiency is used to control emissions from startup/shutdown/maintenance activities (including blowdowns, pigging events and station ESD events).

I. Condensate Stabilizer

An electrically heated 3-phase separator will separate gas vapor, water, and condensate. Water will go to the produced water tanks. Raw condensate from the 3-phase separator will be sent to a stabilizer tower skid to stabilize the condensate to a RVP 12 product. An electric immersion heater will be used to provide the heat necessary to stabilize the condensate. Gas vapor and stabilizer overheads will be gathered by an electric motor driven vapor recovery unit (VRU). The VRU will discharge into the compressor facility suction line.

J. Storage Tanks

There are tanks at the facility used to store various materials, including produced water, lube oil, fresh and spent TEG, etc. All of these tanks, except for the stabilized condensate and produced water storage tanks, generate de-minimis (insignificant) emissions.

Six 400 bbl storage tanks will be used to hold the stabilized condensate product. Each of these tanks will be connected to the thermal oxidizer for emissions control. Two 400 bbl storage tanks will be used to hold produced water from the dehydrators and inlet separator.

K. Truck Load-Out

Produced water will be loaded into tanker trucks and produce small quantities of VOC emissions. Additionally, stabilized condensate will be loaded into tanker trucks and emissions will be controlled by the thermal oxidizer.

L. Piping and Equipment Fugitive Emissions

Piping and process equipment generate from leaks from different component types (connectors, valves, pumps, etc.) in gas-vapor service and light-liquid (condensate) service.

M. Engine Crankcase Emissions

Internal combustion results in a small but continual amount of blow-by, which occurs when some of the gases from combustion leak past the piston rings (that is, blow by them) to end up inside the crankcase, causing pressure to build up in the crank case. These blow-by gases are vented to the atmosphere.

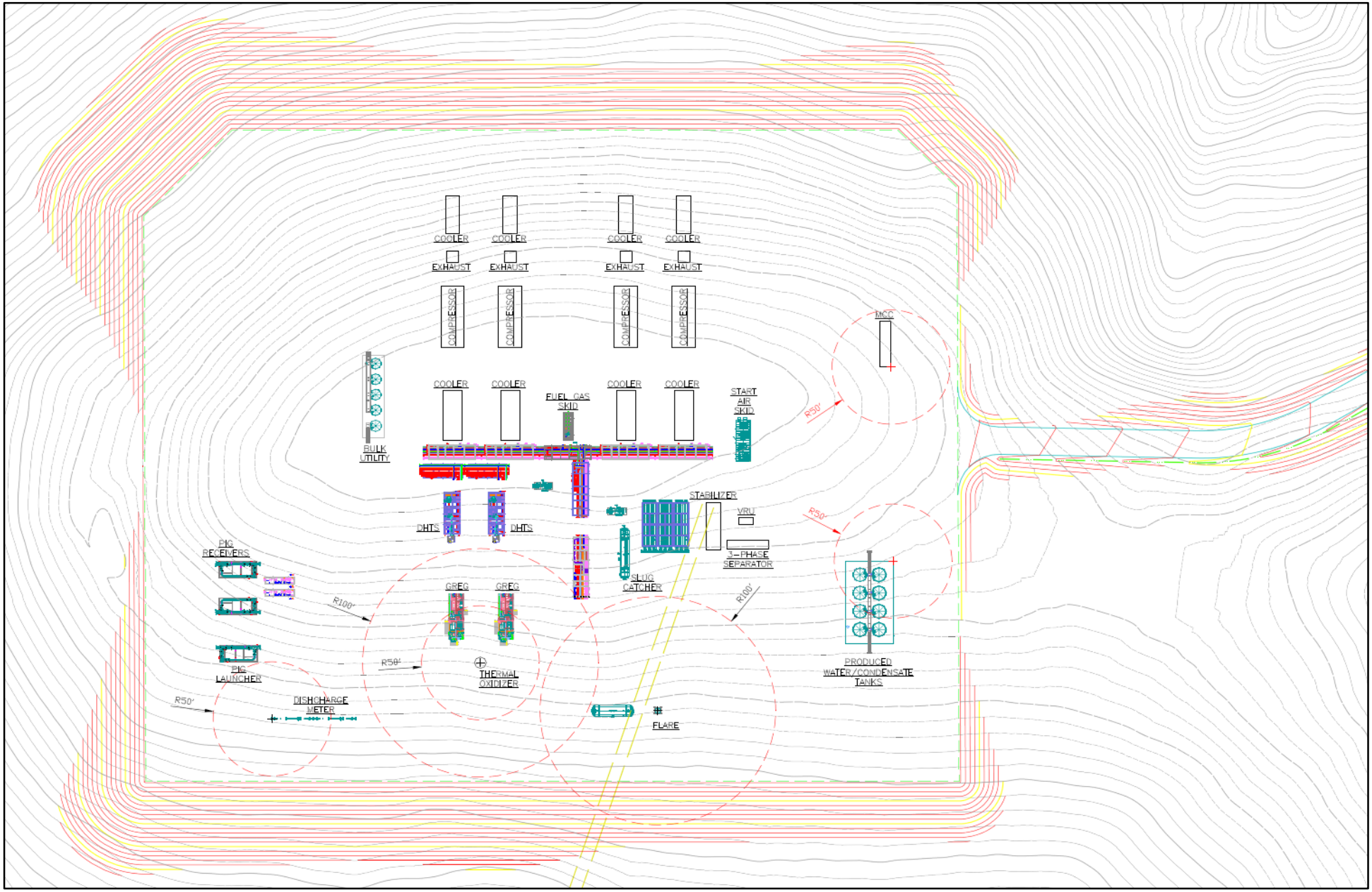
A process flow diagram is included as Attachment D.

ATTACHMENT F

Plot Plan

G35-D General Permit Registration

Attachment F - Plot Plan

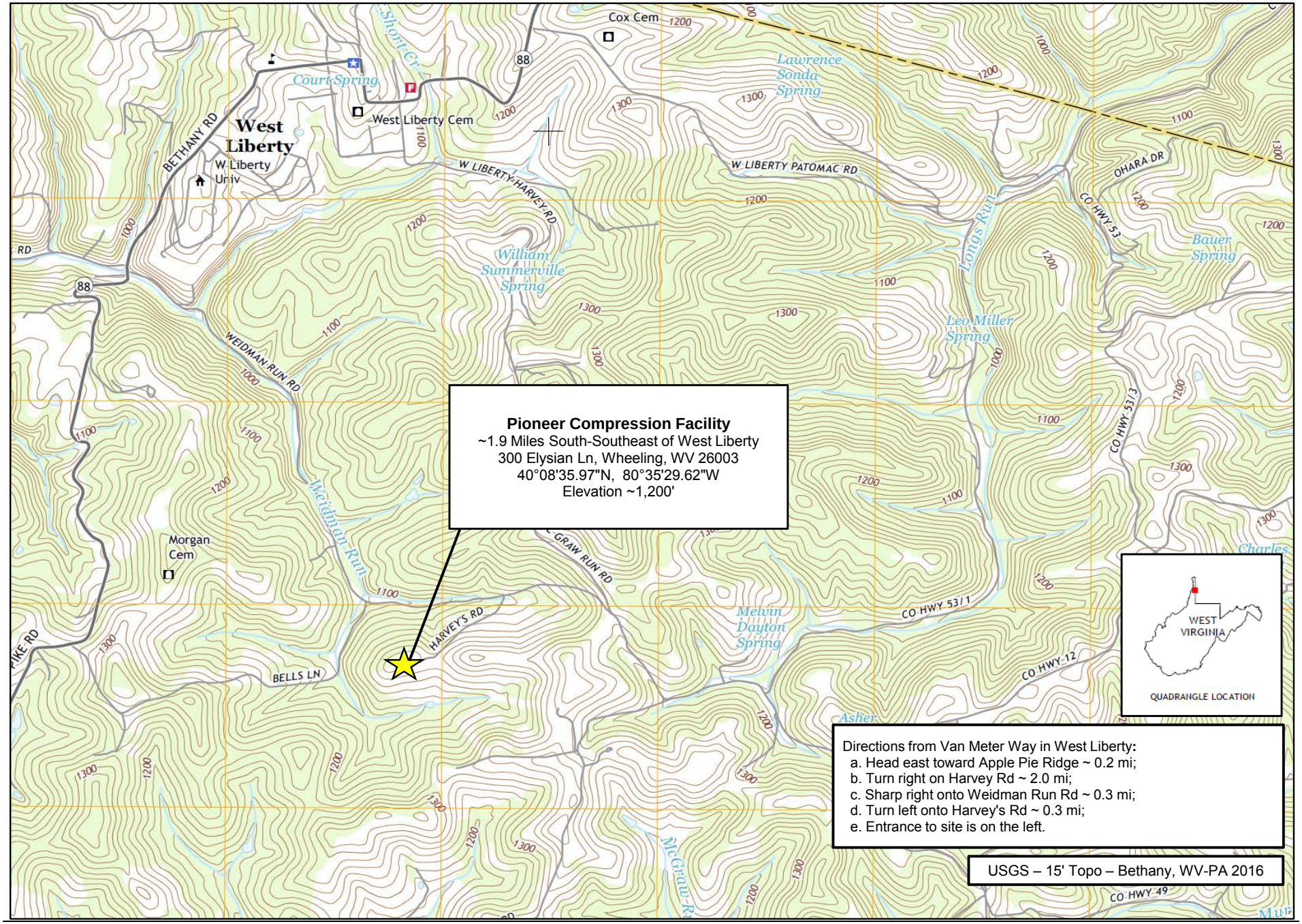


ATTACHMENT G

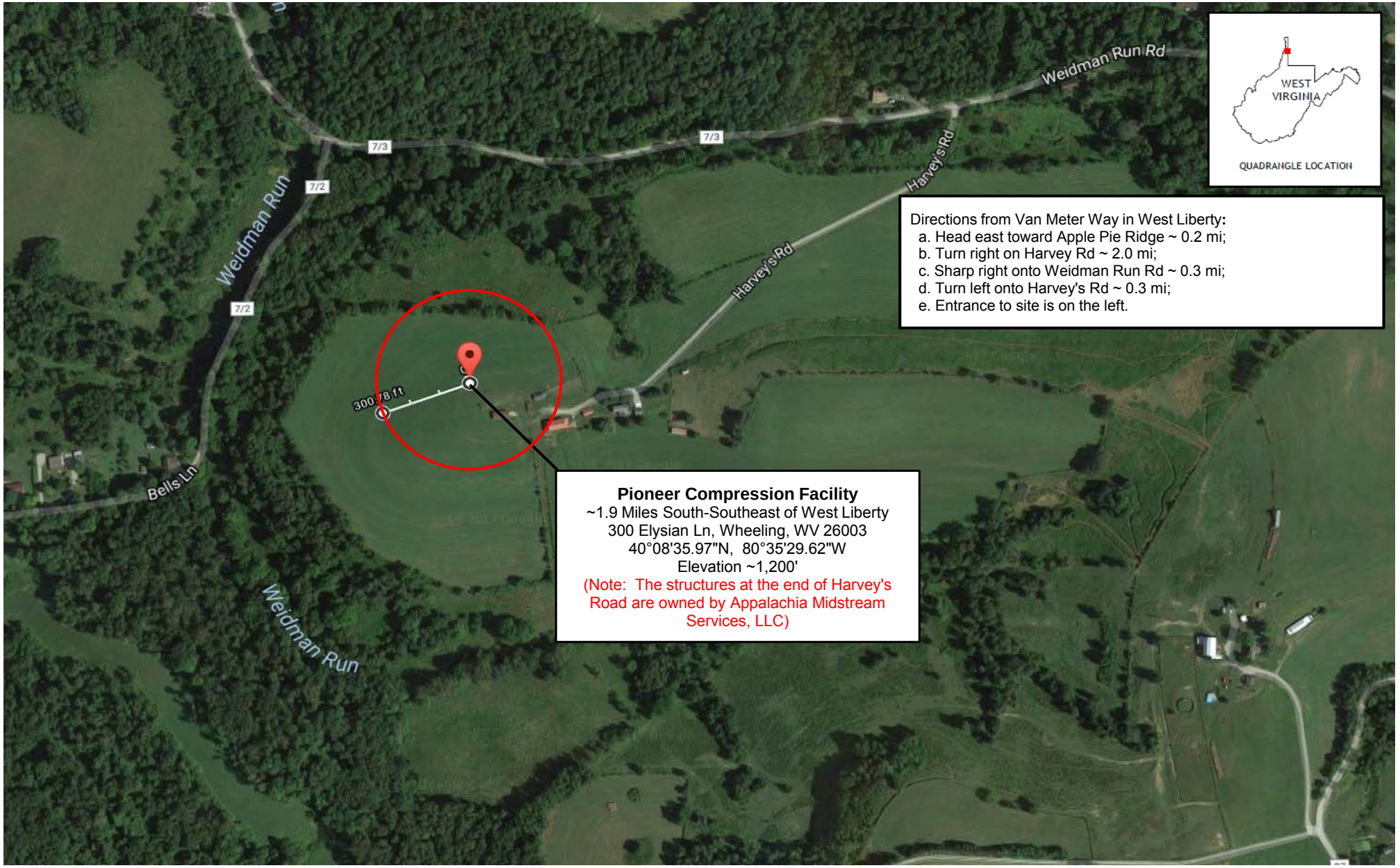
Area Map

G35-D General Permit Registration

Attachment G - Location/Topographic Map



Attachment G' - Area Map



ATTACHMENT H

G35-D Section Applicability Form

G35-D General Permit Registration

General Permit G35-D Registration
Section Applicability Form

General Permit G35-D was developed to allow qualified applicants to seek registration for a variety of sources. These sources include storage vessels, gas production units, in-line heaters, heater treaters, glycol dehydration units and associated reboilers, pneumatic controllers, centrifugal compressors, reciprocating compressors, reciprocating internal combustion engines (RICEs), tank truck loading, fugitive emissions, completion combustion devices, flares, enclosed combustion devices, and vapor recovery systems. All registered facilities will be subject to Sections 1.0, 2.0, 3.0, and 4.0.

General Permit G35-D allows the registrant to choose which sections of the permit they are seeking registration under. Therefore, please mark which additional sections that you are applying for registration under. If the applicant is seeking registration under multiple sections, please select all that apply. Please keep in mind, that if this registration is approved, the issued registration will state which sections will apply to your affected facility.

GENERAL PERMIT G35-D APPLICABLE SECTIONS	
☒ Section 5.0	Storage Vessels Containing Condensate and/or Produced Water[1]
☐ Section 6.0	Storage Vessel Affected Facility (NSPS, Subpart OOOO/OOOOa)
☒ Section 7.0	Control Devices and Emission Reduction Devices not subject to NSPS Subpart OOOO/OOOOa and/or NESHAP Subpart HH
☒ Section 8.0	Small Heaters and Reboilers not subject to 40CFR60 Subpart Dc
☐ Section 9.0	Pneumatic Controllers Affected Facility (NSPS, Subpart OOOO/OOOOa)
☐ Section 10.0	Centrifugal Compressor Affected Facility (NSPS, Subpart OOOO/OOOOa)[2]
☒ Section 11.0	Reciprocating Compressor Affected Facility (NSPS, Subpart OOOO/OOOOa)[2]
☒ Section 12.0	Reciprocating Internal Combustion Engines, Generator Engines. Microturbine Generators
☒ Section 13.0	Tanker Truck Loading[3]
☒ Section 14.0	Glycol Dehydration Units[4]
☒ Section 15.0	Blowdown and Pigging Operations
☒ Section 16.0	Fugitive Emission Components (NSPS, Subpart OOOOa)

1 *Applicants that are subject to Section 5 may also be subject to Section 6 if the applicant is subject to the NSPS, Subpart OOOO/OOOOa control requirements or the applicable control device requirements of Section 7.*

2 *Applicants that are subject to Section 10 and 11 may also be subject to the applicable RICE requirements of Section 12.*

3 *Applicants that are subject to Section 13 may also be subject to control device and emission reduction device requirements of Section 7.*

4 *Applicants that are subject to Section 14 may also be subject to the requirements of Section 8 (reboilers). Applicants that are subject to Section 14 may also be subject to control device and emission reduction device requirements of Section 7.*

ATTACHMENT I

Emission Units/ERD Table

G35-D General Permit Registration

ATTACHMENT I – EMISSION UNITS / EMISSION REDUCTION DEVICES (ERD) TABLE

Include ALL emission units and air pollution control devices/ERDs that will be part of this permit application review. Do not include fugitive emission sources in this table. Deminimis storage tanks shall be listed in the Attachment K table. This information is required for all sources regardless of whether it is a construction, modification, or administrative update.

Emission Unit ID[1]	Emission Point ID[2]	Emission Unit Description	Year Installed	Manufac. Date[3]	Design Capacity	Type[4] and Date of Change	Control Device(s)[5]	ERD(s)[6]
CE-01	1E	Caterpillar G3616 A4 Compressor Engine	2017	After 2012	5,000 bhp	NEW	01-OxCat	---
CE-02	2E	Caterpillar G3616 A4 Compressor Engine	2017	After 2012	5,000 bhp	NEW	02-OxCat	---
CE-03	3E	Caterpillar G3616 A4 Compressor Engine	2017	After 2012	5,000 bhp	NEW	03-OxCat	---
CE-04	4E	Caterpillar G3616 A4 Compressor Engine	2017	After 2012	5,000 bhp	NEW	04-OxCat	---
CRP	5E	Compressor Rod Packing	2017	---	20,000 bhp	NEW	---	---
SSM	6E	Startup/Shutdown/Maintenance (Blowdown)	2017	---	20,000 bhp	NEW	FLR-01	---
DFT-01	7E	TEG Dehydrator - Flash Tank	2017	---	125.0 MMscfd	NEW	TO-01	---
DSV-01	8E	TEG Dehydrator - Still Vent	2017	---	125.0 MMscfd	NEW	TO-01	---
DFT-02	9E	TEG Dehydrator - Flash Tank	2017	---	125.0 MMscfd	NEW	TO-01	---
DSV-02	10E	TEG Dehydrator - Still Vent	2017	---	125.0 MMscfd	NEW	TO-01	---
TO-01	11E	Thermal Oxidizer	2017	---	9.26 MMBtu/hr	NEW	---	---
RBV-01	12E	TEG Dehydrator - Reboiler Vent	2017	---	2.0 MMBtu/hr	NEW	---	---
RBV-02	13E	TEG Dehydrator - Reboiler Vent	2017	---	2.0 MMBtu/hr	NEW	---	---
FLR-01	14E	SSM Flare	2017	---	9,531 MMBtu/hr	NEW	---	---
T-01	15E	Storage Tank - Stabilized Condensate	2017	> 09/18/15	400 bbl	NEW	TO-01	---
T-02	16E	Storage Tank - Stabilized Condensate	2017	> 09/18/15	400 bbl	NEW	TO-01	---
T-03	17E	Storage Tank - Stabilized Condensate	2017	> 09/18/15	400 bbl	NEW	TO-01	---
T-04	18E	Storage Tank - Stabilized Condensate	2017	> 09/18/15	400 bbl	NEW	TO-01	---
T-05	19E	Storage Tank - Stabilized Condensate	2017	> 09/18/15	400 bbl	NEW	TO-01	---
T-06	20E	Storage Tank - Stabilized Condensate	2017	> 09/18/15	400 bbl	NEW	TO-01	---
T-07	21E	Storage Tank - Produced Water	2017	> 09/18/15	400 bbl	NEW	---	---
T-08	22E	Storage Tank - Produced Water	2017	> 09/18/15	400 bbl	NEW	---	---
TLO	23E	Truck Loadout – Stabilized Condensate	2017	---	228,000 bbl/yr	NEW	TO-01	---
		Truck Loadout – Produced Water	2017	---	8,000 bbl/yr	NEW	---	---

[1] For Emission Units (or Sources) use the following numbering system:1S, 2S, 3S,... or other appropriate designation.
[2] For Emission Points use the following numbering system:1E, 2E, 3E, ... or other appropriate designation.
[3] When required by rule
[4] New, modification, removal, existing
[5] For Control Devices use the following numbering system: 1C, 2C, 3C,... or other appropriate designation.
[6] For ERDs use the following numbering system: 1D, 2D, 3D,... or other appropriate designation.

ATTACHMENT J

Fugitive Emissions Summary

G35-D General Permit Registration

ATTACHMENT J – FUGITIVE EMISSIONS SUMMARY SHEET

Sources of fugitive emissions may include loading operations, equipment leaks, blowdown emissions, etc.
Use extra pages for each associated source or equipment if necessary.

Source/Equipment: Fugitive Emissions (FUG-G/FUG-L)

Leak Detection Method Used	☐ Audible, visual, and olfactory (AVO) inspections	☐ Infrared (FLIR) cameras	☐ Other (please describe)	☐ None required

Is the facility subject to quarterly LDAR monitoring under 40CFR60 Subpart OOOOa? ☒ Yes ☐ No. If no, why?

Component Type	Closed Vent System	Count	Source of Leak Factors (EPA, other (specify))	Stream type (gas, liquid, etc.)	Estimated Emissions (tpy)		
					VOC	HAP	GHG (CO_2e)
Pumps	☐ Yes ☒ No	12	EPA Protocol for Equipment Leak Emission Estimates. Table 2-4. (EPA-453/R-95-017, 1995).	☐ Gas ☒ Liquid ☐ Both	0.38	0.06	0
Valves	☐ Yes ☒ No	1536	EPA Protocol for Equipment Leak Emission Estimates. Table 2-4. (EPA-453/R-95-017, 1995).	☐ Gas ☐ Liquid ☒ Both	2.59	0.27	51
Safety Relief Valves	☐ Yes ☒ No			☐ Gas ☐ Liquid ☐ Both			
Open Ended Lines	☐ Yes ☒ No	54	EPA Protocol for Equipment Leak Emission Estimates. Table 2-4. (EPA-453/R-95-017, 1995).	☐ Gas ☐ Liquid ☒ Both	0.45	0.05	10
Sampling Connections	☐ Yes ☒ No			☐ Gas ☐ Liquid ☐ Both			
Connections (Not sampling)	☐ Yes ☒ No	4428	EPA Protocol for Equipment Leak Emission Estimates. Table 2-4. (EPA-453/R-95-017, 1995).	☐ Gas ☐ Liquid ☒ Both	0.30	0.03	7
Compressors	☐ Yes ☒ No			☐ Gas ☐ Liquid ☐ Both			
Flanges	☐ Yes ☒ No	1107	EPA Protocol for Equipment Leak Emission Estimates. Table 2-4. (EPA-453/R-95-017, 1995).	☐ Gas ☐ Liquid ☒ Both	1.15	0.07	45
Other[1]	☐ Yes ☒ No	115	EPA Protocol for Equipment Leak Emission Estimates. Table 2-4. (EPA-453/R-95-017, 1995).	☐ Gas ☐ Liquid ☒ Both	4.82	0.51	94

[1] Other equipment types may include compressor seals, relief valves, diaphragms, drains, meters, etc.

Please indicate if there are any closed vent bypasses (include component):

Specify all equipment used in the closed vent system (e.g. VRU, ERD, thief hatches, tanker truck loading, etc.)

ATTACHMENT K

Storage Vessel(s) Data Sheet

G35-D General Permit Registration

ATTACHMENT K – STORAGE VESSEL DATA SHEET

Complete this data sheet if you are the owner or operator of a storage vessel that contains condensate and/or produced water. This form must be completed for ***each*** new or modified bulk liquid storage vessel(s) that contains condensate and/or produced water. (If you have more than one (1) identical tank (i.e. 4-400 bbl condensate tanks), then you can list all on one (1) data sheet). **Include gas sample analysis, flashing emissions, working and breathing losses, USEPA Tanks, simulation software (ProMax, E&P Tanks, HYSYS, etc.), and any other supporting documents where applicable.**

The following information is REQUIRED:

□ Composition of the representative sample used for the simulation
□ For each stream that contributes to flashing emissions:
- □ Temperature and pressure (inlet and outlet from separator(s))
- □ Simulation-predicted composition
- □ Molecular weight
- □ Flow rate

□ Resulting flash emission factor or flashing emissions from simulation
☒ Working/breathing loss emissions from tanks and/or loading emissions if simulation is used to quantify those emissions

Additional information may be requested if necessary.

GENERAL INFORMATION

1. Bulk Storage Area Name Pioneer Compression Facility	2. Tank Name 400 bbl stabilized condensate tank
3. Emission Unit ID number T-01 thru T-06	4. Emission Point ID number 15E – 20E
5. Date Installed , Modified or Relocated *(for existing tanks)* Was the tank manufactured after August 23, 2011? ☒ Yes ☐ No	6. Type of change: ☒ New construction ☐ New stored material ☐ Other ☐ Relocation
7A. Description of Tank Modification *(if applicable)* NA	
7B. Will more than one material be stored in this tank? *If so, a separate form must be completed for each material.* ☒ Yes ☐ No (The tanks will normally store stabilized condensate; however, they may also store produced water. Emissions for each of the six tanks are based on storage of stabilized condensate as this produces the highest emissions).	
7C. Was USEPA Tanks simulation software utilized? ☒ Yes ☐ No ***If Yes, please provide the appropriate documentation and items 8-42 below are not required.***	

TANK INFORMATION – See EPA TANKS 4.0.9d Output in Attachment U

8. Design Capacity *(specify barrels or gallons).* Use the internal cross-sectional area multiplied by internal height.	
9A. Tank Internal Diameter (ft.)	9B. Tank Internal Height (ft.)
10A. Maximum Liquid Height (ft.)	10B. Average Liquid Height (ft.)
11A. Maximum Vapor Space Height (ft.)	11B. Average Vapor Space Height (ft.)
12. Nominal Capacity *(specify barrels or gallons).* This is also known as "working volume".	
13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
14. Number of tank turnovers per year	15. Maximum tank fill rate (gal/min)
16. Tank fill method ☐ Submerged ☐ Splash ☐ Bottom Loading	
17. Is the tank system a variable vapor space system? ☐ Yes ☐ No If yes, (A) What is the volume expansion capacity of the system (gal)? (B) What are the number of transfers into the system per year?	
18. Type of tank (check all that apply): ☐ Fixed Roof ☐ vertical ☐ horizontal ☐ flat roof ☐ cone roof ☐ dome roof ☐ other (describe) ☐ External Floating Roof ☐ pontoon roof ☐ double deck roof ☐ Domed External (or Covered) Floating Roof ☐ Internal Floating Roof ☐ vertical column support ☐ self-supporting ☐ Variable Vapor Space ☐ lifter roof ☐ diaphragm ☐ Pressurized ☐ spherical ☐ cylindrical ☐ Other (describe)	

PRESSURE/VACUUM CONTROL DATA – See EPA TANKS 4.0.9d Output in Attachment U

19. Check as many as apply: NA

☐ Does Not Apply ☐ Rupture Disc (psig)

☐ Inert Gas Blanket of _____ ☐ Carbon Adsorption[1]

☐ Vent to Vapor Combustion Device[1] (vapor combustors, flares, thermal oxidizers, enclosed combustors)

☐ Conservation Vent (psig) ☐ Condenser[1]

Vacuum Setting Pressure Setting

☐ Emergency Relief Valve (psig)

Vacuum Setting Pressure Setting

☐ Thief Hatch Weighted ☐ Yes ☐ No

[1] Complete appropriate Air Pollution Control Device Sheet

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

Material Name	**Flashing Loss**		**Breathing Loss**		**Working Loss**		**Total Emissions Loss**		**Estimation Method[1]**
	lb/hr	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**	

See Attached Emission Calculations for All Values

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

Remember to attach emissions calculations, including TANKS Summary Sheets and other modeling summary sheets if applicable.

TANK CONSTRUCTION AND OPERATION INFORMATION – See EPA TANKS 4.0.9d Output in Attachment U

21. Tank Shell Construction: ☐ Riveted ☐ Gunite lined ☐ Epoxy-coated rivets ☐ Other (describe)			
21A. Shell Color:	21B. Roof Color:	21C. Year Last Painted:	
22. Shell Condition (if metal and unlined): ☐ No Rust ☐ Light Rust ☐ Dense Rust ☐ Not applicable			
22A. Is the tank heated? ☐ Yes ☐ No	22B. If yes, operating temperature:	22C. If yes, how is heat provided to tank?	
23. Operating Pressure Range (psig): TBD **Must be listed for tanks using VRUs with closed vent system.**			
24. Is the tank a **Vertical Fixed Roof Tank**? ☐ Yes ☐ No	24A. If yes, for dome roof provide radius (ft):	24B. If yes, for cone roof, provide slop (ft/ft):	
25. Complete item 25 for **Floating Roof Tanks** ☐ Does not apply ☐			
25A. Year Internal Floaters Installed:			
25B. Primary Seal Type *(check one):* ☐ Metallic (mechanical) shoe seal ☐ Liquid mounted resilient seal ☐ Vapor mounted resilient seal ☐ Other (describe):			
25C. Is the Floating Roof equipped with a secondary seal? ☐ Yes ☐ No			
25D. If yes, how is the secondary seal mounted? *(check one)* ☐ Shoe ☐ Rim ☐ Other (describe):			
25E. Is the floating roof equipped with a weather shield? ☐ Yes ☐ No			
25F. Describe deck fittings:			
26. Complete the following section for **Internal Floating Roof Tanks** ☐ Does not apply			
26A. Deck Type: ☐ Bolted ☐ Welded	26B. For bolted decks, provide deck construction:		
26C. Deck seam. Continuous sheet construction: ☐ 5 ft. wide ☐ 6 ft. wide ☐ 7 ft. wide ☐ 5 x 7.5 ft. wide ☐ 5 x 12 ft. wide ☐ other (describe)			
26D. Deck seam length (ft.):	26E. Area of deck (ft^2):	26F. For column supported tanks, # of columns:	26G. For column supported tanks, diameter of column:
27. Closed Vent System with VRU? ☐ Yes ☐ No			
28. Closed Vent System with Enclosed Combustor? ☐ Yes ☐ No			
SITE INFORMATION – See EPA TANKS 4.0.9d Output in Attachment U			
29. Provide the city and state on which the data in this section are based:			
30. Daily Avg. Ambient Temperature (°F):	31. Annual Avg. Maximum Temperature (°F):		
32. Annual Avg. Minimum Temperature (°F):	33. Avg. Wind Speed (mph):		
34. Annual Avg. Solar Insulation Factor (BTU/ft^2-day):	35. Atmospheric Pressure (psia):		
LIQUID INFORMATION – See EPA TANKS 4.0.9d Output in Attachment U			
36. Avg. daily temperature range of bulk liquid (°F):	36A. Minimum (°F):	36B. Maximum (°F):	
37. Avg. operating pressure range of tank (psig):	37A. Minimum (psig):	37B. Maximum (psig):	
38A. Minimum liquid surface temperature (°F):	38B. Corresponding vapor pressure (psia):		
39A. Avg. liquid surface temperature (°F):	39B. Corresponding vapor pressure (psia):		
40A. Maximum liquid surface temperature (°F):	40B. Corresponding vapor pressure (psia):		
41. Provide the following for each liquid or gas to be stored in the tank. Add additional pages if necessary.			
41A. Material name and composition:			
41B. CAS number:			
41C. Liquid density (lb/gal):			
41D. Liquid molecular weight (lb/lb-mole):			
41E. Vapor molecular weight (lb/lb-mole):			
41F. Maximum true vapor pressure (psia):			
41G. Maximum Reid vapor pressure (psia):			
41H. Months Storage per year. From: To:			
42. Final maximum gauge pressure and temperature prior to transfer into tank used as inputs into flashing emission calculations.			

ATTACHMENT K – STORAGE VESSEL DATA SHEET (CONTINUED)

Complete this data sheet if you are the owner or operator of a storage vessel that contains condensate and/or produced water. This form must be completed for ***each*** new or modified bulk liquid storage vessel(s) that contains condensate and/or produced water. (If you have more than one (1) identical tank (i.e. 4-400 bbl condensate tanks), then you can list all on one (1) data sheet). **Include gas sample analysis, flashing emissions, working and breathing losses, USEPA Tanks, simulation software (ProMax, E&P Tanks, HYSYS, etc.), and any other supporting documents where applicable.**

The following information is REQUIRED:

☐ Composition of the representative sample used for the simulation
☐ For each stream that contributes to flashing emissions:
- ☐ Temperature and pressure (inlet and outlet from separator(s))
- ☐ Simulation-predicted composition
- ☐ Molecular weight
- ☐ Flow rate

☐ Resulting flash emission factor or flashing emissions from simulation
☒ Working/breathing loss emissions from tanks and/or loading emissions if simulation is used to quantify those emissions

Additional information may be requested if necessary.

GENERAL INFORMATION

1. Bulk Storage Area Name Pioneer Compression Facility	2. Tank Name 400 bbl produced water tank
3. Emission Unit ID number T-07 thru T-08	4. Emission Point ID number 21E – 22E
5. Date Installed , Modified or Relocated *(for existing tanks)* Was the tank manufactured after August 23, 2011? ☒ Yes ☐ No	6. Type of change: ☒ New construction ☐ New stored material ☐ Other ☐ Relocation
7A. Description of Tank Modification *(if applicable)* NA	
7B. Will more than one material be stored in this tank? *If so, a separate form must be completed for each material.* ☐ Yes ☒ No	
7C. Was USEPA Tanks simulation software utilized? ☒ Yes ☐ No ***If Yes, please provide the appropriate documentation and items 8-42 below are not required.***	

TANK INFORMATION – See EPA TANKS 4.0.9d Output in Attachment U

8. Design Capacity *(specify barrels or gallons).* Use the internal cross-sectional area multiplied by internal height.	
9A. Tank Internal Diameter (ft.)	9B. Tank Internal Height (ft.)
10A. Maximum Liquid Height (ft.)	10B. Average Liquid Height (ft.)
11A. Maximum Vapor Space Height (ft.)	11B. Average Vapor Space Height (ft.)
12. Nominal Capacity *(specify barrels or gallons).* This is also known as "working volume".	
13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
14. Number of tank turnovers per year	15. Maximum tank fill rate (gal/min)
16. Tank fill method ☐ Submerged ☐ Splash ☐ Bottom Loading	
17. Is the tank system a variable vapor space system? ☐ Yes ☐ No If yes, (A) What is the volume expansion capacity of the system (gal)? (B) What are the number of transfers into the system per year?	
18. Type of tank (check all that apply): ☐ Fixed Roof ☐ vertical ☐ horizontal ☐ flat roof ☐ cone roof ☐ dome roof ☐ other (describe) ☐ External Floating Roof ☐ pontoon roof ☐ double deck roof ☐ Domed External (or Covered) Floating Roof ☐ Internal Floating Roof ☐ vertical column support ☐ self-supporting ☐ Variable Vapor Space ☐ lifter roof ☐ diaphragm ☐ Pressurized ☐ spherical ☐ cylindrical ☐ Other (describe)	

PRESSURE/VACUUM CONTROL DATA – See EPA TANKS 4.0.9d Output in Attachment U

19. Check as many as apply: NA

☐ Does Not Apply ☐ Rupture Disc (psig)

☐ Inert Gas Blanket of _____ ☐ Carbon Adsorption[1]

☐ Vent to Vapor Combustion Device[1] (vapor combustors, flares, thermal oxidizers, enclosed combustors)

☐ Conservation Vent (psig) ☐ Condenser[1]

Vacuum Setting Pressure Setting

☐ Emergency Relief Valve (psig)

Vacuum Setting Pressure Setting

☐ Thief Hatch Weighted ☐ Yes ☐ No

[1] Complete appropriate Air Pollution Control Device Sheet

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

Material Name	**Flashing Loss**		**Breathing Loss**		**Working Loss**		**Total Emissions Loss**		**Estimation Method[1]**
	lb/hr	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**	
See Attached Emission Calculations for All Values									

[1] EPA = EPA Emission Factor, MB = Material Balance, SS = Similar Source, ST = Similar Source Test, Throughput Data, O = Other (specify)
Remember to attach emissions calculations, including TANKS Summary Sheets and other modeling summary sheets if applicable.

TANK CONSTRUCTION AND OPERATION INFORMATION – See EPA TANKS 4.0.9d Output in Attachment U
21. Tank Shell Construction:

☐ Riveted ☐ Gunite lined ☐ Epoxy-coated rivets ☐ Other (describe)		
21A. Shell Color:	21B. Roof Color:	21C. Year Last Painted:
22. Shell Condition (if metal and unlined): ☐ No Rust ☐ Light Rust ☐ Dense Rust ☐ Not applicable		
22A. Is the tank heated? ☐ Yes ☐ No	22B. If yes, operating temperature:	22C. If yes, how is heat provided to tank?
23. Operating Pressure Range (psig): TBD **Must be listed for tanks using VRUs with closed vent system.**		
24. Is the tank a **Vertical Fixed Roof Tank**? ☐ Yes ☐ No	24A. If yes, for dome roof provide radius (ft):	24B. If yes, for cone roof, provide slop (ft/ft):
25. Complete item 25 for **Floating Roof Tanks** ☐ Does not apply ☐		
25A. Year Internal Floaters Installed:		
25B. Primary Seal Type *(check one):* ☐ Metallic (mechanical) shoe seal ☐ Liquid mounted resilient seal ☐ Vapor mounted resilient seal ☐ Other (describe):		
25C. Is the Floating Roof equipped with a secondary seal? ☐ Yes ☐ No		
25D. If yes, how is the secondary seal mounted? *(check one)* ☐ Shoe ☐ Rim ☐ Other (describe):		
25E. Is the floating roof equipped with a weather shield? ☐ Yes ☐ No		
25F. Describe deck fittings:		
26. Complete the following section for **Internal Floating Roof Tanks** ☐ Does not apply		
26A. Deck Type: ☐ Bolted ☐ Welded	26B. For bolted decks, provide deck construction:	
26C. Deck seam. Continuous sheet construction: ☐ 5 ft. wide ☐ 6 ft. wide ☐ 7 ft. wide ☐ 5 x 7.5 ft. wide ☐ 5 x 12 ft. wide ☐ other (describe)		
26D. Deck seam length (ft.):	26E. Area of deck (ft^2):	26F. For column supported tanks, # of columns:	26G. For column supported tanks, diameter of column:
27. Closed Vent System with VRU? ☐ Yes ☐ No		
28. Closed Vent System with Enclosed Combustor? ☐ Yes ☐ No		
SITE INFORMATION – See EPA TANKS 4.0.9d Output in Attachment U		
29. Provide the city and state on which the data in this section are based:		
30. Daily Avg. Ambient Temperature (°F):	31. Annual Avg. Maximum Temperature (°F):	
32. Annual Avg. Minimum Temperature (°F):	33. Avg. Wind Speed (mph):	
34. Annual Avg. Solar Insulation Factor (BTU/ft^2-day):	35. Atmospheric Pressure (psia):	
LIQUID INFORMATION – See EPA TANKS 4.0.9d Output in Attachment U		
36. Avg. daily temperature range of bulk liquid (°F):	36A. Minimum (°F):	36B. Maximum (°F):
37. Avg. operating pressure range of tank (psig):	37A. Minimum (psig):	37B. Maximum (psig):
38A. Minimum liquid surface temperature (°F):	38B. Corresponding vapor pressure (psia):	
39A. Avg. liquid surface temperature (°F):	39B. Corresponding vapor pressure (psia):	
40A. Maximum liquid surface temperature (°F):	40B. Corresponding vapor pressure (psia):	
41. Provide the following for each liquid or gas to be stored in the tank. Add additional pages if necessary.		
41A. Material name and composition:		
41B. CAS number:		
41C. Liquid density (lb/gal):		
41D. Liquid molecular weight (lb/lb-mole):		
41E. Vapor molecular weight (lb/lb-mole):		
41F. Maximum true vapor pressure (psia):		
41G. Maximum Reid vapor pressure (psia):		
41H. Months Storage per year. From: To:		
42. Final maximum gauge pressure and temperature prior to transfer into tank used as inputs into flashing emission calculations.		

STORAGE TANK DATA TABLE

STORAGE TANK DATA TABLE

List all deminimis storage tanks (i.e. lube oil, glycol, diesel etc.)

Source ID #[1]	Status[2]	Content[3]	Volume[4]
T-09	NEW	Lube Oil	4,200
T-10	NEW	Used Oil	4,200
T-11	NEW	Coolant	4,200
T-12	NEW	Used Coolant	4,200
T-13	NEW	Methanol	4,200
T-14	NEW	Engine Oil	520
T-15	NEW	Engine Oil	520
T-16	NEW	Engine Oil	520
T-17	NEW	Engine Oil	520
T-18	NEW	Compressor Oil	520
T-19	NEW	Compressor Oil	520
T-20	NEW	Compressor Oil	520
T-21	NEW	Compressor Oil	520
T-22	NEW	Triethylene Glycol	1,000

1. Enter the appropriate Source Identification Numbers (Source ID #) for each storage tank located at the compressor station. Tanks should be designated T01, T02, T03, etc.
2. Enter storage tank Status using the following:
   - EXIST Existing Equipment
   - NEW Installation of New Equipment
   - REM Equipment Removed
3. Enter storage tank content such as condensate, pipeline liquids, glycol (DEG or TEG), lube oil, diesel, mercaptan etc.
4. Enter the maximum design storage tank volume in gallons.

ATTACHMENT L

Natural Gas Fired Fuel Burning Unit(s) Data Sheet

G35-D General Permit Registration

ATTACHMENT L – SMALL HEATERS AND REBOILERS NOT SUBJECT TO 40CFR60 SUBPART DC
DATA SHEET

Complete this data sheet for each small heater and reboiler not subject to 40CFR60 Subpart Dc at the facility. ***The Maximum Design Heat Input (MDHI) must be less than 10 MMBTU/hr.***

Emission Unit ID#[1]	Emission Point ID#[2]	Emission Unit Description (manufacturer, model #)	Year Installed/ Modified	Type[3] and Date of Change	Maximum Design Heat Input (MMBTU/hr)[4]	Fuel Heating Value (BTU/scf)[5]
RBV-01	12E	Dehydrator Reboiler 01	2017	NEW	2.0	1300
RBV-02	13E	Dehydrator Reboiler 02	2017	NEW	2.0	1300

1 Enter the appropriate Emission Unit (or Source) identification number for each fuel burning unit located at the production pad. Gas Producing Unit Burners should be designated GPU-1, GPU-2, etc. Heater Treaters should be designated HT-1, HT-2, etc. Heaters or Line Heaters should be designated LH-1, LH-2, etc. For sources, use 1S, 2S, 3S…or other appropriate designation. Enter glycol dehydration unit Reboiler Vent data on the Glycol Dehydration Unit Data Sheet.

2 Enter the appropriate Emission Point identification numbers for each fuel burning unit located at the production pad. Gas Producing Unit Burners should be designated GPU-1, GPU-2, etc. Heater Treaters should be designated HT-1, HT-2, etc. Heaters or Line Heaters should be designated LH-1, LH-2, etc. For emission points, use 1E, 2E, 3E…or other appropriate designation.

3 New, modification, removal

4 Enter design heat input capacity in MMBtu/hr.

5 Enter the fuel heating value in BTU/standard cubic foot.

ATTACHMENT M

Internal Combustion Engine Data Sheet(s)

G35-D General Permit Registration

ATTACHMENT M – INTERNAL COMBUSTION ENGINE DATA SHEET

Complete this data sheet for each internal combustion engine at the facility. Include manufacturer performance data sheet(s) or any other supporting document if applicable. Use extra pages if necessary. *Generator(s) and microturbine generator(s) shall also use this form.*

Emission Unit ID#[1]	CE-01	CE-02	CE-03
Engine Manufacturer/Model	CAT G3616LE	CAT G3616LE	CAT G3616LE
Manufacturers Rated bhp/rpm	5,000/1,000	5,000/1,000	5,000/1,000
Source Status[2]	NEW	NEW	NEW
Date Installed/ Modified/Removed/Relocated[3]	2017	2017	2017
Engine Manufactured /Reconstruction Date[4]	After 2012	After 2012	After 2012
Check all applicable Federal Rules for the engine (include EPA Certificate of Conformity if applicable)[5]	☒40CFR60 Subpart JJJJ ☐JJJJ Certified? ☐40CFR60 Subpart IIII ☐IIII Certified? ☒40CFR63 Subpart ZZZZ ☐ NESHAP ZZZZ/ NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources	☒40CFR60 Subpart JJJJ ☐JJJJ Certified? ☐40CFR60 Subpart IIII ☐IIII Certified? ☒40CFR63 Subpart ZZZZ ☐ NESHAP ZZZZ/ NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources	☒40CFR60 Subpart JJJJ ☐JJJJ Certified? ☐40CFR60 Subpart IIII ☐IIII Certified? ☒40CFR63 Subpart ZZZZ ☐ NESHAP ZZZZ/ NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources
Engine Type[6]	4SLB	4SLB	4SLB
APCD Type[7]	A/F, OxCat	A/F, OxCat	A/F, OxCat
Fuel Type[8]	RG	RG	RG
H_2S (gr/100 scf)	<0.25	<0.25	<0.25
Operating bhp/rpm	5,000/1,000	5,000/1,000	5,000/1,000
BSFC (BTU/bhp-hr)	6,782 (LHV)	6,782 (LHV)	6,782 (LHV)
Hourly Fuel Throughput	36,859 ft^3/hr gal/hr	36,859 ft^3/hr gal/hr	36,859 ft^3/hr gal/hr
Annual Fuel Throughput (Must use 8,760 hrs/yr unless emergency generator)	322.88 $MMft^3$/yr gal/yr	322.88 $MMft^3$/yr gal/yr	322.88 $MMft^3$/yr gal/yr
Fuel Usage or Hours of Operation Metered	Yes ☒ No ☐	Yes ☒ No ☐	Yes ☒ No ☐

Calculation Methodology[9]	**Pollutant[10]**	**Hourly PTE (lb/hr)[11]**	**Hourly PTE (lb/hr)[11]**	**Hourly PTE (lb/hr)[11]**	**Annual PTE (tons/year)[11]**	**Hourly PTE (lb/hr)[11]**	**Annual PTE (tons/year)[11]**
MD	NO_x	4.41	19.31	4.41	19.31	4.41	19.31
MD	CO	2.58	11.32	2.58	11.32	2.58	11.32
MD	VOC	1.97	8.63	1.97	8.63	1.97	8.63
AP	SO_2	0.02	0.09	0.02	0.09	0.02	0.09
AP	PM_{10}	0.37	1.61	0.37	1.61	0.37	1.61
MD	Formaldehyde	0.28	1.22	0.28	1.22	0.28	1.22
MD/AP	Total HAPs	0.39	1.72	0.39	1.72	0.39	1.72
MD/AP	GHG (CO_2e)	5,401	23,656	5,401	23,656	5,401	23,656

ATTACHMENT M – INTERNAL COMBUSTION ENGINE DATA SHEET

Complete this data sheet for each internal combustion engine at the facility. Include manufacturer performance data sheet(s) or any other supporting document if applicable. Use extra pages if necessary. *Generator(s) and microturbine generator(s) shall also use this form.*

Emission Unit ID#[1]	CE-04		
Engine Manufacturer/Model	CAT G3616LE		
Manufacturers Rated bhp/rpm	5,000/1,000		
Source Status[2]	NEW		
Date Installed/ Modified/Removed/Relocated[3]	2017		
Engine Manufactured /Reconstruction Date[4]	After 2012		
Check all applicable Federal Rules for the engine (include EPA Certificate of Conformity if applicable)[5]	☒40CFR60 Subpart JJJJ ☐JJJJ Certified? ☐40CFR60 Subpart IIII ☐IIII Certified? ☒40CFR63 Subpart ZZZZ ☐ NESHAP ZZZZ/ NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources		
Engine Type[6]	4SLB		
APCD Type[7]	A/F, OxCat		
Fuel Type[8]	RG		
H_2S (gr/100 scf)	<0.25		
Operating bhp/rpm	5,000/1,000		
BSFC (BTU/bhp-hr)	6,782 (LHV)		
Hourly Fuel Throughput	36,859 ft^3/hr gal/hr		
Annual Fuel Throughput (Must use 8,760 hrs/yr unless emergency generator)	322.88 $MMft^3$/yr gal/yr		
Fuel Usage or Hours of Operation Metered	Yes ☒ No ☐		

Calculation Methodology[9]	**Pollutant[10]**	**Hourly PTE (lb/hr)[11]**	**Hourly PTE (lb/hr)[11]**				
MD	NO_x	4.41	19.31				
MD	CO	2.58	11.32				
MD	VOC	1.97	8.63				
AP	SO_2	0.02	0.09				
AP	PM_{10}	0.37	1.61				
MD	Formaldehyde	0.28	1.22				
MD/AP	Total HAPs	0.39	1.72				
MD/AP	GHG (CO_2e)	5,401	23,656				

Engine Air Pollution Control Device
(Emission Unit ID# CE-01 thru CE-04, use extra pages as necessary)

Air Pollution Control Device Manufacturer's Data Sheet included?
Yes ☒ No ☐

☐ NSCR	☐ SCR	☒ Oxidation Catalyst

Provide details of process control used for proper mixing/control of reducing agent with gas stream: na

Manufacturer: Catalytic Combustion	Model #: REM-4815-D-20HB-HFX4 (or equivalent)
Design Operating Temperature: 814 ^{o}F	Design gas volume: 31,291 acfm
Service life of catalyst: 24000 hrs or 3 years, whichever comes first	Provide manufacturer data? ☒Yes ☐ No
Volume of gas handled: 31,291 acfm at 814 ^{o}F	Operating temperature range for NSCR/Ox Cat: From 450 ^{o}F to 1,350 ^{o}F
Reducing agent used, if any: NA	Ammonia slip (ppm): NA

Pressure drop against catalyst bed (delta P): < 2.0 inches of H_2O

Provide description of warning/alarm system that protects unit when operation is not meeting design conditions: Engine is equipped with a monitoring device capable of measuring both the catalyst inlet and exit temperatures and to immediately shut the engine down should the catalyst exit temperature reach the 1,350^{o}F limit.

Is temperature and pressure drop of catalyst required to be monitored per 40CFR63 Subpart ZZZZ?
☐ Yes ☒ No

How often is catalyst recommended or required to be replaced (hours of operation)?
24,000

How often is performance test required?
☒ Initial
☐ Annual
☒ Every 8,760 hours of operation
☐ Field Testing Required
☐ No performance test required. If so, why (please list any maintenance required and the applicable sections in NSPS/GACT,

ATTACHMENT N

Tanker Truck Loading Data Sheet (If Applicable)

G35-D General Permit Registration

ATTACHMENT N – TANKER TRUCK LOADING DATA SHEET

Complete this data sheet for each new or modified bulk liquid transfer area or loading rack at the facility. This is to be used for bulk liquid transfer operations to tanker trucks. Use extra pages if necessary.

Truck Loadout Collection Efficiencies

The following applicable capture efficiencies of a truck loadout are allowed:

- For tanker trucks passing the MACT level annual leak test – 99.2%
- For tanker trucks passing the NSPS level annual leak test – 98.7%
- For tanker trucks not passing one of the annual leak tests listed above – 70%

Compliance with this requirement shall be demonstrated by keeping records of the applicable MACT or NSPS Annual Leak Test certification for ***every*** truck and railcar loaded/unloaded. This requirement can be satisfied if the trucking company provided certification that its entire fleet was compliant. This certification must be submitted in writing to the Director of the DAQ. These additional requirements must be noted in the Registration Application and will be noted on the issued G35-D Registration.

Emission Unit ID#: TLO	Emission Point ID#: 23E	Year Installed/Modified: 2017
Emission Unit Description: Truck Loadout of Stabilized Condensate/Produced Water		
Loading Area Data		
Number of Pumps: 1	Number of Liquids Loaded: 2	Max number of trucks loading at one (1) time: 1
Are tanker trucks pressure tested for leaks at this or any other location? ☐ Yes ☒ No ☐ Not Required If Yes, Please describe:		
Provide description of closed vent system and any bypasses.		
Are any of the following truck loadout systems utilized? ☐ Closed System to tanker truck passing a MACT level annual leak test? ☐ Closed System to tanker truck passing a NSPS level annual leak test? ☒ Closed System to tanker truck not passing an annual leak test and has vapor return?		

Projected Maximum Operating Schedule (for rack or transfer point as a whole)

Time	Jan – Mar	Apr - Jun	Jul – Sept	Oct - Dec
Hours/day	6	6	6	6
Days/week	7	7	7	7

Bulk Liquid Data (use extra pages as necessary)

Liquid Name	Stabilized Condensate	Produced Water	
Max. Daily Throughput (1000 gal/day)	26.236	0.92	
Max. Annual Throughput (1000 gal/yr)	9,576	336	
Loading Method[1]	SUB	SUB	
Max. Fill Rate (gal/min)	117	117	
Average Fill Time (min/loading)	60	60	
Max. Bulk Liquid Temperature (^{o}F)	50.3	50.3	
True Vapor Pressure[2]	5.3	0.3	
Cargo Vessel Condition[3]	U	U	
Control Equipment or Method[4]	TO	na	
Max. Collection Efficiency (%)	70.0	na	

Max. Control Efficiency (%)		98.0	na	
Max.VOC Emission Rate	Loading (lb/hr)	10.30	4.62	
	Annual (ton/yr)	7.04	0.11	
Max.HAP Emission Rate	Loading (lb/hr)	3.09	1.39	
	Annual (ton/yr)	2.11	0.03	
Estimation Method[5]		EPA	EPA	

1 BF Bottom Fill SP Splash Fill SUB Submerged Fill

2 At maximum bulk liquid temperature

3 B Ballasted Vessel C Cleaned U Uncleaned (dedicated service)
O Other (describe)

4 List as many as apply (complete and submit appropriate Air Pollution Control Device Sheets)
CA Carbon Adsorption VB Dedicated Vapor Balance (closed system)
ECD Enclosed Combustion Device F Flare
TO Thermal Oxidization or Incineration

5 EPA EPA Emission Factor in AP-42 MB Material Balance
TM Test Measurement based upon test data submittal O Other (describe)

ATTACHMENT O

Glycol Dehydration Unit Data Sheet(s)

G35-D General Permit Registration

ATTACHMENT O – GLYCOL DEHYDRATION UNIT DATA SHEET

Complete this data sheet for each Glycol Dehydration Unit, Reboiler, Flash Tank and/or Regenerator at the facility. Include gas sample analysis and GRI- GLYCalc™ input and aggregate report. Use extra pages if necessary.

Manufacturer: Williams	Model: TBD
Max. Dry Gas Flow Rate: 125 MMscf/day	Reboiler Design Heat Input: 2.0 MMBTU/hr
Design Type: ☒ TEG ☐ DEG ☐ EG	Source Status[1]: NEW
Date Installed/Modified/Removed[2]: 2017	Regenerator Still Vent APCD/ERD[3]: TO
Control Device/ERD ID#[3]: TO-01	Fuel HV (BTU/scf): 1300
H_2S Content (gr/100 scf): < 0.25	Operation (hours/year): 8,760

Pump Rate (gal/min): 20.0 (electric - primary), 7.5 (gas-assisted - backup)

Water Content (wt %) in: Wet Gas: 0.068 vol% Dry Gas: 0.0049 vol%

Is the glycol dehydration unit exempt from 40CFR63 Section 764(d)? ☒ Yes ☐ No: If Yes, answer the following:

The actual annual average flowrate of natural gas to the glycol dehydration unit is less than 85 thousand standard cubic meters per day, as determined by the procedures specified in §63.772(b)(1) of this subpart. ☐ Yes ☒ No

The actual average emissions of benzene from the glycol dehydration unit process vent to the atmosphere are less than 0.90 megagram per year (1 ton per year), as determined by the procedures specified in §63.772(b)(2) of this subpart. ☒ Yes ☐ No

Is the glycol dehydration unit located within an Urbanized Area (UA) or Urban Cluster (UC)? ☐ Yes ☒ No

Is a lean glycol pump optimization plan being utilized? ☐ Yes ☒ No

Recycling the glycol dehydration unit back to the flame zone of the reboiler.
☒ Yes ☐ No
If yes:
Is the reboiler configured to accept flash drum vapors (straight from the glycol dehydrator)? ☒ Yes ☐ No
Is the reboiler configured to accept still vent vapors (after a condenser)? ☐ Yes ☒ No
Is the reboiler configured to accept both in the same operation? ☐ Yes ☒ No

Recycling the glycol dehydration unit back to the flame zone of the reboiler and mixed with fuel.
☒ Yes ☐ No

What happens when temperature controller shuts off fuel to the reboiler?
☐ Still vent emissions to the atmosphere. ☒ Still vent emissions to the thermal oxidizer.
☐ Still vent emissions stopped with valve.
☐ Still vent emissions to glow plug.

Please indicate if the following equipment is present.
☒ Flash Tank
☐ Burner management system that continuously burns condenser or flash tank vapors

Control Device Technical Data

Pollutants Controlled	Manufacturer's Guaranteed Control Efficiency (%)
VOC	98
HAPs	98

Emissions Data

Emission Unit ID / Emission Point ID[4]	Description	Calculation Methodology[5]	PTE[6]	Controlled Maximum Hourly Emissions (lb/hr)	Controlled Maximum Annual Emissions (tpy)
RBV-01, RBV-02 (each)	Reboiler Vent	EPA AP-42	NO_x	0.20	0.86
		EPA AP-42	CO	0.16	0.72
		EPA AP-42	VOC	0.01	0.05
		EPA AP-42	SO_2	1.2E-03	0.01

		EPA AP-42	PM_{10}	0.01	0.07
		EPA AP-42	GHG (CO_2e)	237	1,037
DSV-01, DSV-02 (each)	Glycol Regenerator Still Vent	GRI-GlyCalc™	VOC	1.23	5.37
		GRI-GlyCalc™	Benzene	0.02	0.08
		GRI-GlyCalc™	Toluene	0.08	0.36
		GRI-GlyCalc™	Ethylbenzene	0.06	0.26
		GRI-GlyCalc™	Xylenes	0.10	0.44
		GRI-GlyCalc™	n-Hexane	0.03	0.14
DFT-01, DFT-02 (each)	Glycol Flash Tank	GRI-GlyCalc™	VOC	0.93	4.09
		GRI-GlyCalc™	Benzene	2.1E-04	9.2E-04
		GRI-GlyCalc™	Toluene	5.8E-04	2.5E-03
		GRI-GlyCalc™	Ethylbenzene	2.3E-04	1.0E-03
		GRI-GlyCalc™	Xylenes	2.6E-04	1.2E-03
		GRI-GlyCalc™	n-Hexane	0.01	0.05

1 Enter the Source Status using the following codes:
NS Construction of New Source ES Existing Source
MS Modification of Existing Source

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

3 Enter the Air Pollution Control Device (APCD)/Emission Reduction Device (ERD) type designation using the following codes and the device ID number:
NA None CD Condenser FL Flare
CC Condenser/Combustion Combination TO Thermal Oxidizer O Other (please list)

4 Enter the appropriate Emission Unit ID Numbers and Emission Point ID Numbers for the glycol dehydration unit reboiler vent and glycol regenerator still vent. The glycol dehydration unit reboiler vent and glycol regenerator still vent should be designated RBV-1 and RSV-1, respectively. If the compressor station incorporates multiple glycol dehydration units, a Glycol Dehydration Emission Unit Data Sheet shall be completed for each, using Source Identification RBV-2 and RSV-2, RBV-3 and RSV-3, etc.

5 Enter the Potential Emissions Data Reference designation using the following codes:
MD Manufacturer's Data AP AP-42
GR GRI-GLYCalc™ OT Other (please list)

6 Enter the Reboiler Vent and Glycol Regenerator Still Vent Potential to Emit (PTE) for the listed regulated pollutants in lbs per hour and tons per year. The Glycol Regenerator Still Vent potential emissions may be determined using the most recent version of the thermodynamic software model GRI-GLYCalc™ (Radian International LLC & Gas Research Institute). **Attach all referenced Potential Emissions Data (or calculations) and the GRI-GLYCalc™ Aggregate Calculations Report (shall include emissions reports, equipment reports, and stream reports) to this Glycol Dehydration Emission Unit Data Sheet(s). Backup pumps do not have to be considered as operating for purposes of PTE.** This PTE data shall be incorporated in the Emissions Summary Sheet.

ATTACHMENT P

Pneumatic Controllers Data Sheet(s)

G35-D General Permit Registration

ATTACHMENT P – PNEUMATIC CONTROLLERS DATA SHEET

Are there any continuous bleed natural gas driven pneumatic controllers at this facility that commenced construction, modification or reconstruction after August 23, 2011, and on or before September 18, 2015?

☐ Yes ☒ No

Please list approximate number.

Are there any continuous bleed natural gas driven pneumatic controllers at this facility that commenced construction, modification or reconstruction after September 18, 2015?

☐ Yes ☒ No

Please list approximate number.

Are there any continuous bleed natural gas driven pneumatic controllers at this facility with a bleed rate greater than 6 standard cubic feet per hour that are required based on functional needs, including but not limited to response time, safety and positive actuation that commenced construction, modification or reconstruction after August 23, 2011, and on or before September 18, 2015?

☐ Yes ☒ No

Please list approximate number.

Are there any continuous bleed natural gas driven pneumatic controllers at this facility with a bleed rate greater than 6 standard cubic feet per hour that are required based on functional needs, including but not limited to response time, safety and positive actuation that commenced construction, modification or reconstruction after September 18, 2015?

☐ Yes ☒ No

Please list approximate number.

ATTACHMENT Q

Centrifugal Compressor Data Sheet(s)

G35-D General Permit Registration

ATTACHMENT Q – CENTRIFUGAL COMPRESSOR DATA SHEET

Are there any centrifugal compressors at this facility that commenced construction, modification or reconstruction after August 23, 2011, and on or before September 18, 2015?

☐ Yes ☒ No

Please list:

Emission Unit ID#	Compressor Description

Are there any centrifugal compressors at this facility that commenced construction, modification or reconstruction after September 18, 2015?

☐ Yes ☒ No

Please list:

Emission Unit ID#	Compressor Description

ATTACHMENT R

Reciprocating Compressor Data Sheet(s)

G35-D General Permit Registration

ATTACHMENT R – RECIPROCATING COMPRESSOR DATA SHEET

Are there any reciprocating compressors at this facility that commenced construction, modification or reconstruction after August 23, 2011, and on or before September 18, 2015?

☐ Yes ☒ No

Please list:

Emission Unit ID#	Compressor Description

Are there any reciprocating compressors at this facility that commenced construction, modification or reconstruction after September 18, 2015?

☒ Yes ☐ No

Please list:

Emission Unit ID#	Compressor Description
CRP	Natural Gas Compressor 01
CRP	Natural Gas Compressor 02
CRP	Natural Gas Compressor 03
CRP	Natural Gas Compressor 04
CRP	Stabilized Condensate Tanks VRU Compressor

ATTACHMENT S

Blowdown and Pigging Operations Data Sheet(s)

G35-D General Permit Registration

ATTACHMENT S – BLOWDOWN AND PIGGING OPERATIONS DATA SHEET

Will there be any blowdown and pigging operations that occur at this facility?

☒ Yes ☐ No

Please list:

Type of Event	# of Events (event/yr)	Amount Vented per event (scf/event)	MW of vented gas (lb/lb-mol)	Total Emissions (ton/yr)	VOC weight fraction	VOC emissions (ton/yr)
Compressor Blowdown	**These emissions are accounted for under startup/shutdown/maintenance (SSM). Please reference Attachment U for details.**					
Compressor Startup						
Plant Shutdown						
Low Pressure Pig Venting						
High Pressure Pig Venting						

Type of Event	# of Events (event/yr)	Amount Vented per event (scf/event)	MW of vented gas (lb/lb-mol)	Total Emissions (ton/yr)	HAP weight fraction	HAP emissions (ton/yr)
Compressor Blowdown	**These emissions are accounted for under startup/shutdown/maintenance (SSM). Please reference Attachment U for details.**					
Compressor Startup						
Plant Shutdown						
Low Pressure Pig Venting						
High Pressure Pig Venting						

ATTACHMENT T

Air Pollution Control Device

G35-D General Permit Registration

ATTACHMENT T – AIR POLLUTION CONTROL DEVICE / EMISSION REDUCTION DEVICE SHEETS

Complete the applicable air pollution control device sheets for each flare, vapor combustor, thermal oxidizer, condenser, adsorption system, vapor recovery unit, BTEX Eliminator, Reboiler with and without Glow Plug, etc. at the facility. Use extra pages if necessary.

Emissions calculations must be performed using the most conservative control device efficiency.

The following five (5) rows are only to be completed if registering an alternative air pollution control device.	
Emission Unit ID:	Make/Model:
Primary Control Device ID:	Make/Model:
Control Efficiency (%):	APCD/ERD Data Sheet Completed: ☐ Yes ☐ No
Secondary Control Device ID:	Make/Model:
Control Efficiency (%):	APCD/ERD Data Sheet Completed: ☐ Yes ☐ No

VAPOR COMBUSTION
(Including Enclosed Combustors)

General Information

Control Device ID#: FLR-01	Installation Date: 2017 ☒ New ☐ Modified ☐ Relocated	
Maximum Rated Total Flow Capacity 7,942,197 scfh 190,612,732 scfd	Maximum Design Heat Input (from mfg. spec sheet) 9,531 MMBTU/hr	Design Heat Content 1,200 BTU/scf (LHV)

Control Device Information

Type of Vapor Combustion Control?

☐ Enclosed Combustion Device ☒ Elevated Flare ☐ Ground Flare
☐ Thermal Oxidizer

Manufacturer: Zeeco Model: MJ-16 (Sonic Flare)	Hours of operation per year? 8,760

List the emission units whose emissions are controlled by this vapor control device (Emission Point ID# SSM)

Emission Unit ID#	Emission Source Description	Emission Unit ID#	Emission Source Description
SSM	Startup/Shutdown/Maintenance		

If this vapor combustor controls emissions from more than six (6) emission units, please attach additional pages.

Assist Type (Flares only)	Flare Height	Tip Diameter	Was the design per §60.18?
☐ Steam ☒ Air ☐ Pressure ☐ Non	145 feet	1.5 feet	☐ Yes ☒ No Provide determination.

Waste Gas Information

Maximum Waste Gas Flow Rate 73.8 (scfm)	Heat Value of Waste Gas Stream 1342 BTU/ft^3	Exit Velocity of the Emissions Stream 1,129 (ft/s)

Provide an attachment with the characteristics of the waste gas stream to be burned.

Pilot Gas Information

Number of Pilot Lights 2	Fuel Flow Rate to Pilot Flame per Pilot 50 scfh	Heat Input per Pilot 50,000 BTU/hr	Will automatic re-ignition be used? ☒ Yes ☐ No

If automatic re-ignition is used, please describe the method. Automatic Flame Front Generator (FL-7002 BR) Ignition System

Is pilot flame equipped with a monitor to detect the presence of the flame? ☒ Yes ☐ No	If Yes, what type? ☒ Thermocouple ☐ Infrared ☐ Ultraviolet ☐ Camera ☐ Other:

Describe all operating ranges and maintenance procedures required by the manufacturer to maintain the warranty. *(If unavailable, please indicate).*

Additional information attached? ☒ Yes ☐ No
Please attach copies of manufacturer's data sheets, drawings, flame demonstration per §60.18 or §63.11(b) and performance testing.

VAPOR COMBUSTION
(Including Enclosed Combustors)

General Information

Control Device ID#: TO-01	Installation Date: 2017 ☒ New ☐ Modified ☐ Relocated	
Maximum Rated Total Flow Capacity 7,223 scfh 433,385 scfd	Maximum Design Heat Input (from mfg. spec sheet) 9.26 MMBTU/hr	Design Heat Content 1,282 BTU/scf

Control Device Information

Type of Vapor Combustion Control?

☐ Enclosed Combustion Device ☐ Elevated Flare ☐ Ground Flare
☒ Thermal Oxidizer

Manufacturer: Zeeco (or equivalent) Model: Z-HTO (or equivalent)	Hours of operation per year? 8,760

List the emission units whose emissions are controlled by this vapor control device (Emission Point ID# See Below)

Emission Unit ID#	Emission Source Description	Emission Unit ID#	Emission Source Description
DFT-01	Dehydrator 01 Flash Tank Vent	T-03	Stabilized Condensate Tank 03
DSV-01	Dehydrator 01 Still Vent	T-04	Stabilized Condensate Tank 04
DFT-02	Dehydrator 02 Flash Tank Vent	T-05	Stabilized Condensate Tank 05
DSV-02	Dehydrator 02 Still Vent	T-06	Stabilized Condensate Tank 06
T-01	Stabilized Condensate Tank 01	TLO	Stabilized Condensate Truck Loading
T-02	Stabilized Condensate Tank 02		

If this vapor combustor controls emissions from more than six (6) emission units, please attach additional pages.

Assist Type (Flares only) na	Flare Height	Tip Diameter	Was the design per §60.18?
☐ Steam ☐ Air ☐ Pressure ☐ Non	20 feet	3.5 feet	☐ Yes ☒ No Provide determination.

Waste Gas Information

Maximum Waste Gas Flow Rate 118.5 (scfm)	Heat Value of Waste Gas Stream 1,282 BTU/ft^3	Exit Velocity of the Emissions Stream 76.42 (ft/s)

Provide an attachment with the characteristics of the waste gas stream to be burned.

Pilot Gas Information

Number of Pilot Lights 1	Fuel Flow Rate to Pilot Flame per Pilot 100 scfh	Heat Input per Pilot 100,000 BTU/hr	Will automatic re-ignition be used? ☒ Yes ☐ No

If automatic re-ignition is used, please describe the method. Electric spark

Is pilot flame equipped with a monitor to detect the presence of the flame? ☒ Yes ☐ No	If Yes, what type? ☒ Thermocouple ☐ Infrared ☐ Ultraviolet ☐ Camera ☐ Other:

Describe all operating ranges and maintenance procedures required by the manufacturer to maintain the warranty. *(If unavailable, please indicate).*

Additional information attached? ☒ Yes ☐ No
Please attach copies of manufacturer's data sheets, drawings, flame demonstration per §60.18 or §63.11(b) and performance testing.

CONDENSER – *NOT APPLICABLE*		
General Information		
Control Device ID#:	Installation Date: ☐ New ☐ Modified ☐ Relocated	
Manufacturer:	Model:	Control Device Name:
Control Efficiency (%):		
Manufacturer's required temperature range for control efficiency. °F		
Describe the warning and/or alarm system that protects against operation when unit is not meeting the design requirements:		
Describe all operating ranges and maintenance procedures required by the manufacturer to maintain the warranty.		
Additional information attached? ☐ Yes ☐ No Please attach copies of manufacturer's data sheets.		
Is condenser routed to a secondary APCD or ERD? ☐ Yes ☐ No		

ADSORPTION SYSTEM – *NOT APPLICABLE*		
General Information		
Control Device ID#:	Installation Date: ☐ New ☐ Modified ☐ Relocated	
Manufacturer:	Model:	Control Device Name:
Design Inlet Volume: scfm	Adsorbent charge per adsorber vessel and number of adsorber vessels:	
Length of Mass Transfer Zone supplied by the manufacturer:	Adsorber diameter: ft Adsorber area: ft^2	
Adsorbent type and physical properties:	Overall Control Efficiency (%):	
Working Capacity of Adsorbent (%):		
Operating Parameters		
Inlet volume: scfm @ ^oF		
Adsorption time per adsorption bed (life expectancy):	Breakthrough Capacity (lbs of VOC/100 lbs of adsorbent):	
Temperature range of carbon bed adsorber. ^oF - ^oF		
Control Device Technical Data		
Pollutants Controlled	Manufacturer's Guaranteed Control Efficiency (%)	
Describe the warning and/or alarm system that protects against operation when unit is not meeting the design requirements:		
Has the control device been tested by the manufacturer and certified?		
Describe all operating ranges and maintenance procedures required by the manufacturer to maintain the warranty.		
Additional information attached? ☐ Yes ☐ No Please attach copies of manufacturer's data sheets, drawings, and performance testing.		

VAPOR RECOVERY UNIT – *NOT APPLICABLE*

General Information

Emission Unit ID#:	Installation Date: ☐ New ☐ Modified ☐ Relocated

Device Information

Manufacturer:
Model:

List the emission units whose emissions are controlled by this vapor recovery unit (Emission Point ID#)

Emission Unit ID#	Emission Source Description	Emission Unit ID#	Emission Source Description

If this vapor recovery unit controls emissions from more than six (6) emission units, please attach additional pages.

Additional information attached? ☐ Yes ☐ No
Please attach copies of manufacturer's data sheets, drawings, and performance testing.

The registrant may claim a capture and control efficiency of 95 % (which accounts for 5% downtime) for the vapor recovery unit.

The registrant may claim a capture and control efficiency of 98% if the VRU has a backup flare that meet the requirements of Section 8.1.2 of this general permit.

The registrant may claim a capture and control efficiency of 98% if the VRU has a backup VRU.

ATTACHMENT U

Emission Calculation(s)

G35-D General Permit Registration

- **EMISSION SUMMARIES:**
  - CRITERIA POLLUTANTS – CONTROLLED
  - HAZARDOUS AIR POLLUTANTS - CONTROLLED
  - GREENHOUSE GAS (GHG) - CONTROLLED
  - CRITERIA POLLUTANTS – PRE-CONTROLLED
  - HAZARDOUS AIR POLLUTANTS – PRE-CONTROLLED
- **POINT-SOURCE EMISSIONS:**
  - Compressor Engines (CE-01 thru CE-04) Emissions – 5,000 bhp Caterpillar G3616LE
  - Compressor Rod Packing (CRP) Emissions
  - Startup/Shutdown/Maintenance (Blowdown) (SSM) Emissions
  - Dehydrator Emissions (Flash Tank and Still Vent Components) – 125 MMscfd
  - Dehydrator Emissions (Total) – 125 MMscfd
  - Thermal Oxidizer (TO-01) Emissions
  - Reboiler (BLR-01 thru BLR-02) Emissions – 2.0 MMBtu/hr
  - Process Flare (FL-01) Emissions
  - Storage Tank (T-01 thru T-08) Emissions
  - Truck Load-Out (TLO) Emissions
- **FUGITIVE EMISSIONS:**
  - Gas/Light Oil Piping and Equipment Leak (FUG-G and FUG-L) Emissions
  - Engine Crankcase (ECC) Emissions
- **AP-42 and GHG EMISSION FACTORS**
- **GAS ANALYSES:**
  - Inlet Natural Gas Composition
  - Extended Inlet Gas Analysis Summary
  - Stabilized Condensate Composition
  - Extended Stabilized Condensate Analysis Summary
  - Btu Loading on Thermal Oxidizer
  - Btu Loading on Process Flare
- **ENGINE AND OXIDATION CATALYST DATA SHEETS**
- **FLARE AND THERMAL OXIDIZER DATA SHEETS**
- **GRI-GLYCALC INPUT AND OUTPUT SUMMARIES**
- **EPA TANKS 4.0 SUMMARIES**

Appalachia Midstream Services, LLC

PIONEER COMPRESSION FACILITY

Application for G35-D General Permit Registration

Attachment U - Supporting Emissions Calculations

Controlled Emissions - Criteria Pollutants

Unit ID	Point ID	Control ID	Description	Design Capacity	NOx		CO		VOC		SOx		PM10/2.5	
					lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
CE-01	**1E**	01-OxCat	Compressor Engine - CAT G3616 A4	5,000 bhp	4.41	19.31	2.58	11.32	1.97	8.63	0.02	0.09	0.37	1.61
CE-02	**2E**	02-OxCat	Compressor Engine - CAT G3616 A4	5,000 bhp	4.41	19.31	2.58	11.32	1.97	8.63	0.02	0.09	0.37	1.61
CE-03	**3E**	03-OxCat	Compressor Engine - CAT G3616 A4	5,000 bhp	4.41	19.31	2.58	11.32	1.97	8.63	0.02	0.09	0.37	1.61
CE-04	**4E**	04-OxCat	Compressor Engine - CAT G3616 A4	5,000 bhp	4.41	19.31	2.58	11.32	1.97	8.63	0.02	0.09	0.37	1.61
CRP	**5E**	na	Compressor Rod Packing	20,050 bhp	---	---	---	---	6.30	27.60	---	---	---	---
SSM	**6E**	FLR-01	Startup/Shutdown/Maintenance (Blowdown)	20,050 bhp	---	---	---	---	---	4.27	---	---	---	---
DFT-01	**7E**	TO-01	TEG Dehydrator - Flash Tank	125.0 MMscfd	---	---	---	---	0.93	4.09	---	---	---	---
DSV-01	**8E**	TO-01	TEG Dehydrator - Still Vent	125.0 MMscfd	---	---	---	---	1.23	5.37	---	---	---	---
DFT-02	**9E**	TO-01	TEG Dehydrator - Flash Tank	125.0 MMscfd	---	---	---	---	0.93	4.09	---	---	---	---
DSV-02	**10E**	TO-01	TEG Dehydrator - Still Vent	125.0 MMscfd	---	---	---	---	1.23	5.37	---	---	---	---
TO-01	**11E**	na	Dehys/Tanks/TLO Thermal Oxidizer	9.26 MMBtu/hr	0.91	3.98	2.87	12.58	See Dehys/Tanks/TLO		0.01	0.02	0.07	0.30
RBV-01	**12E**	na	TEG Dehydrator - Reboiler Vent	2.00 MMBtu/hr	0.20	0.86	0.16	0.72	0.01	0.05	1.2E-03	0.01	0.01	0.07
RBV-02	**13E**	na	TEG Dehydrator - Reboiler Vent	2.00 MMBtu/hr	0.20	0.86	0.16	0.72	0.01	0.05	1.2E-03	0.01	0.01	0.07
FLR-01	**14E**	na	SSM Flare	5.94 MMBtu/hr	0.58	2.55	1.84	8.07	See SSM		3.5E-03	0.02	0.04	0.19
T-01	**15E**	TO-01	Storage Tank - Stabilized Condensate	400 bbl	---	---	---	---	0.01	0.06	---	---	---	---
T-02	**16E**	TO-01	Storage Tank - Stabilized Condensate	400 bbl	---	---	---	---	0.01	0.06	---	---	---	---
T-03	**17E**	TO-01	Storage Tank - Stabilized Condensate	400 bbl	---	---	---	---	0.01	0.06	---	---	---	---
T-04	**18E**	TO-01	Storage Tank - Stabilized Condensate	400 bbl	---	---	---	---	0.01	0.06	---	---	---	---
T-05	**19E**	TO-01	Storage Tank - Stabilized Condensate	400 bbl	---	---	---	---	0.01	0.06	---	---	---	---
T-06	**20E**	TO-01	Storage Tank - Stabilized Condensate	400 bbl	---	---	---	---	0.01	0.06	---	---	---	---
T-07	**21E**	na	Storage Tank - Produced Water	400 bbl	---	---	---	---	0.01	0.02	---	---	---	---
T-08	**22E**	na	Storage Tank - Produced Water	400 bbl	---	---	---	---	0.01	0.02	---	---	---	---
TLO	**23E**	TO-01	Truck Load-Out - Stabilized Condensate	228,000 bbl/yr	---	---	---	---	10.30	7.04	---	---	---	---
		na	Truck Load-Out - Produced Water	8,000 bbl/yr	---	---	---	---	4.62	0.11	---	---	---	---
			TOTAL POINT SOURCE PTE:		**19.52**	**85.50**	**15.38**	**67.36**	**33.54**	**92.99**	**0.10**	**0.43**	**1.61**	**7.07**
			WV-DEP Permit Threshold:		6 lb/hr ***AND*** 10 tpy		6 lb/hr ***AND*** 10 tpy		**6 lb/hr *AND* 10 tpy**		6 lb/hr ***AND*** 10 tpy		6 lb/hr ***AND*** 10 tpy	
			Title V Permit Threshold:		---	100	---	100	---	100	---	100	---	100
FUG-G	**1F**	na	Process Piping Fugitives - Gas	4,981 fittings	---	---	---	---	0.85	3.72	---	---	---	---
FUG-L	**2F**	na	Process Piping Fugitives - Light Oil	2,271 fittings	---	---	---	---	1.36	5.97	---	---	---	---
ECC	**3F**	na	Engine Crankcase Emissions	20,000 bhp	0.05	0.21	0.34	1.51	0.13	0.57	2.3E-04	1.0E-03	3.9E-03	0.02
			TOTAL FUGITIVE SOURCE PTE:		**0.05**	**0.21**	**0.34**	**1.51**	**2.34**	**10.26**	**2.3E-04**	**1.0E-03**	**3.9E-03**	**0.02**
			TOTAL PTE:		**19.57**	**85.70**	**15.72**	**68.86**	**35.88**	**103.25**	**0.10**	**0.43**	**1.62**	**7.09**

Notes: 1 - Emissions are based on operation at 100% of rated load for 8,760 hrs/yr; except that Start/Stop/Maintenance (SSM/3E) and Truck Load-Out (TLO/7E) emission generating activities are infrequent.

2 - VOC is volatile organic compounds, as defined by EPA, and includes HCHO (formaldehyde).

3 - PM10/2.5 is filterable and condensable particulate matter; including PM10 and PM2.5.

4 - Fugitive *criteria pollutant emissions* from compressor stations are *not* considered in major source determinations (45CSR30 Section 2.26.b.)

Appalachia Midstream Services, LLC

PIONEER COMPRESSION FACILITY

Application for G35-D General Permit Registration

Attachment U - Supporting Emissions Calculations

Controlled Emissions - Hazardous Air Pollutants (HAP)

Unit ID	Point ID	Benzene		Ethylbenzene		HCHO (HAP)		n-Hexane		Methanol		Toluene		2,2,4-TMP		Xylenes		Other HAP		Total HAP	
		lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
CE-01	**1E**	2.6E-03	0.01	2.3E-04	1.0E-03	0.28	1.22	0.01	0.03	0.01	0.06	2.4E-03	0.01	1.5E-03	0.01	1.1E-03	4.7E-03	0.09	0.37	0.39	1.72
CE-02	**2E**	2.6E-03	0.01	2.3E-04	1.0E-03	0.28	1.22	0.01	0.03	0.01	0.06	2.4E-03	0.01	1.5E-03	0.01	1.1E-03	4.7E-03	0.09	0.37	0.39	1.72
CE-03	**3E**	2.6E-03	0.01	2.3E-04	1.0E-03	0.28	1.22	0.01	0.03	0.01	0.06	2.4E-03	0.01	1.5E-03	0.01	1.1E-03	4.7E-03	0.09	0.37	0.39	1.72
CE-04	**4E**	2.6E-03	0.01	2.3E-04	1.0E-03	0.28	1.22	0.01	0.03	0.01	0.06	2.4E-03	0.01	1.5E-03	0.01	1.1E-03	4.7E-03	0.09	0.37	0.39	1.72
CRP	**5E**	0.01	0.04	0.01	0.04	---	---	0.12	0.51	---	---	0.01	0.04	0.01	0.04	0.01	0.04	---	---	0.16	0.72
SSM	**6E**	---	0.01	---	0.01	---	---	---	0.08	---	---	---	0.01	---	0.01	---	0.01	---	---	---	0.11
DFT-01	**7E**	2.1E-04	9.2E-04	2.3E-04	1.0E-03	---	---	0.01	0.05	---	---	5.8E-04	2.5E-03	2.1E-04	9.2E-04	2.6E-04	1.2E-03	---	---	0.01	0.06
DSV-01	**8E**	0.02	0.08	0.06	0.26	---	---	0.03	0.14	---	---	0.08	0.36	6.2E-04	2.7E-03	0.10	0.44	---	---	0.29	1.29
DFT-02	**9E**	2.1E-04	9.2E-04	2.3E-04	1.0E-03	---	---	0.01	0.05	---	---	5.8E-04	2.5E-03	2.1E-04	9.2E-04	2.6E-04	1.2E-03	---	---	0.01	0.06
DSV-02	**10E**	0.02	0.08	0.06	0.26	---	---	0.03	0.14	---	---	0.08	0.36	6.2E-04	2.7E-03	0.10	0.44	---	---	0.29	1.29
TO-01	**11E**	See Dehys/Tanks/TLO		See Dehys/Tanks/TLO		6.8E-04	3.0E-03	See Dehys/Tanks/TLO		---	---	See Dehys/Tanks/TLO		See Dehys/Tanks/TLO		See Dehys/Tanks/TLO		1.7E-05	7.6E-05	7.0E-04	3.1E-03
RBV-01	**12E**	4.1E-06	1.8E-05	---	---	1.5E-04	6.4E-04	3.5E-03	0.02	---	---	6.7E-06	2.9E-05	---	---	---	---	3.7E-06	1.6E-05	3.7E-03	0.02
RBV-02	**13E**	4.1E-06	1.8E-05	---	---	1.5E-04	6.4E-04	3.5E-03	0.02	---	---	6.7E-06	2.9E-05	---	---	---	---	3.7E-06	1.6E-05	3.7E-03	0.02
FLR-01	**14E**	See SSM		See SSM		4.4E-04	1.9E-03	See SSM		---	---	See SSM		See SSM		See SSM		1.1E-05	4.8E-05	4.5E-04	2.0E-03
T-01	**15E**	1.4E-04	6.1E-04	1.4E-04	6.1E-04	---	---	6.9E-04	3.0E-03	---	---	1.4E-04	6.1E-04	---	---	3.5E-04	1.5E-03	---	---	1.5E-03	0.01
T-02	**16E**	1.4E-04	6.1E-04	1.4E-04	6.1E-04	---	---	6.9E-04	3.0E-03	---	---	1.4E-04	6.1E-04	---	---	3.5E-04	1.5E-03	---	---	1.5E-03	0.01
T-03	**17E**	1.4E-04	6.1E-04	1.4E-04	6.1E-04	---	---	6.9E-04	3.0E-03	---	---	1.4E-04	6.1E-04	---	---	3.5E-04	1.5E-03	---	---	1.5E-03	0.01
T-04	**18E**	1.4E-04	6.1E-04	1.4E-04	6.1E-04	---	---	6.9E-04	3.0E-03	---	---	1.4E-04	6.1E-04	---	---	3.5E-04	1.5E-03	---	---	1.5E-03	0.01
T-05	**19E**	1.4E-04	6.1E-04	1.4E-04	6.1E-04	---	---	6.9E-04	3.0E-03	---	---	1.4E-04	6.1E-04	---	---	3.5E-04	1.5E-03	---	---	1.5E-03	0.01
T-06	**20E**	1.4E-04	6.1E-04	1.4E-04	6.1E-04	---	---	6.9E-04	3.0E-03	---	---	1.4E-04	6.1E-04	---	---	3.5E-04	1.5E-03	---	---	1.5E-03	0.01
T-07	**21E**	5.3E-05	2.3E-04	5.3E-05	2.3E-04	---	---	2.7E-04	1.2E-03	---	---	5.3E-05	2.3E-04	---	---	1.3E-04	5.8E-04	---	---	5.6E-04	2.4E-03
T-08	**22E**	5.3E-05	2.3E-04	5.3E-05	2.3E-04	---	---	2.7E-04	1.2E-03	---	---	5.3E-05	2.3E-04	---	---	1.3E-04	5.8E-04	---	---	5.6E-04	2.4E-03
TLO	**23E**	0.51	0.35	0.51	0.35	---	---	0.51	0.35	---	---	0.51	0.35	0.51	0.35	0.51	0.35	---	---	3.09	2.11
		0.23	0.01	0.23	0.01	---	---	0.23	0.01	---	---	0.23	0.01	0.23	0.01	0.23	0.01	---	---	1.39	0.03
Subtotal:		**0.80**	**0.62**	**0.88**	**0.94**	**1.11**	**4.87**	**0.98**	**1.48**	**0.06**	**0.26**	**0.93**	**1.19**	**0.76**	**0.44**	**0.96**	**1.32**	**0.34**	**1.49**	**6.84**	**12.61**
FUG-G	**1F**	1.3E-03	0.01	1.3E-03	0.01	---	---	0.02	0.07	---	---	1.3E-03	0.01	1.3E-03	0.01	1.3E-03	0.01	---	---	0.02	0.10
FUG-L	**2F**	0.03	0.12	0.03	0.12	---	---	0.07	0.30	---	---	0.03	0.12	0.03	0.12	0.03	0.12	---	---	0.20	0.90
ECC	**3F**	1.7E-04	7.6E-04	1.6E-05	6.8E-05	0.02	0.07	4.4E-04	1.9E-03	9.8E-04	4.3E-03	1.6E-04	7.0E-04	9.8E-05	4.3E-04	7.2E-05	3.2E-04	0.01	0.02	0.02	0.11
Subtotal:		**0.03**	**0.13**	**0.03**	**0.13**	**0.02**	**0.07**	**0.08**	**0.37**	**9.8E-04**	**4.3E-03**	**0.03**	**0.13**	**0.03**	**0.13**	**0.03**	**0.13**	**0.01**	**0.02**	**0.25**	**1.10**
TOTAL PTE:		**0.83**	**0.75**	**0.91**	**1.06**	**1.13**	**4.94**	**1.07**	**1.85**	**0.06**	**0.26**	**0.96**	**1.31**	**0.79**	**0.57**	**0.99**	**1.45**	**0.35**	**1.51**	**7.09**	**13.71**
WV-DEP:		2 lb/hr *OR* 0.5 tpy		2 lb/hr ***OR*** 5 tpy		**2 lb/hr *OR* 0.5 tpy**		2 lb/hr ***OR*** 5 tpy		2 lb/hr ***OR*** 5 tpy		2 lb/hr ***OR*** 5 tpy		2 lb/hr ***OR*** 5 tpy		2 lb/hr ***OR*** 5 tpy		2 lb/hr ***OR*** 5 tpy		**2 lb/hr *OR* 5 tpy**	
Title V:		---	10	---	10	---	10	---	10	---	10	---	10	---	10	---	10	---	10	---	25

Notes: 1 - Emissions are based on operation at 100% of rated load for 8,760 hrs/yr; except that Start/Stop/Maintenance (SSM/3E) and Truck Load-Out (TLO/7E) emission generating activities are infrequent.

2 - HCHO is formaldehyde; Total HAP includes HCHO, n-hexane, BTEX (benzene, toluene, ethylbenzene, xylene), acetaldehyde, acrolein, and methanol.

Greenhouse Gas (GHG) Emissions

Unit ID	Point ID	Control ID	Description	Heat Input MMBtu/hr (HHV)	Hours of Operation hr/yr	kg/MMBtu: GWP: CO2 tpy	53.06 1 CO2e tpy	kg/MMBtu: GWP: CH4 tpy	1.00E-03 25 CO2e tpy	kg/MMBtu: GWP: N2O tpy	1.00E-04 298 CO2e tpy	TOTAL CO2e tpy
CE-01	**1E**	01-OxCat	Compressor Engine - CAT G3616 A4	37.08	8,760	21,389	21,389	90.29	2,257	0.04	10.59	**23,656**
CE-02	**2E**	02-OxCat	Compressor Engine - CAT G3616 A4	37.08	8,760	21,389	21,389	90.29	2,257	0.04	10.59	**23,656**
CE-03	**3E**	03-OxCat	Compressor Engine - CAT G3616 A4	37.08	8,760	21,389	21,389	90.29	2,257	0.04	10.59	**23,656**
CE-04	**4E**	04-OxCat	Compressor Engine - CAT G3616 A4	37.08	8,760	21,389	21,389	90.29	2,257	0.04	10.59	**23,656**
CRP	**5E**	na	Compressor Rod Packing	---	8,760	0.3	0.3	61.49	1,537	---	---	**1,538**
SSM	**6E**	FLR-01	Startup/Shutdown/Maintenance (Blowdown)	---	8,760	2.62	2.62	475.75	11,894	---	---	**11,896**
DFT-01	**7E**	TO-01	TEG Dehydrator - Flash Tank	---	8,760	---	---	2.93	73	---	---	**73**
DSV-01	**8E**	TO-01	TEG Dehydrator - Still Vent	---	8,760	---	---	0.16	4	---	---	**4**
DFT-02	**9E**	TO-01	TEG Dehydrator - Flash Tank	---	8,760	---	---	2.93	73	---	---	**73**
DSV-02	**10E**	TO-01	TEG Dehydrator - Still Vent	---	8,760	---	---	0.16	4	---	---	**4**
TO-01	**11E**	na	Dehys/Tanks/TLO Thermal Oxidizer	9.26	8,760	4,773	4,773	See Dehys/Tanks/TLO		0.09	26.08	**4,799**
RBV-01	**12E**	na	TEG Dehydrator - Reboiler Vent	2.00	8,760	1,031	1,031	0.02	0.5	0.02	5.63	**1,037**
RBV-02	**13E**	na	TEG Dehydrator - Reboiler Vent	2.00	8,760	1,031	1,031	0.02	0.5	0.02	5.63	**1,037**
FLR-01	**14E**	na	SSM Flare	5.94	8,760	3,062	3,062	See SSM		0.06	16.73	**3,079**
T-01	**15E**	TO-01	Storage Tank - Stabilized Condensate	---	8,760	---	---	---	---	---	---	**---**
T-02	**16E**	TO-01	Storage Tank - Stabilized Condensate	---	8,760	---	---	---	---	---	---	**---**
T-03	**17E**	TO-01	Storage Tank - Stabilized Condensate	---	8,760	---	---	---	---	---	---	**---**
T-04	**18E**	TO-01	Storage Tank - Stabilized Condensate	---	8,760	---	---	---	---	---	---	**---**
T-05	**19E**	TO-01	Storage Tank - Stabilized Condensate	---	8,760	---	---	---	---	---	---	**---**
T-06	**20E**	TO-01	Storage Tank - Stabilized Condensate	---	8,760	---	---	---	---	---	---	**---**
T-07	**21E**	na	Storage Tank - Produced Water	---	8,760	---	---	---	---	---	---	**---**
T-08	**22E**	na	Storage Tank - Produced Water	---	8,760	---	---	---	---	---	---	**---**
TLO	**23E**	TO-01	Truck Load-Out - Stabilized Condensate	---	8,760	---	---	---	---	---	---	**---**
		na	Truck Load-Out - Produced Water	---	8,760	---	---	---	---	---	---	**---**
											TOTAL POINT SOURCE PTE:	**118,166**
FUG-G	**1F**	na	Process Piping Fugitives - Gas	---	8,760	0.05	0.05	8	207	---	---	**207**
FUG-L	**2F**	na	Process Piping Fugitives - Light Oil	---	8,760	---	---	---	---	---	---	**---**
ECC	**3F**	na	Engine Crankcase Emissions	---	8,760	227.85	227.85	0.96	24.04	3.8E-04	0.11	**252**
											TOTAL FUGITIVE SOURCE PTE:	**459**

TOTAL FACILITY-WIDE PTE:	**95,682**		**914**		**0.32**		**118,625**
WV-DEP Threshold: (	**na**	**- OR -**	**na**	**- OR -**	**na**	**) - AND -**	**na**
Title V Permit Threshold:	**na**		**na**		**na**		**na**

Notes:
1 - Emissions are based on operation at 100% of rated load.
2 - Engine CO2 and CH4 emissions are based on vendor specifications.
3 - Fugitive CH4 emissions are based on EPA Fugitive Emission Factors for Oil and Gas Production Operations.
4 - All other GHG emissions are based on default values in 40CFR98, Subpart C, Table C-1.
5 - GHG NSR/PSD Thresholds and Title V Major Source Thresholds are applicable only if other regulated air pollutants exceed the corresponding Thresholds.

Appalachia Midstream Services, LLC

PIONEER COMPRESSION FACILITY

Application for G35-D General Permit Registration

Attachment U - Supporting Emissions Calculations

PRE-Controlled Emissions - Criteria Pollutants

Unit ID	Point ID	Control ID	Description	Design Capacity	NOx		CO		VOC		SOx		PM10/2.5	
					lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
CE-01	1E	01-OxCat	Compressor Engine - CAT G3616 A4	5,000 bhp	4.41	19.31	32.30	141.46	12.13	53.11	0.02	0.09	0.37	1.61
CE-02	2E	02-OxCat	Compressor Engine - CAT G3616 A4	5,000 bhp	4.41	19.31	32.30	141.46	12.13	53.11	0.02	0.09	0.37	1.61
CE-03	3E	03-OxCat	Compressor Engine - CAT G3616 A4	5,000 bhp	4.41	19.31	32.30	141.46	12.13	53.11	0.02	0.09	0.37	1.61
CE-04	4E	04-OxCat	Compressor Engine - CAT G3616 A4	5,000 bhp	4.41	19.31	32.30	141.46	12.13	53.11	0.02	0.09	0.37	1.61
CRP	5E	na	Compressor Rod Packing	20,050 bhp	---	---	---	---	6.30	27.60	---	---	---	---
SSM	6E	FLR-01	Startup/Shutdown/Maintenance (Blowdown)	20,050 bhp	---	---	---	---	---	213.53	---	---	---	---
DFT-01	7E	TO-01	TEG Dehydrator - Flash Tank	125 MMscfd	---	---	---	---	46.71	204.58	---	---	---	---
DSV-01	8E	TO-01	TEG Dehydrator - Still Vent	125 MMscfd	---	---	---	---	61.33	268.61	---	---	---	---
DFT-02	9E	TO-01	TEG Dehydrator - Flash Tank	125 MMscfd	---	---	---	---	46.71	204.58	---	---	---	---
DSV-02	10E	TO-01	TEG Dehydrator - Still Vent	125 MMscfd	---	---	---	---	61.33	268.61	---	---	---	---
TO-01	11E	na	Dehys/Tanks/TLO Thermal Oxidizer	9.26 MMBtu/hr	na									
RBV-01	12E	na	TEG Dehydrator - Reboiler Vent	2.0 MMBtu/hr	0.20	0.86	0.16	0.72	0.01	0.05	1.2E-03	0.01	0.01	0.07
RBV-02	13E	na	TEG Dehydrator - Reboiler Vent	2.0 MMBtu/hr	0.20	0.86	0.16	0.72	0.01	0.05	1.2E-03	0.01	0.01	0.07
FLR-01	14E	na	SSM Flare	5.9 MMBtu/hr	na									
T-01	15E	TO-01	Storage Tank - Stabilized Condensate	400 bbl	---	---	---	---	0.69	3.04	---	---	---	---
T-02	16E	TO-01	Storage Tank - Stabilized Condensate	400 bbl	---	---	---	---	0.69	3.04	---	---	---	---
T-03	17E	TO-01	Storage Tank - Stabilized Condensate	400 bbl	---	---	---	---	0.69	3.04	---	---	---	---
T-04	18E	TO-01	Storage Tank - Stabilized Condensate	400 bbl	---	---	---	---	0.69	3.04	---	---	---	---
T-05	19E	TO-01	Storage Tank - Stabilized Condensate	400 bbl	---	---	---	---	0.69	3.04	---	---	---	---
T-06	20E	TO-01	Storage Tank - Stabilized Condensate	400 bbl	---	---	---	---	0.69	3.04	---	---	---	---
T-07	21E	na	Storage Tank - Produced Water	400 bbl	---	---	---	---	0.01	0.02	---	---	---	---
T-08	22E	na	Storage Tank - Produced Water	400 bbl	---	---	---	---	0.01	0.02	---	---	---	---
TLO	23E	TO-01	Truck Load-Out - Stabilized Condensate	228,000 bbl/yr	---	---	---	---	37.41	22.54	---	---	---	---
		na	Truck Load-Out - Produced Water	8,000 bbl/yr	---	---	---	---	4.62	0.11	---	---	---	---
			TOTAL POINT SOURCE PTE:		**18.03**	**78.97**	**129.52**	**567.30**	**317.09**	**1,440.96**	**0.09**	**0.39**	**1.50**	**6.57**
			WV-DEP Permit Threshold:		6 lb/hr ***AND*** 10 tpy		6 lb/hr ***AND*** 10 tpy		**6 lb/hr *AND* 10 tpy**		6 lb/hr ***AND*** 10 tpy		6 lb/hr ***AND*** 10 tpy	
			Title V Permit Threshold:		---	100	---	100	**---**	**100**	---	100	---	100
FUG-G	**1F**	na	Process Piping Fugitives - Gas	4,981 fittings	---	---	---	---	3.62	15.88	---	---	---	---
FUG-L	**2F**	na	Process Piping Fugitives - Light Oil	2,271 fittings	---	---	---	---	4.97	21.78	---	---	---	---
ECC	**3F**	na	Engine Crankcase Emissions	20,000 bhp	0.05	0.21	0.34	1.51	0.13	0.57	2.3E-04	1.0E-03	3.9E-03	0.02
			TOTAL FUGITIVE SOURCE PTE:		**0.05**	**0.21**	**0.34**	**1.51**	**8.73**	**38.23**	**2.3E-04**	**1.0E-03**	**3.9E-03**	**0.02**
			TOTAL PTE:		**18.08**	**79.17**	**129.86**	**568.81**	**325.82**	**1479.19**	**0.09**	**0.39**	**1.50**	**6.59**

Notes: 1 - Emissions are based on operation at 100% of rated load for 8,760 hrs/yr; except that Start/Stop/Maintenance (SSM) and Truck Load-Out (TLO) emission generating activities are infrequent.

2 - VOC is volatile organic compounds, as defined by EPA, and includes HCHO (formaldehyde).

3 - PM10/2.5 is filterable and condensable particulate matter; including PM10 and PM2.5.

4 - Fugitive *criteria pollutant emissions* are *not* considered in major source determinations (45CSR30 Section 2.26.b.)

PRE-Controlled Emissions - Hazardous Air Pollutants (HAP)

Unit ID	Point ID	Benzene		Ethylbenzene		HCHO (HAP)		n-Hexane		Methanol		Toluene		2,2,4-TMP		Xylenes		Other HAP		Total HAP	
		lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
CE-01	1E	0.02	0.07	1.5E-03	0.01	1.54	6.76	0.04	0.18	0.09	0.40	0.02	0.07	0.01	0.04	0.01	0.03	0.53	2.33	2.26	9.88
CE-02	2E	0.02	0.07	1.5E-03	0.01	1.54	6.76	0.04	0.18	0.09	0.40	0.02	0.07	0.01	0.04	0.01	0.03	0.53	2.33	2.26	9.88
CE-03	3E	0.02	0.07	1.5E-03	0.01	1.54	6.76	0.04	0.18	0.09	0.40	0.02	0.07	0.01	0.04	0.01	0.03	0.53	2.33	2.26	9.88
CE-04	4E	0.02	0.07	1.5E-03	0.01	1.54	6.76	0.04	0.18	0.09	0.40	0.02	0.07	0.01	0.04	0.01	0.03	0.53	2.33	2.26	9.88
CRP	5E	0.01	0.04	0.01	0.04	---	---	0.12	0.51	---	---	0.01	0.04	0.01	0.04	0.01	0.04	---	---	0.16	0.72
SSM	6E	---	0.33	---	0.33	---	---	---	3.93	---	---	---	0.33	---	0.33	---	0.33	---	---	---	5.57
DFT-01	7E	0.01	0.05	0.01	0.05	---	---	0.56	2.47	---	---	0.03	0.13	0.01	0.05	0.01	0.06	---	---	0.64	2.79
DSV-01	8E	0.93	4.06	2.98	13.05	---	---	1.57	6.89	---	---	4.16	18.21	0.03	0.14	5.04	22.08	---	---	14.71	64.43
DFT-02	9E	0.01	0.05	0.01	0.05	---	---	0.56	2.47	---	---	0.03	0.13	0.01	0.05	0.01	0.06	---	---	0.64	2.79
DSV-02	10E	0.93	4.06	2.98	13.05	---	---	1.57	6.89	---	---	4.16	18.21	0.03	0.14	5.04	22.08	---	---	14.71	64.43
TO-01	11E	na																			
RBV-01	12E	4.1E-06	1.8E-05	---	---	1.5E-04	6.4E-04	3.5E-03	0.02	---	---	6.7E-06	2.9E-05	---	---	---	---	3.7E-06	1.6E-05	3.7E-03	0.02
RBV-02	13E	4.1E-06	1.8E-05	---	---	1.5E-04	6.4E-04	3.5E-03	0.02	---	---	6.7E-06	2.9E-05	---	---	---	---	3.7E-06	1.6E-05	3.7E-03	0.02
FLR-01	14E	na																			
T-01	15E	0.01	0.03	0.01	0.03	---	---	0.03	0.15	---	---	0.01	0.03	---	---	0.02	0.08	---	---	0.07	0.32
T-02	16E	0.01	0.03	0.01	0.03	---	---	0.03	0.15	---	---	0.01	0.03	---	---	0.02	0.08	---	---	0.07	0.32
T-03	17E	0.01	0.03	0.01	0.03	---	---	0.03	0.15	---	---	0.01	0.03	---	---	0.02	0.08	---	---	0.07	0.32
T-04	18E	0.01	0.03	0.01	0.03	---	---	0.03	0.15	---	---	0.01	0.03	---	---	0.02	0.08	---	---	0.07	0.32
T-05	19E	0.01	0.03	0.01	0.03	---	---	0.03	0.15	---	---	0.01	0.03	---	---	0.02	0.08	---	---	0.07	0.32
T-06	20E	0.01	0.03	0.01	0.03	---	---	0.03	0.15	---	---	0.01	0.03	---	---	0.02	0.08	---	---	0.07	0.32
T-07	21E	5.3E-05	2.3E-04	5.3E-05	2.3E-04	---	---	2.7E-04	1.2E-03	---	---	5.3E-05	2.3E-04	---	---	1.3E-04	5.8E-04	---	---	5.6E-04	2.4E-03
T-08	22E	5.3E-05	2.3E-04	5.3E-05	2.3E-04	---	---	2.7E-04	1.2E-03	---	---	5.3E-05	2.3E-04	---	---	1.3E-04	5.8E-04	---	---	5.6E-04	2.4E-03
TLO	23E	1.87	1.13	1.87	1.13	---	---	1.87	1.13	---	---	1.87	1.13	1.87	1.13	1.87	1.13	---	---	11.22	6.76
Subtotal:		**3.86**	**10.17**	**7.91**	**27.91**	**6.17**	**27.04**	**6.64**	**25.93**	**0.37**	**1.61**	**10.36**	**38.63**	**2.00**	**2.02**	**12.12**	**46.34**	**2.13**	**9.31**	**51.55**	**188.97**
FUG-G	1F	0.01	0.02	0.01	0.02	---	---	0.07	0.29	---	---	0.01	0.02	0.01	0.02	0.01	0.02	---	---	0.09	0.41
FUG-L	2F	0.10	0.44	0.10	0.44	---	---	0.25	1.09	---	---	0.10	0.44	0.10	0.44	0.10	0.44	---	---	0.75	3.27
ECC	3F	1.7E-04	7.6E-04	1.6E-05	6.8E-05	0.02	0.07	4.4E-04	1.9E-03	9.8E-04	4.3E-03	1.6E-04	7.0E-04	9.8E-05	4.3E-04	7.2E-05	3.2E-04	0.01	0.02	0.02	0.11
Subtotal:		**0.11**	**0.46**	**0.11**	**0.46**	**0.02**	**0.07**	**0.32**	**1.38**	**9.8E-04**	**4.3E-03**	**0.11**	**0.46**	**0.11**	**0.46**	**0.11**	**0.46**	**0.01**	**0.02**	**0.86**	**3.79**
TOTAL PTE:		**3.97**	**10.63**	**8.02**	**28.37**	**6.19**	**27.11**	**6.95**	**27.32**	**0.37**	**1.62**	**10.46**	**39.09**	**2.11**	**2.48**	**12.22**	**46.80**	**2.13**	**9.33**	**52.42**	**192.75**
WV-DEP:		**2 lb/hr *OR* 0.5 tpy**		2 lb/hr ***OR*** 5 tpy		**2 lb/hr *OR* 0.5 tpy**		2 lb/hr ***OR*** 5 tpy		2 lb/hr ***OR*** 5 tpy		2 lb/hr ***OR*** 5 tpy		2 lb/hr ***OR*** 5 tpy		**2 lb/hr *OR* 5 tpy**		2 lb/hr ***OR*** 5 tpy		**2 lb/hr *OR* 5 tpy**	
Title V:		---	10	**---**	**10**	**---**	**10**	**---**	**10**	---	10	**---**	**10**	---	10	**---**	**10**	---	10	**---**	**25**

Notes: 1 - Emissions are based on operation at 100% of rated load for 8,760 hrs/yr; except that Start/Stop/Maintenance (SSM/3E) and Truck Load-Out (TLO/7E) emission generating activities are infrequent.

2 - HCHO is formaldehyde; Total HAP includes HCHO, n-hexane, BTEX (benzene, toluene, ethylbenzene, xylene), acetaldehyde, acrolein, and methanol.

Attachment U - Supporting Emissions Calculations

Compressor Engine – 5,000 bhp CAT G3616 A4

Unit ID (Point ID)	Description	Reference	Pollutant	Pre-Controlled Emissions				Control Efficiency	Controlled Emissions			
				g/bhp-hr	lb/MMBtu	lb/hr	tpy		g/bhp-hr	lb/MMBtu	lb/hr	tpy
CE-01 (1E) CE-02 (2E) CE-03 (3E) CE-04 (4E) Each	**Engine 01 thru 04 (Each)**	Vendor Guarantee	NOX	0.40	0.12	4.41	19.31	0.0%	**0.40**	**0.12**	**4.41**	**19.31**
	Caterpillar (CAT)	Vendor Guarantee	CO	2.93	0.88	32.30	141.46	92.0%	**0.23**	**0.07**	**2.58**	**11.32**
	G3616 A4	Vendor Guarantee	THC	3.72	1.11	41.01	179.61	21.7%	**2.91**	**0.87**	**32.12**	**140.67**
	5,000 bhp (Site Rating)	Vendor Guarantee	NMHC	1.85	0.55	20.39	89.32	43.6%	**1.04**	**0.31**	**11.50**	**50.39**
	1,000 rpm	Vendor Guarantee	NMNEHC	0.96	0.29	10.58	46.35	84.0%	**0.15**	**0.05**	**1.69**	**7.42**
	1294 in3/cyl	NMNEHC+HCHO	VOC	1.10	0.34	12.13	53.11	83.7%	**0.18**	**0.06**	**1.97**	**8.63**
	V-16 / 4SLB / AFRC	AP-42 Table 3.2-2	SO2	2.0E-03	5.9E-04	0.02	0.09	---	**2.0E-03**	**5.9E-04**	**0.02**	**0.09**
	Catalytic Comb. OxCat	AP-42 Table 3.2-2	PM10/2.5	0.03	0.01	0.37	1.61	---	**0.03**	**0.01**	**0.37**	**1.61**
	NSPS JJJJ Affected	AP-42 Table 3.2-2	Benzene	1.5E-03	4.4E-04	0.02	0.07	84.0%	**2.4E-04**	**7.0E-05**	**2.6E-03**	**0.01**
		AP-42 Table 3.2-2	Ethylbenzene	1.3E-04	4.0E-05	1.5E-03	0.01	84.0%	**2.1E-05**	**6.4E-06**	**2.3E-04**	**1.0E-03**
	8,760 hr/yr	Vendor Guarantee	HCHO	0.14	0.05	1.54	6.76	82.0%	**0.03**	**0.01**	**0.28**	**1.22**
	920 Btu/scf (LHV)	AP-42 Table 3.2-2	n-Hexane	3.7E-03	1.1E-03	0.04	0.18	84.0%	**5.9E-04**	**1.8E-04**	**0.01**	**0.03**
	1,020 Btu/scf (HHV)	AP-42 Table 3.2-2	Methanol	0.01	2.5E-03	0.09	0.40	84.0%	**1.3E-03**	**4.0E-04**	**0.01**	**0.06**
	6,782 Btu/bhp-hr (LHV)	AP-42 Table 3.2-2	Toluene	1.4E-03	4.1E-04	0.02	0.07	84.0%	**2.2E-04**	**6.5E-05**	**2.4E-03**	**0.01**
	7,363 Btu/bhp-hr (HHV)	AP-42 Table 3.2-2	2,2,4-TMP	8.3E-04	2.5E-04	0.01	0.04	84.0%	**1.3E-04**	**4.0E-05**	**1.5E-03**	**0.01**
	33.91 MMBtu/hr (LHV)	AP-42 Table 3.2-2	Xylenes	6.1E-04	1.8E-04	0.01	0.03	84.0%	**9.8E-05**	**2.9E-05**	**1.1E-03**	**4.7E-03**
	37.60 MMBtu/hr (HHV)	AP-42 Table 3.2-2	Other HAP	0.05	0.01	0.53	2.33	84.0%	**0.01**	**2.3E-03**	**0.09**	**0.37**
	297,052 MMBtu/yr (LHV)	Sum	Total HAP	0.20	0.07	2.26	9.88	84.0%	**0.04**	**0.01**	**0.39**	**1.72**
	329,340 MMBtu/yr (HHV)	Vendor Guarantee	CO2	443	133	4,883	21,389	---	**443**	**133**	**4,883**	**21,389**
	36,859 scf/hr	THC-NMHC	CH4 (GWP=25)	1.87	0.56	20.61	90.29	---	**1.87**	**0.56**	**20.61**	**90.29**
	0.88 MMscfd	40CFR98 - Table C-2	N2O (GWP=298)	7.4E-04	2.2E-04	0.01	0.04	---	**7.4E-04**	**2.2E-04**	**0.01**	**0.04**
	322.88 MMscf/yr	40CFR98 - Table A-1	CO2e	490	147	5,401	23,656	---	**490**	**147**	**5,401**	**23,656**

Notes: 1 - The emissions are based on operation at 100% of rated load for 8,760 hr/yr.

2 - As per Engine Specifications, emission values are based on adjustment to specified NOX level, all other emission values are "Not to Exceed" (i.e., Vendor Guarantee).

3 - As per Engine Specifications, NMNEHC (non-methane/non-ethane hydrocarbon) does not include HCHO. VOC is the sum of NMNEHC and HCHO.

4 - PM10/2.5 is Filterable and Condensable Particulate Matter; including PM10 and PM2.5

5 - HCHO is Formaldehyde; Other HAP includes Acetaldehyde, Acrolein, 1,3-Butadiene, Methanol, Methylene Chloride, and traces of other HAP.

6 - The control efficiency (CE) for each HAP is assumed to be the same as the CE for NMHC, except for HCHO where the vendor provides specific data.

7 - The fuel heating value will vary, 920 Btu/scf (LHV) is at the low end of the range and results in a high (conservative) fuel consumption estimate.

Appalachia Midstream Services, LLC

PIONEER COMPRESSION FACILITY

Application for G35-D General Permit Registration

Attachment U - Supporting Emissions Calculations

Compressor Rod Packing (CRP) Emissions

Unit ID (Point ID)	Unit Description (Compressor Rod Packing) (Raw Natural Gas)	No of Cylinders	scfh per Cylinder	Margin of Safety	Total Leak Rate	
					scfh	MMscfy
CRP (5E)	Recip Compressor 01 thru 04 (ea)	6	12.00	15%	82.80	0.73
	Recip Compressor 05	4	12.00	15%	55.20	0.48
	Recip Compressor 01 thru 05 (tot)	6	12.00	15%	386.40	3.38

	VOC (w/HCHO) 16,307 lb/MMscf		CO2 200 lb/MMscf		CH4 36,332 lb/MMscf		CO2e CH4 GWP = 25 lb/MMscf	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
	1.35	5.91	0.02	0.07	3.0	13	75	329
	0.90	3.94	0.01	0.05	2.0	9	50	220
	6.30	27.60	0.08	0.34	14	61	351	1,538
TOTAL:	**6.30**	**27.60**	**0.08**	**0.34**	**14**	**61**	**351**	**1,538**

Unit ID	Unit Description (Compressor Rod Packing) (Raw Natural Gas)	Benzene 25.00 lb/MMscf		E-Benzene 25.00 lb/MMscf		n-Hexane 300.00 lb/MMscf		Toluene 25.00 lb/MMscf		2,2,4-TMP 25.00 lb/MMscf		Xylene 25.00 lb/MMscf		Tot HAP 425.00 lb/MMscf	
		lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
CRP (5E)	Recip Compressor 01 thru 04 (ea)	2.1E-03	0.01	2.1E-03	0.01	0.02	0.11	2.1E-03	0.01	2.1E-03	0.01	2.1E-03	0.01	0.04	0.15
	Recip Compressor 05	1.4E-03	0.01	1.4E-03	0.01	0.02	0.07	1.4E-03	0.01	1.4E-03	0.01	1.4E-03	0.01	0.02	0.10
	Recip Compressor 01 thru 05 (tot)	0.01	0.04	0.01	0.04	0.12	0.51	0.01	0.04	0.01	0.04	0.01	0.04	0.16	0.72
	TOTAL:	**0.01**	**0.04**	**0.01**	**0.04**	**0.12**	**0.51**	**0.01**	**0.04**	**0.01**	**0.04**	**0.01**	**0.04**	**0.16**	**0.72**

Notes: 1 - The results of a representative **Wet Gas Analysis** were used to determine the following worst-case VOC and HAP components (See Attachment U):

Pollutant	Wet Gas Analysis	Worst-Case
CO2	127.37 lb/MMscf	200 lb/MMscf
Methane (CH4)	30,277 lb/MMscf	36,332 lb/MMscf
Other (N2/C2/etc)	13,809 lb/MMscf	---
VOC	14,824.52 lb/MMscf	16,307 lb/MMscf
Benzene	1.60 lb/MMscf	25.00 lb/MMscf
Ethylbenzene	3.71 lb/MMscf	25.00 lb/MMscf
n-Hexane	180.87 lb/MMscf	300.00 lb/MMscf
Toluene	5.80 lb/MMscf	25.00 lb/MMscf
TMP, 2,2,4-	5.51 lb/MMscf	25.00 lb/MMscf
Xylenes	4.48 lb/MMscf	25.00 lb/MMscf
Total HAP	201.96 lb/MMscf	425 lb/MMscf
TOTAL Gas	59,038 lb/MMscf	--- lb/MMscf

2 - As per the Compressor Manufacturer (Ariel): "Typical leakage rates for traditional segmented packing rings are near 0.1 to 0.17 scfm (6.0 to 10.2 scfh) when the packing seals are in the new condition. Leakage rates of worn rings will increase until replaced. Typical rate for an 'alarm' point in order to schedule maintenance is near 1.7 to 3.4 scfm (10.2 to 20.4 scfh) scfm per packing case."
For this analysis, the 'alarm' point of 12 scfh was used.

3 - One Ariel KBZ/6 reciprocating compressor will be driven by each CAT G3616 engine and one small reciprocating compressor will be driven by an electric motor (< 50 hp) and used to compress stabilized condensate tank vapors.

Startup/Shutdown/Maintenance (Blowdown)

Unit ID (Point ID)	Description	No of Units	Total bhp	SSM and Blowdown Events/yr	Blowdown Gas Volume scf/unit	Blowdown Gas Volume scf/SSM	Total Gas Vented MMscf/yr	VOC 16,307 lb/MMscf tpy	n-Hexane 300 lb/MMscf tpy	BTEX, Hex, TMP (Ea) 25 lb/MMscf tpy	Total HAP 425 lb/MMscf tpy	CO2 200 lb/MMscf tpy	CH4 36,332 lb/MMscf tpy	CO2e GWP = 25 tpy
SSM (6E)	Full Blowdown (Ariel Recip. Comp)	4	20,050	104	54,732	218,926	22.77	185.64	3.42	0.28	4.84	2.28	414	10,343
	Full Blowdown (Stab. Ohvd. Comp)	1	50	6	400	400	0.002	0.02	3.6E-04	3.0E-05	5.1E-04	2.4E-04	0.04	1
	Pigging Events (Launcher/Receiver)	3	na	156	na	15,710	2.45	19.98	0.37	0.03	0.52	0.25	45	1,113
	Station ESD	1	na	1	na	967,000	0.97	7.88	0.15	0.01	0.21	0.10	18	439
TOTAL Pre-Control Blowdown:								**213.53**	**3.93**	**0.33**	**5.57**	**2.62**	**476**	**11,896**
Blowdown Control:								**98%**				**---**	**98%**	**---**
TOTAL Controlled Blowdown:								**4.27**	**0.08**	**0.01**	**0.11**	**2.62**	**10**	**11,896**

Each CAT G3616 Compressor Engine (CE-01 thru CE-04) Drives One (1) Ariel Reciprocating Compressor.

Notes: 1 - SSM Emissions are the sum of full compressor blowdowns and pigging events. Each engine will be equipped with an air starter.

2 - Compressor engine, pigging and station ESD blowdown volumes provided by Engineering Department. Compressor engine blowdown volume assumed the same as that for Dunbar station in New York.

Compressor Engine	Full Blowdown Volume:	54,732	scf/blowdown

Motor Driven Compressor	Full Blowdown Volume:	400	scf/blowdown

Station ESD	Blowdown Volume:	967,000	scf/blowdown

3 - To be conservative, the following gas characteristics were assumed:

Pollutant	Inlet Gas Analysis	Estimated
Carbon Dioxide	127 lb/MMscf	200 lb/MMscf
Methane	30,277 lb/MMscf	36,332 lb/MMscf
VOC (Propane)	14,825 lb/MMscf	16,307 lb/MMscf
n-Hexane	181 lb/MMscf	300 lb/MMscf
BTEX, TMP (ea)	4 lb/MMscf	25 lb/MMscf
Total HAP:	202 lb/MMscf	425 lb/MMscf

4 - Emission estimates are conservatively based on:

2	Full Gas Compressor Blowdowns each week	**3**	Pigging Events each week
6	Full Stabilizer Ovhds. Blowdowns each year	**1**	Station ESD event per year

5 - Pigging volumes are estimated as follows:

PIG	No. of Units	D (in)	L (ft)	Pa (psig)	Vacf	Gas Density (lb/ft3)	Total Mass of Flammable Gas (lbm)	Vscf*
16" Receiver	2	20	10.0	740	43.63	3.4720	151.495	2,883
	2	16	14.5	740	40.49	3.4720	140.587	2,675
	2	12	9.0	740	14.14	3.4720	49.084	934
	2	8	25.0	740	17.45	3.4720	60.598	1,153
							TOTAL:	**7,646**
16" Launcher	1	20	10.0	1,440	21.82	7.5410	164.519	3,041
	1	16	14.5	1,440	20.25	7.5410	152.674	2,822
	1	12	9.0	1,440	7.07	7.5410	53.304	985
	1	8	25.0	1,440	8.73	7.5410	65.808	1,216
							TOTAL:	**8,064**

*Vscf = lbm gas * [379.482 scf/lb-mol] / [gas MW]

Dehydrators 01 and 02 (Flash Tank and Still Vent) – 125.0 MMscfd

Unit ID	Description	Capacity	Reference	Pollutant	GRI-GLYCalc Estimated Pre-Controlled Emissions		120% Worst-Case Pre-Controlled Emissions		Control Efficiency	Controlled Emissions	
					lb/hr	tpy	lb/hr	tpy	%	lb/hr	tpy
DFT-01 (7E) DFT-02 (9E)	Dehy 01 (DFT-01) Dehy 02 (DFT-02) Flash Tank (Controlled w/ Thermal Oxidizer)	Flow Rate **125.0** MMscfd **8,760** hr/yr	GRI-GLYCalc 4.0	VOC	38.92	170.49	46.71	204.58	98.0%	**0.93**	**4.09**
			GRI-GLYCalc 4.0	Benzene	0.01	0.04	0.01	0.05	98.0%	**2.1E-04**	**9.2E-04**
			GRI-GLYCalc 4.0	Ethylbenzene	9.5E-03	0.04	0.01	0.05	98.0%	**2.3E-04**	**1.0E-03**
			GRI-GLYCalc 4.0	n-Hexane	0.47	2.06	0.56	2.47	98.0%	**0.01**	**0.05**
			GRI-GLYCalc 4.0	Toluene	0.02	0.11	0.03	0.13	98.0%	**5.8E-04**	**2.5E-03**
			GRI-GLYCalc 4.0	2,2,4-TMP	0.01	0.04	0.01	0.05	98.0%	**2.1E-04**	**9.2E-04**
			GRI-GLYCalc 4.0	Xylenes	0.01	0.05	0.01	0.06	98.0%	**2.6E-04**	**1.2E-03**
			GRI-GLYCalc 4.0	Tot HAP	0.53	2.33	0.64	2.79	98.0%	**0.01**	**0.06**
			GRI-GLYCalc 4.0	CH4	27.89	122.17	33.47	146.61	98.0%	**0.67**	**2.93**
			40CFR98 - Table A-1	CO2e	697	3,054	837	3,665	98.0%	**17**	**73**
DSV-01 (8E) DSV-02 (10E)	Dehy 01 (DSV-01) Dehy 02 (DSV-02) Still Vent (aka Regenerator) (Controlled w/ Thermal Oxidizer)	Flow Rate **125.0** MMscfd **8,760** hr/yr	GRI-GLYCalc 4.0	VOC	51.11	223.84	61.33	268.61	98.0%	**1.23**	**5.37**
			GRI-GLYCalc 4.0	Benzene	0.77	3.38	0.93	4.06	98.0%	**0.02**	**0.08**
			GRI-GLYCalc 4.0	Ethylbenzene	2.48	10.88	2.98	13.05	98.0%	**0.06**	**0.26**
			GRI-GLYCalc 4.0	n-Hexane	1.31	5.74	1.57	6.89	98.0%	**0.03**	**0.14**
			GRI-GLYCalc 4.0	Toluene	3.47	15.18	4.16	18.21	98.0%	**0.08**	**0.36**
			GRI-GLYCalc 4.0	2,2,4-TMP	0.03	0.11	0.03	0.14	98.0%	**6.2E-04**	**2.7E-03**
			GRI-GLYCalc 4.0	Xylenes	4.20	18.40	5.04	22.08	98.0%	**0.10**	**0.44**
			GRI-GLYCalc 4.0	Tot HAP	12.26	53.69	14.71	64.43	98.0%	**0.29**	**1.29**
			GRI-GLYCalc 4.0	CH4	1.57	6.87	1.88	8.25	98.0%	**0.04**	**0.16**
			40CFR98 - Table A-1	CO2e	39	172	47	206	98.0%	**1**	**4**
DEHY 01, 02 (Sum of DSV and DFT) EACH UNIT	Dehy 01 (Total) Dehy 02 (Total) Total Dehydrator Emissions	Flow Rate **125.0** MMscfd **8,760** hr/yr	GRI-GLYCalc 4.0	VOC	90.03	394.33	108.04	473.19	98.0%	**2.16**	**9.46**
			GRI-GLYCalc 4.0	Benzene	0.78	3.42	0.94	4.10	98.0%	**0.02**	**0.08**
			GRI-GLYCalc 4.0	Ethylbenzene	2.49	10.92	2.99	13.10	98.0%	**0.06**	**0.26**
			GRI-GLYCalc 4.0	n-Hexane	1.78	7.80	2.14	9.36	98.0%	**0.04**	**0.19**
			GRI-GLYCalc 4.0	Toluene	3.49	15.28	4.19	18.34	98.0%	**0.08**	**0.37**
			GRI-GLYCalc 4.0	2,2,4-TMP	3.5E-02	0.15	4.2E-02	0.18	98.0%	**8.3E-04**	**3.6E-03**
			GRI-GLYCalc 4.0	Xylenes	4.21	18.45	5.05	22.14	98.0%	**0.10**	**0.44**
			GRI-GLYCalc 4.0	Tot HAP	12.79	56.02	15.35	67.22	98.0%	**0.31**	**1.34**
			GRI-GLYCalc 4.0	CH4	29.46	129.05	35.36	154.86	98.0%	**0.71**	**3.10**
			40CFR98 - Table A-1	CO2e	737	3,226	884	3,871	98.0%	**18**	**77**

Notes: 1 - Used GRI-GLYCalc V4.0 to calculate combined regenerator vent/flash gas emissions.

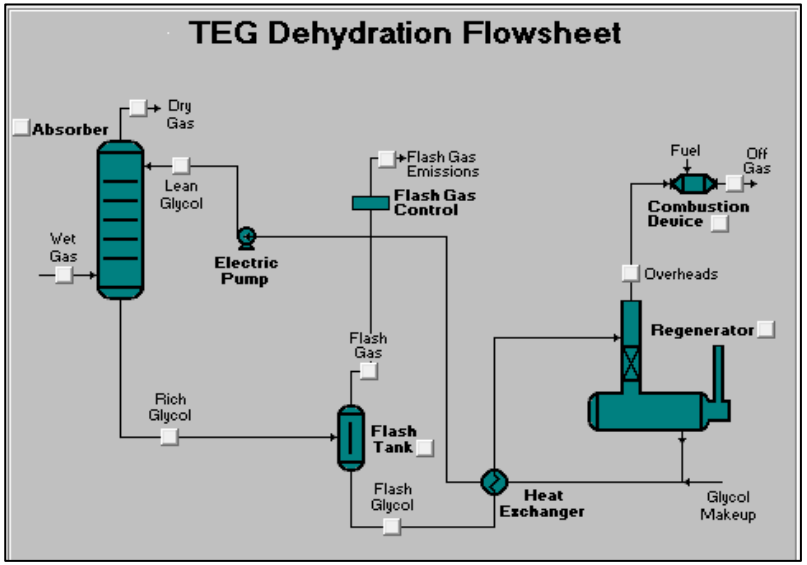
2 - Total HAP includes n-hexane, BTEX (benzene, toluene, ethylbenzene, xylene), and other components.

3 - A 20% contingency has been added to the GRI-GLYCalc results to account for potential future changes in gas quality.

4 - Normal dehydration unit operation to include an electric glycol pump; however, during periods of electric power interruption, a smaller gas-assisted glycol pump will be used. Dehydrator emissions associated with operation of an electric glycol pump are presented above as they are higher than emissions associated with operation of a gas-assisted glycol pump.

Dehydrators 01 and 02 (Summary) – 125.0 MMscfd

Unit ID	Description	Reference	Pollutant	GRI-GLYCalc Results lb/hr	GRI-GLYCalc Results tpy	W/ 20% Margin lb/hr	W/ 20% Margin tpy	Control Eff %	Controlled Emissions lb/hr	Controlled Emissions tpy
DEHY-01 (7E/8E) DEHY-02 (9E/10E)	Dehydrator 01 Dehydrator 02 Sum of Flash Tank and Still Vent - (Flash Tank Offgas and Still Vent Controlled w/ Thermal Oxidizer) 125.0 MMscfd Dehy 01 (DSV-01) Hr/yr #VALUE! MMscf/yr 5.21 MMscf/hr NESHAP HH - Exempt	---	NOX	---	---	---	---	---	---	---
		---	CO	---	---	---	---	---	---	---
		GRI-GLYCalc 4.0	VOC	90.03	394.33	108.04	473.19	98.0%	**2.16**	**9.46**
		---	SO2	---	---	---	---	---	---	---
		---	PM10/2.5	---	---	---	---	---	---	---
		GRI-GLYCalc 4.0	Benzene	0.78	3.42	0.94	4.10	98.0%	**0.02**	**0.08**
		GRI-GLYCalc 4.0	Ethylbenzene	2.49	10.92	2.99	13.10	98.0%	**0.06**	**0.26**
		---	HCHO	---	---	---	---	---	---	---
		GRI-GLYCalc 4.0	n-Hexane	1.78	7.80	2.14	9.36	98.0%	**0.04**	**0.19**
		---	Methanol	---	---	---	---	---	---	---
		GRI-GLYCalc 4.0	Toluene	3.49	15.28	4.19	18.34	98.0%	**0.08**	**0.37**
		GRI-GLYCalc 4.0	2,2,4-TMP	0.03	0.15	0.04	0.18	98.0%	**8.3E-04**	**3.6E-03**
		GRI-GLYCalc 4.0	Xylenes	4.21	18.45	5.05	22.14	98.0%	**0.10**	**0.44**
		---	Other HAP	---	---	---	---	---	---	---
		GRI-GLYCalc 4.0	Total HAP	12.79	56.02	15.35	67.22	98.0%	**0.31**	**1.34**
		---	CO2	---	---	---	---	---	---	---
		GRI-GLYCalc 4.0	CH4	29.46	129.05	35	155	98.0%	**1**	**3**
		---	N2O	---	---	---	---	---	---	---
		40CFR98 - Table A-1	CO2e	737	3,226	884	3,871	98.0%	**18**	**77**



***Dehydrator Operating Parameters**

Dry Gas Flow Rate:	125.0 MMscfd	Extended Gas Analysis:	Process Simulation
Wet Gas Temperature:	80 oF	Flash Tank Temperature:	110 oF
Wet Gas Pressure:	1,000 psig	Flash Tank Pressure:	60 psig
Wet Gas Water Content:	Saturated	Flash Tank Off-Gas:	≥ 98% Control
Dry Gas Water Content:	7.0 lb H2O/MMscf	Stripping Gas:	na
Lean Glycol Water Content:	1.5 wt% H2O	Stripping Gas Flow Rate:	na
Glycol Pump Type:	Electric	Regen Overhead Control:	98% Thermal Oxidizer
Glycol Pump Model:	na	Condenser Temperature:	na
Lean Glycol Circulation Rate:	20.00 gpm	Condenser Pressure:	na

Note: Each dehydrator will be equipped with an electric glycol pump (primary) and gas-assist pump (backup).

Additional GRI-GLYCalc 4.0 Model Results:

Flash Tank Off-Gas Flow:	1,330 scfh	Wet Gas Water Content:	0.068 Vol%
Regen Overhead Stream:	3,800 scfh	Dry Gas Water Content:	0.003 Vol%
Lean Glycol Recirc Ratio:	7.4 gal/lb-H2O	Rich Glycol Water Content:	2.850 wt%

Thermal Oxidizer 01 - 9.26 MMBtu/hr

Unit ID (Point ID)	Description	Reference	Pollutant	Emission Factor		Pre-Controlled		Control	Controlled	
				lb/MMscf	lb/MMBtu	lb/hr	tpy	%	lb/hr	tpy
TO-01 (11E) Controls Dehydrators, Stabilized Condensate Tanks and Stabilized Condensate Loading	**Thermal Oxidizer 01 (Combustion Only)** 8.35 MMBtu/hr (LHV) **9.26 MMBtu/hr (HHV)** **8,760 hr/yr** 1,157 Btu/scf (LHV) 1,282 Btu/scf (HHV) 7,223 scf/hr 173.36 Mscfd 63.28 MMscf/yr	EPA AP-42 Table 1.4-2	NOx	125.72	0.098	na	na	na	**0.91**	**3.98**
		EPA AP-42 Table 13.5-2	CO	397.52	0.31	na	na	na	**2.87**	**12.58**
		GRI-GLYCalc, EPA AP-42	VOC	See Dehys, Tanks, TLO						
		EPA AP-42 Table 1.4-2	SO2	0.75	5.88E-04	na	na	na	**5.4E-03**	**0.02**
		EPA AP-42 Table 1.4-2	PM10/2.5	9.55	0.01	na	na	na	**0.07**	**0.30**
		GRI-GLYCalc, EPA AP-42	Benzene	See Dehys, Tanks, TLO						
		GRI-GLYCalc, EPA AP-42	Ethylbenzene	See Dehys, Tanks, TLO						
		EPA AP-42 Table 1.4-3	HCHO	0.09	7.35E-05	na	na	na	**6.8E-04**	**3.0E-03**
		GRI-GLYCalc, EPA AP-42	n-Hexane	See Dehys, Tanks, TLO						
		EPA AP-42 Table 1.4-3	Methanol	---	---	na	na	na	**---**	**---**
		GRI-GLYCalc, EPA AP-42	Toluene	See Dehys, Tanks, TLO						
		GRI-GLYCalc, EPA AP-42	2,2,4-TMP	See Dehys, Tanks, TLO						
		GRI-GLYCalc, EPA AP-42	Xylenes	See Dehys, Tanks, TLO						
		EPA AP-42 Table 1.4-3	Other HAP	2.4E-03	1.86E-06	na	na	na	**1.7E-05**	**7.6E-05**
		Sum	Total HAP	0.10	7.54E-05	na	na	na	**7.0E-04**	**3.1E-03**
		EPA AP-42 Table 1.4-2	CO2	150,861	118	na	na	na	**1,090**	**4,773**
		GRI-GLYCalc, EPA AP-42	CH4	See Dehys, Tanks, TLO						
		EPA AP-42 Table 1.4-2	N2O	2.77	2.16E-03	na	na	na	**2.0E-02**	**0.09**
		40CFR98 - Table A-1	CO2e	151,685	118	na	na	na	**1,096**	**4,799**

Notes:

1 - The combustion emission factors are based on a default fuel heat content of 1,020 Btu/scf (HHV).

2 - PM10/2.5 is filterable and condensable particulate matter; including PM10 and PM2.5.

3 - Max Heat Input calculated as follows:

Total Flash Tank Offgas (GRI-GLYCalc):

	2,660	scf/hr Total Flash Tank Off-Gas
	1,628	Btu/scf (HHV)
SubTotal:	**4.33**	**MMBtu/hr**

Total Regenerator/Still Vent Gas (GRI-GLYCalc):

	7,600	scf/hr Total Still Vent Gas
	320	Btu/scf (HHV)
SubTotal:	**2.43**	**MMBtu/hr**

Stabilized Condensate Storage Tanks:

	24	scf/hr
	3,397	Btu/scf (HHV)
SubTotal:	**0.08**	**MMBtu/hr**

Stabilized Condensate Truck Loading:

	32	scf/hr
	3,397	Btu/scf (HHV)
SubTotal:	**0.11**	**MMBtu/hr**

Pilot and Fuel Gas:

	850	scf/hr
	1,300	Btu/scf (HHV)
SubTotal:	**1.1**	**MMBtu/hr**

Total Heat Input:

Flash Tank Offgas:	4.33	MMBtu/hr	1,628	Btu/scf
Regenerator/Still Vents:	2.43	MMBtu/hr	320	Btu/scf
Stabilized Condensate Storage Tanks:	0.08	MMBtu/hr	3,397	Btu/scf
Stabilized Condensate Truck Loading:	0.11	MMBtu/hr	3,397	Btu/scf
Pilot and Fuel Gas:	1.11	MMBtu/hr	1,300	Btu/scf
15% Contingency:	1.21	MMBtu/hr	1,628	Btu/scf
TOTAL:	**9.26**	MMBtu/hr (HHV)	**1,282**	Btu/scf (HHV)

Dehydrator Reboiler - 2.00 MMBtu/hr

Unit ID (Point ID)	Description	Reference	Pollutant	Emission Factor		Pre-Controlled		Control	Controlled	
				lb/MMscf	lb/MMBtu	lb/hr	tpy	%	lb/hr	tpy
RBV-01 (12E) RBV-02 (13E)	**Reboiler 01** **Reboiler 02** **2.00 MMBtu/hr (HHV)** **8,760 hr/yr** 1,020 Btu/scf (HHV) 1,961 scf/hr 47.06 Mscfd 17.18 MMscf/yr	EPA AP-42 Table 1.4-2	NOX	100.00	0.10	0.20	0.86	na	**0.20**	**0.86**
		EPA AP-42 Table 1.4-2	CO	84.00	0.08	0.16	0.72	na	**0.16**	**0.72**
		EPA AP-42 Table 1.4-2	VOC	5.68	0.01	0.01	0.05	na	**0.01**	**0.05**
		EPA AP-42 Table 1.4-2	SO2	0.60	5.88E-04	1.2E-03	5.2E-03	na	**1.2E-03**	**5.2E-03**
		EPA AP-42 Table 1.4-2	PM10/2.5	7.60	0.01	0.01	0.07	na	**0.01**	**0.07**
		EPA AP-42 Table 1.4-3	Benzene	2.1E-03	2.06E-06	4.1E-06	1.8E-05	na	**4.1E-06**	**1.8E-05**
		EPA AP-42 Table 1.4-3	Ethylbenzene	---	---	---	---	---	**---**	**---**
		EPA AP-42 Table 1.4-3	HCHO	0.08	7.35E-05	1.5E-04	6.4E-04	na	**1.5E-04**	**6.4E-04**
		EPA AP-42 Table 1.4-3	n-Hexane	1.80	1.76E-03	3.5E-03	0.02	na	**3.5E-03**	**0.02**
		EPA AP-42 Table 1.4-3	Methanol	---	---	---	---	---	**---**	**---**
		EPA AP-42 Table 1.4-3	Toluene	3.4E-03	3.33E-06	6.7E-06	2.9E-05	---	**6.7E-06**	**2.9E-05**
		EPA AP-42 Table 1.4-3	2,2,4-TMP	---	---	---	---	na	**---**	**---**
		EPA AP-42 Table 1.4-3	Xylenes	---	---	---	---	---	**---**	**---**
		EPA AP-42 Table 1.4-3	Other HAP	1.9E-03	1.86E-06	3.7E-06	1.6E-05	na	**3.7E-06**	**1.6E-05**
		EPA AP-42 Table 1.4-3	Total HAP	1.88	1.85E-03	3.7E-03	0.02	na	**3.7E-03**	**0.02**
		EPA AP-42 Table 1.4-2	CO2	120,000	118	235	1,031	na	**235**	**1,031**
		EPA AP-42 Table 1.4-2	CH4	2.30	2.25E-03	4.5E-03	0.02	na	**4.5E-03**	**0.02**
		EPA AP-42 Table 1.4-2	N2O	2.20	2.16E-03	4.3E-03	0.02	na	**4.3E-03**	**0.02**
		40CFR98 - Table A-1	CO2e	120,713	118	237	1,037	na	**237**	**1,037**

Notes: 1 - The combustion emission factors are based on a default fuel heat content of 1,020 Btu/scf (HHV).

2 - PM10/2.5 is filterable and condensable particulate matter; including PM10 and PM2.5.

3 - Total HAP includes HCHO, n-hexane, BTEX (benzene, toluene, ethylbenzene, xylene), acetaldehyde, acrolein, and methanol.

Flare 01 - 5.94 MMBtu/hr

Unit ID (Point ID)	Description	Reference	Pollutant	Emission Factor		Pre-Controlled		Control	Controlled	
				lb/MMscf	lb/MMBtu	lb/hr	tpy	%	lb/hr	tpy
FLR-01 (14E) Controls Blowdowns	**Flare 01 (Combustion Only)** 5.36 MMBtu/hr (LHV) **5.94 MMBtu/hr (HHV)** **8,760 hr/yr** 1,211 Btu/scf (LHV) 1,342 Btu/scf (HHV) 4,427 scf/hr 106.25 Mscfd 38.78 MMscf/yr	EPA AP-42 Table 1.4-2	NOx	131.61	0.098	na	na	na	**0.58**	**2.55**
		EPA AP-42 Table 13.5-2	CO	416.14	0.31	na	na	na	**1.84**	**8.07**
		Engineering Judgement	VOC	See SSM						
		EPA AP-42 Table 1.4-2	SO2	0.79	5.88E-04	na	na	na	**3.5E-03**	**0.02**
		EPA AP-42 Table 1.4-2	PM10/2.5	10.00	0.01	na	na	na	**0.04**	**0.19**
		Engineering Judgement	Benzene	See SSM						
		Engineering Judgement	Ethylbenzene	See SSM						
		EPA AP-42 Table 1.4-3	HCHO	0.10	7.35E-05	na	na	na	**4.4E-04**	**1.9E-03**
		Engineering Judgement	n-Hexane	See SSM						
		EPA AP-42 Table 1.4-3	Methanol	---	---	na	na	na	**---**	**---**
		Engineering Judgement	Toluene	See SSM						
		Engineering Judgement	2,2,4-TMP	See SSM						
		Engineering Judgement	Xylenes	See SSM						
		EPA AP-42 Table 1.4-3	Other HAP	2.5E-03	1.86E-06	na	na	na	**1.1E-05**	**4.8E-05**
		Sum	Total HAP	0.10	7.54E-05	na	na	na	**4.5E-04**	**2.0E-03**
		EPA AP-42 Table 1.4-2	CO2	157,929	118	na	na	na	**699**	**3,062**
		Engineering Judgement	CH4	See SSM						
		EPA AP-42 Table 1.4-2	N2O	2.90	2.16E-03	na	na	na	**1.3E-02**	**0.06**
		40CFR98 - Table A-1	CO2e	158,792	118	na	na	na	**703**	**3,079**

Notes:
1 - The flare is used to control compressor blowdowns, pigging emissions and ESD events.
2 - The combustion emission factors are based on a default fuel heat content of 1,020 Btu/scf (HHV).
3 - PM10/2.5 is filterable and condensable particulate matter; including PM10 and PM2.5.
4 - Max Heat Input calculated as follows:

Total Blowdown Volume:

	2,990	scf/hr
	1,342	Btu/scf (HHV)
SubTotal:	**4.01**	**MMBtu/hr**

Pilot and Purge Gas:

	860	scf/hr
	1,342	Btu/scf (HHV)
SubTotal:	**1.15**	**MMBtu/hr**

Total Heat Input:

Blowdowns:	4.01	MMBtu/hr	1,342	Btu/scf
Pilot and Purge Gas:	1.15	MMBtu/hr	1,342	Btu/scf
15% Contingency:	0.78	MMBtu/hr	1,342	Btu/scf
TOTAL:	**5.94**	MMBtu/hr (HHV)	**1,342**	Btu/scf (HHV)

Storage Tanks - Stabilized Condensate / Produced Water

Unit ID (Point ID)	Material Stored	Capa-city bbl	Turn-overs /yr	T-Put bbl/yr	TANKS 4.0 (Working Losses)	TANKS 4.0 (Breathing Losses)	VOC 100.00 Wgt%		n-Hexane 5.00 Wgt%		Benzene 1.00 Wgt%		Toluene 1.00 Wgt%		Ethylbenzene 1.00 Wgt%		Xylenes 2.50 Wgt%		Total HAP 10.50 Wgt%	
							lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
T-01 (15E)	Stab. Cond.	400	95.0	38,000	0.139 lb/bbl	0.021 lb/bbl	0.69	3.04	0.03	0.15	0.01	0.03	0.01	0.03	0.01	0.03	0.02	0.08	0.07	0.32
T-02 (16E)	Stab. Cond.	400	95.0	38,000	0.139 lb/bbl	0.021 lb/bbl	0.69	3.04	0.03	0.15	0.01	0.03	0.01	0.03	0.01	0.03	0.02	0.08	0.07	0.32
T-03 (17E)	Stab. Cond.	400	95.0	38,000	0.139 lb/bbl	0.021 lb/bbl	0.69	3.04	0.03	0.15	0.01	0.03	0.01	0.03	0.01	0.03	0.02	0.08	0.07	0.32
T-04 (18E)	Stab. Cond.	400	95.0	38,000	0.139 lb/bbl	0.021 lb/bbl	0.69	3.04	0.03	0.15	0.01	0.03	0.01	0.03	0.01	0.03	0.02	0.08	0.07	0.32
T-05 (19E)	Stab. Cond.	400	95.0	38,000	0.139 lb/bbl	0.021 lb/bbl	0.69	3.04	0.03	0.15	0.01	0.03	0.01	0.03	0.01	0.03	0.02	0.08	0.07	0.32
T-06 (20E)	Stab. Cond.	400	95.0	38,000	0.139 lb/bbl	0.021 lb/bbl	0.69	3.04	0.03	0.15	0.01	0.03	0.01	0.03	0.01	0.03	0.02	0.08	0.07	0.32
Total Pre-Control Emissions:							**4.16**	**18.21**	**0.21**	**0.91**	**0.04**	**0.18**	**0.04**	**0.18**	**0.04**	**0.18**	**0.10**	**0.46**	**0.44**	**1.91**
Thermal Oxidizer Control:							**98%**													
Total Controlled Emissions:							**0.08**	**0.36**	**0.00**	**0.02**	**8.3E-04**	**3.6E-03**	**8.3E-04**	**3.6E-03**	**8.3E-04**	**3.6E-03**	**2.1E-03**	**0.01**	**0.01**	**0.04**

Unit ID (Point ID)	Material Stored	Capa-city bbl	Turn-overs /yr	T-Put bbl/yr	TANKS 4.0 (Working Losses)	TANKS 4.0 (Breathing Losses)	VOC 100.00 Wgt%		n-Hexane 2.00 Wgt%		Benzene 1.00 Wgt%		Toluene 1.00 Wgt%		Ethylbenzene 1.00 Wgt%		Xylenes 1.00 Wgt%		Total HAP 6.00 Wgt%	
							lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
T-07 (21E)	Prod. H2O	400	10.0	4,000	0.007 lb/bbl	0.005 lb/bbl	0.01	0.02	2.7E-04	1.2E-03	5.3E-05	2.3E-04	5.3E-05	2.3E-04	5.3E-05	2.3E-04	1.3E-04	5.8E-04	5.6E-04	2.4E-03
T-08 (22E)	Prod. H2O	400	10.0	4,000	0.007 lb/bbl	0.005 lb/bbl	0.01	0.02	2.7E-04	1.2E-03	5.3E-05	2.3E-04	5.3E-05	2.3E-04	5.3E-05	2.3E-04	1.3E-04	5.8E-04	5.6E-04	2.4E-03
Total Emissions:							**0.01**	**0.05**	**5.3E-04**	**2.3E-03**	**1.1E-04**	**4.7E-04**	**1.1E-04**	**4.7E-04**	**1.1E-04**	**4.7E-04**	**2.7E-04**	**1.2E-03**	**1.1E-03**	**4.9E-03**

Notes: 1 - Storage tanks emissions are estimated using the EPA TANKS 4.0.9d software program. The stabilized condensate composition is based on a process simulation and the produced water composition is estimated to be 95% water and 5% condensate (gasoline RVP=12).

Table 1. Produced Water Storage Tank Flash Loss Emissions Factors for Barnett Shale Special Inventory Purposes ONLY

Pollutant	Average Produced Water Emission Factor (lb/bbl)	
	Gas Production Only Sites	Liquid Hydrocarbon and Gas Production Sites
VOC	0.01	0.0402
Benzene	0.0001	0.000054
Toluene	0.0003	0.000130
Ethylbenzene	0.000006	0.000003
Xylene(s)	0.00006	0.000049
n-Hexane	NA	0.000987

2 - Total HAP from the produced water tanks is estimated at 6.0% of VOC emissions. This is conservative based on an investigation of other produced water emission estimating protocols, as exemplified above (e.g., (0.0001+0.0003+0.000006+0.00006)*100 = 4.7%).

3 - There will be no flashing losses from the stabilized condensate tanks as the product is heated to remove the lighter-end hydrocarbons prior to the liquids being placed in the storage tanks.

4 - It is estimated that each stabilized condensate tank will be emptied up to: **95** t-o/yr = **38,000** bbl/yr

5 - It is estimated that each produced water tank will be emptied up to: **10** t-o/yr = **4,000** bbl/yr

6 - It is projected each stabilized condensate storage tank will have an average throughput of 38,000 bbl/yr; however, it is possible that all product (228,000 bbl/yr) could be moved through one tank.

7 - It is projected each produced water storage tank will have an average throughput of 4,000 bbl/yr; however, it is possible that all product (8,000 bbl/yr) could be moved through one tank.

Truck Load-Out - Stabilized Condensate

Unit ID (Point ID)	Description	S	P	M	T	CE	L_L	T-Put	VOC AP-42 Sect 5.2		n-Hexane, BTEX, and 2,2,4-TMP (Ea) 5.00% of VOC		Total HAP 30.00% of VOC	
		sat. fac.	psia	lb/lb-mol	°R	%	lb/Mgal	Mgal/yr	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
TLO (24E)	Truck Load-Out - Stab. Condensate	0.60	5.3	60.3	510	68.6%	1.47	9,576	10.30	7.04	0.51	0.35	3.09	2.11

Unit ID	Description	S	P	M	T	CE	L_L	T-Put	VOC AP-42 Sect 5.2		n-Hexane, BTEX, and 2,2,4-TMP (Ea) 5.00% of VOC		Total HAP 30.00% of VOC	
		sat. fac.	psia	lb/lb-mol	°R	%	lb/Mgal	Mgal/yr	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
TLO (23E)	Truck Load-Out - Produced Water	0.60	1.5	30.0	510	0.0%	0.66	336	4.62	0.11	0.23	0.01	1.39	0.03
								TOTAL EMISSIONS:	**14.91**	**7.15**	**0.75**	**0.36**	**4.47**	**2.15**

Notes: 1 - Emission factors and formulas are from AP-42 Section 5.2 "Transportation and Marketing of Petroleum Liquids":

$L_L = 12.46 \times S \times P \times M / T \times (1 - CE)$

where:
- L_L = loading loss, lb/1000 gal of liquid loaded
- S = saturation factor, use 0.60 for submerged fill.
- P = true vapor pressure of liquid loaded, psia. Stab. condensate vapor pressure from EPA TANKS 4.0.9d output. Vapor pressure for produced water is estimated.
- M = molecular weight of vapors, lb/lb-mol. Stab. Condensate MW from EPA TANKS 4.0, MW for produced water is estimated.
- T = temperature of bulk liquid loaded, °R = °F + 460 (Conservatively assumed 50 °F.)
- CE = overall emission reduction efficiency (collection efficiency x control efficiency). For condensate loading, the collection efficiency is 70% for tanker trucks with no annual leak test and the control efficiency is 98%.

2 - Produced water molecular weight and vapor pressure are based on operator experience and sampling data at various locations in the Marcellus Shale basin.

3 - The total stabilized condensate storage tank capacity at the facility is:	**2,400**	bbl	=	**100,800**	gal.
4 - The total produced water storage tank capacity at the facility is:	**800**	bbl	=	**33,600**	gal.
5 - It is estimated the stabilized condensate tanks will be emptied up to:	**95**	t-o/yr	=	**228,000**	bbl/yr
6 - It is estimated the produced water tanks will be emptied up to:	**10**	t-o/yr	=	**8,000**	bbl/yr

7 - n-Hexane, each BTEX, and 2,2,4-TMP components are conservatively estimated at 5% of VOC emissions and Total HAP is estimated at 30% of VOC emissions.

8 - Emissions from loading of stabilized condensate will be controlled by a thermal oxidizer with 98% VOC/HAP destruction efficiency.

9 - It is assumed each tanker truck holds 7,000 gallons and can be loaded in one hour.

Piping and Equipment Fugitives - Gas & Light Oil

Unit ID (Point ID)	Description	Component (Unit) Type (Gas)	Unit Count	THC Factor lb/hr/Unit	LDAR Control Credit	Hydrocarbons (THC)		VOC 27.62 Wgt%		n-Hexane 0.51 Wgt%		BTEX, TMP-ea 0.04 Wgt%		Total HAP 0.72 Wgt%		CO2 0.34 Wgt%		CH4 61.54 Wgt%		CO2e GWP = 25	
						lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
FUG-G (1F)	Process Piping Fugitives (Gas)	Valves	960	0.00992	92%	0.76	3.34	0.21	0.92	3.9E-03	0.02	3.2E-04	1.4E-03	5.5E-03	0.02	2.6E-03	0.01	0.47	2.05	12	51
		Pump Seals	0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
		Other	72	0.01940	0%	1.40	6.12	0.39	1.69	0.01	0.03	5.9E-04	2.6E-03	0.01	0.04	4.7E-03	0.02	0.86	3.77	21	94
		Connectors	3,132	0.00044	93%	0.10	0.42	0.03	0.12	4.9E-04	2.2E-03	4.1E-05	1.8E-04	7.0E-04	3.0E-03	3.3E-04	1.4E-03	0.06	0.26	1	7
		Flanges	783	0.00086	0%	0.67	2.95	0.19	0.81	3.4E-03	0.01	2.9E-04	1.2E-03	4.8E-03	0.02	2.3E-03	0.01	0.41	1.81	10	45
		Open-ended	34	0.00441	0%	0.15	0.65	0.04	0.18	7.5E-04	3.3E-03	6.3E-05	2.7E-04	1.1E-03	4.7E-03	5.0E-04	2.2E-03	0.09	0.40	2	10
			4,981		**Subtotal:**	**3.08**	**13.48**	**0.85**	**3.72**	**0.02**	**0.07**	**1.3E-03**	**5.7E-03**	**0.02**	**0.10**	**0.01**	**0.05**	**1.89**	**8.29**	**47**	**207**

Unit ID (Point ID)	Description	Component (Unit) Type (Light Oil)	Unit Count	THC Factor lb/hr/Unit	LDAR Control Credit	Hydrocarbons (THC)		VOC 100.00 Wgt%		n-Hexane 5.00 Wgt%		BTEX, TMP-ea 2.00 Wgt%		Total HAP 15.00 Wgt%		CO2 --- Wgt%		CH4 --- Wgt%		CO2e GWP = 25	
						lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
FUG-L (2F)	Process Piping Fugitives (Light Oil)	Valves	576	0.00551	88%	0.38	1.67	0.38	1.67	0.02	0.08	0.01	0.03	0.06	0.25	---	---	---	---	---	---
		Pump Seals	12	0.02866	75%	0.09	0.38	0.09	0.38	4.3E-03	0.02	1.7E-03	0.01	0.01	0.06	---	---	---	---	---	---
		Other	43	0.01653	0%	0.71	3.13	0.71	3.13	0.04	0.16	0.01	0.06	0.11	0.47	---	---	---	---	---	---
		Connectors	1,296	0.00046	93%	0.04	0.18	0.04	0.18	2.1E-03	0.01	8.4E-04	3.7E-03	0.01	0.03	---	---	---	---	---	---
		Flanges	324	0.00024	0%	0.08	0.34	0.08	0.34	3.9E-03	0.02	1.6E-03	0.01	0.01	0.05	---	---	---	---	---	---
		Open-ended	20	0.00309	0%	0.06	0.27	0.06	0.27	3.1E-03	0.01	1.2E-03	5.5E-03	0.01	0.04	---	---	---	---	---	---
			2,271		**Subtotal:**	**1.36**	**5.97**	**1.36**	**5.97**	**0.07**	**0.30**	**0.03**	**0.12**	**0.20**	**0.90**	**---**	**---**	**---**	**---**	**---**	**---**
		TOTAL FUGITIVE EMISSIONS:				**4.44**	**19.45**	**2.21**	**9.70**	**0.08**	**0.37**	**0.03**	**0.13**	**0.23**	**0.99**	**0.01**	**0.05**	**1.89**	**8.29**	**47**	**207**

Notes: 1 - Assumed 8,760 hours per year of fugitive emissions.

2 - Gas and Light Oil emissions calculated using EPA Protocol for Equipment Leak Emission Estimates, EPA-453/R-95-017, Nov 1995.

TABLE 2.4 O&G PROD (AVE)	Gas		Light Oil	
	kg/hr	lb/hr	kg/hr	lb/hr
Valves	4.5E-03	0.00992	2.5E-03	0.00551
Pump Seals	na	na	1.3E-02	0.02866
Others	8.8E-03	0.01940	7.5E-03	0.01653
Connectors	2.0E-04	0.00044	2.1E-04	0.00046
Flanges	3.9E-04	0.00086	1.1E-04	0.00024
Open-Ended Lines	2.0E-03	0.00441	1.4E-03	0.00309

3 - Component counts based on engineering judgement and include a 20% contingency.

4 - "Other" components include compressor seals, relief valves, diaphragms, drains, meters, etc.

5 - To be conservative, the following gas and water/oil characteristics were assumed:

Pollutant	Gas		Light Oil	
	Analysis	Estimated	Analysis	Estimated
Carbon Dioxide	0.22 Wgt%	0.34 Wgt%	--- Wgt%	--- Wgt%
Methane	51.28 Wgt%	61.54 Wgt%	--- Wgt%	--- Wgt%
VOC	25.11 Wgt%	27.62 Wgt%	--- Wgt%	100.00 Wgt%
n-Hexane	0.31 Wgt%	0.51 Wgt%	--- Wgt%	5.00 Wgt%
BTEX, TMP-ea	0.01 Wgt%	0.04 Wgt%	--- Wgt%	2.00 Wgt%
Total HAP	0.34 Wgt%	0.72 Wgt%	--- Wgt%	15.00 Wgt%

6 - As the facility will be subject to the equipment leak standards under NSPS Subpart OOOOa, an LDAR control credit has been taken for a 500 ppm leak definition LDAR program.

Appalachia Midstream Services, LLC

PIONEER COMPRESSION FACILITY

Application for G35-D General Permit Registration

Attachment U - Supporting Emissions Calculations

Engine Crankcase (ECC) Emissions (Fugitive)

Unit ID (Point ID)	Site Rating	Operations	Leak Rate	NOx		CO		VOC w/ HCHO		SO2		PM10/2.5	
			0.40 scf/bhp-hr	5.92 lb/MMscf		43.37 lb/MMscf		16.28 lb/MMscf		0.03 lb/MMscf		0.49 lb/MMscf	
			MMscf/yr	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
ECC (3F)	5,000 bhp (ea)	8,760 hr/yr	17.37	0.01	0.05	0.09	0.38	0.03	0.14	5.8E-05	2.5E-04	9.8E-04	4.3E-03
	20,000 bhp (tot)	8,760 hr/yr	69.50	0.05	0.21	0.34	1.51	0.13	0.57	2.3E-04	1.0E-03	3.9E-03	0.02
TOTAL:	**20,000 bhp**		**TOTAL:**	**0.05**	**0.21**	**0.34**	**1.51**	**0.13**	**0.57**	**2.3E-04**	**1.0E-03**	**3.9E-03**	**0.02**

Unit ID	Site Rating	Operations	Leak Rate	Benzene		Ethylbenzene		Formaldehyde		n-Hexane		Methanol	
			0.40 scf/bhp-hr	0.02 lb/MMscf		2.0E-03 lb/MMscf		2.07 lb/MMscf		0.05 lb/MMscf		0.12 lb/MMscf	
			MMscf/yr	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
ECC (3F)	5,000 bhp (ea)	8,760 hr/yr	17.37	4.3E-05	1.9E-04	3.9E-06	1.7E-05	4.1E-03	0.02	1.1E-04	4.8E-04	2.5E-04	1.1E-03
	20,000 bhp (tot)	8,760 hr/yr	69.50	1.7E-04	7.6E-04	1.6E-05	6.8E-05	0.02	0.07	4.4E-04	1.9E-03	9.8E-04	4.3E-03
TOTAL:	**20,000 bhp**		**TOTAL:**	**1.7E-04**	**7.6E-04**	**1.6E-05**	**6.8E-05**	**0.02**	**0.07**	**4.4E-04**	**1.9E-03**	**9.8E-04**	**4.3E-03**

Unit ID	Site Rating	Operations	Leak Rate	Toluene		TMP, 2,2,4-		Xylenes		Other/Trace		Total HAPs	
			0.40 scf/bhp-hr	0.02 lb/MMscf		0.01 lb/MMscf		0.01 lb/MMscf		0.71 lb/MMscf		3.03 lb/MMscf	
			MMscf/yr	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
ECC (3F)	5,000 bhp (ea)	8,760 hr/yr	17.37	4.0E-05	1.8E-04	2.5E-05	1.1E-04	1.8E-05	7.9E-05	1.4E-03	0.01	0.01	0.03
	20,000 bhp (tot)	8,760 hr/yr	69.50	1.6E-04	7.0E-04	9.8E-05	4.3E-04	7.2E-05	3.2E-04	0.01	0.02	0.02	0.11
TOTAL:	**20,000 bhp**		**TOTAL:**	**1.6E-04**	**7.0E-04**	**9.8E-05**	**4.3E-04**	**7.2E-05**	**3.2E-04**	**0.01**	**0.02**	**0.02**	**0.11**

Unit ID	Site Rating	Operations	Leak Rate	CO2		CH4		N2O		CO2e	
			0.40 scf/bhp-hr	6,557 lb/MMscf		28 lb/MMscf		0.011 lb/MMscf		7,252 lb/MMscf	
			MMscf/yr	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
ECC (3F)	5,000 bhp (ea)	8,760 hr/yr	17.37	13	57	0.05	0.24	2E-05	9E-05	14	63
	20,000 bhp (tot)	8,760 hr/yr	69.50	52	228	0.2	1.0	9E-05	4E-04	58	252
TOTAL:	**20,000 bhp**		**TOTAL:**	**52**	**228**	**0.2**	**1.0**	**9E-05**	**4E-04**	**58**	**252**

Notes:

As per Caterpillar's Application & Installation Guide - Crankcase Ventilation Systems:
"[B]low-by on a new engine is approx. 0.5 ft3/bhp-hr
and design for a worn engine should be 1.0 ft3/bhp-hr."
http://s7d2.scene7.com/is/content/Caterpillar/CM20160713-53120-62603

Actual (acf) to Standard (scf) Conversions

1.0 acf/hp-hr = 0.40 scf/hp-hr

31,291 acf/min = 12,413 scf/min

1,200 Ft Elev 14.07 Patm 0.0 psig (P) 814 oF (T)

(14.07 = Patm @ 1,200 ft elev)

scf = acf * [(P+Patm)/14.7] * [528/(T+460)]

Potentially Applicable

AP-42 and GHG EMISSION FACTORS

(Preferentially use test data or vendor data where available)

	Pollutant	GAS-FIRED ENGINE			GAS-FIRED TURBINE		
		AP-42 Table 3.2-1; 3.2-2; 3.2-3 07/00			AP-42 Table 3.1-1; 3.1-2a; 3.1-3 04/00		
		2SLB lb/MMBtu	4SLB lb/MMBtu	4SRB lb/MMBtu	Uncontrolled lb/MMBtu	Water Injection lb/MMBtu	Lean Pre-Mix# lb/MMBtu
CRITERIA	NOX (≥ 90% Load)	3.170E+00	4.080E+00	2.210E+00	3.200E-01	1.300E-01	9.900E-02
	CO (≥ 90% Load)	3.860E-01	3.170E-01	3.720E+00	8.200E-02	3.000E-02	1.500E-02
	THC (TOC)	1.640E+00	1.470E+00	3.580E-01	1.100E-02	1.100E-02	1.100E-02
	NMHC (THC-CH4)	1.900E-01	2.200E-01	1.280E-01	2.400E-03	2.400E-03	2.400E-03
	NMNEHC (NMHC-C2H6)	1.191E-01	1.150E-01	5.760E-02	2.100E-03	2.100E-03	2.100E-03
	VOC	1.200E-01	1.180E-01	2.960E-02	2.100E-03	2.100E-03	2.100E-03
	SO2*** (2,000 gr-S/MMscf)	5.880E-04	5.880E-04	5.880E-04	3.400E-03	3.400E-03	3.400E-03
	PM10/2.5 (Filter+Cond)	4.831E-02	9.987E-03	1.941E-02	6.600E-03	6.600E-03	6.600E-03
HAPs	Benzene	1.940E-03	4.400E-04	1.580E-03	1.200E-05	1.200E-05	9.100E-07
	Ethylbenzene	1.080E-04	3.970E-05	2.480E-05	3.200E-05	3.200E-05	3.200E-05
	Formaldehyde (HCHO)	5.520E-02	5.280E-02	2.050E-02	7.100E-04	7.100E-04	2.000E-05
	n-Hexane	4.450E-04	1.110E-03	---	---	---	---
	Methanol (MeOH)	2.480E-03	2.500E-03	3.060E-03	---	---	---
	Toluene	9.630E-04	4.080E-04	5.580E-04	1.300E-04	1.300E-04	1.300E-04
	TMP, 2,2,4- (i-Octane)	8.460E-04	2.500E-04	---	---	---	---
	Xylenes	2.680E-04	1.840E-04	1.950E-04	6.400E-05	6.400E-05	6.400E-05
	Other HAPs	1.715E-02	1.443E-02	6.359E-03	1.061E-04	1.061E-04	1.061E-04
GHG	CO2**** (GWP=1)	1.170E+02	1.170E+02	1.170E+02	1.170E+02	1.170E+02	1.170E+02
	CH4 (GWP=25)	1.450E+00	1.250E+00	2.300E-01	8.600E-03	8.600E-03	8.600E-03
	N2O (GWP=298)	*2.205E-04*	*2.205E-04*	*2.205E-04*	3.000E-03	3.000E-03	3.000E-03
	CO2e	*1.533E+02*	*1.483E+02*	*1.228E+02*	*1.181E+02*	*1.181E+02*	*1.181E+02*

(#Lean Pre-Mix - aka: Dry Low Emissions (DLE or DLN) and SoLoNOx)

	Pollutant	GAS-FIRED EXTERNAL COMBUSTION			FLARE	DIESEL ENGINE
		AP-42 Table 1.4-1; 1.4-2; 1.4-3 (<100 MMBtu/hr) 07/98			13.5-1 12/16	3.3-1; 3.3-2 10/96
		Uncontrolled lb/MMBtu	LoNOx Burners lb/MMBtu	Flue Gas Recirc lb/MMBtu	Combustion lb/MMBtu	Uncontrolled lb/MMBtu
CRITERIA	NOX	9.804E-02	4.902E-02	3.137E-02	9.800E-02	4.410E+00
	CO	8.235E-02	8.235E-02	8.235E-02	3.100E-01	9.500E-01
	THC (TOC)	1.078E-02	1.078E-02	1.078E-02	≥98% Destruction and Removal Efficiency	3.600E-01
	NMHC (THC-CH4)	8.529E-03	8.529E-03	8.529E-03		3.534E-01
	NMNEHC (NMHC-C2H6)	5.490E-03	5.490E-03	5.490E-03		3.503E-01
	VOC (NMNEHC+HCHO)	5.564E-03	5.564E-03	5.564E-03		3.600E-01
	SO2 (2,000 gr-S/MMscf)	5.882E-04	5.882E-04	5.882E-04	*5.882E-04*	2.900E-01
	PM10/2.5 (Filter+Condense)	7.451E-03	7.451E-03	7.451E-03	*7.451E-03*	3.100E-01
HAPs	Benzene	2.059E-06	2.059E-06	2.059E-06	≥98% Destruction and Removal Efficiency	9.330E-04
	Ethylbenzene	---	---	---		---
	HCHO (Formaldehyde)	7.353E-05	7.353E-05	7.353E-05		1.180E-03
	n-Hexane	1.765E-03	1.765E-03	1.765E-03		---
	Methanol (MeOH)	---	---	---		---
	Toluene	3.333E-06	3.333E-06	3.333E-06		4.090E-04
	2,2,4-TMP (i-Octane)	---	---	---		---
	Xylenes	---	---	---		2.850E-04
	Other HAPs	1.861E-06	1.861E-06	1.861E-06		1.050E-03
GHG	CO2 (GWP=1)	1.176E+02	1.176E+02	1.176E+02	*1.176E+02*	1.640E+02
	CH4 (GWP=25)	2.255E-03	2.255E-03	2.255E-03	*98% DRE*	*6.614E-03*
	N2O (GWP=298)	2.157E-03	6.275E-04	6.275E-04	*2.157E-03*	*1.323E-03*
	CO2e	*1.183E+02*	*1.179E+02*	*1.179E+02*	*1.183E+02*	*1.646E+02*

40 CFR 98 - DEFAULT EMISSION FACTORS				
Fuel Type	Table C-1 to Subpart C of Part 98		Table C-2 to Subpart C of Part 98	
	Default HHV	Carbon Dioxide lb CO2/MMBtu	Methane lb CH4/MMBtu	Nitrous Oxide lb N2O/MMBtu
Fuel Oil No. 2 (Diesel)	0.138 MMBtu/gal	163.054	6.614E-03	1.323E-03
Propane	0.091 MMBtu/gal	138.605	6.614E-03	1.323E-03
Natural Gas	1,026 Btu/scf	116.977	2.205E-03	2.205E-04

Global Warming Potential (100 Yr) (GWP)		
Table A-1 to Subpart A of Part 98		
CO2	CH4*	N2O#
1.00	25.00	298.00

#Revised by EPA on 11/29/13

Conversion Factors

http://www.onlineconversion.com/

1.0 lb	=	453.592 g
1.0 kg	=	2.205 lb
1.0 hp	=	2,544.433 Btu/hr
1.0 hp	=	745.700 Watt
1.0 kW	=	3,412.142 Btu/hr
1.0 kW-hr	=	1.340 hp-hr
1.0 cf	=	7.481 gal
1.0 gal H2O	=	8.338 lb
1.0 cf H2O	=	62.371 gal
1.0 m	=	3.281 ft
1.0 km	=	0.621 mi
1.0 acre	=	43,560.174 ft2
1.0 °F	=	(°C*9/5)+32
1.0 °R	=	°F+459.67
1.0 %	=	10,000 ppm
UGC (stp)	=	379.48 scf/lb-mol

*Converted Ext Comb Emission Factors to lb/MMBtu by dividing lb/MMscf by AP-42 default HHV of 1,020 Btu/scf.

**Converted GHG Emission Factors to lb/MMBtu by multiplying kg/MMBtu by 2.2046 lb/kg.

***Assumes 100% conversion of fuel sulfur to SOX (2,000 gr/MMscf).

****Assumes 99.5% conversion of fuel carbon to CO2 for natural gas.

Inlet Natural Gas Composition

PIONEER	
	Mol %
Water	0.004987673
TEG	7.62E-05
Oxygen	0
Nitrogen	0.414401354
Methane	71.61616414
CO2	0.109822778
Ethane	17.04042019
Propane	6.678017477
i-Butane	0.667255052
n-Butane	2.161864892
i-Pentane	0.337623257
n-Pentane	0.533286101
2,2-Dimethylbutane	0
2,3-Dimethylbutane	0.112643041
2-Methylpentane	0
3-Methylpentane	0.07362004
Hexane	0.079642174
2,2-Dimethylpentane	0.000738684
Methylcyclopentane	0.006601254
Benzene	0.000775912
3,3-Dimethylpentane	0.000599801
Cyclohexane	0.009586361
2-Methylhexane	0.023655905
2,3-Dimethylpentane	0.000749083
3-Methylhexane	0.020141212
Heptane	0.0408188
Toluene	0.002387363
Octane	0.01024341
Ethylbenzene	0.00132532
o-Xylene	0.000206937
2-Methylheptane	0.009070721
1,t-2-Dimethylcyclopentane	0
1,t-3Dimethylcyclopentane	0
Methylcyclohexane	0.018513458
2,5-Dimethylhexane	0.001984056
2,3-Dimethylhexane	0
4-Methylheptane	0
3-Methylheptane	0
1,t-4-Dimethylcyclohexane	0
1,t-3-Dimethylcyclohexane	0.000581604
2,4,4-Trimethylhexane	0
2,6-Dimethylheptane	0
Ethylcyclohexane	0
Nonane	0.002391595
Neopentane	0
n-Undecane	3.83E-05
n-Decane	0.000478486
m-Xylene	0.000680904
p-Xylene	0.00071442
2,2,4-Trimethylpentane	0.001831033
2,4-Dimethylpentane	0.000267814
3-Ethylpentane	0.002933928
2,4-Dimethylhexane	0.002004552
trans-1,2-Dimethylcyclohexane	0.007055752
cis-1,2-Dimethylcyclohexane	0.002751797
cis-1,3-Dimethylcyclohexane	0.001042446

Appalachia Midstream Services, LLC

PIONEER COMPRESSION FACILITY

Application for G35-D General Permit Registration

Attachment U - Gas Analysis

Extended Inlet Gas Analysis Summary

Representative Gas Analysis - Process Simulation

Compound	CAS	Formula	Molecular Weight (MW)	Mole % (M%)	Mole Fraction (M%/Sum-M%)	Weighted Sum (MW*MF)	Weight % (WS/Sum-WS)	lb/MMscf (WS/UGC#)
Water	109-86-4	H2O	18.02	---	---	---	---	---
Carbon Monoxide	630-08-0	CO	28.01	---	---	---	---	---
Nitrogen	7727-37-9	N2	28.01	**0.4144**	0.00414	0.1161	0.5182	**305.93**
Oxygen	7782-44-7	O2	32.00	---	---	---	---	---
Hydrogen Sulfide	2148-87-8	H2S	34.09	---	---	---	---	---
Carbon Dioxide	124-38-9	CO2	44.01	**0.1098**	0.00110	0.0483	0.2157	**127.37**
Methane*	75-82-8	CH4	16.04	**71.6162**	0.71620	11.4896	51.2841	**30,277.02**
Ethane*	74-84-0	C2H6	30.07	**17.0404**	0.17041	5.1241	22.8718	**13,503.01**
Propane**	74-98-6	C3H8	44.10	**6.6780**	0.06678	2.9449	13.1445	**7,760.20**
i-Butane**	75-28-5	C4H10	58.12	**0.6673**	0.00667	0.3878	1.7311	**1,022.03**
n-Butane**	106-97-8	C4H10	58.12	**2.1619**	0.021620	1.2566	5.6088	**3,311.32**
Cyclopentane**	287-92-3	C5H10	70.10	---	---	---	---	---
i-Pentane**	78-78-4	C5H12	72.15	**0.3376**	0.003376	0.2436	1.0873	**641.89**
n-Pentane**	109-66-0	C5H12	72.15	**0.5333**	0.005333	0.3848	1.7175	**1,013.96**
Cyclohexane**	110-82-7	C6H12	84.16	**0.0162**	0.000162	0.0136	0.0608	**35.90**
Other Hexanes**	110-54-3	C6H14	86.18	**0.1863**	0.001863	0.1605	0.7165	**422.99**
Methylcyclohexanes**	varies	C7H14	98.19	**0.0185**	0.000185	0.0182	0.0811	**47.90**
Heptanes**	varies	C7H16	100.20	**0.0899**	0.000899	0.0901	0.4021	**237.40**
C8+ Heavies**	varies	C8+	130.00 est	**0.0376**	0.000376	0.0489	0.2184	**128.95**
Benzene***	71-43-2	C6H6	78.11	**0.0008**	0.000008	0.0006	0.0027	**1.60**
Ethylbenzene***	100-41-4	C8H10	106.17	**0.0013**	0.000013	0.0014	0.0063	**3.71**
n-Hexane***	110-54-3	C6H14	86.18	**0.0796**	0.000796	0.0686	0.3064	**180.87**
Toluene***	108-88-3	C7H8	92.14	**0.0024**	0.000024	0.0022	0.0098	**5.80**
2,2,4-Trimethylpentane***	540-84-1	C8H18	114.23	**0.0018**	0.000018	0.0021	0.0093	**5.51**
Xylenes***	1330-20-7	C8H10	106.17	**0.0016**	0.000016	0.0017	0.0076	**4.48**

Total:	**99.99**	**1.0000**	**22.40**	**100.00**	**59,038**
THC:	**99.47**	**0.9948**	**22.24**	**99.27**	**58,605**
Total CH4:	**71.62**	**0.7162**	**11.49**	**51.28**	**30,277**
Total VOC:	**10.81**	**0.1081**	**5.63**	**25.11**	**14,825**
Total HAP:	**0.09**	**0.0009**	**0.08**	**0.34**	**202**

* = Hydrocarbon (HC) ** = also Volatile Organic Compound (EPA-VOC) *** = also Hazardous Air Pollutant (EPA-HAP)

#UGC (Universal Gas Constant) = 379.482 scf/lb-mol @ 60 ^{o}F and 14.696 psia. Pound "X"/scf = M% of "X" * MW of "X" / UGC

To be conservative, the following "worst-case" values were assumed:

Compound	CAS	Formula	Representative Gas Analysis			Assumed "Worst-Case"		
			Mole %	Wgt %	lb/MMscf	Mole %	Wgt %	lb/MMscf
Nitrogen	7727-37-9	N2	0.4144	0.5182	305.9263	0.000	**0.000**	**0.00**
Carbon Dioxide	124-38-9	CO2	0.1098	0.2157	127.37	0.172	**0.339**	**200.00**
Methane*	75-82-8	CH4	71.6162	51.2841	30,277.02	85.939	**61.541**	**36,332.43**
Ethane*	74-98-6	C2H6	17.0404	22.8718	13,503.01	0.000	**0.000**	**0.00**
VOC**	Various	C3 thru C10+	10.8141	25.1102	14,824.52	11.895	**27.621**	**16,306.97**
Benzene***	71-43-2	C6H6	0.0008	0.0027	1.60	0.0121	**0.042**	**25.00**
Ethylbenzene***	100-41-4	C8H10	0.0013	0.0063	3.71	0.0089	**0.042**	**25.00**
n-Hexane***	110-54-3	C6H14	0.0796	0.3064	180.87	0.1321	**0.508**	**300.00**
Toluene***	108-88-3	C7H8	0.0024	0.0098	5.80	0.0103	**0.042**	**25.00**
2,2,4-Trimethylpentane***	540-84-1	C8H18	0.0018	0.0093	5.51	0.0083	**0.042**	**25.00**
Xylenes***	1330-20-7	C8H10	0.0016	0.0076	4.48	0.0089	**0.042**	**25.00**
Total HAP***	Various	C6 thru C8	0.0876	0.3421	201.96	0.1843	**0.720**	**425.00**

Stabilized Condensate Composition

Constituent	Mol%
Water	2.70E-09
Methane	1.57E-11
CO2	1.91E-10
Ethane	6.66E-05
Propane	1.13E+00
i-Butane	1.70E+00
n-Butane	9.29E+00
i-Pentane	4.33E+00
n-Pentane	9.44E+00
2,3-Dimethylbutane	4.83E+00
3-Methylpentane	3.83E+00
Hexane	5.47E+00
2,2-Dimethylpentane	6.94E-02
Methylcyclopentane	4.42E-01
Benzene	6.15E-02
3,3-Dimethylpentane	7.28E-02
Cyclohexane	8.33E-01
2-Methylhexane	3.54E+00
2,3-Dimethylpentane	1.10E-01
3-Methylhexane	3.37E+00
Heptane	9.07E+00
Toluene	6.95E-01
Octane	7.55E+00
Ethylbenzene	1.20E+00
o-Xylene	2.54E-01
2-Methylheptane	4.62E+00
Methylcyclohexane	4.17E+00
2,5-Dimethylhexane	6.79E-01
1,t-3-Dimethylcyclohexane	3.34E-01
Nonane	6.00E+00
n-Undecane	9.70E-01
n-Decane	3.64E+00
Dodecane	3.23E-01
Tridecane	1.05E-01
Tetradecane	3.65E-02
Pentadecane	3.00E-02
Hexadecane	8.63E-02
Heptadecane	6.20E-02
Octadecane	7.37E-02
Nonadecane	6.68E-02
Eicosane	8.65E-02
C21	2.46E-01
C22	6.64E-01
C23	1.38E+00
C24	1.65E-01
m-Xylene	6.65E-01
p-Xylene	6.52E-01
2,2,4-Trimethylpentane	3.76E-01
2,4-Dimethylpentane	2.75E-02
3-Ethylpentane	4.97E-01
2,4-Dimethylhexane	6.62E-01
trans-1,2-Dimethylcyclohexane	3.69E+00
cis-1,2-Dimethylcyclohexane	1.91E+00
cis-1,3-Dimethylcyclohexane	4.91E-01

Appalachia Midstream Services, LLC

PIONEER COMPRESSION FACILITY

Application for G35-D General Permit Registration

Attachment U - Gas Analysis

Extended Stabilized Condensate Analysis Summary

Representative Analysis - Process Simulation

Compound	CAS	Formula	Molecular Weight (MW)	Mole % (M%)	Mole Fraction (M%/Sum-M%)	Weighted Sum (MW*MF)	Weight % (WS/Sum-WS)	lb/MMscf (WS/UGC#)
Water	109-86-4	H2O	18.02	---	---	---	---	---
Carbon Monoxide	630-08-0	CO	28.01	---	---	---	---	---
Nitrogen	7727-37-9	N2	28.01	---	---	---	---	---
Oxygen	7782-44-7	O2	32.00	---	---	---	---	---
Hydrogen Sulfide	2148-87-8	H2S	34.09	---	---	---	---	---
Carbon Dioxide	124-38-9	CO2	44.01	---	---	---	---	---
Methane*	75-82-8	CH4	16.04	---	---	---	---	---
Ethane*	74-84-0	C2H6	30.07	---	---	---	---	---
Propane**	74-98-6	C3H8	44.10	**1.1284**	0.01128	0.4976	0.5024	**1,311.20**
i-Butane**	75-28-5	C4H10	58.12	**1.7023**	0.01702	0.9894	0.9989	**2,607.28**
n-Butane**	106-97-8	C4H10	58.12	**9.2860**	0.092860	5.3972	5.4490	**14,222.65**
Cyclopentane**	287-92-3	C5H10	70.10	---	---	---	---	---
i-Pentane**	78-78-4	C5H12	72.15	**4.3322**	0.043322	3.1256	3.1556	**8,236.58**
n-Pentane**	109-66-0	C5H12	72.15	**9.4398**	0.094398	6.8107	6.8761	**17,947.40**
Cyclohexane**	110-82-7	C6H12	84.16	**1.2746**	0.012746	1.0727	1.0830	**2,826.74**
Other Hexanes**	110-54-3	C6H14	86.18	**8.6598**	0.086598	7.4626	7.5342	**19,665.19**
Methylcyclohexanes**	varies	C7H14	98.19	**4.1743**	0.041743	4.0986	4.1379	**10,800.40**
Heptanes**	varies	C7H16	100.20	**16.7643**	0.167643	16.7982	16.9594	**44,266.11**
C8+ Heavies**	varies	C8+	130.00 est	**33.8626**	0.338627	44.0215	44.4439	**116,004.07**
Benzene***	71-43-2	C6H6	78.11	**0.0615**	0.000615	0.0481	0.0485	**126.67**
Ethylbenzene***	100-41-4	C8H10	106.17	**1.1994**	0.011994	1.2733	1.2856	**3,355.48**
n-Hexane***	110-54-3	C6H14	86.18	**5.4719**	0.054719	4.7154	4.7607	**12,425.99**
Toluene***	108-88-3	C7H8	92.14	**0.6950**	0.006950	0.6403	0.6465	**1,687.35**
2,2,4-Trimethylpentane***	540-84-1	C8H18	114.23	**0.3764**	0.003764	0.4299	0.4340	**1,132.92**
Xylenes***	1330-20-7	C8H10	106.17	**1.5714**	0.015714	1.6683	1.6843	**4,396.29**

Total:	**100.00**	**1.0000**	**99.05**	**100.00**	**261,012**
THC:	**100.00**	**1.0000**	**99.05**	**100.00**	**261,012**
Total CH4:	**---**	**---**	**---**	**---**	**---**
Total VOC:	**100.00**	**1.0000**	**99.05**	**100.00**	**261,012**
Total HAP:	**9.38**	**0.0938**	**8.78**	**8.86**	**23,125**

* = Hydrocarbon (HC) ** = also Volatile Organic Compound (EPA-VOC) *** = also Hazardous Air Pollutant (EPA-HAP)

#UGC (Universal Gas Constant) = 379.482 scf/lb-mol @ 60 ^{o}F and 14.696 psia. Pound "X"/scf = M% of "X" * MW of "X" / UGC

Appalachia Midstream Services, LLC

PIONEER COMPRESSION FACILITY

Application for G35-D General Permit Registration

Btu Loading on the Thermal Oxidizer (TO-01)

Component	Formula	Component Btu/scf (HHV)	Dehy-01 and -02 Flash Gas Elect. Pump Flowrate: 2,660 scf/hr		Dehy-01 and -02 Still Vents Elect. Pump Flowrate: 7,600 scf/hr		Stabilized Condensate Tanks Flowrate: 24 scf/hr		Stabilized Condensate Loading Flowrate: 32 scf/hr		TOTAL 10,316 scf/hr
			Mol%	MMBtu/hr	Mol%	MMBtu/hr	Mol%	MMBtu/hr	Mol%	MMBtu/hr	MMBtu/Hr
Water	H2O	---	0.1140	---	89.5000	---	---	---	---	---	---
Carbon Monoxide	CO	---	---	---	---	---	---	---	---	---	---
Nitrogen	N2	---	0.3570	---	0.0068	---	---	---	---	---	---
Oxygen	O2	---	---	---	---	---	---	---	---	---	---
Hydrogen Sulfide	H2S	637.64	---	---	---	---	---	---	---	---	---
Carbon Dioxide	CO2	---	0.6380	---	0.1690	---	---	---	---	---	---
Methane	CH4	1,010.00	49.6000	1.3326	0.9780	0.0751	---	---	---	---	1.4076
Ethane	C2H6	1,769.70	28.1000	1.3228	2.0800	0.2798	---	---	---	---	1.6025
Propane	C3H8	2,516.20	12.5000	0.8366	2.0300	0.3882	20.9828	0.0125	20.9828	0.0170	1.2544
i-Butane	C4H10	3,252.00	1.3200	0.1142	0.3400	0.0840	11.1692	0.0086	11.1692	0.0117	0.2185
n-Butane	C4H10	3,262.40	4.9000	0.4252	1.6800	0.4165	41.2633	0.0320	41.2633	0.0434	0.9171
Cyclopentane	C5H10	3,763.60	0.0000	0.0000	0.0000	0.0000	---	---	---	---	0.0000
i-Pentane	C5H12	4,000.90	0.6310	0.0672	0.2570	0.0781	6.8913	0.0066	6.8913	0.0089	0.1607
n-Pentane	C5H12	4,008.90	1.1200	0.1194	0.5790	0.1764	10.9539	0.0104	10.9539	0.0141	0.3204
Cyclohexane	C6H12	4,481.60	0.0465	0.0055	0.1860	0.0634	0.2953	0.0003	0.2953	0.0004	0.0696
Other Hexanes	C6H14	4,750.30	0.3480	0.0440	0.2540	0.0917	4.0254	0.0045	4.0254	0.0062	0.1464
Methylcyclohexane	C7H14	5,215.90	0.0396	0.0055	0.2100	0.0832	0.3790	0.0005	0.3790	0.0006	0.0898
Heptanes	C7H16	5,502.50	0.1550	0.0227	0.3280	0.1372	1.4480	0.0019	1.4480	0.0026	0.1643
C8+ Heavies	C8+	7,150.00 est	0.0712	0.0135	0.1720	0.0935	0.7174	0.0012	0.7174	0.0017	0.1099
Benzene	C6H6	3,741.90	0.0032	0.0003	0.0987	0.0281	0.0119	0.0000	0.0119	0.0000	0.0284
Ethylbenzene	C8H10	5,222.00	0.0026	0.0004	0.2340	0.0929	0.0210	0.0000	0.0210	0.0000	0.0933
n-Hexane	C6H14	4,756.00	0.1550	0.0196	0.1520	0.0549	1.7402	0.0020	1.7402	0.0027	0.0792
Toluene	C7H8	4,474.90	0.0075	0.0009	0.3760	0.1279	0.0375	0.0000	0.0375	0.0001	0.1289
2,2,4-TMP (i-Octane)	C8H18	6,213.60	0.0022	0.0004	0.0023	0.0011	0.0369	0.0001	0.0369	0.0001	0.0016
Xylenes	C8H10	5,208.67	0.0030	0.0004	0.3950	0.1564	0.0271	0.0000	0.0271	0.0000	0.1569

Mol%=Vol% Values from GRI-GLYCalc Model Results						
	MMBtu/hr:	4.33	2.43	0.08	0.11	6.95
	scf/hr:	2,660	7,600	24	32	10,316
	Btu/scf:	1,628	320	3,397	3,397	674

Appalachia Midstream Services, LLC

PIONEER COMPRESSION FACILITY

Application for G35-D General Permit Registration

Btu Loading on the Flare (FLR-01)

Component	Formula	Molecular Weight (MW)	Component Btu/scf (HHV)	SSM Activities (Blowdowns) Flowrate: 2,990 scf/hr		TOTAL 2,990 scf/hr
				Mol%	MMBtu/hr	MMBtu/Hr
Water	H2O	18.02	---	---	---	**---**
Carbon Monoxide	CO	28.01	---	---	---	**---**
Nitrogen	N2	28.01	---	**0.4144**	---	**---**
Oxygen	O2	32.00	---	---	---	**---**
Hydrogen Sulfide	H2S	34.09	637.64	---	---	**---**
Carbon Dioxide	CO2	44.01	---	**0.1098**	---	**---**
Methane	CH4	16.04	1,010.00	**71.6162**	2.1624	**2.1624**
Ethane	C2H6	30.07	1,769.70	**17.0404**	0.9015	**0.9015**
Propane	C3H8	44.10	2,516.20	**6.6780**	0.5023	**0.5023**
i-Butane	C4H10	58.12	3,252.00	**0.6673**	0.0649	**0.0649**
n-Butane	C4H10	58.12	3,262.40	**2.1619**	0.2109	**0.2109**
Cyclopentane	C5H10	70.10	3,763.60	**0.0000**	0.0000	**0.0000**
i-Pentane	C5H12	72.15	4,000.90	**0.3376**	0.0404	**0.0404**
n-Pentane	C5H12	72.15	4,008.90	**0.5333**	0.0639	**0.0639**
Cyclohexane	C6H12	84.16	4,481.60	**0.0162**	0.0022	**0.0022**
Other Hexanes	C6H14	86.18	4,750.30	**0.1863**	0.0265	**0.0265**
Methylcyclohexane	C7H14	98.19	5,215.90	**0.0185**	0.0029	**0.0029**
Heptanes	C7H16	100.20	5,502.50	**0.0899**	0.0148	**0.0148**
C8+ Heavies	C8+	130.00 est	7,150.00 est	**0.0376**	0.0080	**0.0080**
Benzene	C6H6	78.11	3,741.90	**0.0008**	0.0001	**0.0001**
Ethylbenzene	C8H10	106.17	5,222.00	**0.0013**	0.0002	**0.0002**
n-Hexane	C6H14	86.18	4,756.00	**0.0796**	0.0113	**0.0113**
Toluene	C7H8	92.14	4,474.90	**0.0024**	0.0003	**0.0003**
2,2,4-TMP (i-Octane)	C8H18	114.23	6,213.60	**0.0018**	0.0003	**0.0003**
Xylenes	C8H10	106.17	5,208.67	**0.0016**	0.0002	**0.0002**

Mol%=Vol% Values from GRI-GLYCalc Model Results

MMBtu/hr:	**4.01**	**4.01**
scf/hr:	**2,990**	**2,990**
Btu/scf:	**1,342**	**1,342**

G3616

GAS COMPRESSION APPLICATION

GAS ENGINE SITE SPECIFIC TECHNICAL DATA

CATERPILLAR®

ENGINE SPEED (rpm):	1000	RATING STRATEGY:	STANDARD
COMPRESSION RATIO:	7.6	RATING LEVEL:	CONTINUOUS
AFTERCOOLER TYPE:	SCAC	FUEL SYSTEM:	GAV
AFTERCOOLER - STAGE 2 INLET (°F):	130		WITH AIR FUEL RATIO CONTROL
AFTERCOOLER - STAGE 1 INLET (°F):	174	**SITE CONDITIONS:**	
JACKET WATER OUTLET (°F):	190	FUEL:	Pioneer
ASPIRATION:	TA	FUEL PRESSURE RANGE(psig): (See note 1)	58.0-70.3
COOLING SYSTEM:	JW+1AC, OC+2AC	FUEL METHANE NUMBER:	53.9
CONTROL SYSTEM:	ADEM4	FUEL LHV (Btu/scf):	1214
EXHAUST MANIFOLD:	DRY	ALTITUDE(ft):	500
COMBUSTION:	LOW EMISSION	MAXIMUM INLET AIR TEMPERATURE(°F):	77
NOx EMISSION LEVEL (g/bhp-hr NOx):	0.3	STANDARD RATED POWER:	5000 bhp@1000rpm
SET POINT TIMING:	16		

				MAXIMUM RATING	SITE RATING AT MAXIMUM INLET AIR TEMPERATURE		
RATING		**NOTES**	**LOAD**	**100%**	**100%**	**75%**	**50%**
ENGINE POWER	(WITHOUT FAN)	(2)	bhp	5000	5000	3750	2500
INLET AIR TEMPERATURE			°F	77	77	77	77
ENGINE DATA							
FUEL CONSUMPTION (LHV)		(3)	Btu/bhp-hr	6782	6782	6950	7414
FUEL CONSUMPTION (HHV)		(3)	Btu/bhp-hr	7466	7466	7651	8162
AIR FLOW (@inlet air temp, 14.7 psia)	(WET)	(4)(5)	ft3/min	12425	12425	9379	6385
AIR FLOW	(WET)	(4)(5)	lb/hr	55092	55092	41587	28311
FUEL FLOW (60ºF, 14.7 psia)			scfm	466	466	358	254
INLET MANIFOLD PRESSURE		(6)	in Hg(abs)	107.9	107.9	80.6	56.3
EXHAUST TEMPERATURE - ENGINE OUTLET		(7)	°F	814	814	860	926
EXHAUST GAS FLOW (@engine outlet temp, 14.5 psia)	(WET)	(8)(5)	ft3/min	31291	31291	24493	17538
EXHAUST GAS MASS FLOW	(WET)	(8)(5)	lb/hr	56722	56722	42839	29202
EMISSIONS DATA - ENGINE OUT							
NOx (as NO2)		(9)(10)	g/bhp-hr	0.30	0.30	0.30	0.30
CO		(9)(10)	g/bhp-hr	2.93	2.93	2.93	2.94
THC (mol. wt. of 15.84)		(9)(10)	g/bhp-hr	3.72	3.72	4.08	4.33
NMHC (mol. wt. of 15.84)		(9)(10)	g/bhp-hr	1.85	1.85	2.03	2.15
NMNEHC (VOCs) (mol. wt. of 15.84)		(9)(10)(11)	g/bhp-hr	0.96	0.96	1.05	1.11
HCHO (Formaldehyde)		(9)(10)	g/bhp-hr	0.14	0.14	0.15	0.20
CO2		(9)(10)	g/bhp-hr	443	443	460	487
EXHAUST OXYGEN		(9)(12)	% DRY	11.1	11.1	10.8	10.5
HEAT REJECTION							
HEAT REJ. TO JACKET WATER (JW)		(13)	Btu/min	53172	53172	43238	36471
HEAT REJ. TO ATMOSPHERE		(13)	Btu/min	18171	18171	16968	15506
HEAT REJ. TO LUBE OIL (OC)		(13)	Btu/min	30493	30493	27342	24075
HEAT REJ. TO A/C - STAGE 1 (1AC)		(13)(14)	Btu/min	46733	46733	24091	6534
HEAT REJ. TO A/C - STAGE 2 (2AC)		(13)(14)	Btu/min	11576	11576	8103	4994

COOLING SYSTEM SIZING CRITERIA			
TOTAL JACKET WATER CIRCUIT (JW+1AC)	(14)(15)	Btu/min	107559
TOTAL STAGE 2 AFTERCOOLER CIRCUIT (OC+2AC)	(14)(15)	Btu/min	48747
A cooling system safety factor of 0% has been added to the cooling system sizing criteria.			

CONDITIONS AND DEFINITIONS

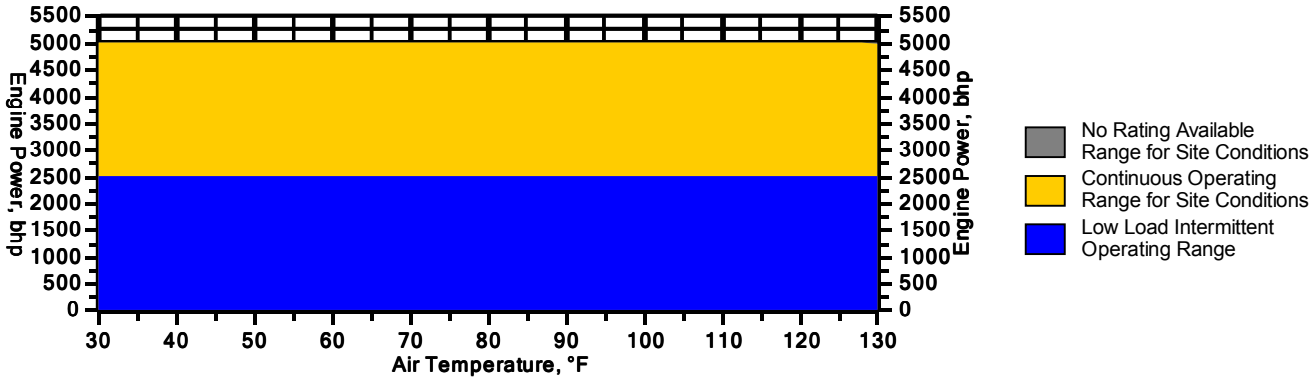
Engine rating obtained and presented in accordance with ISO 3046/1, adjusted for fuel, site altitude and site inlet air temperature. 100% rating at maximum inlet air temperature is the maximum engine capability for the specified fuel at site altitude and maximum site inlet air temperature. Maximum rating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

For notes information consult page three.

PREPARED BY:
Data generated by Gas Engine Rating Pro Version 6.04.00
Ref. Data Set EM1426-04-001, Printed 03May2017

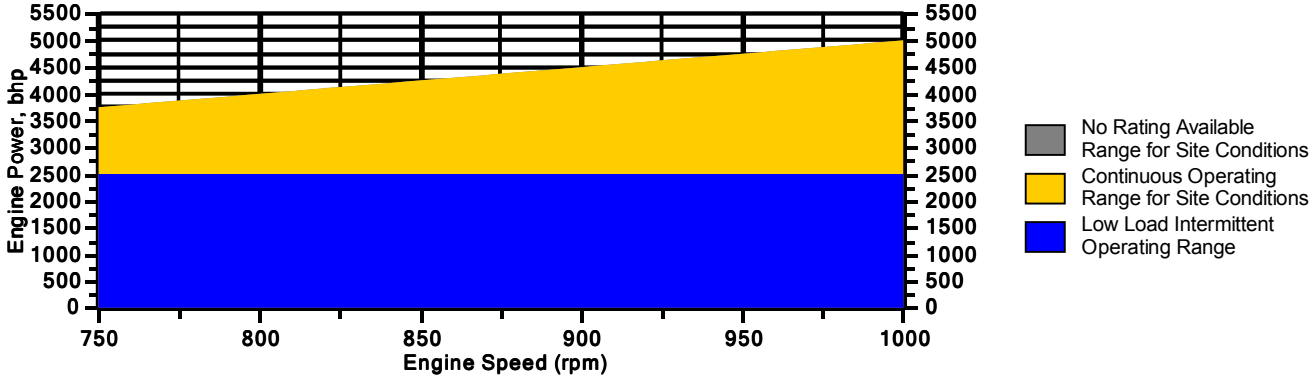
Engine Power vs. Inlet Air Temperature

Data represents temperature sweep at 500 ft and 1000 rpm



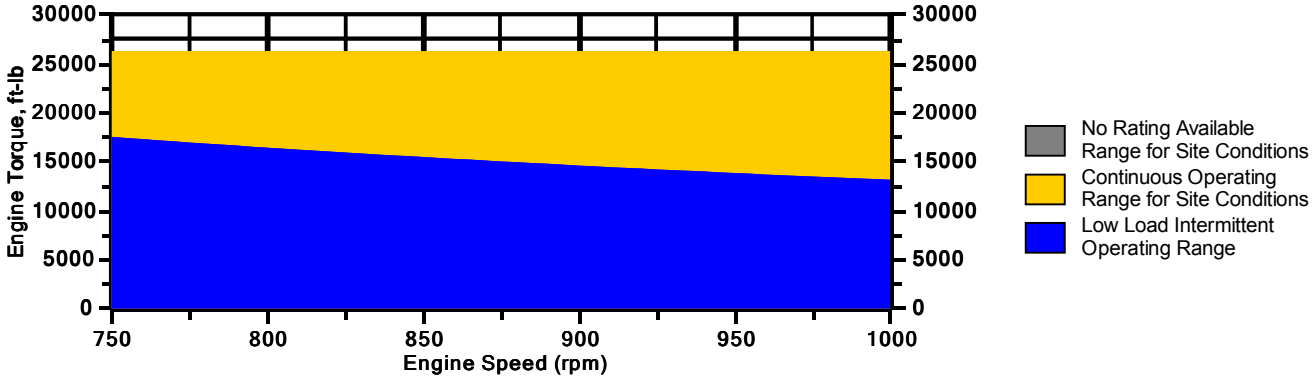
Engine Power vs. Engine Speed

Data represents speed sweep at 500 ft and 77 ºF



Engine Torque vs. Engine Speed

Data represents speed sweep at 500 ft and 77 ºF



Note: At site conditions of 500 ft and 77°F inlet air temp., constant torque can be maintained down to 750 rpm. The minimum speed for loading at these conditions is 750 rpm.

NOTES

1. Fuel pressure range specified is to the engine gas shutoff valve (GSOV). Additional fuel train components should be considered in pressure and flow calculations.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Constituent	Abbrev	Mole %	Norm
Water Vapor	H2O	0.0050	0.0050
Methane	CH4	71.6162	71.8339
Ethane	C2H6	17.0404	17.0922
Propane	C3H8	6.6780	6.6983
Isobutane	iso-C4H1O	0.6673	0.6693
Norbutane	nor-C4H1O	2.1619	2.1685
Isopentane	iso-C5H12	0.3376	0.3386
Norpentane	nor-C5H12	0.5333	0.5349
Hexane	C6H14	0.0796	0.0798
Heptane	C7H16	0.0408	0.0409
Nitrogen	N2	0.4144	0.4157
Carbon Dioxide	CO2	0.1098	0.1101
Hydrogen Sulfide	H2S	0.0000	0.0000
Carbon Monoxide	CO	0.0000	0.0000
Hydrogen	H2	0.0000	0.0000
Oxygen	O2	0.0000	0.0000
Helium	HE	0.0000	0.0000
Neopentane	neo-C5H12	0.0000	0.0000
Octane	C8H18	0.0102	0.0102
Nonane	C9H20	0.0024	0.0024
Ethylene	C2H4	0.0000	0.0000
Propylene	C3H6	0.0000	0.0000
TOTAL (Volume %)		99.6969	99.9998

Fuel Makeup:	Pioneer
Unit of Measure:	English

Calculated Fuel Properties

Caterpillar Methane Number:	53.9
Lower Heating Value (Btu/scf):	1214
Higher Heating Value (Btu/scf):	1336
WOBBE Index (Btu/scf):	1387
THC: Free Inert Ratio:	189.18
Total % Inerts (% N2, CO2, He):	0.53%
RPC (%) (To 905 Btu/scf Fuel):	100%
Compressibility Factor:	0.996
Stoich A/F Ratio (Vol/Vol):	12.57
Stoich A/F Ratio (Mass/Mass):	16.40
Specific Gravity (Relative to Air):	0.766
Fuel Specific Heat Ratio (K):	1.271

CONDITIONS AND DEFINITIONS

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

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

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

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

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

FUEL LIQUIDS

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

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

Catalyst Group
311 Riggs Street, Bloomer, WI 54724
Tel: (715) 568-2882 • Fax: (715)568-2884
E-mail : bweninger@catalyticcombustion.com

CATALYTIC COMBUSTION
EMISSION TECHNOLOGIES

To Williams
Attn Austin Day
Via E-mail

Our Ref. QT-117-2097-2
Date: 25 May, 2017

PERFORMANCE EXPECTATION

For : Location : Pioneer

Engine Parameters

				Raw Exhaust	
Engine Manufacturer	Caterpillar				
Engine Model	G3616		NOx	0.30	g/bhp-hr
Horsepower	5000	bhp	CO	2.93	g/bhp-hr
Speed	1000	rpm	NMHC	1.85	g/bhp-hr
Exhaust Flowrate	31291	acfm	NMNEHC (VOC)	0.96	g/bhp-hr
Exhaust Temperature	814	° F	HCHO	0.14	g/bhp-hr
Fuel			Oxygen	11.10	%

Catalyst Description and Performance Expectations

Substrate Type	Folded Metal Foil	Catalyst Dimensions	47.875 x 14.875 x 3.50"
Cell Pattern	200 cpsi Herringbone	Quantity Required	4 per Unit
Banding	CCC C-Channel Design	Formulation	HFX4

	Warranted Performance	
NOx	na	% Conversion
CO	92	% Conversion
NMHC	58	% Conversion
NMNEHC (VOC)	84	% Conversion
HCHO	82	% Conversion

General Terms and Conditions of Sale and Manufacturers Warranty documents are available upon request.

This catalyst is to be installed into a converter housing produced by another manufacturer. CCC cannot verify that the housing is structurally sound and permits proper catalyst sealing. Therefore, should the catalyst not reach the catalyst outlet targets with the engine operating as listed above, then all efforts must be made to ensure that a proper catalyst seal has been obtained before questioning the performance of the catalyst.

Please contact us if you have any questions or to let us know how we can be of further help.

Best regards,

Brian Weninger
Mechanical Engineer, Catalyst Group

-Burners
-Flares
-Incinerators

22151 East 91st Street
Broken Arrow, OK 74014 USA
Phone: 918-258-8551
Fax: 918-251-5519
www.zeeco.com

PRICED

July 13, 2017

Williams
Park Place Corporate Center 2
2000 Commerce Drive
Pittsburgh, PA 15275
Ph: 412-787-3132
fax:

Attention: Austin Day, Sr. Project Engr

Subject: Williams Ref.: Pioneer
Zeeco Reference: 2017-03133FL-01 -- Rev. 2

Thank you for your interest in Zeeco, Inc. We look forward to the opportunity to work with you on this project. In response to your above referenced inquiry, we are pleased to provide you with our proposal for the combustion equipment designed specifically for your needs.

Zeeco's flare systems are designed to handle peak releases immediately, with no adverse effects on the flare itself or on the pilots or ignition system. Zeeco's design also offers exceptional reliability and life expectancy as well as provisions for easy maintenance and repair.

Zeeco appreciates the opportunity to propose our products to Williams. We are confident that we offer the best flaring equipment in the world at competitive prices. Should you have additional questions or require additional information, please feel free to contact us.

Best Regards,

Nikki Jenlink
Flare Application Engineer
(reach me by email at: nikki_jenlink@zeeco.com)

AVAILABLE ATTACHMENTS

Attachment A Company Introduction*

Attachment B Commercial Proposal

Attachment C Process Conditions

Attachment D Specification Sheets:

- Flare Tip Specification Sheet
- Flare Pilot Specification Sheet
- Flare Stack Structure Specification Sheet
- Flame Front Generator (FFG) Specification Sheet
- Utility Piping Scope of Supply Specification Sheet
- Typical High-Temp Thermocouple Wiring Spec Sheet*

Attachment E Spare Parts

- Spare Parts for Start-up & Commissioning
- Spare Parts for Two Years Operation

Attachment F Clarifications and Exceptions

Attachment G Start-up & Maintenance Services*

Attachment H Radiation /Noise**

Attachment I Typical GA Drawing - Upon Request

Attachment J ISO &ASME Sec. VIII Code Certificates*

Attachment K Sample Inspection and Test Plan*

Attachment L Zeeco Rental Brochure*

*See R0 Proposal
**See R1 Proposal

ATTACHMENTS

Attachment B

Commercial Proposal

COMMERCIAL PROPOSAL

Scope of Supply

Our scope of supply will include:

1) General Arrangement Drawings for customer approval.
2) Operation & Maintenance Manual.
3) The equipment necessary for flaring the waste streams as specified in the inquiry documents, including:

Flare Tip (FL-7002 Pioneer) with Integral Velocity Seal & Two (2) Pilots
Self-supported Flare Stack (FL-7002 Pioneer)
Manual/Automatic Flame Front Generator (FL-7002 Pioneer) Ignition System

Process Engineering & Design Work for the Complete Flare System
Ladders & Platforms Per OSHA from Flare Tip to Near Grade
Utility Piping & Supports Along Flare Stack from Tip to Near Grade
Conduit & High Temp Thermocouple Wiring Along Stack with JB Near Grade
Conduit & High Temp HEI Ignition Wiring Along Stack with JB Near Grade
One (1) Duplex Fixed Type K 310 SS Sheathed Thermocouple per Pilot

BASE Proposal: MJ Sonic/Multi-nozzle Tips

Scope of Supply (Continued)

Our Scope of Supply does NOT include:

1) Stack or Piping External Insulation, Fireproofing, or Heat Tracing.
2) Field Assembly and / or Erection.
3) Commissioning, Start-up, Supervision, Training, etc. (PER DIEM BASIS).
4) Foundation Design / Supply or Civil Engineering.
5) Interconnecting Piping, Wiring or Conduit Between Stack Base and LCP.
6) Ocean or Inland Freight to Jobsite.
7) Shop Details / Fabrication Drawings of Proprietary Equipment.
8) Any Containerization of Equipment for Shipment or Storage Purposes.
9) Flare Stack Base Plate Templates.
10) Foundation Imbedded Anchor Bolts.
11) Spare Parts Quoted Separately and Priced Lists Included in Proposal.
12) Any Motor Starters or Motor Drivers or Motor Controls.
13) Any Third Party Inspection / Testing / Certification Services.
14) Any Export/Domestic Packing of Quoted Items.
15) Any Delivery of Quoted Items.
16) Any VFD for Pressure Blower/Air Assist Option.
17) Any Automatic Controls/Instrumentation for Blowers.

ATTACHMENTS

Attachment C

Process Conditions

Process Conditions -- English Units

Client:	Williams	Zeeco Ref.: 2017-03133FL-01		Date:	13-Jul-17
Location:	West Virgina	Client Ref.: Pioneer		Rev.	2

	Mol %					
	MJ Flare Tip					
	Pioneer Flare					
	Pioneer Max	Pioneer Min			Pioneer FG	
METHANE	71.47	71.47			71.61	
ETHANE	17.02	17.02			17.04	
PROPANE	6.67	6.67			6.67	
BUTANE	2.83	2.83			2.84	
PENTANE	0.87	0.87			0.87	
HEXANE	0.08	0.08			0.08	
HEPTANE					0.04	
OCTANE					0.01	
NONANE						
DECANE						
DODECANE						
TRIDECANE						
CYCLOPENTANE						
ETHYLENE						
PROPYLENE						
BUTYLENE						
ACETYLENE						
BENZENE						
TOLUENE						
XYLENE						
CARBON MONOXIDE						
CARBON DIOXIDE	0.11	0.11			0.11	
HYDROGEN SULFIDE						
SULFUR DIOXIDE						
AMMONIA						
AIR						
HYDROGEN						
OXYGEN						
NITROGEN	0.41	0.41			0.41	
WATER						
BUTADIENE						
METHANOL						
Total	**99**	**99**			**100**	
Mol. Wt.	22.03	22.03			22.40	
L. H. V. (BTU/SCF):	1,200	1,200			1,342	
Temperature (Deg. F):						
Avail. Static Pressure (psig):						
Flow Rate (lbs/hr):						
Smokeless Rate (lbs/hr):						

ATTACHMENTS

Attachment D

Specification Sheets:

Flare Tip Specification Sheet
• Flare Pilot Specification Sheet
• Flare Stack Structure Specification Sheet
• Flame Front Generator (FFG) Specification Sheet
• Utility Piping Scope of Supply Specification Sheet
• Typical High-Temp Thermocouple Wiring Spec Sheet

Flare Tip Specification Sheet

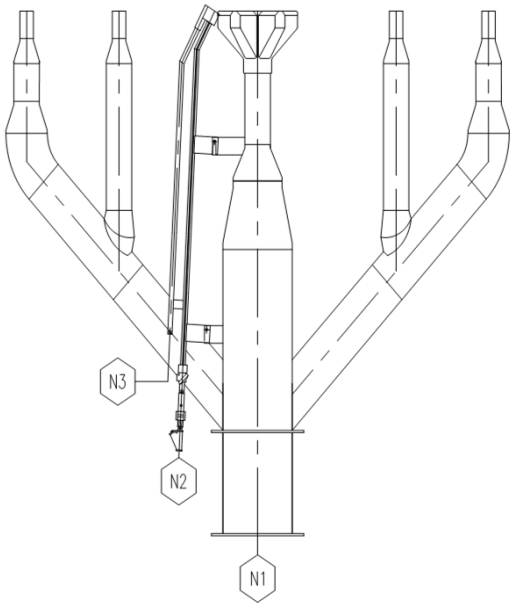
Client:	Williams	Zeeco Ref.:	2017-03133FL-01	Date:	13-Jul-17
Location:	West Virgina	Client Ref.:	Pioneer	Rev.	2

General Information:

Tag No.:	FL-7002 Pioneer	
Model:	MJ-16	Type: Sonic
Length:	10'- 0 "	
Weight:	1298.26444444444 lbs	
No. of Pilots:	2	

Design Case:

Governing Case:	Pioneer Max
Molecular Weight:	22.0
L. H. V. :	1,200 BTU/SCF
Temperature:	-26 Deg. F
Available Static Pressure:	35 psig
Design Flow Rate:	460,660 lbs/hr
Approximate Exit Velocity:	1129 ft/s
Mach No.:	1.00
Approx. Tip Press. Drop:	31.14 psig



(Typical drawing only)

Construction:

Upper Section:	310 SS	Windshield:	NO
Lower Section:	304 SS	Flame Retention Ring:	n/a
Refractory:	None	Lifting Lugs:	YES - S.S. Type
Refractory Thk:	N/A		

Surface Finish (Carbon Steel Surfaces):

Surface Preparation:	SSPC-SP6	Primer:	Inorganic Zinc
Paint (c. s. surfaces):	High Heat Aluminum		

Connections:

	Qty.	Size	Type	Material
N1 - Flare Gas Inlet:	1	16 "	150# RFSO	304 SS
N2 - Pilot Gas:	1	1"	150# RFSW	304 SS
N3 - Ignition Line:	2	1 "	FNPT	304 SS

Miscellaneous Notes:

1. Includes Integral Purge Reducing Velocity Seal.
2. Required Fuel Gas Purge Rate = 760 SCFH.

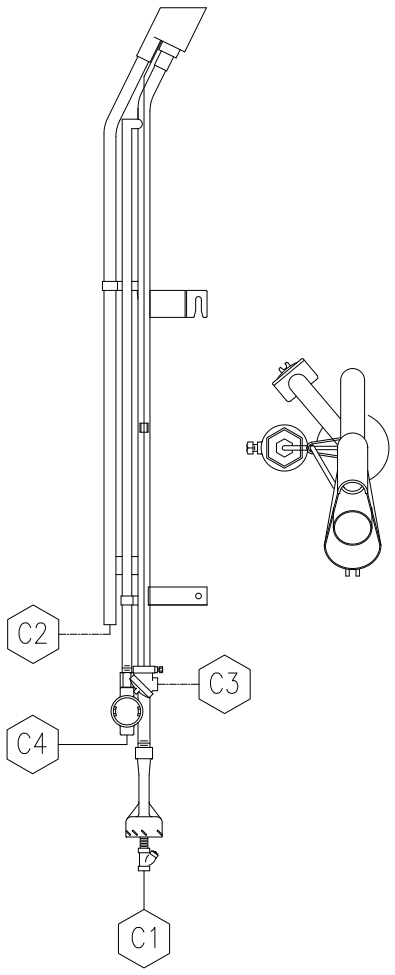
Pre-Mix Flare Pilot Assembly Specification Sheet

Client:	Williams	Zeeco Ref.:	2017-03133FL-01	Date:	13-Jul-17
Location:	West Virgina	Client Ref.:	Pioneer	Rev.	2

General Information:		
Tag No.:	FP-1	
Model:	HSLF	
Length:	9.135	feet
Weight:	68	lbs.
Pilot Type:	Pre-Mix	High Stability
Ignition Type:	Flame Front Generator	

Process Design Data:		
Design Heat Release:	65,000	BTU/hr
Fuel Gas MW:	22.40	
Fuel Gas LHV:	1,342	BTU/SCF
Fuel Gas Temperature:	100	Deg. F
Fuel Gas Inlet Pressure:	15.00	psig
Fuel Gas Flow rate:	48.4	SCFH
Design Wind Velocity:	150	mph
Design Rainfall:	50.00	inches/hr
Mounting Position:	Vertical	
Thermocouple Type:	K	Ungrounded

Construction:	
Pilot Firing Tip:	HK
Windshield Assembly:	HK
Integral Thermowell:	HK
FFG Ignition Line:	310 SS
Mounting Brackets:	HK
Premix Fuel Line:	310 SS
Thermocouple Sheath:	310 SS
Thermocouple Head:	316 SS
Fuel Mixer / Spud Assembly:	CF-3M / 18-8
Fuel Strainer Assembly:	CF-8M
HEI Probe and Support:	N/A
HEI Junction Head:	N/A



Connections:	**Qty.**	**Size**	**Type**	**Material**
C1 - Fuel Gas Inlet:	1	1/2"	FNPT	CF8M
C2 - FFG Ignition Inlet:	1	1 "	SW	310 SS
C3 - Thermocouple:	1	3/4"	Conduit	Cast Iron
C4 - HEI Ignition:	0	n/a	n/a	n/a

Misc. Notes: (see ignition system datasheet for type applicable to this quote)

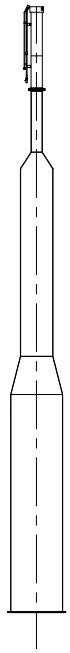
1. Upper mounting bracket is reinforced hook type for pilot removal from platform.
2. Pilot mounting brackets and thermocouple mounting brackets are investment cast assemblies.
3. Pilot mixer assembly is investment cast, high efficiency computer modeled venturi section.
4. Thermocouples are duplex fixed type. Retractable type (replaceable from grade) available upon request.

Self-supported Flare Stack Specification Sheet

Client:	Williams	Zeeco Ref.:	2017-03133FL-01	Date:	13-Jul-17
Location:	West Virgina	Client Ref.:	Pioneer	Rev.:	2

General Information:

Tag No.:	FL-7002 Pioneer
Overall Height:	145'- 0 "



(Typical drawing only)

Design Criteria:

Wind Design Code:	ASCE 7-10	
Seismic Design Code:	ASCE 7-10	
Importance Factor:	1.25	
Structural Design Code:	AISC	
Wind Speed (Structural):	120	mph
Seismic Zone:	D	
Max. Design Temperature:	150	Deg. F
Min. Design Temperature:	-65	Deg. F
Design Pressure:	50	psig
Riser Corrosion Allow.:	0.000	in.

Construction:

Inner Gas Riser Material:	304 SS	Ladders & Step-offs:	per OSHA
Inner Gas Riser Diameter:	18"	Platform at Tip:	360 deg
Outer Support Stack Material:	A36CS	Additional Platforms:	None
Outer Support Stack Diameter:	Varies Along Height (for SS Stack)	ACWL:	None

Surface Finish (Carbon Steel Surfaces):

Surface Preparation:	Per Spec	Primer:	Per Spec
Int. Coat:	Per Spec	Finish Paint:	Per Spec

Utility Piping:

Per Attached Utility Piping Scope of Supply

Miscellaneous Notes:

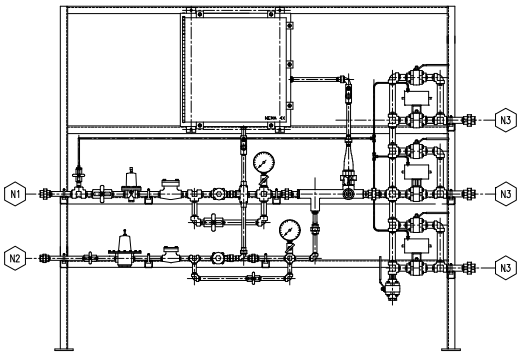
Flame Front Generator Specification Sheet

Client:	Williams	Zeeco Ref.:	2017-03133FL-01	Date:	13-Jul-17
Location:	West Virgina	Client Ref.:	Pioneer	Rev.	2

General Information:	
Tag No.:	FL-7002 Pioneer
Model No.:	LMC-2-DT/S
Operation:	Manual/Automatic
No. of Pilots Ignited:	2
Area Classification:	Class 1, Div 2, Group C&D

Fuel Gas Data:	
Molecular Weight:	22.4
L. H. V.:	1,342 BTU/SCF
Temperature:	100 deg. F
Pressure:	15 psig

Utility Consumption:	
Pilot Gas (Per Pilot):	48 SCFH
Pilot Gas (Total):	97 SCFH
Ignition Gas (Intermittent):	82 SCFH
Ignition Air (Intermittent):	820 SCFH
Power Available:	120 Volt, 1 Phase, 60 Hertz



(Typical drawing only)

Construction:			
Ignition Line Piping:	Carbon Steel	Ignition Chamber:	Cast Iron
Fuel Gas Piping:	Carbon Steel	No. Thermocouples/Pilot:	1
Mounting Rack:	Carbon Steel	Thermocouple Type:	K
Enclosure:	NEMA 4X/7	Propane Backup:	No
Sun / Rain Shield:	No	Ignition Air PCV:	YES
Pilot Gas PCV:	YES	Ignition Gas PCV:	YES

Surface Finish (Carbon Steel Surfaces):			
Surface Preparation:	SSPC-SP6	First Coat:	High Build Epoxy; 1 Coat (4~6 mils)
Second Coat:	Polyurethane; 1 Coat (2~3 mils)	Finish Color:	Grey - RAL7038

Connections:	**Qty.**	**Size**	**Type**	**Material**
N1 - Instrument Air Inlet:	1	3/4"	3000# Thrd. Union	Galvanized C.S.
N2 - Pilot Gas Inlet:	1	1/2"	150# RFSW	Carbon Steel
N3 - Ignition Gas Outlet:	2	1 "	150# RFSW	Carbon Steel
Pilot Gas Out. (Not Shown):	1	1/2"	150# RFSW	Carbon Steel

Miscellaneous Notes:

1. Zeeco has considered relay logic. PLC can be considered upon request.
2. Piping/valves/instruments shall be CS w/ SW connections

• Burners
• Flares
• Incinerators
• Combustion Systems

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July 20, 2017

Williams - NE G&P
2000 Commerce Drive
Pittsburgh, PA 15275

Attention: Ignacio Russo
Ignacio.Russo@williams.com

Reference: Pioneer and Blake Ridge Thermal Oxidizers
Zeeco Proposal No. 2017-02645IN-01 Rev 4

Dear Mr. Russo:

Thank you for your inquiry. We appreciate this opportunity to provide our **revised** proposal **to include Waste Stream 5 & 6 as shown in the updated process data provided on July 18, 2017,** for the following equipment:

- Two (2) Zeeco Standard, Direct Fired Horizontal Thermal Oxidizer Packages

The attached proposal describes specific features and performance of Zeeco's standard thermal oxidizer system. Our design incorporates a proven thermal process to effectively treat the waste gas stream from your process. The design and materials of construction have been chosen to maximize on-line time and operational life.

Please note that the base of the thermal oxidizer is mounted on a pre-wired and pre-piped rectangular structural steel skid that will also house the fuel rack and control panel. This is intended to reduce installation time associated with interconnecting piping and wiring between the fuel rack/control panel and the thermal oxidizer.

Furthermore, the unit is ***NFPA 86 compliant*** to ensure personnel and equipment safety.

Again, we appreciate the opportunity to quote on your combustion equipment requirements. After you have had an opportunity to review our proposal, should you have any questions or require additional information, please contact me at (918)893-8416 or email me at sydney_levine@zeeco.com.

Best regards,

Sydney Levine
Applications Engineer

Cc: Ryan B. Tate, Zeeco- Broken Arrow

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1.0 INTRODUCTION

Zeeco has been designing and manufacturing burners, flares, incinerators, air pre-heaters, and combustion systems for world wide use since 1980.

Zeeco's Engineering Staff offers over 1,000 years of experience in the development, design, and testing of Combustion Systems. Zeeco has the proven skills and innovative abilities to design a practical and environmentally friendly combustion system to thermally treat virtually any industrial waste. This learned "art" gained by research and design efforts which are refined by testing and field experience has been implemented in the process plants of numerous industries throughout the world.

From project planning through design, procurement, manufacturing, installation, and even start-up, Zeeco will provide project management and support as deemed necessary. It is our world class HANDS ON type design skills, quality products, experienced staff, and especially our responsiveness to our customers needs that truly set Zeeco apart from our competition.

Quality: Our customers expect it. We demand it!

2.0 SCOPE OF SUPPLY

Zeeco will provide, as specified in your inquiry, One (1) Zeeco Standard Thermal Oxidizer Package for each location, Blake Ridge and Pioneer. A more detailed description of this equipment is included in Section 5.0 entitled: EQUIPMENT DESCRIPTION.

Our Scope of Supply **will include:**

- All Equipment as listed in this Proposal Designed as a Zeeco Standard Unit using Zeeco Standard Suppliers
- General Arrangement and Plot Layout Drawings for Customer Approval
- Required Documentation for Customer Information
- Field Service per the attached Rate Sheet
- Required Inspection and Testing as per Zeeco Standard Inspection and Test Plan

Our Scope of Supply **does not include:**

- Delivery to Jobsite
- Equipment Anchor Bolts, Templates or Slide Plates
- Field Installation and/or Erection
- Start-Up (available on a per diem basis)
- Foundations or Foundation Design
- Environmental Licensing, Registration and Associated Testing
- Area Lighting
- Heat Tracing and External Insulation
- Oxygen Analyzer (can be included as an option)
- Detonation Arrestor (can be included as an option)
- Knock Out Drum (can be included as an option)
- Waste Block Valves or Controls (can be included as an option)
- Process Control System (can be included as an option)

The Zeeco standard, skid mounted horizontal thermal oxidizer package can ship ***32 weeks*** from the date of firm order commitment and release to proceed with procurement of raw materials. One (1) review and approval cycle has been considered in the above shipping schedule and consists of the following:

1. Williams has 2 weeks to review initial submissions of Zeeco's standard drawing and documentation package
2. Zeeco to update the documents and drawings as necessary and send final revision within 2 weeks of receiving the formal drawing comments

Both options presented above are based on using the Zeeco existing standard design and on current materials availability, drafting, and shop schedules. Expedited delivery is available if required. Please contact Zeeco for an updated proposal.

3.5 Preliminary Shipping Weights:

Blake Ridge & Pioneer Scope- Skidded Horizontal Zeeco Standard Thermal Oxidizers

Item	Approximate Shipping Weight (lb)	Approximate Shipping Dimensions
Skid including thermal oxidizer base with refractory installed, fuel rack, and combustion air fan	10,200	8' W x 20' L x 8' H
Thermal Oxidizer Stack	6,000	3' W x 3' L x 22' H

3.6 Start-Up

Start-up and installation are not included in this proposal. If such assistance is required it will be charged in accordance with Zeeco's Standard Rate Schedule attached.

3.7 Limited Liability

Seller shall not be liable for any loss of profit, special, indirect, incidental or consequential damages whether arising under warranty, contract, strict liability, indemnification, or any other cause or combination of causes whatsoever. This limitation shall apply notwithstanding any failure of essential purpose of any limited remedy.

Seller's cumulative liability, inclusive of insurance proceeds paid to Agent under Seller's insurance policies and liquidated damages paid to Agent, shall in no event be in excess of the value of the purchase price, whether arising under warranty, contract, strict liability, indemnification, or any other cause or combination of causes whatsoever. These limitations shall prevail over any conflicting or inconsistent provisions stated elsewhere.

4.0 DESIGN BASIS

4.1 Site Conditions

Elevation, feet	Blake Ridge: 1,450 Pioneer: 1,250
Barometric Pressure, psia	13.9
Temperature, ^{o}F (Min/Max)	-20* / 100
Design Relative Humidity	90% (assumed)
Wind Design	ASCE 7-10, 120MPH

*Note: The Thermal Oxidizer package is acceptable to -20°F with the exception of the HMI, which is guaranteed to 32°F.

4.2 Waste Stream Summary

	PIONEER					
	Waste Gas 1	**Waste Gas 2**	**Waste Gas 3**	**Waste Gas 4**	**Waste Gas 5**	**Waste Gas 6**
	Mol %	**Mol %**	**Mol %**	**Mol %**	**Mol %**	**Mol %**
Water	85.80192	85.80192	0.1649743	0.1649743	**0**	**0**
TEG	0.0001174	0.0001174	0.0001382	0.0001382	**0**	**0**
Nitrogen	0.00054	0.00054	0.0896987	0.0896987	**0**	**0**
Methane	1.3688041	1.3688041	51.344687	51.344687	**0**	**0**
CO2	0.1482647	0.1482647	0.5000099	0.5000099	**0**	**0**
Ethane	2.7699719	2.7699719	26.727424	26.727424	**0**	**0**
Propane	2.8329436	2.8329436	13.104553	13.104553	**20.986107**	**20.983331**
i-Butane	0.3045151	0.3045151	1.1240846	1.1240846	**11.165111**	**11.16968**
n-Butane	1.7903509	1.7903509	4.4060352	4.4060352	**41.265849**	**41.265083**
i-Pentane	0.4968271	0.4968271	0.6435775	0.6435775	**6.8906596**	**6.891371**
n-Pentane	1.0508567	1.0508567	1.1111151	1.1111151	**10.954713**	**10.953998**
2,3-Dimethylbutane	0.3533435	0.3533435	0.2251448	0.2251448	**2.4705339**	**2.4699713**
3-Methylpentane	0.2620526	0.2620526	0.1449929	0.1449929	**1.5553963**	**1.5556149**
Hexane	0.2724999	0.2724999	0.1442947	0.1442947	**1.7404499**	**1.7402445**
2,2-Dimethylpentane	0.0025424	0.0025424	0.0011917	0.0011917	**0.0151192**	**0.0151176**
Methylcyclopentane	0.1080608	0.1080608	0.0169657	0.0169657	**0.1282144**	**0.1282291**
Benzene	0.1038125	0.1038125	0.0027162	0.0027162	**0.0118769**	**0.0118758**
3,3-Dimethylpentane	0.0034755	0.0034755	0.0010277	0.0010277	**0.0124009**	**0.0124003**
Cyclohexane	0.131173	0.131173	0.0224721	0.0224721	**0.167149**	**0.1671086**
2-Methylhexane	0.1065749	0.1065749	0.0363433	0.0363433	**0.1272613**	**0.127264**
2,3-Dimethylpentane	0.0047007	0.0047007	0.0012513	0.0012513	**0.0152063**	**0.0152027**
3-Methylhexane	0.1157544	0.1157544	0.0319648	0.0319648	**0.4129168**	**0.4128873**
Heptane	0.2365455	0.2365455	0.0588878	0.0588878	**0.8027164**	**0.8024295**

Toluene	0.4661113	0.4661113	0.0063571	0.0063571	**0.0374895**	**0.0374861**
Octane	0.0781148	0.0781148	0.0112213	0.0112213	**0.1909147**	**0.1908976**
Ethylbenzene	0.2614509	0.2614509	0.0023632	0.0023632	**0.021013**	**0.021008**
o-Xylene	0.0583867	0.0583867	0.0003829	0.0003829	**0.002905**	**0.0029045**
2-Methylheptane	0.0569704	0.0569704	0.0108261	0.0108261	**0.1766993**	**0.1767202**
Methylcyclohexane	0.2703071	0.2703071	0.0339189	0.0339189	**0.3790713**	**0.3790206**
2,5-Dimethylhexane	0.0086627	0.0086627	0.0024037	0.0024037	**0.0391255**	**0.0391205**
1,t-3-Dimethylcyclohexane	0.0103362	0.0103362	0.0007206	0.0007206	**0.0109802**	**0.0109802**
Nonane	0.024489	0.024489	0.0018243	0.0018243	**0.043396**	**0.0433819**
n-Undecane	0.000775	0.000775	1.57E-05	1.57E-05	**5.70E-04**	**5.70E-04**
n-Decane	0.0060499	0.0060499	0.0002399	0.0002399	**0.0076207**	**0.007618**
Dodecane	0.0001128	0.0001128	1.19E-06	1.19E-06	**5.64E-05**	**5.64E-05**
Tridecane	1.54E-05	1.54E-05	9.25E-08	9.25E-08	**5.43E-06**	**5.42E-06**
Tetradecane	1.82E-06	1.82E-06	7.74E-09	7.74E-09	**5.72E-07**	**5.73E-07**
Pentadecane	4.66E-07	4.66E-07	1.65E-09	1.65E-09	**1.56E-07**	**1.56E-07**
Hexadecane	3.63E-07	3.63E-07	1.22E-09	1.22E-09	**1.24E-07**	**1.24E-07**
Heptadecane	7.27E-08	7.27E-08	2.40E-10	2.40E-10	**2.76E-08**	**2.76E-08**
Octadecane	2.96E-08	2.96E-08	8.59E-11	8.59E-11	**1.08E-08**	**1.08E-08**
Nonadecane	7.95E-09	7.95E-09	1.99E-11	1.99E-11	**2.49E-09**	**2.50E-09**
Eicosane	2.53E-09	2.53E-09	4.46E-12	4.46E-12	**9.04E-10**	**9.05E-10**
C21	2.31E-09	2.31E-09	4.13E-12	4.13E-12	**1.05E-09**	**1.05E-09**
C22	2.03E-09	2.03E-09	3.57E-12	3.57E-12	**8.08E-10**	**8.08E-10**
C23	8.64E-10	8.64E-10	1.47E-12	1.47E-12	**4.00E-10**	**4.00E-10**
C24	1.92E-11	1.92E-11	0	0	**2.17E-11**	**2.17E-11**
m-Xylene	0.1335432	0.1335432	0.0011677	0.0011677	**0.0139191**	**0.0139206**
p-Xylene	0.1275405	0.1275405	0.0012043	0.0012043	**0.0102296**	**0.0102275**
2,2,4-Trimethylpentane	0.0100727	0.0100727	0.002629	0.002629	**0.0369041**	**0.0368986**
2,4-Dimethylpentane	0.0009178	0.0009178	0.0004242	0.0004242	**0.0055755**	**0.0055764**
3-Ethylpentane	0.0196507	0.0196507	0.0046713	0.0046713	**0.057195**	**0.0571814**
2,4-Dimethylhexane	0.0104157	0.0104157	0.0025313	0.0025313	**0.0382339**	**0.0382293**
trans-1,2-Dimethylcyclohexane	0.1165761	0.1165761	0.0088281	0.0088281	**0.1352164**	**0.135206**
cis-1,2-Dimethylcyclohexane	0.0566796	0.0566796	0.0032722	0.0032722	**0.0511976**	**0.0511875**
cis-1,3-Dimethylcyclohexane	0.0171711	0.0171711	0.0014461	0.0014461	**0.0199998**	**0.0199939**
PRESSURE	0.1 psig	0.1 psig	57 psig	57 psig	**1 psig**	**1 psig**
TEMPERATURE	205 F	205 F	108 F	108 F	**100 F**	**100 F**
MW	23.5	23.5	27.6	27.6	**60.6**	**60.6**

FLOW RATE	230 lb/hr	230 lb/hr	104 lb/hr	104 lb/hr	**23 lb/hr**	**3 lb/hr**

	BLAKE RIDGE					
	Waste Gas 1	**Waste Gas 2**	**Waste Gas 3**	**Waste Gas 4**	**Waste Gas 5**	**Waste Gas 6**
	Mol %	**Mol %**	**Mol %**	**Mol %**	**Mol %**	**Mol %**
Water	90.708664	90.708664	0.2017609	0.2017609	**0**	**0**
TEG	0.0001122	0.0001122	0.0001397	0.0001397	**0**	**0**
Nitrogen	0.0004032	0.0004032	0.0852151	0.0852151	**0**	**0**
Methane	1.3278677	1.3278677	63.75814	63.75814	**0**	**0**
CO2	0.163891	0.163891	0.7111178	0.7111178	**0**	**0**
Ethane	1.7101505	1.7101505	21.237356	21.237356	**0**	**0**
Propane	1.396036	1.396036	8.3472711	8.3472711	**38.323047**	**38.323876**
i-Butane	0.2289641	0.2289641	1.0938283	1.0938283	**12.777954**	**12.779927**
n-Butane	0.7701528	0.7701528	2.4546063	2.4546063	**26.131425**	**26.134075**
i-Pentane	0.363147	0.363147	0.6120734	0.6120734	**6.9368491**	**6.9331473**
n-Pentane	0.4541709	0.4541709	0.6269606	0.6269606	**6.4849562**	**6.481844**
2,3-Dimethylbutane	0.3026362	0.3026362	0.2514102	0.2514102	**2.7623678**	**2.7629963**
3-Methylpentane	0.2249217	0.2249217	0.1619479	0.1619479	**1.7231632**	**1.7234484**
Hexane	0.2326474	0.2326474	0.1614611	0.1614611	**1.8912048**	**1.8915898**
2,2-Dimethylpentane	0.0021887	0.0021887	0.0013412	0.0013412	**0.0160914**	**0.0160933**
Methylcyclopentane	0.089903	0.089903	0.0185289	0.0185289	**0.1400683**	**0.1401048**
Benzene	0.0844365	0.0844365	0.0028887	0.0028887	**0.0131832**	**0.0131829**
3,3-Dimethylpentane	0.0029518	0.0029518	0.0011436	0.0011436	**0.0130236**	**0.0130266**
Cyclohexane	0.107881	0.107881	0.0241539	0.0241539	**0.18067**	**0.1806805**
2-Methylhexane	0.0909396	0.0909396	0.0406738	0.0406738	**0.1313767**	**0.1314031**
2,3-Dimethylpentane	0.003982	0.003982	0.0013899	0.0013899	**0.0157618**	**0.0157643**
3-Methylhexane	0.0980455	0.0980455	0.0355655	0.0355655	**0.4234141**	**0.4236583**
Heptane	0.199117	0.199117	0.0652781	0.0652781	**0.8041488**	**0.803854**
Toluene	0.3817306	0.3817306	0.0068002	0.0068002	**0.0378072**	**0.0378085**
Octane	0.0655045	0.0655045	0.0124363	0.0124363	**0.1754799**	**0.1754847**
Ethylbenzene	0.2156914	0.2156914	0.0025333	0.0025333	**0.0193993**	**0.0193989**
o-Xylene	0.0487716	0.0487716	0.0004097	0.0004097	**0.0026479**	**0.002648**
2-Methylheptane	0.0482573	0.0482573	0.0120698	0.0120698	**0.1662129**	**0.1662205**
Methylcyclohexane	0.2229197	0.2229197	0.0366772	0.0366772	**0.3825573**	**0.3825713**
2,5-Dimethylhexane	0.0073056	0.0073056	0.002683	0.002683	**0.0378094**	**0.0378049**
1,t-3-Dimethylcyclohexane	0.0085951	0.0085951	0.0007932	0.0007932	**0.0102749**	**0.0102757**
Nonane	0.0216021	0.0216021	0.0021341	0.0021341	**0.0377681**	**0.0377642**
n-Undecane	0.0007895	0.0007895	2.13E-05	2.13E-05	**4.84E-04**	**4.84E-04**
n-Decane	0.0056354	0.0056354	0.0002983	0.0002983	**0.0065143**	**0.0065136**

Dodecane	0.0001279	0.0001279	1.79E-06	1.79E-06	**4.80E-05**	**4.80E-05**
Tridecane	1.94E-05	1.94E-05	1.51E-07	1.51E-07	**4.62E-06**	**4.61E-06**
Tetradecane	2.67E-06	2.67E-06	1.38E-08	1.38E-08	**4.87E-07**	**4.86E-07**
Pentadecane	7.98E-07	7.98E-07	3.16E-09	3.16E-09	**1.32E-07**	**1.32E-07**
Hexadecane	7.03E-07	7.03E-07	2.55E-09	2.55E-09	**1.05E-07**	**1.05E-07**
Heptadecane	1.56E-07	1.56E-07	5.45E-10	5.45E-10	**2.34E-08**	**2.34E-08**
Octadecane	6.79E-08	6.79E-08	2.09E-10	2.09E-10	**9.12E-09**	**9.12E-09**
Nonadecane	1.99E-08	1.99E-08	5.22E-11	5.22E-11	**2.13E-09**	**2.12E-09**
Eicosane	6.78E-09	6.78E-09	1.24E-11	1.24E-11	**7.67E-10**	**7.68E-10**
C21	6.60E-09	6.60E-09	1.20E-11	1.20E-11	**8.88E-10**	**8.88E-10**
C22	6.16E-09	6.16E-09	1.06E-11	1.06E-11	**6.86E-10**	**6.85E-10**
C23	2.49E-09	2.49E-09	3.87E-12	3.87E-12	**3.39E-10**	**3.40E-10**
C24	4.45E-11	4.45E-11	7.76E-14	7.76E-14	**1.85E-11**	**1.85E-11**
m-Xylene	0.1106692	0.1106692	0.0012565	0.0012565	**0.0127826**	**0.0127818**
p-Xylene	0.1057971	0.1057971	0.0012974	0.0012974	**0.0094165**	**0.0094196**
2,2,4-Trimethylpentane	0.0086311	0.0086311	0.002963	0.002963	**0.0370198**	**0.037021**
2,4-Dimethylpentane	0.0007906	0.0007906	0.0004778	0.0004778	**0.0058991**	**0.0058979**
3-Ethylpentane	0.0165798	0.0165798	0.0051684	0.0051684	**0.0585258**	**0.0585323**
2,4-Dimethylhexane	0.0087772	0.0087772	0.0028154	0.0028154	**0.0371051**	**0.0370923**
trans-1,2-Dimethylcyclohexane	0.0971593	0.0971593	0.0097175	0.0097175	**0.1272388**	**0.1272405**
cis-1,2-Dimethylcyclohexane	0.0471172	0.0471172	0.0036043	0.0036043	**0.0473183**	**0.0473343**
cis-1,3-Dimethylcyclohexane	0.0143137	0.0143137	0.0015894	0.0015894	**0.0189802**	**0.0189809**
PRESSURE	0.1 psig	0.1 psig	57 psig	57 psig	**1 psig**	**1 psig**
TEMPERATURE	205 F	205 F	108 F	108 F	**100 F**	**100 F**
MW	23.7	23.7	24.6	24.6	**57.7**	**57.7**
FLOW RATE	267 lb/hr	267 lb/hr	108 lb/hr	108 lb/hr	**30 lb/hr**	**3.3 lb/hr**

Waste streams for both locations are assumed to be in vapor phase, no liquid has been considered within this design. For both locations, it has been assumed that Waste Streams 1 and 2 are together in one pipe coming to the thermal oxidizer, Waste 3 and 4 are in together in one pipe and Wastes 5 & 6 are combined into one pipe.

4.3 Utilities

Electrical Power	460V / 3 Phase / 60 Hz
Instrument Air, SCFH	2000
Maximum Fuel Gas Required, MMBtu/Hr	1

4.4 Flue Gas Summary

	PIONEER at 1800F Operating Temperature			
	Waste Gas 1, 2, 3, 4, 5 & 6	Waste Gas 1, 2, 3, 4 & 6	Waste Gas 1, 3, 5 & 6	Waste Gas 1, 3 & 6
	Mol %	Mol %	Mol %	Mol %
Carbon Dioxide	4.81	4.81	4.84	4.82
Water	15.89	16.06	15.64	15.92
Nitrogen	69.17	69.05	69.41	69.22
Oxygen	10.12	10.08	10.11	10.04
Total, lb/hr	16,972	16,079	9,858	8,976
Mol. Wt.	27.6	27.6	27.6	27.6

	BLAKE RIDGE at 1800F Operating Temperature			
	Waste Gas 1, 2, 3, 4, 5 & 6	Waste Gas 1, 2, 3, 4 & 6	Waste Gas 1, 3, 5 & 6	Waste Gas 1, 3 & 6
	Mol %	Mol %	Mol %	Mol %
Carbon Dioxide	4.76	4.75	4.78	4.75
Water	16.97	17.28	16.53	17.02
Nitrogen	68.38	68.16	68.77	68.42
Oxygen	9.89	9.81	9.92	9.80
Total, lb/hr	16,480	15,313	9,755	8,601
Mol. Wt.	27.5	27.4	27.5	27.5

4.5 System Performance

Stack Parameter	Guaranteed Values
VOC Destruction Efficiency	99.5 %

These values are understood to apply only when the system is operated in accordance with the operating conditions stipulated in the design summary and for the waste(s) stipulated in the design basis sections of this proposal.

5.0 PROCESS DESCRIPTION

The Horizontal Forced Draft Thermal Oxidizer is equipped with one (1) GB-Series Fuel Gas Burner. The system is purged using the combustion blower provided. When the purge cycle is complete, the burner pilot is ignited via electric ignition. Once the burner pilot flame is proven, the main burner flame is ignited.

The thermal oxidizer is then allowed to achieve a waste permissive temperature of 1800°F for Blake Ridge and Pioneer. Waste gas can then be introduced into the thermal oxidizer. The thermal oxidizer controlled temperature and residence time ensures that the waste gasses are destroyed using a minimum fuel quantity. The flue gases from the thermal oxidizer exit to atmosphere via the refractory lined vent stack.

- Manufacturer's standard construction
- Manufacturer's standard paint system

6.5 Instrumentation & Controls

Instrumentation will be provided as shown on the attached P&ID by Zeeco Standard Suppliers. Some scope shown in P&ID is option scope as defined in this proposal. Zeeco's scope includes:

1. Pre-assembled fuel gas and instrument air control rack, skid mounted.
2. Instrument and piping connections from fuel rack to burner.
3. Rack mounted local control panel with BMS PLC only and provision to use the customer DCS for process control functions.
4. The BMS complies with NFPA 86; this proposal offers a SIL 2 compliant Siemens PLC.

Zeeco has considered the process control package, waste gas piping and instrumentation to be provided by others. However, these items can be provided by Zeeco upon request. **Zeeco has included an oxygen analyzer within the base scope of supply.**

7.0 EQUIPMENT DESCRIPTION--PIONEER

7.1 Standard Horizontal Thermal Oxidizer

One (1) standard horizontal thermal oxidizer is offered. It is designed to operate at 1800^{o}F with excess air to ensure complete combustion of the waste gas combustible components. The thermal oxidizer has the following features:

- Nominal 5'-0" O.D. x 20'-0" overall skid length
- Includes 3'-6" O.D. Stack
- Discharge height of 20'-0" above grade
- Thermal oxidizer and Stack Shell Material: SA-36
- All Carbon Steel External Surfaces Sandblasted and Painted per Williams Above Ground Protective Coating Specification, 09 96 10C Revision 01.02
- The base portion of the thermal oxidizer shall be mounted on a structural steel skid, along with the waste gas piping, fuel metering rack, and control panel. Skid dimensions will be approximately 8' W x 20 L x 8' H.
- The stack portion of the thermal oxidizer shall be shipped loose for bolting to the base portion in the field.

7.2 Burner

One (1) Forced Draft Burner Assembly is offered and will consist of One (1) Zeeco GB-Series Burner. The Burner is specially designed for forced draft operation and has the following features:

- 1.0 MMBtu/hr maximum fuel gas release rating
- High Energy Electric Spark Ignition System
- A-36 Carbon Steel Construction
- 60% Al_2O_3 Burner Tile Construction
- All Carbon Steel External Surfaces Sandblasted and Painted per Williams Above Ground Protective Coating Specification, 09 96 10C Revision 01.02
- **10**:1 Fuel Gas Turndown

7.3 Combustion Air Blower

- **4153 ACFM** at 100°F
- **5**" H_2O static pressure
- < **7.5** HP Motor
- Manufacturer's standard construction
- Manufacturer's standard paint system

7.4 Refractory

The refractory will be supplied and shop installed by Zeeco. Refractory material proposed within the thermal oxidizer chamber is a hard castable lining supplied by Zeeco standard suppliers. Refractory material for the stack has been quoted with a ceramic fiber lining due to the increased stack size.

7.5 Instrumentation and Controls

Zeeco's Standard Burner Management System Instrumentation and Controls scope is offered by Zeeco Standard Suppliers:

5. Pre-assembled fuel gas and instrument air control rack, skid mounted.
6. Instrument and piping connections from rack to field instruments and other field equipment by others.
7. Rack mounted local control panel with BMS PLC only and provision to use the customer DCS for process control functions.
8. The BMS complies with NFPA 86; this proposal offers a Siemens ET200S with a VFD included in the Panel.

Zeeco has considered the process control package, waste gas piping and instrumentation to be provided by others. However, these items can be provided by Zeeco upon request. **Zeeco has included an oxygen analyzer within the base scope of supply.**

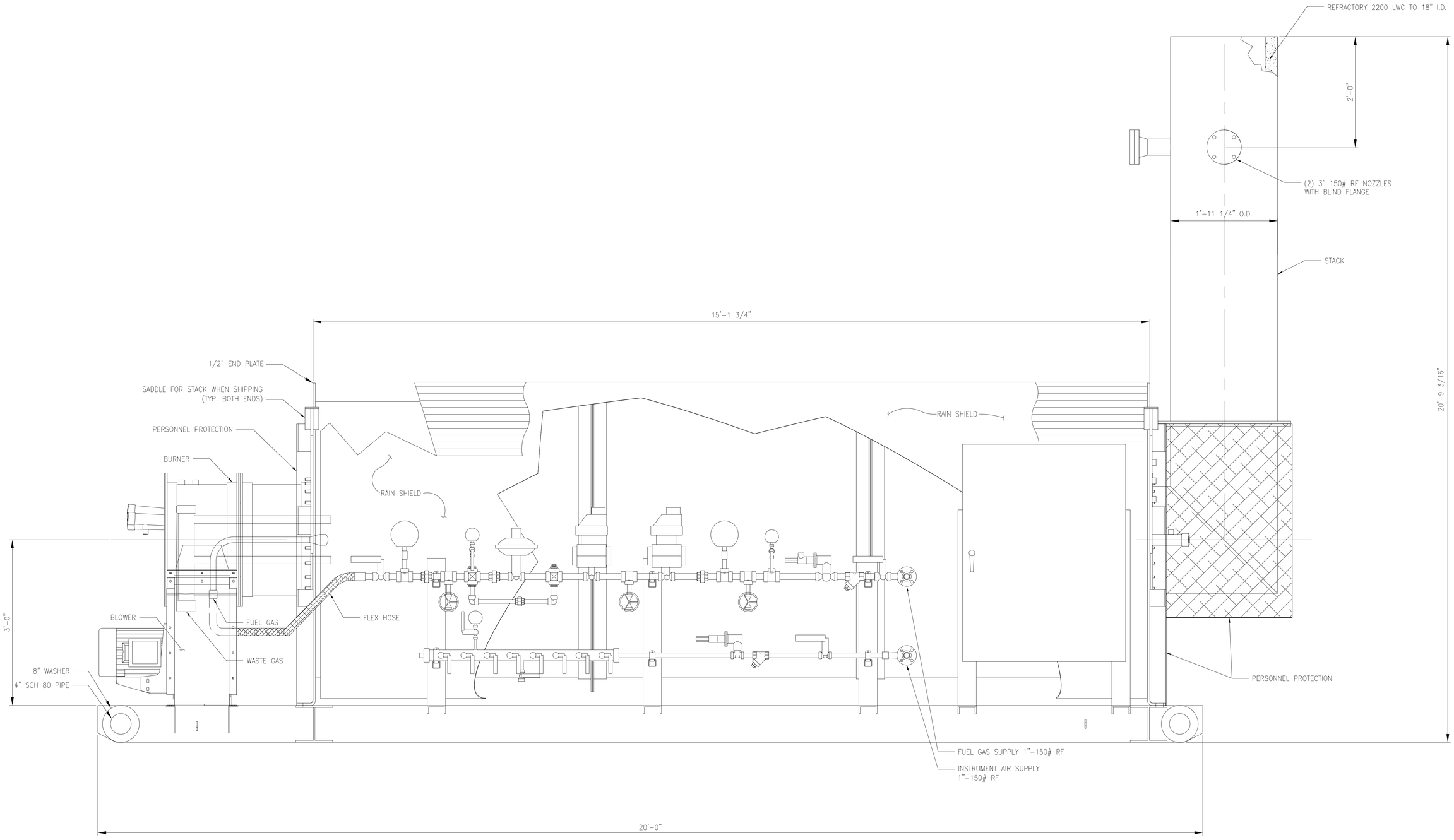
8.0 PERFORMANCE WARRANTY

Zeeco warranties the system performance stated in this proposal. These values are understood to apply only when the system is operated in accordance with the operating conditions stipulated in the **DESIGN SUMMARY** for the waste (s) stipulated in the **DESIGN BASIS** sections of this proposal.

The purchaser, at his option and cost, may conduct a performance test to determine if the performance warranties are being met. The purchaser shall provide sufficient written notice to Zeeco so that a representative of Zeeco can witness the test. Additionally, Zeeco will be given access to all operating data and laboratory analysis that would bear on the final determination of performance. All analysis of operating data will be done in accordance with generally accepted engineering practice and only published physical data will be used.

Attachment E

General Arrangement Drawing



ELEVATION VIEW

GENERAL WEIGHTS	
DESCRIPTION	WEIGHT
FOUNDATION LOAD/LIFT LOAD	16,200 LB

** PRELIMINARY DRAWING **

CUSTOMER:	
JOBSITE:	
END USER:	
P.O. NO.:	

ZEECO, INC.
22151 EAST 91st STREET
BROKEN ARROW, OK 74014
PHONE: (918) 258-8551
FAX: (918) 251-5519
www.zeeco.com
sales@zeeco.com

GENERAL ARRANGEMENT
STANDARD HORIZONTAL
INCINERATOR SYSTEM

DRAWN	DATE
SLR	07AUG14
CHK	APP
RBT	STO
SCALE	APP
NONE	STO

S.O. NO. DWG., SUB. CAT. & SYSTEM NO. DWG. NO.	REV. NO.
Z-HTO - G065A - 001	A

Attachment F

Piping & Instrumentation Diagram (P&ID)

CONTINUED ON DWG. -002

REMOTE ESD — DCS
COMMON ALARM — DCS

LCP-100 LOCAL CONTROL PANEL
BMS | HMI
POWER ON — HS 100
POWER OFF — XL 100
ESD — ESD 100

BMS L — PAL 100, PAL 100
PSL 100, PAL 100

5mm BTU/HR FUEL GAS SUPPLY
1"-FG NOTE 2
1" 150#

1" BAV-101
1" STR-110
SET @ 50 PSIG
PCV 101A
1" PCV-101A
PI 101A
1/4" BAV-210
1/2" BAV-122

PALL 101A
BMS LL
PSLL 101A

BMS S XY 101A
XV 101A
1" XV-101A F.C.
1/2" BAV-122

BMS S XY 101B
XV 101B
1" XV-101B F.C.

FROM TIC-201A
BMS ZSC 101
I/P TY 101
TV 101
1" TV-101

PI 101B
1/4" BAV-210
1/2" BAV-122

PAHH 101A
BMS HH
PSHH 101A
1" BAV-101
1"-FG
DWG. -002 MAIN FUEL GAS BURNER

FLOW	MIN	588.2 SCFH
	MAX	5882 SCFH
DESIGN	S.G.	0.6
TEMP	MIN	AMB.
	MAX	100
PRESS	MIN	65 PSIG
	NORM	160 PSIG
	MAX	250 PSIG

PI 103A
1/4" BAV-210

SET @ 70 PSIG
INST. AIR SUPPLY
3/4"-IA NOTE 2
3/4" 150#
3/4" BAV-125
3/4" STR-210
3/4" PCV-102A
1/2" BAV-122

FLOW	MIN	1035 SCFH
	MAX	2835 SCFH
DESIGN	S.G.	1.0
TEMP	MIN	AMB
	MAX	AMB
PRESS	MIN	80 PSIG
	MAX	160 PSIG

CONTINUED ON DWG. -002

FUEL RACK/SKID

SEE DWG. -000 FOR LEGEND AND NOTES

NO.	DATE	REVISION DESCRIPTION	BY	CKD.	APP.
0	17SEP14	FOR ISSUE	JJA/TRP	AMS	MAB

CUSTOMER:
JOBSITE:
END USER:
P.O. NO.:

ZEECO, INC.
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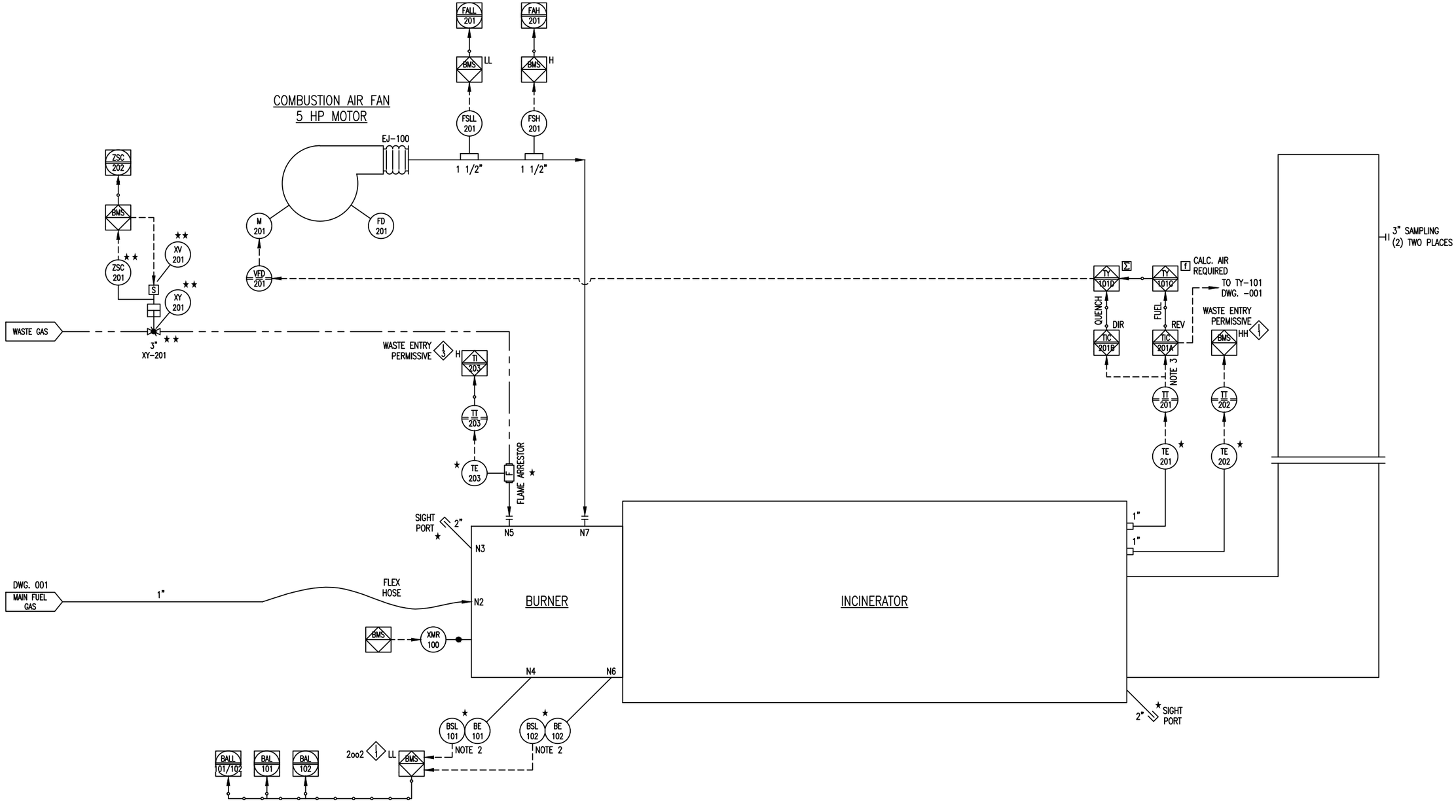
www.zeeco.com
sales@zeeco.com

P & I DIAGRAM
INCINERATOR PACKAGE
–

DRAWN JJA/TRP	DATE 17SEP14
CHK KNV	APP STO
SCALE N.T.S.	APP STO

S.O. NO. | GROUP | DWG. SUB CAT. SYSTEM NO. | DWG. NO. | REV. NO.
-04-11001-001 | 0



SEE DWG. -000 FOR LEGEND AND NOTES

NO.	DATE	REVISION DESCRIPTION	BY	CKD.	APP.
0	17SEP14	FOR ISSUE	JJA/TRP	AMS	MAB

CUSTOMER:
JOBSITE:
END USER:
P.O. NO.:

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P & I DIAGRAM
INCINERATOR PACKAGE
–

DRAWN	DATE
JJA/TRP	17SEP14
CHK	APP
KNV	STO
SCALE	APP
N.T.S.	STO

S.O. NO.	GROUP	DWG. SUB CAT.	SYSTEM NO.	DWG. NO.	REV. NO.
04-11001-002					0

GRI-GLYCalc VERSION 4.0 - SUMMARY OF INPUT VALUES

Case Name: Pioneer CF - 125 MMscfd w/Electric Pump
File Name: D:\Projects2\wfs\OVM\Pioneer\Pioneer CF - 125 MMscfd (2MM) w.Electric Pump.ddf
Date: July 24, 2017

DESCRIPTION:

Description: 125 MMscfd (2 MMBtu/hr Regen), 80 oF, 1,000 psig;
Pioneer Extended Gas Analysis;
Elect Pump, 20 gpm
Flash Tank, 110 oF, 60 psig;
Emissions Controlled by Thermal Oxidizer

Annual Hours of Operation: 8760.0 hours/yr

WET GAS:

Temperature: 80.00 deg. F
Pressure: 1000.00 psig
Wet Gas Water Content: Saturated

Component	Conc. (vol %)
Carbon Dioxide	0.1098
Nitrogen	0.4144
Methane	71.6162
Ethane	17.0404
Propane	6.6780
Isobutane	0.6673
n-Butane	2.1619
Isopentane	0.3376
n-Pentane	0.5333
n-Hexane	0.0796
Cyclohexane	0.0162
Other Hexanes	0.1863
Heptanes	0.0899
Methylcyclohexane	0.0185
2,2,4-Trimethylpentane	0.0018
Benzene	0.0008
Toluene	0.0024
Ethylbenzene	0.0013
Xylenes	0.0016
C8+ Heavies	0.0376

DRY GAS:

Flow Rate: 125.0 MMSCF/day
Water Content: 7.0 lbs. H2O/MMSCF

LEAN GLYCOL:

Glycol Type: TEG
Water Content: 1.5 wt% H2O
Flow Rate: 20.0 gpm

PUMP:

Glycol Pump Type: Electric/Pneumatic

FLASH TANK:

Flash Control:	Combustion device
Flash Control Efficiency:	98.00 %
Temperature:	110.0 deg. F
Pressure:	60.0 psig

REGENERATOR OVERHEADS CONTROL DEVICE:

Control Device:	Combustion Device
Destruction Efficiency:	98.0 %
Excess Oxygen:	5.0 %
Ambient Air Temperature:	50.0 deg. F

GRI-GLYCalc VERSION 4.0 - AGGREGATE CALCULATIONS REPORT

Case Name: Pioneer CF - 125 MMscfd w/Electric Pump
File Name: D:\Projects2\wfs\OVM\Pioneer\Pioneer CF - 125 MMscfd (2MM) w.Electric Pump.ddf
Date: July 24, 2017

DESCRIPTION:

Description: 125 MMscfd (2 MMBtu/hr Regen), 80 oF, 1,000 psig;
Pioneer Extended Gas Analysis;
Elect Pump, 20 gpm
Flash Tank, 110 oF, 60 psig;
Emissions Controlled by Thermal Oxidizer

Annual Hours of Operation: 8760.0 hours/yr

EMISSIONS REPORTS:

CONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	0.0314	0.753	0.1375
Ethane	0.1255	3.011	0.5496
Propane	0.1796	4.310	0.7866
Isobutane	0.0396	0.950	0.1734
n-Butane	0.1959	4.702	0.8582
Isopentane	0.0371	0.890	0.1624
n-Pentane	0.0837	2.009	0.3666
n-Hexane	0.0262	0.629	0.1148
Cyclohexane	0.0314	0.753	0.1374
Other Hexanes	0.0439	1.053	0.1921
Heptanes	0.0658	1.580	0.2883
Methylcyclohexane	0.0413	0.992	0.1810
2,2,4-Trimethylpentane	0.0005	0.012	0.0023
Benzene	0.0154	0.371	0.0676
Toluene	0.0693	1.663	0.3036
Ethylbenzene	0.0497	1.192	0.2175
Xylenes	0.0840	2.016	0.3680
C8+ Heavies	0.0587	1.409	0.2571
Total Emissions	1.1790	28.295	5.1639
Total Hydrocarbon Emissions	1.1790	28.295	5.1639
Total VOC Emissions	1.0221	24.531	4.4768
Total HAP Emissions	0.2452	5.884	1.0738
Total BTEX Emissions	0.2184	5.242	0.9567

UNCONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	1.5696	37.670	6.8748
Ethane	6.2737	150.569	27.4789
Propane	8.9791	215.498	39.3285
Isobutane	1.9796	47.510	8.6706
n-Butane	9.7966	235.118	42.9090
Isopentane	1.8538	44.491	8.1196

n-Pentane	4.1846	100.430	18.3285
n-Hexane	1.3106	31.456	5.7406
Cyclohexane	1.5688	37.651	6.8714
Other Hexanes	2.1927	52.625	9.6041
Heptanes	3.2909	78.981	14.4140
Methylcyclohexane	2.0665	49.597	9.0515
2,2,4-Trimethylpentane	0.0259	0.622	0.1135
Benzene	0.7719	18.526	3.3810
Toluene	3.4655	83.172	15.1790
Ethylbenzene	2.4831	59.593	10.8758
Xylenes	4.2005	100.811	18.3981
C8+ Heavies	2.9353	70.447	12.8566
Total Emissions	58.9487	1414.769	258.1953
Total Hydrocarbon Emissions	58.9487	1414.769	258.1953
Total VOC Emissions	51.1054	1226.530	223.8416
Total HAP Emissions	12.2575	294.181	53.6880
Total BTEX Emissions	10.9210	262.103	47.8339

FLASH GAS EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	0.5579	13.389	2.4435
Ethane	0.5925	14.220	2.5951
Propane	0.3869	9.286	1.6947
Isobutane	0.0540	1.297	0.2366
n-Butane	0.2000	4.801	0.8761
Isopentane	0.0320	0.767	0.1400
n-Pentane	0.0566	1.359	0.2481
n-Hexane	0.0094	0.225	0.0411
Cyclohexane	0.0027	0.066	0.0120
Other Hexanes	0.0211	0.505	0.0922
Heptanes	0.0109	0.262	0.0477
Methylcyclohexane	0.0027	0.065	0.0119
2,2,4-Trimethylpentane	0.0002	0.004	0.0008
Benzene	0.0002	0.004	0.0008
Toluene	0.0005	0.012	0.0021
Ethylbenzene	0.0002	0.005	0.0008
Xylenes	0.0002	0.005	0.0010
C8+ Heavies	0.0009	0.020	0.0037
Total Emissions	1.9288	46.292	8.4483
Total Hydrocarbon Emissions	1.9288	46.292	8.4483
Total VOC Emissions	0.7785	18.683	3.4097
Total HAP Emissions	0.0106	0.255	0.0466
Total BTEX Emissions	0.0011	0.026	0.0047

FLASH TANK OFF GAS

Component	lbs/hr	lbs/day	tons/yr
Methane	27.8933	669.439	122.1727
Ethane	29.6243	710.984	129.7546
Propane	19.3453	464.288	84.7326
Isobutane	2.7012	64.828	11.8312
n-Butane	10.0014	240.034	43.8062
Isopentane	1.5984	38.362	7.0010

n-Pentane	2.8317	67.960	12.4027
n-Hexane	0.4694	11.265	2.0559
Cyclohexane	0.1373	3.295	0.6013
Other Hexanes	1.0529	25.270	4.6118
Heptanes	0.5451	13.082	2.3875
Methylcyclohexane	0.1364	3.273	0.5973
2,2,4-Trimethylpentane	0.0088	0.211	0.0385
Benzene	0.0088	0.210	0.0384
Toluene	0.0242	0.580	0.1058
Ethylbenzene	0.0095	0.229	0.0418
Xylenes	0.0110	0.265	0.0483
C8+ Heavies	0.0426	1.022	0.1864
Total Emissions	96.4415	2314.597	422.4140
Total Hydrocarbon Emissions	96.4415	2314.597	422.4140
Total VOC Emissions	38.9239	934.174	170.4867
Total HAP Emissions	0.5317	12.760	2.3287
Total BTEX Emissions	0.0535	1.284	0.2343

COMBINED REGENERATOR VENT/FLASH GAS EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	0.5893	14.142	2.5809
Ethane	0.7180	17.231	3.1447
Propane	0.5665	13.596	2.4812
Isobutane	0.0936	2.247	0.4100
n-Butane	0.3960	9.503	1.7343
Isopentane	0.0690	1.657	0.3024
n-Pentane	0.1403	3.368	0.6146
n-Hexane	0.0356	0.854	0.1559
Cyclohexane	0.0341	0.819	0.1495
Other Hexanes	0.0649	1.558	0.2843
Heptanes	0.0767	1.841	0.3360
Methylcyclohexane	0.0441	1.057	0.1930
2,2,4-Trimethylpentane	0.0007	0.017	0.0030
Benzene	0.0156	0.375	0.0684
Toluene	0.0698	1.675	0.3057
Ethylbenzene	0.0499	1.196	0.2184
Xylenes	0.0842	2.022	0.3689
C8+ Heavies	0.0596	1.429	0.2609
Total Emissions	3.1078	74.587	13.6122
Total Hydrocarbon Emissions	3.1078	74.587	13.6122
Total VOC Emissions	1.8006	43.214	7.8866
Total HAP Emissions	0.2558	6.139	1.1203
Total BTEX Emissions	0.2195	5.268	0.9614

COMBINED REGENERATOR VENT/FLASH GAS EMISSION CONTROL REPORT:

Component	Uncontrolled tons/yr	Controlled tons/yr	% Reduction
Methane	129.0474	2.5809	98.00
Ethane	157.2335	3.1447	98.00
Propane	124.0610	2.4812	98.00
Isobutane	20.5018	0.4100	98.00

n-Butane	86.7152	1.7343	98.00
Isopentane	15.1206	0.3024	98.00
n-Pentane	30.7312	0.6146	98.00
n-Hexane	7.7966	0.1559	98.00
Cyclohexane	7.4727	0.1495	98.00
Other Hexanes	14.2159	0.2843	98.00
Heptanes	16.8015	0.3360	98.00
Methylcyclohexane	9.6488	0.1930	98.00
2,2,4-Trimethylpentane	0.1520	0.0030	98.00
Benzene	3.4194	0.0684	98.00
Toluene	15.2848	0.3057	98.00
Ethylbenzene	10.9176	0.2184	98.00
Xylenes	18.4464	0.3689	98.00
C8+ Heavies	13.0430	0.2609	98.00
Total Emissions	680.6093	13.6122	98.00
Total Hydrocarbon Emissions	680.6093	13.6122	98.00
Total VOC Emissions	394.3283	7.8866	98.00
Total HAP Emissions	56.0168	1.1203	98.00
Total BTEX Emissions	48.0682	0.9614	98.00

EQUIPMENT REPORTS:

COMBUSTION DEVICE

Ambient Temperature: 50.00 deg. F
Excess Oxygen: 5.00 %
Combustion Efficiency: 98.00 %
Supplemental Fuel Requirement: 3.09e-001 MM BTU/hr

Component	Emitted	Destroyed
Methane	2.00%	98.00%
Ethane	2.00%	98.00%
Propane	2.00%	98.00%
Isobutane	2.00%	98.00%
n-Butane	2.00%	98.00%
Isopentane	2.00%	98.00%
n-Pentane	2.00%	98.00%
n-Hexane	2.00%	98.00%
Cyclohexane	2.00%	98.00%
Other Hexanes	2.00%	98.00%
Heptanes	2.00%	98.00%
Methylcyclohexane	2.00%	98.00%
2,2,4-Trimethylpentane	2.00%	98.00%
Benzene	2.00%	98.00%
Toluene	2.00%	98.00%
Ethylbenzene	2.00%	98.00%
Xylenes	2.00%	98.00%
C8+ Heavies	2.00%	98.00%

ABSORBER

NOTE: Because the Calculated Absorber Stages was below the minimum allowed, GRI-GLYCalc has set the number of Absorber Stages to 1.25 and has calculated a revised Dry Gas Dew Point.

Calculated Absorber Stages:	1.25
Calculated Dry Gas Dew Point:	1.42 lbs. H2O/MMSCF
Temperature:	80.0 deg. F
Pressure:	1000.0 psig
Dry Gas Flow Rate:	125.0000 MMSCF/day
Glycol Losses with Dry Gas:	2.4078 lb/hr
Wet Gas Water Content:	Saturated
Calculated Wet Gas Water Content:	32.37 lbs. H2O/MMSCF
Calculated Lean Glycol Recirc. Ratio:	7.44 gal/lb H2O

Component	Remaining in Dry Gas	Absorbed in Glycol
Water	4.37%	95.63%
Carbon Dioxide	99.74%	0.26%
Nitrogen	99.98%	0.02%
Methane	99.98%	0.02%
Ethane	99.95%	0.05%
Propane	99.93%	0.07%
Isobutane	99.91%	0.09%
n-Butane	99.89%	0.11%
Isopentane	99.90%	0.10%
n-Pentane	99.87%	0.13%
n-Hexane	99.81%	0.19%
Cyclohexane	99.09%	0.91%
Other Hexanes	99.85%	0.15%
Heptanes	99.69%	0.31%
Methylcyclohexane	99.12%	0.88%
2,2,4-Trimethylpentane	99.88%	0.12%
Benzene	90.90%	9.10%
Toluene	88.51%	11.49%
Ethylbenzene	86.85%	13.15%
Xylenes	81.94%	18.06%
C8+ Heavies	99.66%	0.34%

FLASH TANK

Flash Control:	Combustion device
Flash Control Efficiency:	98.00 %
Flash Temperature:	110.0 deg. F
Flash Pressure:	60.0 psig

Component	Left in Glycol	Removed in Flash Gas
Water	99.98%	0.02%
Carbon Dioxide	43.03%	56.97%
Nitrogen	5.18%	94.82%
Methane	5.33%	94.67%
Ethane	17.48%	82.52%
Propane	31.70%	68.30%
Isobutane	42.29%	57.71%
n-Butane	49.48%	50.52%
Isopentane	53.93%	46.07%
n-Pentane	59.84%	40.16%

n-Hexane	73.76%	26.24%
Cyclohexane	92.21%	7.79%
Other Hexanes	67.88%	32.12%
Heptanes	85.86%	14.14%
Methylcyclohexane	94.06%	5.94%
2,2,4-Trimethylpentane	75.04%	24.96%
Benzene	98.93%	1.07%
Toluene	99.36%	0.64%
Ethylbenzene	99.66%	0.34%
Xylenes	99.77%	0.23%
C8+ Heavies	98.74%	1.26%

REGENERATOR

No Stripping Gas used in regenerator.

Component	Remaining in Glycol	Distilled Overhead
Water	51.15%	48.85%
Carbon Dioxide	0.00%	100.00%
Nitrogen	0.00%	100.00%
Methane	0.00%	100.00%
Ethane	0.00%	100.00%
Propane	0.00%	100.00%
Isobutane	0.00%	100.00%
n-Butane	0.00%	100.00%
Isopentane	0.93%	99.07%
n-Pentane	0.84%	99.16%
n-Hexane	0.68%	99.32%
Cyclohexane	3.47%	96.53%
Other Hexanes	1.47%	98.53%
Heptanes	0.58%	99.42%
Methylcyclohexane	4.25%	95.75%
2,2,4-Trimethylpentane	2.00%	98.00%
Benzene	5.05%	94.95%
Toluene	7.95%	92.05%
Ethylbenzene	10.45%	89.55%
Xylenes	12.96%	87.04%
C8+ Heavies	12.17%	87.83%

STREAM REPORTS:

WET GAS STREAM

Temperature: 80.00 deg. F
Pressure: 1014.70 psia
Flow Rate: 5.21e+006 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	6.82e-002	1.69e+002
Carbon Dioxide	1.10e-001	6.64e+002
Nitrogen	4.14e-001	1.59e+003

Methane	7.16e+001	1.58e+005
Ethane	1.70e+001	7.04e+004
Propane	6.67e+000	4.04e+004
Isobutane	6.67e-001	5.33e+003
n-Butane	2.16e+000	1.73e+004
Isopentane	3.37e-001	3.34e+003
n-Pentane	5.33e-001	5.28e+003
n-Hexane	7.95e-002	9.42e+002
Cyclohexane	1.62e-002	1.87e+002
Other Hexanes	1.86e-001	2.20e+003
Heptanes	8.98e-002	1.24e+003
Methylcyclohexane	1.85e-002	2.49e+002
2,2,4-Trimethylpentane	1.80e-003	2.82e+001
Benzene	7.99e-004	8.58e+000
Toluene	2.40e-003	3.04e+001
Ethylbenzene	1.30e-003	1.90e+001
Xylenes	1.60e-003	2.33e+001
C8+ Heavies	3.76e-002	8.79e+002
Total Components	100.00	3.08e+005

DRY GAS STREAM

Temperature: 80.00 deg. F
Pressure: 1014.70 psia
Flow Rate: 5.21e+006 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	2.99e-003	7.38e+000
Carbon Dioxide	1.10e-001	6.62e+002
Nitrogen	4.14e-001	1.59e+003
Methane	7.16e+001	1.58e+005
Ethane	1.70e+001	7.03e+004
Propane	6.68e+000	4.04e+004
Isobutane	6.67e-001	5.32e+003
n-Butane	2.16e+000	1.72e+004
Isopentane	3.37e-001	3.34e+003
n-Pentane	5.33e-001	5.28e+003
n-Hexane	7.95e-002	9.40e+002
Cyclohexane	1.61e-002	1.86e+002
Other Hexanes	1.86e-001	2.20e+003
Heptanes	8.97e-002	1.23e+003
Methylcyclohexane	1.83e-002	2.47e+002
2,2,4-Trimethylpentane	1.80e-003	2.82e+001
Benzene	7.27e-004	7.80e+000
Toluene	2.12e-003	2.69e+001
Ethylbenzene	1.13e-003	1.65e+001
Xylenes	1.31e-003	1.91e+001
C8+ Heavies	3.75e-002	8.77e+002
Total Components	100.00	3.08e+005

LEAN GLYCOL STREAM

Temperature: 80.00 deg. F
Flow Rate: 2.00e+001 gpm

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.85e+001	1.11e+004
Water	1.50e+000	1.69e+002
Carbon Dioxide	1.54e-012	1.73e-010
Nitrogen	3.28e-013	3.69e-011
Methane	8.79e-018	9.90e-016
Ethane	1.51e-007	1.69e-005
Propane	1.02e-008	1.15e-006
Isobutane	1.25e-009	1.40e-007
n-Butane	4.36e-009	4.91e-007
Isopentane	1.54e-004	1.73e-002
n-Pentane	3.13e-004	3.53e-002
n-Hexane	7.94e-005	8.94e-003
Cyclohexane	5.01e-004	5.64e-002
Other Hexanes	2.91e-004	3.28e-002
Heptanes	1.71e-004	1.93e-002
Methylcyclohexane	8.15e-004	9.18e-002
2,2,4-Trimethylpentane	4.69e-006	5.29e-004
Benzene	3.65e-004	4.11e-002
Toluene	2.66e-003	2.99e-001
Ethylbenzene	2.57e-003	2.90e-001
Xylenes	5.55e-003	6.25e-001
C8+ Heavies	3.61e-003	4.07e-001
Total Components	100.00	1.13e+004

RICH GLYCOL STREAM

Temperature: 80.00 deg. F
Pressure: 1014.70 psia
Flow Rate: 2.07e+001 gpm
NOTE: Stream has more than one phase.

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.58e+001	1.11e+004
Water	2.85e+000	3.30e+002
Carbon Dioxide	1.49e-002	1.73e+000
Nitrogen	3.20e-003	3.70e-001
Methane	2.55e-001	2.95e+001
Ethane	3.10e-001	3.59e+001
Propane	2.45e-001	2.83e+001
Isobutane	4.04e-002	4.68e+000
n-Butane	1.71e-001	1.98e+001
Isopentane	3.00e-002	3.47e+000
n-Pentane	6.09e-002	7.05e+000
n-Hexane	1.55e-002	1.79e+000
Cyclohexane	1.52e-002	1.76e+000
Other Hexanes	2.83e-002	3.28e+000
Heptanes	3.33e-002	3.86e+000
Methylcyclohexane	1.98e-002	2.29e+000
2,2,4-Trimethylpentane	3.04e-004	3.52e-002
Benzene	7.10e-003	8.22e-001
Toluene	3.27e-002	3.79e+000
Ethylbenzene	2.40e-002	2.78e+000
Xylenes	4.18e-002	4.84e+000

Component	Conc. (vol%)	Loading (lb/hr)
C8+ Heavies	2.92e-002	3.38e+000
Total Components	100.00	1.16e+004

FLASH TANK OFF GAS STREAM

Temperature: 110.00 deg. F
Pressure: 74.70 psia
Flow Rate: 1.33e+003 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	1.14e-001	7.23e-002
Carbon Dioxide	6.38e-001	9.86e-001
Nitrogen	3.57e-001	3.51e-001
Methane	4.96e+001	2.79e+001
Ethane	2.81e+001	2.96e+001
Propane	1.25e+001	1.93e+001
Isobutane	1.32e+000	2.70e+000
n-Butane	4.90e+000	1.00e+001
Isopentane	6.31e-001	1.60e+000
n-Pentane	1.12e+000	2.83e+000
n-Hexane	1.55e-001	4.69e-001
Cyclohexane	4.65e-002	1.37e-001
Other Hexanes	3.48e-001	1.05e+000
Heptanes	1.55e-001	5.45e-001
Methylcyclohexane	3.96e-002	1.36e-001
2,2,4-Trimethylpentane	2.19e-003	8.80e-003
Benzene	3.20e-003	8.77e-003
Toluene	7.47e-003	2.42e-002
Ethylbenzene	2.56e-003	9.55e-003
Xylenes	2.96e-003	1.10e-002
C8+ Heavies	7.12e-003	4.26e-002
Total Components	100.00	9.79e+001

FLASH TANK GLYCOL STREAM

Temperature: 110.00 deg. F
Flow Rate: 2.04e+001 gpm

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.66e+001	1.11e+004
Water	2.88e+000	3.30e+002
Carbon Dioxide	6.49e-003	7.45e-001
Nitrogen	1.67e-004	1.92e-002
Methane	1.37e-002	1.57e+000
Ethane	5.47e-002	6.27e+000
Propane	7.82e-002	8.98e+000
Isobutane	1.72e-002	1.98e+000
n-Butane	8.54e-002	9.80e+000
Isopentane	1.63e-002	1.87e+000
n-Pentane	3.68e-002	4.22e+000
n-Hexane	1.15e-002	1.32e+000
Cyclohexane	1.42e-002	1.63e+000
Other Hexanes	1.94e-002	2.23e+000
Heptanes	2.88e-002	3.31e+000

Methylcyclohexane	1.88e-002	2.16e+000
2,2,4-Trimethylpentane	2.30e-004	2.64e-002
Benzene	7.08e-003	8.13e-001
Toluene	3.28e-002	3.76e+000
Ethylbenzene	2.42e-002	2.77e+000
Xylenes	4.20e-002	4.83e+000
C8+ Heavies	2.91e-002	3.34e+000
Total Components	100.00	1.15e+004

FLASH GAS EMISSIONS

Flow Rate: 6.07e+003 scfh
Control Method: Combustion Device
Control Efficiency: 98.00

Component	Conc. (vol%)	Loading (lb/hr)
Water	6.03e+001	1.74e+002
Carbon Dioxide	3.92e+001	2.76e+002
Nitrogen	7.82e-002	3.51e-001
Methane	2.17e-001	5.58e-001
Ethane	1.23e-001	5.92e-001
Propane	5.48e-002	3.87e-001
Isobutane	5.81e-003	5.40e-002
n-Butane	2.15e-002	2.00e-001
Isopentane	2.77e-003	3.20e-002
n-Pentane	4.90e-003	5.66e-002
n-Hexane	6.81e-004	9.39e-003
Cyclohexane	2.04e-004	2.75e-003
Other Hexanes	1.53e-003	2.11e-002
Heptanes	6.80e-004	1.09e-002
Methylcyclohexane	1.74e-004	2.73e-003
2,2,4-Trimethylpentane	9.62e-006	1.76e-004
Benzene	1.40e-005	1.75e-004
Toluene	3.28e-005	4.83e-004
Ethylbenzene	1.12e-005	1.91e-004
Xylenes	1.30e-005	2.20e-004
C8+ Heavies	3.12e-005	8.51e-004
Total Components	100.00	4.52e+002

REGENERATOR OVERHEADS STREAM

Temperature: 212.00 deg. F
Pressure: 14.70 psia
Flow Rate: 3.80e+003 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	8.95e+001	1.61e+002
Carbon Dioxide	1.69e-001	7.45e-001
Nitrogen	6.83e-003	1.92e-002
Methane	9.77e-001	1.57e+000
Ethane	2.08e+000	6.27e+000
Propane	2.03e+000	8.98e+000
Isobutane	3.40e-001	1.98e+000

n-Butane	1.68e+000	9.80e+000
Isopentane	2.57e-001	1.85e+000
n-Pentane	5.79e-001	4.18e+000
n-Hexane	1.52e-001	1.31e+000
Cyclohexane	1.86e-001	1.57e+000
Other Hexanes	2.54e-001	2.19e+000
Heptanes	3.28e-001	3.29e+000
Methylcyclohexane	2.10e-001	2.07e+000
2,2,4-Trimethylpentane	2.27e-003	2.59e-002
Benzene	9.87e-002	7.72e-001
Toluene	3.76e-001	3.47e+000
Ethylbenzene	2.34e-001	2.48e+000
Xylenes	3.95e-001	4.20e+000
C8+ Heavies	1.72e-001	2.94e+000
Total Components	100.00	2.21e+002

COMBUSTION DEVICE OFF GAS STREAM

Temperature: 1000.00 deg. F
Pressure: 14.70 psia
Flow Rate: 7.87e+000 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Methane	9.43e+000	3.14e-002
Ethane	2.01e+001	1.25e-001
Propane	1.96e+001	1.80e-001
Isobutane	3.28e+000	3.96e-002
n-Butane	1.62e+001	1.96e-001
Isopentane	2.48e+000	3.71e-002
n-Pentane	5.59e+000	8.37e-002
n-Hexane	1.47e+000	2.62e-002
Cyclohexane	1.80e+000	3.14e-002
Other Hexanes	2.45e+000	4.39e-002
Heptanes	3.17e+000	6.58e-002
Methylcyclohexane	2.03e+000	4.13e-002
2,2,4-Trimethylpentane	2.19e-002	5.18e-004
Benzene	9.53e-001	1.54e-002
Toluene	3.63e+000	6.93e-002
Ethylbenzene	2.25e+000	4.97e-002
Xylenes	3.81e+000	8.40e-002
C8+ Heavies	1.66e+000	5.87e-002
Total Components	100.00	1.18e+000

GRI-GLYCalc VERSION 4.0 - SUMMARY OF INPUT VALUES

Case Name: Pioneer CF - 125 MMscfd w/Gas Pump (Backup)
File Name: D:\Projects2\wfs\OVM\Pioneer\Pioneer CF - 125 MMscfd (2MM) w.Gas Pump.ddf
Date: July 24, 2017

DESCRIPTION:

Description: 125 MMscfd (2 MMBtu/hr Regen), 80 oF, 1,000 psig;
Pioneer Extended Gas Analysis;
Gas Pump, 7.5 gpm;
Flash Tank, 110 oF, 60 psig;
Emissions Controlled by Thermal Oxidizer

Annual Hours of Operation: 8760.0 hours/yr

Gas-Assisted Kimray Pump Will Be Used as Backup to the Electric Glycol Pump. GLYCalc Run Included to Demonstrate the Electric Pump Results in Higher Emissions.

WET GAS:

Temperature: 80.00 deg. F
Pressure: 1000.00 psig
Wet Gas Water Content: Saturated

Component	Conc. (vol %)
Carbon Dioxide	0.1098
Nitrogen	0.4144
Methane	71.6162
Ethane	17.0404
Propane	6.6780
Isobutane	0.6673
n-Butane	2.1619
Isopentane	0.3376
n-Pentane	0.5333
n-Hexane	0.0796
Cyclohexane	0.0162
Other Hexanes	0.1863
Heptanes	0.0899
Methylcyclohexane	0.0185
2,2,4-Trimethylpentane	0.0018
Benzene	0.0008
Toluene	0.0024
Ethylbenzene	0.0013
Xylenes	0.0016
C8+ Heavies	0.0376

DRY GAS:

Flow Rate: 125.0 MMSCF/day
Water Content: 7.0 lbs. H2O/MMSCF

LEAN GLYCOL:

Glycol Type: TEG
Water Content: 1.5 wt% H2O
Flow Rate: 7.5 gpm

PUMP:

Glycol Pump Type: Gas Injection
Gas Injection Pump Volume Ratio: 0.080 acfm gas/gpm glycol

FLASH TANK:

Flash Control: Combustion device
Flash Control Efficiency: 98.00 %
Temperature: 110.0 deg. F
Pressure: 60.0 psig

REGENERATOR OVERHEADS CONTROL DEVICE:

Control Device: Combustion Device
Destruction Efficiency: 98.0 %
Excess Oxygen: 5.0 %
Ambient Air Temperature: 50.0 deg. F

GRI-GLYCalc VERSION 4.0 - AGGREGATE CALCULATIONS REPORT

Case Name: Pioneer CF - 125 MMscfd w/Gas Pump (Backup)
File Name: D:\Projects2\wfs\OVM\Pioneer\Pioneer CF - 125 MMscfd (2MM) w.Gas Pump.ddf
Date: July 24, 2017

DESCRIPTION:

Description: 125 MMscfd (2 MMBtu/hr Regen), 80 oF, 1,000 psig;
Pioneer Extended Gas Analysis;
Gas Pump, 7.5 gpm;
Flash Tank, 110 oF, 60 psig;
Emissions Controlled by Thermal Oxidizer

Annual Hours of Operation: 8760.0 hours/yr

Gas-Assisted Kimray Pump Will Be Used as Backup to the Electric Glycol Pump. GLYCalc Run Included to Demonstrate the Electric Pump Results in Higher Emissions.

EMISSIONS REPORTS:

CONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	0.0152	0.366	0.0667
Ethane	0.0277	0.665	0.1214
Propane	0.0401	0.963	0.1757
Isobutane	0.0085	0.205	0.0374
n-Butane	0.0396	0.951	0.1735
Isopentane	0.0084	0.202	0.0368
n-Pentane	0.0181	0.434	0.0791
n-Hexane	0.0062	0.150	0.0273
Cyclohexane	0.0080	0.192	0.0351
Other Hexanes	0.0103	0.246	0.0449
Heptanes	0.0178	0.427	0.0778
Methylcyclohexane	0.0117	0.280	0.0510
2,2,4-Trimethylpentane	0.0002	0.004	0.0007
Benzene	0.0055	0.132	0.0241
Toluene	0.0253	0.608	0.1109
Ethylbenzene	0.0185	0.445	0.0811
Xylenes	0.0328	0.787	0.1436
C8+ Heavies	0.0283	0.679	0.1238
Total Emissions	0.3221	7.731	1.4110
Total Hydrocarbon Emissions	0.3221	7.731	1.4110
Total VOC Emissions	0.2792	6.700	1.2228
Total HAP Emissions	0.0885	2.124	0.3876
Total BTEX Emissions	0.0821	1.971	0.3597

UNCONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	0.7617	18.280	3.3361
Ethane	1.3863	33.271	6.0720
Propane	2.0052	48.125	8.7828
Isobutane	0.4266	10.238	1.8684
n-Butane	1.9804	47.529	8.6740
Isopentane	0.4201	10.084	1.8403

n-Pentane	0.9033	21.680	3.9566
n-Hexane	0.3116	7.477	1.3646
Cyclohexane	0.4007	9.616	1.7550
Other Hexanes	0.5130	12.312	2.2469
Heptanes	0.8886	21.326	3.8920
Methylcyclohexane	0.5826	13.983	2.5519
2,2,4-Trimethylpentane	0.0077	0.186	0.0339
Benzene	0.2746	6.590	1.2026
Toluene	1.2661	30.386	5.5454
Ethylbenzene	0.9262	22.229	4.0567
Xylenes	1.6389	39.334	7.1784
C8+ Heavies	1.4136	33.925	6.1914
Total Emissions	16.1071	386.570	70.5490
Total Hydrocarbon Emissions	16.1071	386.570	70.5490
Total VOC Emissions	13.9591	335.018	61.1409
Total HAP Emissions	4.4251	106.201	19.3817
Total BTEX Emissions	4.1058	98.538	17.9832

FLASH GAS EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	2.2371	53.690	9.7984
Ethane	1.1372	27.293	4.9810
Propane	0.6912	16.588	3.0273
Isobutane	0.0945	2.268	0.4138
n-Butane	0.3281	7.874	1.4370
Isopentane	0.0599	1.437	0.2622
n-Pentane	0.1011	2.426	0.4428
n-Hexane	0.0187	0.449	0.0820
Cyclohexane	0.0063	0.152	0.0277
Other Hexanes	0.0415	0.997	0.1819
Heptanes	0.0254	0.608	0.1110
Methylcyclohexane	0.0069	0.166	0.0304
2,2,4-Trimethylpentane	0.0005	0.011	0.0020
Benzene	0.0005	0.012	0.0022
Toluene	0.0015	0.035	0.0064
Ethylbenzene	0.0006	0.014	0.0026
Xylenes	0.0007	0.017	0.0031
C8+ Heavies	0.0036	0.087	0.0158
Total Emissions	4.7552	114.125	20.8279
Total Hydrocarbon Emissions	4.7552	114.125	20.8279
Total VOC Emissions	1.3809	33.142	6.0484
Total HAP Emissions	0.0225	0.539	0.0984
Total BTEX Emissions	0.0033	0.079	0.0144

FLASH TANK OFF GAS

Component	lbs/hr	lbs/day	tons/yr
Methane	111.8542	2684.500	489.9213
Ethane	56.8609	1364.661	249.0507
Propane	34.5585	829.403	151.3661
Isobutane	4.7240	113.376	20.6911
n-Butane	16.4039	393.693	71.8489
Isopentane	2.9933	71.839	13.1106

n-Pentane	5.0550	121.321	22.1411
n-Hexane	0.9360	22.465	4.0999
Cyclohexane	0.3167	7.600	1.3870
Other Hexanes	2.0766	49.838	9.0954
Heptanes	1.2676	30.422	5.5520
Methylcyclohexane	0.3468	8.324	1.5191
2,2,4-Trimethylpentane	0.0227	0.546	0.0996
Benzene	0.0255	0.613	0.1118
Toluene	0.0735	1.763	0.3218
Ethylbenzene	0.0301	0.723	0.1319
Xylenes	0.0355	0.852	0.1555
C8+ Heavies	0.1802	4.325	0.7894
Total Emissions	237.7610	5706.263	1041.3931
Total Hydrocarbon Emissions	237.7610	5706.263	1041.3931
Total VOC Emissions	69.0459	1657.102	302.4211
Total HAP Emissions	1.1234	26.961	4.9205
Total BTEX Emissions	0.1646	3.950	0.7210

COMBINED REGENERATOR VENT/FLASH GAS EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	2.2523	54.056	9.8651
Ethane	1.1649	27.959	5.1025
Propane	0.7313	17.551	3.2030
Isobutane	0.1030	2.472	0.4512
n-Butane	0.3677	8.824	1.6105
Isopentane	0.0683	1.638	0.2990
n-Pentane	0.1192	2.860	0.5220
n-Hexane	0.0250	0.599	0.1093
Cyclohexane	0.0143	0.344	0.0628
Other Hexanes	0.0518	1.243	0.2268
Heptanes	0.0431	1.035	0.1889
Methylcyclohexane	0.0186	0.446	0.0814
2,2,4-Trimethylpentane	0.0006	0.015	0.0027
Benzene	0.0060	0.144	0.0263
Toluene	0.0268	0.643	0.1173
Ethylbenzene	0.0191	0.459	0.0838
Xylenes	0.0335	0.804	0.1467
C8+ Heavies	0.0319	0.765	0.1396
Total Emissions	5.0774	121.857	22.2388
Total Hydrocarbon Emissions	5.0774	121.857	22.2388
Total VOC Emissions	1.6601	39.842	7.2712
Total HAP Emissions	0.1110	2.663	0.4860
Total BTEX Emissions	0.0854	2.050	0.3741

COMBINED REGENERATOR VENT/FLASH GAS EMISSION CONTROL REPORT:

Component	Uncontrolled tons/yr	Controlled tons/yr	% Reduction
Methane	493.2574	9.8651	98.00
Ethane	255.1227	5.1025	98.00
Propane	160.1490	3.2030	98.00
Isobutane	22.5595	0.4512	98.00

n-Butane	80.5229	1.6105	98.00
Isopentane	14.9508	0.2990	98.00
n-Pentane	26.0976	0.5220	98.00
n-Hexane	5.4645	0.1093	98.00
Cyclohexane	3.1420	0.0628	98.00
Other Hexanes	11.3423	0.2268	98.00
Heptanes	9.4439	0.1889	98.00
Methylcyclohexane	4.0710	0.0814	98.00
2,2,4-Trimethylpentane	0.1335	0.0027	98.00
Benzene	1.3144	0.0263	98.00
Toluene	5.8672	0.1173	98.00
Ethylbenzene	4.1886	0.0838	98.00
Xylenes	7.3339	0.1467	98.00
C8+ Heavies	6.9808	0.1396	98.00
Total Emissions	1111.9421	22.2388	98.00
Total Hydrocarbon Emissions	1111.9421	22.2388	98.00
Total VOC Emissions	363.5620	7.2712	98.00
Total HAP Emissions	24.3022	0.4860	98.00
Total BTEX Emissions	18.7042	0.3741	98.00

EQUIPMENT REPORTS:

COMBUSTION DEVICE

Ambient Temperature: 50.00 deg. F
Excess Oxygen: 5.00 %
Combustion Efficiency: 98.00 %
Supplemental Fuel Requirement: 1.27e-001 MM BTU/hr

Component	Emitted	Destroyed
Methane	2.00%	98.00%
Ethane	2.00%	98.00%
Propane	2.00%	98.00%
Isobutane	2.00%	98.00%
n-Butane	2.00%	98.00%
Isopentane	2.00%	98.00%
n-Pentane	2.00%	98.00%
n-Hexane	2.00%	98.00%
Cyclohexane	2.00%	98.00%
Other Hexanes	2.00%	98.00%
Heptanes	2.00%	98.00%
Methylcyclohexane	2.00%	98.00%
2,2,4-Trimethylpentane	2.00%	98.00%
Benzene	2.00%	98.00%
Toluene	2.00%	98.00%
Ethylbenzene	2.00%	98.00%
Xylenes	2.00%	98.00%
C8+ Heavies	2.00%	98.00%

ABSORBER

NOTE: Because the Calculated Absorber Stages was below the minimum allowed, GRI-GLYCalc has set the number of Absorber Stages to 1.25 and has calculated a revised Dry Gas Dew Point.

Calculated Absorber Stages:	1.25
Calculated Dry Gas Dew Point:	2.34 lbs. H2O/MMSCF
Temperature:	80.0 deg. F
Pressure:	1000.0 psig
Dry Gas Flow Rate:	125.0000 MMSCF/day
Glycol Losses with Dry Gas:	2.4098 lb/hr
Wet Gas Water Content:	Saturated
Calculated Wet Gas Water Content:	32.37 lbs. H2O/MMSCF
Calculated Lean Glycol Recirc. Ratio:	2.88 gal/lb H2O

Component	Remaining in Dry Gas	Absorbed in Glycol
Water	7.21%	92.79%
Carbon Dioxide	99.90%	0.10%
Nitrogen	99.99%	0.01%
Methane	99.99%	0.01%
Ethane	99.98%	0.02%
Propane	99.97%	0.03%
Isobutane	99.97%	0.03%
n-Butane	99.96%	0.04%
Isopentane	99.96%	0.04%
n-Pentane	99.95%	0.05%
n-Hexane	99.93%	0.07%
Cyclohexane	99.68%	0.32%
Other Hexanes	99.95%	0.05%
Heptanes	99.89%	0.11%
Methylcyclohexane	99.69%	0.31%
2,2,4-Trimethylpentane	99.96%	0.04%
Benzene	96.57%	3.43%
Toluene	95.65%	4.35%
Ethylbenzene	95.02%	4.98%
Xylenes	92.88%	7.12%
C8+ Heavies	99.88%	0.12%

FLASH TANK

Flash Control:	Combustion device
Flash Control Efficiency:	98.00 %
Flash Temperature:	110.0 deg. F
Flash Pressure:	60.0 psig

Component	Left in Glycol	Removed in Flash Gas
Water	99.83%	0.17%
Carbon Dioxide	8.55%	91.45%
Nitrogen	0.64%	99.36%
Methane	0.68%	99.32%
Ethane	2.38%	97.62%
Propane	5.48%	94.52%
Isobutane	8.28%	91.72%
n-Butane	10.77%	89.23%
Isopentane	12.47%	87.53%
n-Pentane	15.34%	84.66%

n-Hexane	25.16%	74.84%
Cyclohexane	57.04%	42.96%
Other Hexanes	20.17%	79.83%
Heptanes	41.40%	58.60%
Methylcyclohexane	63.93%	36.07%
2,2,4-Trimethylpentane	25.83%	74.17%
Benzene	91.91%	8.09%
Toluene	94.94%	5.06%
Ethylbenzene	97.18%	2.82%
Xylenes	98.15%	1.85%
C8+ Heavies	89.61%	10.39%

REGENERATOR

No Stripping Gas used in regenerator.

Component	Remaining in Glycol	Distilled Overhead
Water	28.84%	71.16%
Carbon Dioxide	0.00%	100.00%
Nitrogen	0.00%	100.00%
Methane	0.00%	100.00%
Ethane	0.00%	100.00%
Propane	0.00%	100.00%
Isobutane	0.00%	100.00%
n-Butane	0.00%	100.00%
Isopentane	1.47%	98.53%
n-Pentane	1.39%	98.61%
n-Hexane	1.02%	98.98%
Cyclohexane	4.69%	95.31%
Other Hexanes	2.24%	97.76%
Heptanes	0.76%	99.24%
Methylcyclohexane	5.21%	94.79%
2,2,4-Trimethylpentane	2.35%	97.65%
Benzene	5.35%	94.65%
Toluene	8.22%	91.78%
Ethylbenzene	10.60%	89.40%
Xylenes	13.10%	86.90%
C8+ Heavies	9.04%	90.96%

STREAM REPORTS:

WET GAS STREAM

Temperature: 80.00 deg. F
Pressure: 1014.70 psia
Flow Rate: 5.21e+006 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	6.82e-002	1.69e+002
Carbon Dioxide	1.10e-001	6.63e+002
Nitrogen	4.14e-001	1.59e+003

Methane	7.16e+001	1.58e+005
Ethane	1.70e+001	7.03e+004
Propane	6.67e+000	4.04e+004
Isobutane	6.67e-001	5.32e+003
n-Butane	2.16e+000	1.73e+004
Isopentane	3.37e-001	3.34e+003
n-Pentane	5.33e-001	5.28e+003
n-Hexane	7.95e-002	9.42e+002
Cyclohexane	1.62e-002	1.87e+002
Other Hexanes	1.86e-001	2.20e+003
Heptanes	8.98e-002	1.24e+003
Methylcyclohexane	1.85e-002	2.49e+002
2,2,4-Trimethylpentane	1.80e-003	2.82e+001
Benzene	7.99e-004	8.58e+000
Toluene	2.40e-003	3.04e+001
Ethylbenzene	1.30e-003	1.89e+001
Xylenes	1.60e-003	2.33e+001
C8+ Heavies	3.76e-002	8.79e+002
Total Components	100.00	3.08e+005

DRY GAS STREAM

Temperature: 80.00 deg. F
Pressure: 1014.70 psia
Flow Rate: 5.21e+006 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	4.92e-003	1.22e+001
Carbon Dioxide	1.10e-001	6.63e+002
Nitrogen	4.14e-001	1.59e+003
Methane	7.16e+001	1.58e+005
Ethane	1.70e+001	7.03e+004
Propane	6.68e+000	4.04e+004
Isobutane	6.67e-001	5.32e+003
n-Butane	2.16e+000	1.72e+004
Isopentane	3.38e-001	3.34e+003
n-Pentane	5.33e-001	5.28e+003
n-Hexane	7.96e-002	9.41e+002
Cyclohexane	1.62e-002	1.87e+002
Other Hexanes	1.86e-001	2.20e+003
Heptanes	8.98e-002	1.24e+003
Methylcyclohexane	1.84e-002	2.49e+002
2,2,4-Trimethylpentane	1.80e-003	2.82e+001
Benzene	7.73e-004	8.28e+000
Toluene	2.30e-003	2.90e+001
Ethylbenzene	1.24e-003	1.80e+001
Xylenes	1.49e-003	2.17e+001
C8+ Heavies	3.76e-002	8.78e+002
Total Components	100.00	3.08e+005

LEAN GLYCOL STREAM

Temperature: 80.00 deg. F
Flow Rate: 7.50e+000 gpm

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.85e+001	4.16e+003
Water	1.50e+000	6.33e+001
Carbon Dioxide	1.52e-012	6.40e-011
Nitrogen	3.14e-013	1.33e-011
Methane	8.45e-018	3.57e-016
Ethane	1.43e-007	6.02e-006
Propane	1.00e-008	4.24e-007
Isobutane	1.21e-009	5.12e-008
n-Butane	4.25e-009	1.79e-007
Isopentane	1.49e-004	6.29e-003
n-Pentane	3.03e-004	1.28e-002
n-Hexane	7.60e-005	3.21e-003
Cyclohexane	4.67e-004	1.97e-002
Other Hexanes	2.79e-004	1.18e-002
Heptanes	1.62e-004	6.82e-003
Methylcyclohexane	7.58e-004	3.20e-002
2,2,4-Trimethylpentane	4.41e-006	1.86e-004
Benzene	3.67e-004	1.55e-002
Toluene	2.68e-003	1.13e-001
Ethylbenzene	2.60e-003	1.10e-001
Xylenes	5.85e-003	2.47e-001
C8+ Heavies	3.33e-003	1.40e-001
Total Components	100.00	4.22e+003

RICH GLYCOL AND PUMP GAS STREAM

Temperature: 80.00 deg. F
Pressure: 1014.70 psia
Flow Rate: 8.37e+000 gpm
NOTE: Stream has more than one phase.

Component	Conc. (wt%)	Loading (lb/hr)
TEG	8.97e+001	4.16e+003
Water	4.75e+000	2.20e+002
Carbon Dioxide	2.31e-002	1.07e+000
Nitrogen	2.51e-002	1.16e+000
Methane	2.43e+000	1.13e+002
Ethane	1.26e+000	5.82e+001
Propane	7.89e-001	3.66e+001
Isobutane	1.11e-001	5.15e+000
n-Butane	3.97e-001	1.84e+001
Isopentane	7.38e-002	3.42e+000
n-Pentane	1.29e-001	5.97e+000
n-Hexane	2.70e-002	1.25e+000
Cyclohexane	1.59e-002	7.37e-001
Other Hexanes	5.61e-002	2.60e+000
Heptanes	4.67e-002	2.16e+000
Methylcyclohexane	2.08e-002	9.61e-001
2,2,4-Trimethylpentane	6.62e-004	3.07e-002
Benzene	6.81e-003	3.16e-001
Toluene	3.14e-002	1.45e+000
Ethylbenzene	2.30e-002	1.07e+000
Xylenes	4.15e-002	1.92e+000

Component	Conc. (vol%)	Loading (lb/hr)
C8+ Heavies	3.74e-002	1.73e+000
Total Components	100.00	4.63e+003

FLASH TANK OFF GAS STREAM

Temperature: 110.00 deg. F
Pressure: 74.70 psia
Flow Rate: 3.90e+003 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	2.05e-001	3.78e-001
Carbon Dioxide	2.16e-001	9.78e-001
Nitrogen	4.02e-001	1.16e+000
Methane	6.79e+001	1.12e+002
Ethane	1.84e+001	5.69e+001
Propane	7.63e+000	3.46e+001
Isobutane	7.92e-001	4.72e+000
n-Butane	2.75e+000	1.64e+001
Isopentane	4.04e-001	2.99e+000
n-Pentane	6.83e-001	5.06e+000
n-Hexane	1.06e-001	9.36e-001
Cyclohexane	3.67e-002	3.17e-001
Other Hexanes	2.35e-001	2.08e+000
Heptanes	1.23e-001	1.27e+000
Methylcyclohexane	3.44e-002	3.47e-001
2,2,4-Trimethylpentane	1.94e-003	2.27e-002
Benzene	3.18e-003	2.55e-002
Toluene	7.77e-003	7.35e-002
Ethylbenzene	2.76e-003	3.01e-002
Xylenes	3.26e-003	3.55e-002
C8+ Heavies	1.03e-002	1.80e-001
Total Components	100.00	2.40e+002

FLASH TANK GLYCOL STREAM

Temperature: 110.00 deg. F
Flow Rate: 7.84e+000 gpm

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.46e+001	4.16e+003
Water	5.00e+000	2.20e+002
Carbon Dioxide	2.08e-003	9.14e-002
Nitrogen	1.69e-004	7.43e-003
Methane	1.73e-002	7.62e-001
Ethane	3.16e-002	1.39e+000
Propane	4.56e-002	2.01e+000
Isobutane	9.71e-003	4.27e-001
n-Butane	4.51e-002	1.98e+000
Isopentane	9.71e-003	4.26e-001
n-Pentane	2.09e-002	9.16e-001
n-Hexane	7.16e-003	3.15e-001
Cyclohexane	9.57e-003	4.20e-001
Other Hexanes	1.19e-002	5.25e-001
Heptanes	2.04e-002	8.95e-001

Methylcyclohexane	1.40e-002	6.15e-001
2,2,4-Trimethylpentane	1.80e-004	7.92e-003
Benzene	6.60e-003	2.90e-001
Toluene	3.14e-002	1.38e+000
Ethylbenzene	2.36e-002	1.04e+000
Xylenes	4.29e-002	1.89e+000
C8+ Heavies	3.54e-002	1.55e+000
Total Components	100.00	4.39e+003

FLASH GAS EMISSIONS

Flow Rate: 1.54e+004 scfh
Control Method: Combustion Device
Control Efficiency: 98.00

Component	Conc. (vol%)	Loading (lb/hr)
Water	6.20e+001	4.53e+002
Carbon Dioxide	3.74e+001	6.69e+002
Nitrogen	1.02e-001	1.16e+000
Methane	3.43e-001	2.24e+000
Ethane	9.31e-002	1.14e+000
Propane	3.86e-002	6.91e-001
Isobutane	4.00e-003	9.45e-002
n-Butane	1.39e-002	3.28e-001
Isopentane	2.04e-003	5.99e-002
n-Pentane	3.45e-003	1.01e-001
n-Hexane	5.35e-004	1.87e-002
Cyclohexane	1.85e-004	6.33e-003
Other Hexanes	1.19e-003	4.15e-002
Heptanes	6.23e-004	2.54e-002
Methylcyclohexane	1.74e-004	6.94e-003
2,2,4-Trimethylpentane	9.81e-006	4.55e-004
Benzene	1.61e-005	5.11e-004
Toluene	3.93e-005	1.47e-003
Ethylbenzene	1.40e-005	6.02e-004
Xylenes	1.65e-005	7.10e-004
C8+ Heavies	5.21e-005	3.60e-003
Total Components	100.00	1.13e+003

REGENERATOR OVERHEADS STREAM

Temperature: 212.00 deg. F
Pressure: 14.70 psia
Flow Rate: 3.40e+003 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	9.69e+001	1.56e+002
Carbon Dioxide	2.32e-002	9.14e-002
Nitrogen	2.96e-003	7.43e-003
Methane	5.30e-001	7.62e-001
Ethane	5.15e-001	1.39e+000
Propane	5.08e-001	2.01e+000
Isobutane	8.19e-002	4.27e-001

n-Butane	3.80e-001	1.98e+000
Isopentane	6.50e-002	4.20e-001
n-Pentane	1.40e-001	9.03e-001
n-Hexane	4.04e-002	3.12e-001
Cyclohexane	5.32e-002	4.01e-001
Other Hexanes	6.65e-002	5.13e-001
Heptanes	9.90e-002	8.89e-001
Methylcyclohexane	6.62e-002	5.83e-001
2,2,4-Trimethylpentane	7.56e-004	7.74e-003
Benzene	3.92e-002	2.75e-001
Toluene	1.53e-001	1.27e+000
Ethylbenzene	9.74e-002	9.26e-001
Xylenes	1.72e-001	1.64e+000
C8+ Heavies	9.26e-002	1.41e+000
Total Components	100.00	1.72e+002

COMBUSTION DEVICE OFF GAS STREAM

Temperature: 1000.00 deg. F
Pressure: 14.70 psia
Flow Rate: 2.11e+000 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Methane	1.71e+001	1.52e-002
Ethane	1.66e+001	2.77e-002
Propane	1.64e+001	4.01e-002
Isobutane	2.64e+000	8.53e-003
n-Butane	1.23e+001	3.96e-002
Isopentane	2.10e+000	8.40e-003
n-Pentane	4.51e+000	1.81e-002
n-Hexane	1.30e+000	6.23e-003
Cyclohexane	1.71e+000	8.01e-003
Other Hexanes	2.14e+000	1.03e-002
Heptanes	3.19e+000	1.78e-002
Methylcyclohexane	2.14e+000	1.17e-002
2,2,4-Trimethylpentane	2.44e-002	1.55e-004
Benzene	1.27e+000	5.49e-003
Toluene	4.95e+000	2.53e-002
Ethylbenzene	3.14e+000	1.85e-002
Xylenes	5.56e+000	3.28e-002
C8+ Heavies	2.99e+000	2.83e-002
Total Components	100.00	3.22e-001

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

Identification

User Identification:	Pioneer CF Stabilized Condensate Tank
City:	Moundsville
State:	West Virginia
Company:	Appalachia Midstream Services
Type of Tank:	Vertical Fixed Roof Tank
Description:	Total of six 400 bbl storage vessels holding stabilized condensate. Each storage vessel will receive up to 38,000 bbl of stabilized condensate per year.

Tank Dimensions

Shell Height (ft):	20.00
Diameter (ft):	12.00
Liquid Height (ft) :	19.00
Avg. Liquid Height (ft):	10.00
Volume (gallons):	16,800.00
Turnovers:	95.00
Net Throughput(gal/yr):	1,596,000.00
Is Tank Heated (y/n):	N

Paint Characteristics

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

Roof Characteristics

Type:	Cone
Height (ft)	0.00
Slope (ft/ft) (Cone Roof)	0.06

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Pittsburgh, Pennsylvania (Avg Atmospheric Pressure = 14.11 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Pioneer CF Stabilized Condensate Tank - Vertical Fixed Roof Tank
Moundsville, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Stabilized Condensate	All	51.94	47.06	56.81	50.33	4.7743	4.3390	5.2511	60.2678			94.63	
2,2,4-Trimethylpentane						0.4700	0.4055	0.5431	114.2300	0.0043	0.0007	114.23	Option 2: A=6.8118, B=1257.84, C=220.74
Benzene						0.9298	0.8065	1.0684	78.1100	0.0005	0.0001	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.9696	0.8439	1.1105	84.1600	0.0108	0.0035	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0815	0.0682	0.0971	106.1700	0.0129	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Heptane (-n)						0.4785	0.4109	0.5555	100.2000	0.1696	0.0267	100.20	Option 3: A=37358, B=8.2585
Hexane (-n)						1.5451	1.3522	1.7601	86.1700	0.0476	0.0242	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Hexanes						1.5451	1.3522	1.7601	86.1700	0.0753	0.0383	86.17	Option 2: A=6.876, B=1171.17, C=224.41
iso-Butane						33.1744	30.3990	36.1806	58.1300	0.0100	0.1090	58.13	Option 1: VP50 = 31.982 VP60 = 38.144
iso-Pentane						7.9463	7.1399	8.8396	72.1500	0.0316	0.0825	72.15	Option 1: VP50 = 7.592 VP60 = 9.423
Methylcyclohexane						0.4402	0.3794	0.5089	98.1800	0.0414	0.0060	98.18	Option 2: A=6.823, B=1270.763, C=221.42
n-Butane						22.4567	20.4389	24.6593	58.1300	0.0545	0.4024	58.13	Option 1: VP50 = 21.583 VP60 = 26.098
n-Pentane						5.7463	5.1349	6.4279	72.1500	0.0688	0.1299	72.15	Option 1: VP50 = 5.476 VP60 = 6.873
Octane (-n)						0.1188	0.1049	0.1349	114.2300	0.4444	0.0174	114.23	Option 1: VP50 = .112388 VP60 = .145444
Propane						95.7217	88.6799	103.2639	44.1100	0.0050	0.1582	44.11	Option 1: VP50 = 92.73 VP60 = 108.19
Toluene						0.2556	0.2178	0.2987	92.1300	0.0065	0.0005	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-m)						0.0677	0.0565	0.0807	106.1700	0.0168	0.0004	106.17	Option 2: A=7.009, B=1462.266, C=215.11

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

Emissions Report for: Annual

Pioneer CF Stabilized Condensate Tank - Vertical Fixed Roof Tank
Moundsville, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Stabilized Condensate	5,275.20	795.97	6,071.17
Propane	834.28	125.88	960.17
iso-Butane	574.88	86.74	661.63
n-Butane	2,122.84	320.31	2,443.15
iso-Pentane	435.01	65.64	500.65
n-Pentane	685.47	103.43	788.90
Cyclohexane	18.22	2.75	20.97
Hexanes	201.95	30.47	232.42
Methylcyclohexane	31.60	4.77	36.37
Octane (-n)	91.59	13.82	105.40
Benzene	0.78	0.12	0.90
Ethylbenzene	1.82	0.27	2.09
Hexane (-n)	127.61	19.25	146.86
Toluene	2.87	0.43	3.30
2,2,4-Trimethylpentane	3.54	0.53	4.07
Xylene (-m)	1.98	0.30	2.28
Heptane (-n)	140.78	21.24	162.02

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

Identification

User Identification:	Pioneer CF Produced Water Tank
City:	Moundsville
State:	West Virginia
Company:	Williams Ohio Valley Midstream
Type of Tank:	Vertical Fixed Roof Tank
Description:	400 bbl produced water storage tank

Tank Dimensions

Shell Height (ft):	20.00
Diameter (ft):	12.00
Liquid Height (ft) :	19.00
Avg. Liquid Height (ft):	10.00
Volume (gallons):	16,800.00
Turnovers:	10.00
Net Throughput(gal/yr):	168,000.00
Is Tank Heated (y/n):	N

Paint Characteristics

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

Roof Characteristics

Type:	Cone
Height (ft)	0.00
Slope (ft/ft) (Cone Roof)	0.06

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Pittsburgh, Pennsylvania (Avg Atmospheric Pressure = 14.11 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Pioneer CF Produced Water Tank - Vertical Fixed Roof Tank
Moundsville, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Produced Water (95% Water + 5% Condensate)	All	51.94	47.06	56.81	50.33	0.2465	0.2101	0.2893	28.3522			18.75	
Gasoline (RVP 12)						5.4430	4.9447	5.9807	64.0000	0.0500	0.5080	92.00	Option 4: RVP=12, ASTM Slope=3
Water						0.1930	0.1614	0.2307	18.0000	0.9500	0.4920	18.00	Option 1: VP50 = .178073 VP60 = .255246

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

Emissions Report for: Annual

Pioneer CF Produced Water Tank - Vertical Fixed Roof Tank
Moundsville, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Produced Water (95% Water + 5% Condensate)	27.96	18.57	46.53
Water	13.75	9.14	22.89
Gasoline (RVP 12)	14.20	9.44	23.64

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

Identification

User Identification:	Pioneer CF 100 bbl Methanol Tank
City:	Moundsville
State:	West Virginia
Company:	Appalachia Midstream Services
Type of Tank:	Vertical Fixed Roof Tank
Description:	100 bbl methanol storage tank

Tank Dimensions

Shell Height (ft):	8.00
Diameter (ft):	9.50
Liquid Height (ft) :	8.00
Avg. Liquid Height (ft):	4.00
Volume (gallons):	4,200.00
Turnovers:	6.00
Net Throughput(gal/yr):	25,200.00
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	Gray/Light
Shell Condition	Good
Roof Color/Shade:	Gray/Light
Roof Condition:	Good

Roof Characteristics

Type:	Dome
Height (ft)	5.00
Radius (ft) (Dome Roof)	9.50

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Pittsburgh, Pennsylvania (Avg Atmospheric Pressure = 14.11 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Pioneer CF 100 bbl Methanol Tank - Vertical Fixed Roof Tank
Moundsville, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Methyl alcohol	All	56.69	48.70	64.69	52.55	1.2985	1.0009	1.6690	32.0400			32.04	Option 2: A=7.897, B=1474.08, C=229.13

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

Emissions Report for: Annual

Pioneer CF 100 bbl Methanol Tank - Vertical Fixed Roof Tank
Moundsville, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Methyl alcohol	24.96	104.42	129.38

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

Identification

User Identification:	Pioneer CF 100 bbl Lube Oil Tank
City:	Moundsville
State:	West Virginia
Company:	Appalachia Midstream Services
Type of Tank:	Vertical Fixed Roof Tank
Description:	100 bbl lube oil storage tank. Emission IDs: T-09, T-10, T-14 thru T-19

Tank Dimensions

Shell Height (ft):	15.00
Diameter (ft):	10.00
Liquid Height (ft) :	15.00
Avg. Liquid Height (ft):	7.00
Volume (gallons):	8,820.00
Turnovers:	6.00
Net Throughput(gal/yr):	52,920.00
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	Gray/Light
Shell Condition	Good
Roof Color/Shade:	Gray/Light
Roof Condition:	Good

Roof Characteristics

Type:	Dome
Height (ft)	0.00
Radius (ft) (Dome Roof)	10.00

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Pittsburgh, Pennsylvania (Avg Atmospheric Pressure = 14.11 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Pioneer CF 100 bbl Lube Oil Tank - Vertical Fixed Roof Tank
Moundsville, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Residual oil no. 6	All	56.69	48.70	64.69	52.55	0.0000	0.0000	0.0000	190.0000			387.00	Option 1: VP50 = .00003 VP60 = .00004

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

Emissions Report for: Annual

Pioneer CF 100 bbl Lube Oil Tank - Vertical Fixed Roof Tank
Moundsville, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Residual oil no. 6	0.01	0.02	0.03

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

Identification

User Identification:	Pioneer 100 bbl Coolant Tank
City:	Moundsville
State:	West Virginia
Company:	Appalachia Midstream Services
Type of Tank:	Vertical Fixed Roof Tank
Description:	100 bbl Coolant Tank Emission IDs: T-11 and T-12

Tank Dimensions

Shell Height (ft):	15.00
Diameter (ft):	10.00
Liquid Height (ft) :	15.00
Avg. Liquid Height (ft):	7.00
Volume (gallons):	8,820.00
Turnovers:	6.00
Net Throughput(gal/yr):	52,920.00
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	Gray/Light
Shell Condition	Good
Roof Color/Shade:	Gray/Light
Roof Condition:	Good

Roof Characteristics

Type:	Dome
Height (ft)	0.00
Radius (ft) (Dome Roof)	10.00

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Pittsburgh, Pennsylvania (Avg Atmospheric Pressure = 14.11 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Pioneer 100 bbl Coolant Tank - Vertical Fixed Roof Tank
Moundsville, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Ethylene Glycol	All	56.69	48.70	64.69	52.55	0.0006	0.0004	0.0010	62.0700			62.07	Option 1: VP50 = .000413 VP60 = .000725

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

Emissions Report for: Annual

Pioneer 100 bbl Coolant Tank - Vertical Fixed Roof Tank
Moundsville, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Ethylene Glycol	0.05	0.10	0.15

ATTACHMENT V

Facility-Wide Emission Summary Sheets

G35-D General Permit Registration

ATTACHMENT V – FACILITY-WIDE CONTROLLED EMISSIONS SUMMARY SHEET

List all sources of emissions in this table. Use extra pages if necessary.

Emission Point ID#	NO_x		CO		VOC		SO_2		PM_{10}		$PM_{2.5}$		GHG (CO_2e)	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
CE-01	4.41	19.31	2.58	11.32	1.97	8.63	0.02	0.09	0.37	1.61	0.37	1.61	5,401	23,656
CE-02	4.41	19.31	2.58	11.32	1.97	8.63	0.02	0.09	0.37	1.61	0.37	1.61	5,401	23,656
CE-03	4.41	19.31	2.58	11.32	1.97	8.63	0.02	0.09	0.37	1.61	0.37	1.61	5,401	23,656
CE-04	4.41	19.31	2.58	11.32	1.97	8.63	0.02	0.09	0.37	1.61	0.37	1.61	5,401	23,656
CRP	---	---	---	---	6.30	27.60	---	---	---	---	---	---	351	1,538
SSM	---	---	---	---	---	4.27	---	---	---	---	---	---	2,716	11,896
DFT-01	---	---	---	---	0.93	4.09	---	---	---	---	---	---	17	73
DSV-01	---	---	---	---	1.23	5.37	---	---	---	---	---	---	1	4
DFT-02	---	---	---	---	0.93	4.09	---	---	---	---	---	---	17	73
DSV-02	---	---	---	---	1.23	5.37	---	---	---	---	---	---	1	4
TO-01	0.91	3.98	2.87	12.58	See Dehys/Tanks/TLO		0.01	0.02	0.07	0.30	0.07	0.30	1,096	4,799
RBV-01	0.20	0.86	0.16	0.72	0.01	0.05	1.2E-03	0.01	0.01	0.07	0.01	0.07	237	1,037
RBV-02	0.20	0.86	0.16	0.72	0.01	0.05	1.2E-03	0.01	0.01	0.07	0.01	0.07	237	1,037
FLR-01	0.58	2.55	1.84	8.07	See SSM		3.5E-03	0.02	0.04	0.19	0.04	0.19	703	3,079
T-01	---	---	---	---	0.01	0.06	---	---	---	---	---	---	---	---
T-02	---	---	---	---	0.01	0.06	---	---	---	---	---	---	---	---
T-03	---	---	---	---	0.01	0.06	---	---	---	---	---	---	---	---

Annual emissions shall be based on 8,760 hours per year of operation for all emission units except emergency generators.
According to 45CSR14 Section 2.43.e, fugitive emissions are not included in the major source determination because it is not listed as one of the source categories in Table 1. Therefore, fugitive emissions shall not be included in the PTE above.

ATTACHMENT V – FACILITY-WIDE CONTROLLED EMISSIONS SUMMARY SHEET (CONTINUED)

List all sources of emissions in this table. Use extra pages if necessary.

Emission Point ID#	NO_x		CO		VOC		SO_2		PM_{10}		$PM_{2.5}$		GHG (CO_2e)	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
T-04	---	---	---	---	0.01	0.06	---	---	---	---	---	---	---	---
T-05	---	---	---	---	0.01	0.06	---	---	---	---	---	---	---	---
T-06	---	---	---	---	0.01	0.06	---	---	---	---	---	---	---	---
T-07	---	---	---	---	0.01	0.02	---	---	---	---	---	---	---	---
T-08	---	---	---	---	0.01	0.02	---	---	---	---	---	---	---	---
TLO	---	---	---	---	14.92	7.15	---	---	---	---	---	---	---	---
TOTAL	**19.52**	**85.50**	**15.38**	**67.36**	**33.54**	**92.99**	**0.10**	**0.43**	**1.61**	**7.07**	**1.61**	**7.07**	**26,978**	**118,166**

Annual emissions shall be based on 8,760 hours per year of operation for all emission units except emergency generators.
According to 45CSR14 Section 2.43.e, fugitive emissions are not included in the major source determination because it is not listed as one of the source categories in Table 1. Therefore, fugitive emissions shall not be included in the PTE above.

ATTACHMENT V – FACILITY-WIDE HAP CONTROLLED EMISSIONS SUMMARY SHEET

List all sources of emissions in this table. Use extra pages if necessary.

Emission Point ID#	Formaldehyde		Benzene		Toluene		Ethylbenzene		Xylenes		Hexane		Total HAPs	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
CE-01	0.28	1.22	2.6E-03	0.01	2.4E-03	0.01	2.3E-04	1.0E-03	1.1E-03	0.00	0.01	0.03	0.39	1.72
CE-02	0.28	1.22	2.6E-03	0.01	2.4E-03	0.01	2.3E-04	1.0E-03	1.1E-03	0.00	0.01	0.03	0.39	1.72
CE-03	0.28	1.22	2.6E-03	0.01	2.4E-03	0.01	2.3E-04	1.0E-03	1.1E-03	0.00	0.01	0.03	0.39	1.72
CE-04	0.28	1.22	2.6E-03	0.01	2.4E-03	0.01	2.3E-04	1.0E-03	1.1E-03	0.00	0.01	0.03	0.39	1.72
CRP	---	---	0.01	0.04	0.01	0.04	0.01	0.04	0.01	0.04	0.12	0.51	0.16	0.72
SSM	---	---	---	0.01	---	0.01	---	0.01	---	0.01	---	0.08	---	0.11
DFT-01	---	---	2.1E-04	9.2E-04	5.8E-04	2.5E-03	2.3E-04	1.0E-03	2.6E-04	1.2E-03	0.01	0.05	0.01	0.06
DSV-01	---	---	0.02	0.08	0.08	0.36	0.06	0.26	0.10	0.44	0.03	0.14	0.29	1.29
DFT-02	---	---	2.1E-04	9.2E-04	5.8E-04	2.5E-03	2.3E-04	1.0E-03	2.6E-04	1.2E-03	0.01	0.05	0.01	0.06
DSV-02	---	---	0.02	0.08	0.08	0.36	0.06	0.26	0.10	0.44	0.03	0.14	0.29	1.29
TO-01	6.8E-04	3.0E-03	See Dehys/Tanks/TLO										7.0E-04	3.1E-03
RBV-01	1.5E-04	6.4E-04	4.1E-06	1.8E-05	6.7E-06	2.9E-05	---	---	---	---	3.5E-03	0.02	3.7E-03	0.02
RBV-02	1.5E-04	6.4E-04	4.1E-06	1.8E-05	6.7E-06	2.9E-05	---	---	---	---	3.5E-03	0.02	3.7E-03	0.02
FLR-01	4.4E-04	1.9E-03	See SSM										4.5E-04	2.0E-03
T-01	---	---	1.4E-04	6.1E-04	1.4E-04	6.1E-04	1.4E-04	6.1E-04	3.5E-04	1.5E-03	6.9E-04	3.0E-03	1.5E-03	6.4E-03
T-02	---	---	1.4E-04	6.1E-04	1.4E-04	6.1E-04	1.4E-04	6.1E-04	3.5E-04	1.5E-03	6.9E-04	3.0E-03	1.5E-03	0.01

Annual emissions shall be based on 8,760 hours per year of operation for all emission units except emergency generators.
According to 45CSR14 Section 2.43.e, fugitive emissions are not included in the major source determination because it is not listed as one of the source categories in Table 1. Therefore, fugitive emissions shall not be included in the PTE above.

ATTACHMENT V – FACILITY-WIDE HAP CONTROLLED EMISSIONS SUMMARY SHEET (CONTINUED)

List all sources of emissions in this table. Use extra pages if necessary.

Emission Point ID#	Formaldehyde		Benzene		Toluene		Ethylbenzene		Xylenes		Hexane		Total HAPs	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
T-03	---	---	1.4E-04	6.1E-04	1.4E-04	6.1E-04	1.4E-04	6.1E-04	3.5E-04	1.5E-03	6.9E-04	3.0E-03	1.5E-03	0.01
T-04	---	---	1.4E-04	6.1E-04	1.4E-04	6.1E-04	1.4E-04	6.1E-04	3.5E-04	1.5E-03	6.9E-04	3.0E-03	1.5E-03	0.01
T-05	---	---	1.4E-04	6.1E-04	1.4E-04	6.1E-04	1.4E-04	6.1E-04	3.5E-04	1.5E-03	6.9E-04	3.0E-03	1.5E-03	0.01
T-06	---	---	1.4E-04	6.1E-04	1.4E-04	6.1E-04	1.4E-04	6.1E-04	3.5E-04	1.5E-03	6.9E-04	3.0E-03	1.5E-03	0.01
T-07	---	---	5.3E-05	2.3E-04	5.3E-05	2.3E-04	5.3E-05	2.3E-04	5.3E-05	2.3E-04	2.7E-04	1.2E-03	5.6E-04	2.4E-03
T-08	---	---	5.3E-05	2.3E-04	5.3E-05	2.3E-04	5.3E-05	2.3E-04	5.3E-05	2.3E-04	2.7E-04	1.2E-03	5.6E-04	2.4E-03
TLO	---	---	0.74	0.36	0.74	0.36	0.74	0.36	0.74	0.36	0.74	0.36	4.48	2.14
TOTAL	**1.11**	**4.87**	**0.80**	**0.62**	**0.93**	**1.19**	**0.88**	**0.94**	**0.96**	**1.32**	**0.98**	**1.48**	**6.84**	**12.61**

Annual emissions shall be based on 8,760 hours per year of operation for all emission units except emergency generators.
According to 45CSR14 Section 2.43.e, fugitive emissions are not included in the major source determination because it is not listed as one of the source categories in Table 1. Therefore, fugitive emissions shall not be included in the PTE above.

ATTACHMENT W

Class I Legal Advertisement

G35-D General Permit Registration

AIR QUALITY PUBLIC NOTICE
Notice of Application

Notice is given that Appalachia Midstream Services, LLC has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a G35-D General Permit Registration for a new compressor staton to be located approximately 1.9 Miles South-Southeast of West Liberty in Ohio County, West Virginia.

The latitude and longitude coordinates are 40.14333° North and -80.59156° West.

The applicant estimates the increased potential to regulated air pollutants will be as follows:

85.70	tons of nitrogen oxides per year
68.86	tons of carbon monoxide per year
103.25	tons of volatile organic compounds per year
7.09	tons of particulate matter per year
0.43	tons of sulfur dioxide per year
0.75	tons of benzene per year
1.31	tons of toluene per year
1.06	tons of ethylbenzene per year
1.45	tons of xylenes per year
4.94	tons of formaldehyde per year
13.71	tons of total hazardous air pollutants per year
118,625	tons of carbon dioxide equivalent per year

Startup of the facility is anticipated on or about June 1, 2018.

Written comments will be received by the West Virginia Department of Environmental Protection, Division of Air Quality (DAQ), 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 _____ day of _____, 2017.

By: Appalachia Midstream Services, LLC
Paul Hunter
Vice President, Northeast Operating Area
Park Place Corporate Center 2
2000 Commerce Drive
Pittsburgh, PA 15275

******* End of Application for G35-D Class II General Permit ******