MEMO

TO James D. Rebarchak
Manager, Regional Air Quality Program
Southeastern Regional Office

FROM David S. Smith
Facilities Permitting Section
Air Quality Program

THROUGH Janine Tulloch-Reid, P.E.
James Beach, P.E.
Managers, Facilities Permitting Section
Air Quality Program

DATE November 02, 2018

RE **DRAFT** Plan Approval Review Memo
Application No. 09-0242
Adelphia Pipeline Company, LLC – Quakertown Compressor Station
West Rockhill Township
Bucks County
APS No.: 969182, AUTH No.: 1230871

1. Introduction

On May 16, 2018, Adelphia Pipeline Company, LLC (Adelphia) submitted a Plan Approval application to the Department of Environmental Protection (DEP), for construction and operation of a new Natural Gas Compressor Station – the Quakertown Hook Compressor Station (Quakertown CS), located at West Rockhill Township, Bucks County.

Quakertown CS is a natural gas transmission facility, with a Standard Industrial Classification (SIC) Code 4922 and regulated by the Federal Energy Regulatory Commissions (FERC).

The application was received in triplicate, along copies of compliance review form, general information form, and application fee. The delivery confirmation for the municipal and county notifications was received on May 24, 2018. The application was considered administratively complete on June 5, 2018.

On August 30, 2018, DEP emailed the technical deficiencies of the application to Adelphia requesting clarification and additional information regarding this application (please see Appendix A - Technical Deficiencies and Responses). Adelphia's initial responses to DEP's deficiency email was received on September 14, 2018; subsequently, Adelphia provided additional information for this application from October 25 through November 2, 2018.

Listed below is a summary:

Administrative/Notifications

Application Received:	*May 16, 2018*
Application Fee:	*$1,700 along with Application*
Municipal notification Confirmation:	*May 24,2018*
Administratively Complete:	*June 5, 2018*
Technical Deficiency Email:	*August 30, 2018*
Responses to Tech Deficiency Received:	*September 14, 2018*
Additional Information Received:	*October 25 -November 2, 2018*
Public Notification:	*November 3, 2018*

2. Project Description

2.1 Project Scope

The proposed Quakertown CS to be constructed at the current TETCO Interconnect site (See Appendix B – Site Plan) will compress pipeline natural gas from the interstate pipelines (either the existing TETCO or IEC Pipelines) and transport to the downstream customers along the transmission system. In addition, a new metering station will be constructed at this site.

The proposed facility is designed for 250 million cubic feet per day (mmcf/d) throughput capacity (daily maximum: 375 mmcf/d) with provisions for expanding to 350 mmcf/d throughput capacity by installing an additional compressor (as shown in Appendix B – Plot Plan), or constructing a new midpoint compressor station.

The process flow for Quakertown CS is as follows:

1) Pipeline quality natural gas enters the station and flows through a suction filter separator and into station suction piping;
2) Three (3) units of reciprocating compressors compress natural gas from 820 psig to 1020 psig; and
3) The compressed natural gas flows into the discharge header, continues through a coalescing filter and exits the station that delivers natural gas to various downstream customers.

The application indicates that at Quakertown CS:

- There are no cooling process and/or equipment installed as cooling for natural gas is not required.
- There is no glycol dehydration unit as part of this project. The glycol is exclusively used with an engine cooling system.

- All pneumatic controllers at Quakertown CS will either be air/electric operated, or intermittent bleed natural gas driven. Therefore, there are possible emissions associated with their operation.

2.2 Source Aggregation

According to the Department's Guidance for Performing Single Stationary Source Determinations for Oil and Gas Industries (Docket 270-0810-006), the source aggregation analysis is based on the following three factors to determine whether emission sources should be aggregated:

(1) the sources all belong to the same industrial grouping;
(2) the activities are located on one or more contiguous or adjacent properties; and
(3) the activities are under common control.

The proposed Quakertown CS is sited partially within the boundaries of, or adjacent to, the existing Quakertown Metering (M&R) Station. The existing Quakertown M&R Station, which would be under the control of Adelphia, consists of piping components and a small exempt emergency generator. The new proposed meter station consists of additional piping components and fugitive emissions. As a result of the above-described analysis, it is determined that the proposed Quakertown CS shall be aggregated with the existing Quakertown and the new M&R Stations but not with any other sources.

2.3 Program Coordination

This project is not in coordination with any other Department programs.

3. Emission Sources and Regulations

Quakertown CS is designed to have the following equipment and processes.

<u>3.1 Compressors and Compressor Engines (Source IDs 101 – 103)</u>

Adelphia will install three (3) identical units of reciprocating compressors, as indicated below:

Rated capacity:	125 mmcf/d each
operating range:	820 psig to 1020 psig
proposed operating hours:	8760 hours per year (hr/yr) for each unit

Each compressor is powered by a spark ignition (SI) Engine (3 identical units):

manufacturer/model:	Caterpillar G3606, stationary spark ignition
rated capacity:	1,875 bhp each, 4-stroke, lean burn
fuel consumption:	natural gas, 13,955 standard cubic feet per hour (SCF/hr)
proposed operating hours:	8760 hr/yr for each engine
engine emission control:	each engine with an oxidation catalytical unit
post-control emissions:	meeting BAT standards [Section C1(c)(i), GP5]

Adelphia uses oxidation catalytical units (Source IDs C101 – C103) for compressor engine emission control:

manufacturer/model:	DCL America, Inc. Model No. DC66-18CC (or equivalent), 3 units
flowrate capacity:	11,972 cfm
inlet temperature of gas flow:	847 °F
pressure drop across the unit:	less than 3.6 inches of water
emission performance guarantee:	meeting the BAT standards

***40 CFR Part 60 Subpart OOOOa** — Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After September 18, 2015.*

The reciprocating compressors at this facility (a natural gas compressor station) are subject to the applicable requirements of this subpart in accordance with §60.5365a(c). **The facility elects the option of "<u>replacing the reciprocating compressor rod packing</u>" as specified in 40 CFR §60.5385a(a)(1) or (2), to demonstrate their compliance status with the GHG and VOC standards of this subpart.** The respective requirements for the compressor rod packing pursuant to 40 CFR Part 60 Subpart OOOOa have been incorporated.

40 CFR Part 60 Subpart JJJJ—Standards of Performance for Stationary Spark Ignition Internal Combustion Engines

The compressor engines, stationary spark ignition (SI) internal combustion engines (ICE), **<u>are</u>** subject to the applicable requirements of this subpart in accordance with §60.4230(a).

40 CFR Part 63 Subpart ZZZZ—National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines

The compressor SI engines are subject to 40 CFR Part 63 Subpart ZZZZ, as a new area source. **The facility elects to fulfill the applicable Subpart ZZZZ requirements by complying with the standards of 40 CFR Part 60 Subpart JJJJ in accordance with 40 CFR §63.6590(c).**

Best Available Technology (BAT) Standards
For the compressor SI engines, the Department BAT standards as specified in Section C Condition 1 (c)(i), of General Plan Approval and/or General Operating Permit BAQ-GPA/GP-5 (GP5), for lean burn SI engines constructed after August 8, 2018 (500 hp < engine < 2370 hp), were used as baseline for BAT. These standards are shown below:

CO (Carbon Monoxide):	0.25 g/bhp-hr
NOx (Nitrogen Oxides):	0.5 g/bhp-hr
VOCs (NMNEHC as propane, excluding HCHO):	0.25 g/bhp-hr
HCHO (Formaldehyde):	0.05 g/bhp-hr

According to the manufacturer's specifications for the oxidation catalytical units (Source IDs C101 – C103), post-control emissions of the compressor engines **meet** the above BAT standards. In addition, testing is required for the compressor engines to ensure that the emission standards are being met.

25 Pa. Code §§ 129.203 - 129.205 (Additional NOx Requirements)
The compressor engines are subject to the applicable requirements of 25 Pa. Code §§129.203 through 129.205, as the engines are rated at greater than 1,000 horsepower and located in Bucks County.

3.2 Pigging Operations (Source ID 300)
Purpose of the pigging operations at Quakertown CS is to:

- clean the pipeline by sweeping any liquid out of the line to improve overall flow efficiency; and
- conduct in-line inspections of natural gas pipelines.

This is accomplished by inserting a pig into a "pig launcher"— an oversized section in the pipeline, reducing to the normal diameter. The launching station is then closed and the pressure-driven flow of the natural gas in the pipeline is used to push the pig along down the pipe until it reaches the receiving trap — the "pig receiver".

The application indicates that Quakertown CS conducts the pigging operations based on the following schedule:

- cleaning the pipeline, annually.
- conducting inspections, once every 5-7 years.

The estimated gas volume from the pigging operations are:

16,000 scf per year for Quakertown CS

BAT standards
There are no requirements in 40 CFR Part 60 Subpart OOOOa established for the pigging operations. Therefore, the Department BAT standards for pigging operations as specified in Section K of GP5 were established for Quakertown Pigging Operations. The conditions are as follows:

The emissions from pigging operations shall not exceed the following limits, as a 12-month rolling sum:

Methane:	200 tons/year, or
VOC:	2.7 tons/yr or
A single HAP:	0.5 tons/yr, or
Combined total HAPs:	1.0 tons/yr

3.3 Fugitive Emissions Components (Source ID 400)
Fugitive emissions components at Quakertown CS are any component that has the potential to emit fugitive emissions of methane or VOC as specified in 40 CFR §60.5430a, including but not limited to:
- compressor rod packing and seal leaking,
- engine crankcase,
- natural gas pipeline valves, connectors, flanges,
- pressure relief devices, emergency shutdown,
- pneumatic controllers,
- M&R station activities, and
- any maintenance activities.

The permittee shall comply with the applicable monitoring, recordkeeping, reporting, and work practice standards as specified in 40 CFR Part 60 Subpart OOOOa and the BAT requirements as specified in Section G of GP5.

3.4 Two Emergency Generator SI Engines (Source IDs 600 and 601)
The following SI engines for emergency generator sets are permitted as "exempt engines" in this Plan Approval:

- A SI engine for Cummins GTA28 Emergency Generator Set
  - generator engine: 4 stroke, rich-burn engine, Caterpillar G3412C
  - rated capacity: 701 bhp (670 hp)
  - engine fuel: natural gas, 5,699 SCF/hr
  - operating hours: 500 hr/yr proposed by Adelphia
  - control device: a non-selective catalytical reduction unit
  - post-control emissions: meeting NSPS Subpart JJJJ emission standards

Testing is required for the compressor SI engines to ensure that the emission standards are being met.

- Existing SI engine for Generac Emergency Generator Set (Model: CorePower)
  - generator engine: Generac Power System
  - rated capacity: 14.8bhp
  - engine fuel: natural gas, 148.0 SCF/hr
  - operating hours: 500 hr/yr proposed by Adelphia

In accordance with the DEP document, 275-2101-003 / August 8, 2018:

> *"25 Pa. §127.14(a)(8) Item 6: Internal combustion engines regardless of size, with combined NOx emissions less than 100 lbs/hr, 1000 lbs/day, 2.75 tons per ozone season and 6.6 tpy on a 12-month rolling basis for all exempt engines at the site."*

The above exempt limitations are placed in the Plan Approval as well as the applicable requirements of 40 CFR Part 60 Subpart JJJJ and Part 63 Subpart ZZZZ. **Adelphia elects to fulfill the applicable Subpart ZZZZ requirements by complying the Subpart JJJJ standards.**

3.5 Insignificant Emission Sources

The Department has determined that emissions from the following sources are of insignificant size and do not require additional limitations.

3.5.1 Produced Fluids Tank

Capacity:	1,000 gallons
Vapor pressure of liquid of the tank:	<1.5 psia
Total throughput:	24,000 gallons/year

3.5.2 Engine Oil Tank

Capacity:	500 gallons
Vapor pressure of liquid of the tank:	negligible
Total throughput:	6,000 gallons/year

3.5.3 Triethylene Glycol (TEG) Tank

Capacity:	500 gallons
Vapor pressure of liquid of the tank:	negligible
Total throughput:	6,000 gallons/year

These vessels **are not** subject to the regulations and requirements as identified below:

40 CFR Part 60 Subpart OOOOa
The potential-to-emit (PTE) VOC emissions from each storage vessel are significantly less than 6 tons per year. In accordance with §60.5395a(e), all storage vessels at Quakertown CS are not subject to this subpart.

40 CFR Part 60 Subparts K and Ka, and Kb – Storage Vessels for Petroleum Liquids/Volatile Organic Liquids

- 40 CFR Part 60 Subpart K and Ka apply to storage tanks constructed, reconstructed, or modified prior to 1978 and 1984, respectively. All storage vessels at Quakertown CS are constructed after these dates; therefore, the requirements of Subparts K and Ka do not apply.

- 40 CFR Part 60 Subpart Kb applies to volatile organic liquid (VOL) storage tanks constructed, reconstructed, or modified after July 23, 1984 with a capacity equal to or greater than 75 m3 (~19,813 gallons). All storage vessels at Quakertown CS do not have a capacity greater than 75 m^3. Therefore, Subpart Kb does not apply.

25 Pa. Code §129.56: Storage tanks greater than 40,000 gallons capacity containing VOCs.
25 Pa. Code §129.57: Storage tanks less than 40,000 gallons capacity containing VOCs.

- These storage vessels are not subject to 25 Pa. Code §129.56 as the capacity of each vessels is less than 40,000 gallons.

- These storage vessels are not subject to 25 Pa. Code §129.57 as the provisions of this section apply to above ground stationary storage tanks with a capacity equal to or greater than 2,000 gallons.

BAT Standards
Based on the Plan Approval application, the combined PTE VOC emissions from all storage vessels at Quakertown CS are significantly less than 2.7 tons per year. Thus, these storage vessels are not subject to the standards in Section E of GP5.

In accordance with the DEP document, 275-2101-003 / August 8, 2018, these storage vessels are exempt from the Plan Approval requirements:

1. *25 Pa. §127.14(a)(8) Item 15: storage vessels for VOC [which do not contain HAP] which have capacities less than 10, 000gallons...., and*
2. *25 Pa. §127.14(a)(8) Item 31: Sources of uncontrolled VOC emissions not addressed elsewhere in this exemption listing modified or newly added, such that emission increases are less than 2.7 tpy.*

3.5.4 Pneumatic Controllers
All pneumatic controllers at Quakertown CS will either be air/electric operated, or intermittent bleed natural gas driven. Accordance with §60.5365a(d)(1); therefore, these units are not subject to 40 CFR Part 60 Subpart OOOOa.

Quakertown CS is **not** subject to the following regulations, as indicated below:

40 CFR Part 63 Subpart HH — National Emission Standards for Hazardous Air Pollutants From Oil and Natural Gas Production Facilities

Subpart HH – NESHAP for natural gas production facilities applies to glycol dehydration units at natural gas production facilities that are major or area sources of HAP emissions prior to custody transfer to the transmission pipeline. The proposed project would be located after custody transfer. Therefore, the proposed Marcus Hook CS would not be a natural gas production facility as defined by the rule, and this subpart would not be applicable.

40 CFR Part 63 Subpart HHH – Natural Gas Transmission and Storage Facilities

This subpart applies to glycol dehydration units at natural gas transmission and storage facilities that are major sources of HAP emissions. Quakertown CS is an area source of HAP emissions; therefore, Quakertown CS is not subject to Subpart HHH.

40 CFR Part 98 — Mandatory Greenhouse Gas Reporting

The facility's Greenhouse Gases (GHG) potential-to-emit is 34,000 tons per year carbon dioxide equivalent (CO_2e), less than the GHG Title V threshold level of 75,000 ton/yr CO_2e. Furthermore, the facility is not listed as a source category in Table A-3 (40 CFR § 98.2(a)(1)), Table A-4 (40 CFR § 98.2(a)(2)) or Table A-5 (40 CFR § 98.2(a)(4)) of 40 CFR Part 98 Subpart A. Therefore, Quakertown CS is not a Major facility for GHG emissions and is not subject to the standards of 40 CFR Part 98.

4. Emission Limits

The potential-to-emit (PTE) emissions calculations for this facility are shown below.

Table 4.1 PTE Emissions from Compressor Engine and Emergency Engine Operations

Pollutant	3 Compressor Engines[1)] Source IDs 101 - 103		Cummins Emergency Engine[2] Source ID 600		Generac Emergency Engine[2)] Source ID 601	
	Emission factors (g/bhp-hr)	Emissions (ton/yr)	Emission factors (g/bhp-hr)	Emissions (ton/yr)	Emission factors (g/bhp-hr)	Emissions (ton/yr)
NOx	0.30	16.30	2.0	0.77	6.0[3)]	<0.05
VOC	0.16	8.69	1.0	0.39	6.0[3)]	<0.05
CO	0.17	9.47	4.0	1.54	455	3.70
HCHO	0.04	2.06	0.02	0.01	-	-

1): Operating hour: 8760 hr/yr for each compressor SI engine.
2): Operating hour: 500 hr/yr.
3): Emission factor for NOx + NMHC.

Table 4.2 Facility-wide PTE Emissions

Pollutant	Compressor Rod Packing	Compressor Engines Operation	Compressor Engines Crankcase	Pigging Operation	Estimated Fugitive1) Emissions	ID 600 Engine Operation	ID 601 Engine Operation	Combined Total Emissions
NOx	-	16.30	-	-	-	0.77	<0.05	**17.07**
VOC	1.84	8.69	4.46[2)]	2.7	5.41	0.39	<0.05	**23.54**
CO	-	9.47	-	-	-	1.54	3.70	**11.01**
HCHO	-	2.06	-	-	-	0.01	-	**2.07**

1): The emissions from all *fugitive emissions components* as defined in 40 CFR §60.5430a of Subpart OOOOa and GP5, excluding emissions from compressor rod packing and compressor engine crankcase.
2): This emission estimate is provided by Adelphia. Adelphia is contacting the manufacturer to verify this emission calculation.

DEP has established the following:

a. facility-wide emission limits from all emitting sources, calculated as a 12-month rolling sum:

Nitric Oxides (NOx):	24.9 tons per year
Volatile Organic Compounds (VOCs):	24.9 tons per year
Individual Hazardous Air Pollutant (HAP):	9.9 tons per year
Total HAPs:	24.9 tons per year

Tons per year = Tons per 12-month rolling period, calculated monthly.
HCHO = Formaldehyde.
NMNEHCs = Non-methane, non-ethane hydrocarbons, as propane, excluding HCHO.

b. the combined emission limits for the three (3) compressor engines:

Pollutant	ton/yr (as a 12-month rolling sum)
Carbon Monoxide (CO):	9.47
Formaldehyde (HCHO):	2.06
Nitrogen Oxides (NOx):	16.30
NMNEHCs (non-methane hydrocarbons):	8.69

Quakertown CS is a State-only (not a Major) facility as their NOx and VOC emissions are below the threshold level of 25 tons per year, respectively. Potential-to-emit HAP emissions are also below the threshold levels, 10 ton/yr for any single HAP emissions and 25 ton/yr for combined total HAP emissions. Thus, Quakertown CS is an area source for HAP emissions.

5 Additional Requirements and Analysis

5.1 New Source Review (NSR)

The VOC and NOx emissions from the proposed project at Quakertown CS are below the threshold of 25 tons respectively. Therefore, the Marcus Hook CS is not considered a major facility, and NSR does not apply.

5.2 Best Available Technology (BAT) Determination

BAT is a pollutant specific determination and each plan approval application is required to demonstrate that the emissions from the new source will be the minimum attainable through the use of a BAT analysis as per 25 Pa. Code §127.12(a)(5). In accordance with the Department's definition of BAT, Adelphia has conducted such an analysis and researched the following databases: EPA's NSR website, RBLC database, technical books and articles, vendor information, and various state and federal regulations and documents.

5.3 Testing

Testing is required for the compressor engines and Cummins Emergency Engine (Source ID 600) to ensure that the emission standards are being met.

5.4 Monitoring, recordkeeping, and implementation

In accordance with the requirements of 40 CFR § 60.18, sufficient monitoring and recordkeeping is required to be retained for a minimum of five (5) years.

6. Recommendation

I recommend issuing Plan Approval, No. 09-0242, to Adelphia – the Quakertown Compressor Station, located at West Rockhill Township, Bucks County, based on the above conditions.

7. Listing of Appendices

Appendix A – Technical Deficiencies and Responses

A1 – Identified Technical Deficiencies
A2 – Revised Application Form
A3 – Revised Emission Calculations
A4 – General Responses from Adelphia

Appendix B – Diagrams

B1 – Site Plan
B2 – Plot Plan

<u>Quakertown Compressor Station</u>

Draft Plan Approval No. 09-0242

Appendix A - Technical Deficiencies and Responses

Guo, Jing

From:	Smith, David S
Sent:	Friday, August 31, 2018 9:27 AM
To:	mvalori@NJResources.com
Cc:	idonaldson@trinityconsultants.com; Jonathan Hess; awesthoven@njresources.com; jperry@njresources.com; Rebarchak, James; Tulloch-Reid, Janine; Guo, Jing; Mountain, Shawn; Mclemore, Kevin
Subject:	RE: Technical Deficiencies for Plan Approval Applications for Adelphia Pipeline Co., LLC—Marcus Hook (23-0225) & Quakertown (09-0242)
Attachments:	EPA Compliance Guide for 40 C.F.R. Part 60, Subpart OOOOa.pdf; Comp of GP-5 and EPA OOOOa Reqs.pdf; EPA Doc Reducing CH4 Emiss from Compressor Rod Packing Sys.pdf

My apologies, I did not include the referenced attachments in the original e-mail....

David S. Smith, E.I.T. | Air Quality Engineering Specialist
Pennsylvania Department of Environmental Protection
Southeast Regional Office
2 East Main Street | Norristown, PA 19401
Phone: 484.250.5064 | Fax: 484.250.5921
www.dep.pa.gov

From: Smith, David S
Sent: Thursday, August 30, 2018 1:52 PM
To: 'mvalori@NJResources.com' <mvalori@NJResources.com>
Cc: 'idonaldson@trinityconsultants.com' <idonaldson@trinityconsultants.com>; 'Jonathan Hess' <Jonathan.Hess@nv5.com>; 'awesthoven@njresources.com' <awesthoven@njresources.com>; 'jperry@njresources.com' <jperry@njresources.com>; Rebarchak, James <jrebarchak@pa.gov>; Tulloch-Reid, Janine <jtullochre@pa.gov>; Guo, Jing <jguo@pa.gov>; Mountain, Shawn <smountain@pa.gov>; Mclemore, Kevin <kmclemore@pa.gov>
Subject: Technical Deficiencies for Plan Approval Applications for Adelphia Pipeline Co., LLC—Marcus Hook (23-0225) & Quakertown (09-0242)

Dear Mr. Valori,

On May 16, 2018, the Department of Environmental Protection (DEP) received Plan Approval applications and associated documents for construction and operation of a natural gas compressor station at Adelphia Pipeline Company, LLC's (Adelphia's) Marcus Hook facility **[Plan Approval No. 23-0225, APS ID 969188, Auth ID 1230881]**, and construction and/or operation of a natural gas compressor station and metering stations at Adelphia's Quakertown facility **[Plan Approval No. 09-0242, APS ID 969182, Auth ID 1230871]** (hereinafter referred to as "the facilities"). DEP has reviewed these submittals and determined that significant technical deficiencies exist:

A. Emergency Generator Engine (Narrative: Sections 2, 2.2, 3.2.2.2, and 4.2, Appendix B, Table B-2, and Appendix C; Application: Section C, Item 10)

In addition, Section 3.2.2.2 indicates that the engine would be equipped with a non-selective catalytic reduction (NSCR) catalyst. While Section 3.2.2.2, Table 3-2, indicates the same emissions data as the manufacturer's specifications after the application of NSCR, the manufacturer's specifications make no mention of NSCR or any other control technique. Please confirm whether the emissions levels indicated in the manufacturer's specifications are before or after the application of NSCR.

3. The above notwithstanding, Section 3.2.2.2, Table 3-2, is correct that the emissions data indicated in the manufacturer's specifications demonstrate compliance with the applicable emission standards (i.e., for an emergency engine rated at equal to or greater than 130 *bhp*) indicated in 40 C.F.R. Subpart JJJJ (specifically § 60.4233(e)). However, Section 4.2 incorrectly states that "[t]hese rates are equivalent to [DEP's] [best available technology] (BAT) level for ... engines under [General Plan Approval and/or General Operating Permit BAQ-GPA/GP5] (GP-5)." Please be aware that, since the date that Adelphia submitted the Plan Approval application, DEP has revised the GP-5, including the BAT compliance requirements and emission standards. [Note: Pursuant to 25 Pa. Code § 127.1, [n]ew sources shall control the emission of air pollutants to the maximum extent, consistent with [BAT] as determined by [DEP] as of the date of issuance of the plan approval for the new source. Therefore, the facility is subject to all applicable BAT compliance requirements and emission standards specified in the GP-5.] For engines constructed and authorized to operate after August 8, 2018, the applicable BAT emission standards (for a lean-burn engine rated at greater than 500 *bhp* and less than 2,370 *bhp*), as indicated in Condition 1(c)(i), Section C, of the GP-5, are as follows:

   NO_x: 0.50 *g/bhp-hr*
   CO: 0.25 *g/bhp-hr*
   Non-methane, non-ethane hydrocarbons (NMNEHCs): 0.25 *g/bhp-hr* (as propane)
   Formaldehyde (HCHO): 0.05 *g/bhp-hr*

   Pursuant to 25 Pa. Code § 127.12(a)(5), DEP requests that Adelphia conduct a BAT analysis for the emergency generator engine. The format of the BAT analysis may follow that of a "top-down" Best Available Control Technology (BACT) analysis, as follows:

   a. Step 1: Identify Available Control Technologies

   b. Step 2: Eliminate Technically Infeasible Operation

   c. Step 3: Rank Remaining Control Technologies by Control Effectiveness

   d. Step 4: Evaluate Economic, Environmental, and Energy Impacts of Technically Feasible Control Technologies

   e. Step 5: Identify BAT

   Please ensure that the BAT analysis addresses HCHO emissions from the emergency generator engine, which are not addressed in the manufacturer's specifications.

4. Please specify the following for the emergency generator engine:

   a. The life of the catalyst, as requested in Section C, Item 10, of the Plan Approval application.

   b. The stack diameter, height, elevation, and distance to nearest property line, exhaust moisture percentage, and location of sampling ports, as requested in Section F, Item 2, of the Plan Approval application.

B. Compressor Engines and Associated Oxidation Catalyst Units (Narrative: Sections 3.2.2.2 and 4.1, Appendix B, Table B-1, Appendix C; Application: Section C, Item 11, Section E, Section F, Item 2)

Moreover, please note that the compressor engines are subject to the same BAT emission standards as indicated for the emergency generator engine in deficiency A.3., above. While the post-catalyst emissions data indicated in the manufacturer's specifications for the oxidation catalyst units also demonstrates compliance with the BAT emission standards, this is not clear when projecting the post-catalyst emissions data higher. Please confirm the post-catalyst emissions data, and revise the affected page(s) of the submittal.

Lastly, DEP requests that Adelphia revise/expand upon the BAT analysis presented in Section 4.1. As indicated for the emergency generator engine in deficiency A.3., above, the format of the BAT analysis may follow that of a "top-down" BACT analysis.

2. Please specify the following for the oxidation catalyst units:

   a. The differential pressure range across the catalytic bed, as requested in Section C, Item 11, of the Plan Approval application.

   b. The outlet flow rate and temperature, as requested in Section C, Item 11, of the Plan Approval application.

   c. Whether Adelphia intends to install devices to monitor the differential pressure, inlet and outlet flow rate, and inlet and outlet temperature, and the corresponding monitoring and recordkeeping frequency, as referenced in Section E of the Plan Approval application.

3. Please specify the following for the compressor engines:

   a. Whether Adelphia intends to install hour meters on each engine to monitor the operating hours, and the corresponding monitoring and recordkeeping frequency, as referenced in Section E of the Plan Approval application.

   b. Whether Adelphia intends to install natural gas meters on each engine, or a combined fuel meter, to monitor the natural gas consumption by the engines, and the corresponding monitoring and recordkeeping frequency, as referenced in Section E of the Plan Approval application.

   c. The stack diameter, height, elevation, and distance to nearest property line, exhaust moisture percentage, and location of sampling ports, as requested in Section F, Item 2, of the Plan Approval application.

4. Please provide the basis for the total volume of natural gas emitted from the station ESD venting, pigging and pipeline blowdowns, and reciprocating compressors, as indicated in Appendix B, Table B-5. Please also specify the intended pigging frequency.

5. In accordance with Condition 1(a), Section K, of the GP-5, Adelphia is required to employ best management practices for the pigging operations at the facility, and specify the appropriate best management practices in the Plan Approval application. Please provide this information. [Note: Based on the calculations for pigging and pipeline blowdown emissions in Appendix B, Table B-5, the pigging operations do not figure to exceed the emission rates specified in Condition 1(b), Section K, of the GP-5, such that Adelphia would be required to control the emissions by at least 95%. Please be advised that, if any of these emission rates are exceeded, Adelphia would be subject to this requirement.]

E. Produced Fluids, Engine Oil, and Triethylene Glycol (TEG) Tanks (Application: Section B, Item 4)

Please specify the following for the tanks, as requested in Section B, Item 4, of the Plan Approval application:

1. The maximum pressure of the produced fluids and engine oil tanks.

2. The type of pressure relief device for each of the tanks.

2. A detailed site layout of all equipment proposed to be installed as part of the Marcus Hook natural gas compressor station project, including, but not limited to: compressors, the emergency generator, storage tanks, each pig chamber, and piping. Please label the respective equipment for easy discernment.

3. Detailed process and control diagrams, including, but not limited to, all proposed instrumentation, pneumatic controllers, and valves.

4. A maintenance plan and schedule for the various equipment at the facility.

The above requests are made in accordance with 25 Pa. Code § 127.12(a)(2), (4), and (5), and are produced under the responsible charge of Ms. Janine Tulloch-Reid, P.E. In accordance with DEP's Permit Review Process Policy, please submit the requested information by **September 14, 2018**; otherwise, DEP will send a technical deficiency letter. Should you have any questions regarding the identified deficiencies, please contact me to discuss your concerns or to schedule a meeting.

If you believe the stated deficiencies are not significant, you have the option of asking DEP to make a decision based on the information you have already made available. If you choose this option, you should justify how your current submission satisfies the deficiencies noted above.

PROJECT REPORT

Adelphia Pipeline Company > Quakertown Compressor Station

Plan Approval Application

Prepared By:

TRINITY CONSULTANTS
4500 Brooktree Road
Suite 103
Wexford, PA 15090
(724) 935-2611

September 2018

Project Report 173901.0147

Trinity Consultants

EHS Solutions Delivered Uncommonly Well

TABLE OF CONTENTS

1. EXECUTIVE SUMMARY

Adelphia Pipeline Company, LLC (Adelphia) is planning to construct a new natural gas compressor station in West Rockhill Township, Bucks County, PA (the Quakertown CS). Adelphia is submitting this Plan Approval application seeking authorization for the installation of the equipment associated with the construction of the compressor station. Note that the Plan Approval application also addresses the proposed Quakertown M&R Station, a new receipt interconnect, due to source aggregation.

The Quakertown Compressor Station (Quakertown CS) would be a minor source of air emissions with respect to New Source Review and Title V permitting. Emissions from the equipment associated with the proposed compressor station is reflected in site-wide total emissions shown in this Plan Approval application.

The following sections of this application report address the following topics:

- Section 2: Project Description
- Section 3: Applicable Regulations Review (includes Aggregation Analysis)
- Section 4: Best Available Technology (BAT) Review
- Section 5: Potential Emissions Calculations
- Appendix A : Area Maps and Process Flow Diagram
- Appendix B : Detailed Emission Calculations and BAT Analysis
- Appendix C : Manufacturer's Specifications
- Appendix D: Plan Approval Application Forms
- Appendix E: General Information Form (GIF)
- Appendix F: Compliance Review Form
- Appendix G: County & Municipal Notifications
- Appendix H: Application Fee

2. PROJECT DESCRIPTION

The proposed Quakertown CS would be a natural gas transmission facility covered under Standard Industrial Classification (SIC) Code 4922 and regulated by the Federal Energy Regulatory Commission (FERC). The Quakertown CS would compress natural gas from the Marcus Hook interstate pipeline system to be transported downstream along the transmission system. The Quakertown CS would have the potential to operate 24 hours per day, 7 days per week and 365 days per year.

At this time, the proposed equipment to be installed at the Quakertown CS is as follows:

- Three (3) Caterpillar (CAT) G3606 natural gas compressor engines (rated at 1,875 horsepower [hp] each) equipped with oxidation catalysts;
- One (1) Cummins GTA28 emergency generator engine (rated at 701 hp) equipped with non-selective catalytic reduction (NSCR);
- One (1) 1,000 gallon produced fluid tank;
- One (1) 500 gallon engine oil tank;
- One (1) 500 gallon triethylene glycol (TEG) tank; and
- Associated piping and components and gas releases. Note that additional piping and components will be located at the adjacent Quakertown M&R Station.

The proposed sources are described in detail below and depicted on a process flow diagram included in Appendix A.

2.1 COMPRESSOR ENGINES

Adelphia is proposing to install three (3) natural gas-fired reciprocating engines (each rated at 1,875 hp) for the compression and transmission of natural gas. The engines would be 4-stroke, lean burn, spark ignition engines each rated at 1,875 hp and equipped with oxidation catalyst for control of carbon monoxide (CO), volatile organic compound (VOC), and formaldehyde emissions. The compressor engines are expected to operate on a full-time basis and as such are being permitted for 8,760 hours per year. Manufacturer's specifications for the engines and oxidation catalysts are included in Appendix C. This information is based on current design and will, at least, be equivalent to final design.

The function of these reciprocating compressors is to raise the pressure of the gas to overcome the higher operating pressure in the transmission pipeline downstream of the proposed station.

2.2 EMERGENCY GENERATOR

Adelphia is proposing to install one (1) natural gas fired generator that would provide back-up power at the facility. The generator would be powered by a 4-stroke, rich burn, spark ignition engine, rated at 701 hp. This information is based on current design and will, at least, be equivalent to final design. The generator is expected to operate on an emergency basis and as such is being permitted for 500 hours per year.

2.3 STORAGE TANKS

Adelphia is proposing to install one (1) 1,000 gallon produced fluids storage tank, one (1) 500 gallon engine oil tank and one (1) 500 gallon TEG tank. The true vapor pressure of the contents of these tanks would be less than 1.5 psia.

3. APPLICABLE REGULATIONS REVIEW

Authorization to begin construction and initially operate a new or modified source must be obtained by complying with key regulatory elements:

- Plan Approval Requirements located in 25 PA Code §127.11 – 127.51;
- Prevention of Significant Deterioration (PSD) and/or Nonattainment New Source Review programs (NNSR) [both parts of the federal New Source Review (NSR) as incorporated by reference under 25 PA Code §127.81 – 127.83 for PSD and implemented in the Pennsylvania SIP under 25 PA Code §127.201 – 127.218 for NNSR];
- Applicable federal and state emission standards and control programs contained in the Pennsylvania State Implementation Plan (SIP); and
- Title V of the 1990 Clean Air Act Amendments (as incorporated and implemented in the Pennsylvania SIP under 25 PA Code §127.501 – 127.543).

This section of the report addresses the applicability of the proposed project to these permitting programs and requirements.

3.1 SOURCE AGGREGATION ANALYSIS

To determine applicability of various permitting programs to the proposed Quakertown CS, a single source determination must be performed for the site. According to the Department's Guidance for Performing Single Stationary Source Determinations for Oil and Gas Industries (Docket 270-0810-006), the following three factors must all be met in order for emission sources to be aggregated and considered a single facility: (1) the sources all belong to the same industrial grouping; (2) the activities are located on one or more contiguous or adjacent properties; and (3) the activities are under common control.

The proposed Quakertown CS would be sited partially within the boundaries of, or adjacent to, the existing Quakertown M&R Station and a new M&R Station. The existing Quakertown M&R Station, which would be under the control of Adelphia, consists of piping components and a small exempt emergency generator. The new meter station would consist of additional piping components and fugitive emissions. As a result of the above-described analysis, Adelphia has determined that the proposed Quakertown CS is a single source with the Quakertown M&R Stations but not with any other sources. The plan approval application includes the new proposed Quakertown M&R station according to this conclusion.

3.3 MAJOR NEW SOURCE REVIEW (25 PA CODE §127)

The Federal New Source Review (NSR) program applies to major stationary sources. The NSR permitting regulations are comprised of two programs: 1) Prevention of Significant Deterioration (PSD) for projects located in areas where specified pollutant levels have met National Ambient Air Quality Standards (NAAQS); and 2) Nonattainment New Source Review (NNSR) for projects located in areas where pollutant levels have not attained the corresponding NAAQS. The NSR program regulates the installation of new major sources or major modifications to existing major sources. The Quakertown CS is located in Bucks County which is classified as attainment with all NAAQS except for ozone. Due to its location within the Ozone Transport Region (OTR), in accordance with 25 Pa. Code 127.201(f), a facility located in Bucks County that emits or has the potential to emit at least 25 tpy VOC or NO_X would be considered a major facility and would be subject to the requirement applicable to a major facility located in a severe nonattainment area for ozone. These requirements would include Lowest Achievable Emission Rate (LAER), an alternative site analysis and obtaining emissions offsets.

However, if NNSR permitting is not triggered, then the project is deemed to not significantly impact the ability of the area to attain the NAAQS.

The estimated emissions as a result of the proposed project, as shown in Table 3-1, are below major source thresholds for NSR under 25 Pa Code Section 127, Subchapter E and PSD permitting under 25 Pa Code Section 127, Subchapter D. As such, NSR is not applicable to this plan approval application.

Table 3-1: NSR Major Source Thresholds[4]

Pollutant	Potential Site-Wide PTE (TPY)[1]	Major Source Threshold (TPY)	NSR Program	Subject to Major NSR?
PM_{10}	1.92	250	PSD	No
$PM_{2.5}$	1.92	250	PSD	No
SO_2	0.11	250	PSD	No
CO	11.16	250	PSD	No
NO_X	17.16	25	NNSR[2]	No
VOC	19.93	25	NNSR	No
CO_2e	33,905	NA[3]	PSD	No

[1] PTE includes site-wide emissions from all sources, including storage tanks, fugitive leaks, and blowdowns including sources at the adjacent existing and proposed M&R stations.
[2] NO_2 is also a regulated PSD pollutant with a major source threshold of 250 tpy.
[3] Only applicable if another pollutant exceeds major source threshold for PSD.
[4] Emissions are based on current design for which the formal bidding process is underway. Final design specifications are to be, at least, equivalent.

3.4 POTENTIALLY APPLICABLE FEDERAL EMISSIONS STANDARDS

Two types of federal emission standards could apply to certain operations being permitted as part of this project. These emission standards are: New Source Performance Standards (NSPS) codified in 40 CFR 60 and National Emission Standards for Hazardous Air Pollutants (NESHAP) standards codified in 40 CFR 63.

3.2.1. National Emission Standards for Hazardous Air Pollutants (NESHAP or MACT)

Regulatory requirements for facilities subject to NESHAP standards, otherwise known Maximum Available Control Technology (MACT) Standards for source categories, are contained in 40 CFR Part 63. 40 CFR Part 61 NESHAP standards are defined for specific pollutants while Part 63 NESHAPs are defined for source categories where allowable emission limits are established on the basis of a MACT determination for a particular major source. A major source of HAP is defined as having potential emissions in excess of 25 tpy for total Hazardous Air Pollutants (HAPs) and/or potential emissions in excess of 10 tpy for any individual HAP.

Potential HAP emissions from the proposed Quakertown CS would be below the major source thresholds, as shown in Appendix B, and therefore the facility would be an area source of HAP. The potential applicability of specific MACT standards to the Quakertown CS is discussed below.

3.2.1.1. NESHAP Subpart HH - Natural Gas Production Facilities

Subpart HH – NESHAP for natural gas production facilities applies to glycol dehydration units at natural gas production facilities that are major or area sources of HAP emissions prior to custody transfer to the transmission pipeline. The proposed project would be located after custody transfer. Therefore, the proposed Quakertown CS would not be a natural gas production facility as defined by the rule, and this subpart would not be applicable.

3.2.1.2. NESHAP Subpart HHH - Natural Gas Transmission and Storage Facilities

Subpart HHH, NESHAP from Natural Gas Transmission and Storage Facilities applies to glycol dehydration units at natural gas transmission and storage facilities that are major sources of HAP emissions located downstream of the point of custody transfer (after processing and/or treatment in the production sector), but upstream of the distribution sector. The Quakertown CS would be an area source of HAP emissions; therefore, the Quakertown CS would not be subject to Subpart HHH.

3.2.1.3. NESHAP Subpart ZZZZ - Stationary Reciprocating Internal Combustion Engines

Stationary reciprocating internal combustion engines (RICE) at both area and major sources of HAP emissions are potentially subject to Subpart ZZZZ – *NESHAP for Stationary Reciprocating Internal Combustion Engines (RICE)*. Stationary RICE at facilities that are major sources of HAP are considered new if they are ordered after June 12, 2006. Per 40 CFR §63.6590(c), new area source (such as the Quakertown CS) stationary RICE are required to meet the requirements of this MACT standard by meeting the applicable requirements of the applicable New Source Performance Standard in 40 CFR 60 (Subpart IIII for compression ignition engines and Subpart JJJJ for spark ignition engines). No further requirements apply to such engines under NESHAP Subpart ZZZZ.

The three (3) proposed CAT 3606 compressor engines and the Cummins GTA28 generator engine at the proposed Quakertown CS would comply with Subpart ZZZZ by complying with 40 CFR 60, Subpart JJJJ as described in the following section.

3.2.2. New Source Performance Standards (NSPS)

Pennsylvania has received delegation from EPA to regulate facilities subject to NSPS. Regulatory requirements for facilities subject to NSPS are contained in Pennsylvania SIP in 25 Pa Code §122 and 40 CFR Part 60. The potential applicability of NSPS standards to the proposed operations at the Quakertown CS are:

- 40 CFR Part 60 Subpart K/Ka/Kb – Storage Vessels for Petroleum Liquids/Volatile Organic Liquids
- 40 CFR Part 60 Subpart JJJJ – Stationary Spark Ignition Internal Combustion Engine
- 40 CFR Part 60 Subpart OOOO – Crude Oil and Natural Gas Production, Transmission, and Distribution
- 40 CFR Part 60 Subpart OOOOa – Crude Oil and Natural Gas Facilities

3.2.2.1. NSPS Subparts K, Ka, and Kb - Storage Vessels for Petroleum Liquids/Volatile Organic Liquids

These subparts apply to storage tanks of certain sizes constructed, reconstructed, or modified during various time periods. Subpart K applies to storage tanks constructed, reconstructed, or modified prior to 1978, and Subpart Ka to those constructed, reconstructed, or modified prior to 1984. All storage tanks located at the Quakertown CS would be constructed after these dates; therefore, the requirements of Subparts K and Ka do not apply. Subpart Kb applies to volatile organic liquid (VOL) storage tanks constructed, reconstructed, or modified after July 23, 1984 with a capacity equal to or greater than 75 m^3 (~19,813 gallons). All storage tanks at the

Quakertown CS were constructed after this date, but do not have a capacity greater than 75 m^3. Therefore, Subpart Kb would not apply to the storage tanks at the Quakertown CS.

3.2.2.2. NSPS Subpart JJJJ - Stationary Spark Ignition Internal Combustion Engines

Subpart JJJJ, Standards of Performance for Stationary Spark Ignition Internal Combustion Engines, applies to manufacturers, owners and operators of stationary spark (SI) engines. The requirements for SI engines with a maximum power rating greater than or equal to 500 hp (except lean burn engines 500 hp ≤ hp < 1,350) apply to owner/operators of such engines ordered on or after July 1, 2007.

The proposed Cummins GTA28 emergency generator engine is a 4-stroke, rich burn spark ignition RICE rated at 701 hp. The engine would be equipped with a non-selective catalytic reduction (NSCR or "three-way") catalyst for control of NO_X, CO, VOC, and HAPs. The engine would be operated only for electric generation during emergency situations and would be subject to the following emissions standards per Table 1 to NSPS Subpart JJJJ applicable to emergency use engines.

Table 3-2: NSPS Subpart JJJJ Emission Standards for Emergency Natural Gas Engines ≥ 130 HP Manufactured On or After 7/1/2010

Pollutant	Emission Standards (g/hp-hr)	Cummins GTA28 Specifications - with NSCR (g/hp-hr)**
NOx	2.0	2.0
CO	4.0	4.0
VOC*	1.0	1.0

*VOC as defined in NSPS JJJJ does not include formaldehyde.

**Emissions are based on current design for which the formal bidding process is underway. Final design specifications are to be, at least, equivalent.

The proposed three (3) CAT G3606 compressor engines would be new 4-stroke, lean burn spark ignition RICE rated at 1,875 hp each. The compressor engines would be equipped with oxidation catalysts and would be subject to the following emissions standards per Table 1 to NSPS Subpart JJJJ applicable to non-emergency use engines. All catalysts will be guaranteed by the manufacturer to have emissions less than those cited in Table 3-3 below.

Table 3-3: NSPS Subpart JJJJ Emission Standards for Non-Emergency Natural Gas Engines ≥ 500 HP Manufactured On or After 7/1/2010

Pollutant	Emission Standards (g/hp-hr)	CAT G3606 Specifications - with Oxidation Catalyst (g/hp-hr)**
NOx	1.0	0.3
CO	2.0	0.17
VOC*	0.7	0.16

*VOC as defined in NSPS JJJJ does not include formaldehyde.

**Emissions are based on current design for which the formal bidding process is underway. Final design specifications are to be, at least, equivalent.

It should be noted that 40 CFR §60.4243(b)(1) allows for compliance with this subpart to be demonstrated by purchasing an engine certified by the manufacturer according to specified procedures and then operating the engine in accordance with the manufacturer's emission-related written instructions. However, while the proposed engines at Quakertown CS would be equipped with control technology to achieve the emissions limits shown in Table 3-3, certification is not available from the engine manufacturer.

Therefore, Adelphia would demonstrate compliance with this subpart for all non-certified engines at the Quakertown CS in accordance with 40 CFR 60.4243(b)(2)(ii), which requires Adelphia to keep a maintenance plan and records of conducted maintenance and to maintain and operate the engines, to the extent practicable, in a manner consistent with good air pollution control practices for minimizing emissions. Additionally, Adelphia would be required to conduct an initial performance test and subsequent compliance testing every 8,760 hours of operation or three (3) years, whichever comes first, to demonstrate continued compliance. Testing would be conducted in accordance with 40 CFR §60.4244.

Records of all notifications submitted to comply with this subpart, maintenance conducted on the engines, and performance testing would be maintained in accordance with 40 CFR §60.4245(a). Initial notification of construction commencement would be submitted as required in 40 CFR §60.7(a)(1) and §60.4245(c), and performance testing results would be reported as required in 40 CFR §60.4245(d).

3.2.2.3. NSPS Subpart OOOO - Natural Gas Production, Transmission, and Storage

Subpart OOOO, Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution, applies to affected facilities that commenced construction, reconstruction, or modification after August 23, 2011 and before September 18, 2015. The proposed project does not include any source categories within the applicability dates for this subpart. Therefore, this subpart would not apply.

3.2.2.4. NSPS Subpart OOOOa - Crude Oil and Natural Gas Facilities

Subpart OOOOa, Standards of Standards of Performance for Crude Oil and Natural Gas Facilities, applies to affected facilities that commenced construction, reconstruction, or modification after September 18, 2015. The regulation was published final in the Federal Register on June 3, 2016. The rule includes provisions for the following facilities:

- Hydraulically fractured wells;
- Centrifugal compressors with wet seals located between the wellhead and the point of custody transfer to the natural gas distribution segment;
- Reciprocating compressors located between the wellhead and the point of custody transfer to the natural gas distribution segment;
- Continuous bleed natural gas-driven pneumatic controllers with a bleed rate of > 6 scfh located in the production, gathering, processing, or transmission and storage segments (excluding natural gas processing plants);
- Continuous bleed natural gas-driven pneumatic controllers located at natural gas processing plants;
- Pneumatic pumps located in the production and processing segments;
- Storage vessels located in the production, gathering, processing, or transmission and storage segments;
- The collection of fugitive emissions components at a well site;
- The collection of fugitive emissions components at a compressor station; and
- Sweetening units located onshore that process natural gas produced from either onshore or offshore wells.

The Quakertown CS would not be a gas wellhead, nor is it a natural gas processing plant. Therefore, the only potentially applicable requirements for the equipment at the station are those for new storage vessels, reciprocating compressors, fugitive emission sources, and pneumatic controllers, where construction commenced after September 18, 2015.

The produced water storage vessel for the Quakertown CS commenced construction after the applicability date, and would be potentially subject to requirements of Subpart OOOOa. Subpart OOOOa applies to storage vessels with VOC emissions equal to or greater than 6 tpy. As shown in Appendix B, the storage vessel at the facility would have VOC emissions less than 6 tpy and, therefore, would not be subject to Subpart OOOOa.

The reciprocating compressors at the facility are subject to the requirements of NSPS OOOOa, 40 CFR §60.5385a, which requires owners and operators of affected reciprocating compressors to change the rod packing prior to each operating 26,000 hours or prior to 36 months of since start up or the last packing replacement. Adelphia would comply with the requirements of this rule for the compressors at the facility.

The pneumatic controllers at the facility would potentially be subject to NSPS OOOOa. All pneumatic controllers proposed to be located at the Quakertown CS would either be intermittent or air/electric. Therefore, these units would not be subject to the requirements of Subpart OOOOa.

The collection of fugitive emission sources at the Quakertown CS would be an affected facility under this subpart. Per 60.5397a, Adelphia would be required to monitor all fugitive emission components (ex. connectors, flanges, etc.) with an optical gas imaging (OGI) device, and repair all sources of fugitive emissions in accordance with the rule. Adelphia would also develop a corporate-wide monitoring plan and a site specific monitoring plan (or one plan that incorporates all required elements), and conduct surveys on a quarterly basis. Adelphia would also be subject to the applicable recordkeeping and reporting requirements of the rule.

3.5 POTENTIALLY APPLICABLE STATE STANDARDS

The Pennsylvania Code contains regulations that fall under two (2) main categories: the regulations that are generally applicable (e.g., permitting requirements), and those that have specific applicability (e.g., sulfur compound emissions from combustion units). The generally applicable requirements are straightforward (e.g., filing of emission statements) and, as such, are not discussed in further detail. The specific requirements associated with the proposed Quakertown CS are discussed in the following section.

3.3.1. 25 Pa Code §123.1 and 123.2

25 Pa Code §123.1 and 123.2, *Prohibition of Certain Fugitive Emissions* and *Fugitive Particulate Matter*, both state exceptions to fugitive emissions sources and methods for controlling fugitive emissions. This regulation applies to the facility in general.

3.3.2. 25 Pa Code §123.11 and 123.13

25 Pa Code §123.11, *Particulate Emissions: Combustion Units,* defines particulate matter emissions for combustion units. Combustion units are defined in §121.1 as stationary equipment used to burn fuel primarily for the purpose of producing power or heat by indirect heat transfer such as boilers. This definition does not apply to the proposed generator and compressor engines at the Quakertown CS. As such, the particulate matter emissions limitations for processes in 25 Pa Code §123.13 *Particulate Emissions: Processes* would apply to these units instead.

25 Pa Code §123.13 defines particulate matter emissions limitations for processes. For processes excluded from Table 1 of §123.13(b), particulate emissions are limited to 0.04 gr/dscf and 0.02 gr/dscf, for exhaust flowrates less than 150,000 dscfm and greater than 300,000 dscfm, respectively. Particulates from equipment with

exhaust flowrates between 150,000 dscfm and 300,000 dscfm are limited to the allowable emission rate calculated using the formula in §123.13(c)(1)(ii). As all proposed combustion sources at the facility would be fueled exclusively with pipeline quality natural gas, potential particulate emissions from all sources would be expected to comply with these requirements.

3.3.3. 25 Pa Code §123.21

25 Pa Code §123.21, *Sulfur Compound Emissions: General*, states that the concentration of sulfur oxides in the effluent gas may not exceed 500 ppmvd. The proposed equipment at Quakertown CS would combust pipeline quality natural gas and the sulfur oxide emissions would be expected to be well below this concentration level in the combustion exhaust.

3.3.4. 25 Pa Code §123.31

25 Pa Code §123.31, *Odor Emissions*, prohibits the emission of malodorous air contaminants from any source that are detectable outside the facility fence line. This regulation applies to the facility in general. The gas in the pipeline will be odorized. However, Adelphia would take measures to minimize odor from the Quakertown CS operations by combusting pipeline quality natural gas fuel only, using air pneumatics, employing gas detection monitors inside the compressor station building that is continuously monitored by a supervisory control and data acquisition (SCADA) system, and by use of pressure/vacuum reliefs on the produced fluid storage tank to minimize atmospheric venting under normal operations.

3.3.5. 25 Pa Code §123.41 and 123.43

25 Pa Code §123.41, *Visible Emissions: Limitations*, states that a facility may not emit visible emissions equal to or greater than 20% for a period or periods aggregating more than 3 minutes in any 1 hour, or equal to or greater than 60% at any time. This standard would apply to the proposed combustion units at the Quakertown CS. The use of pipeline quality natural gas as fuel would ensure compliance with this requirement.

3.3.6. 25 Pa Code §127.11

25 Pa Code §127.11, *Plan Approval Requirements*, outlines requirements for Plan Approvals required to authorize construction or modification of air contamination sources. Construction, installation, modification, or reactivation of air contaminant sources or air pollution control devices is prohibited unless otherwise approved by the Department. The construction of new equipment at the proposed Quakertown CS would be subject to Plan Approval permitting requirements under this requirement.

3.3.7. 25 Pa Code §129.57

25 Pa Code §129.57, *Storage Tanks Less Than or Equal to 40,000 Gallons Capacity Containing VOCs*, contains requirements for storage vessels less than 40,000 gallons in capacity that contain VOCs. Under this section, above-ground storage tanks with a capacity greater than or equal to 2,000 gallons which contain VOCs with a vapor pressure greater than 1.5 psia must be equipped with pressure relief valves which are maintained in good operating condition and which are set to release at no less than 0.7 psig of pressure or 0.3 psig of vacuum (or the highest possible pressure and vacuum in accordance with state or local fire codes or the National Fire Prevention Association (NFPA) guidelines). The proposed produced fluid storage tank, oil storage tank, and TEG tank for the Quakertown CS would be less than 2,000 gallons in capacity, and also would not contain VOCs with a vapor pressure greater than 1.5 psia (see EPA TANKS output for vapor pressure data in Appendix B). As such, the proposed tanks would not be subject to the requirements in 25 Pa. Code §129.57.

3.3.8. 25 Pa Code §129.96

25 Pa Code §129.96, *Additional RACT Requirements for Major Sources of NOx and VOCs*, establishes control standards for major stationary sources of NO_X and VOC under the Reasonably Available Control Technology (RACT) program. The standards are also only applicable for sources in existence on or before July 20, 2012. Major stationary sources of NO_X and VOC are defined in 25 PA Code §121.1. For RACT purposes, the applicable major source thresholds are 100 tons per year of NO_X and 50 tons per year of VOC.

This regulation would not apply because the Quakertown CS would not have potential emissions of NO_X in excess of 100 tpy or VOC in excess of 50 tpy and because the compressor station would be built after July 20, 2012. However, note that the limitation on hours of operation would be consistent with presumptive RACT for an emergency engine as set for in 25 Pa Code §129.93.

3.3.9. 25 Pa Code §129.203 and 204

25 Pa Code §129.203, *Stationary Internal Combustion Engines*, establishes NO_X RACT emission limits for stationary internal combustion engines rated for more than 1,000 hp which are located in Bucks, Chester, Delaware, Montgomery, or Philadelphia County. The proposed Quakertown CS would be located in Bucks County. As such, the proposed compressor engines would be subject to these requirements. The allowable emissions for spark-ignited engines are 3.0 grams of NO_X per brake horsepower- hr. Also, the owner or operator of the stationary internal combustion engine shall calculate the difference between the allowable and actual emissions from the unit during the period from May 1 through September 30. Adelphia would comply with the requirements of this rule by installing natural gas fired spark ignition compressor engines that do not exceed the allowable emissions rate. Adelphia would also keep records of actual emissions from each engine for the specified reporting period. Actual emissions of NO_X from the proposed engines would be determined using the 1-year average emission rate calculated from the most recent permit emission limit compliance demonstration test data for NO_X.

3.3.10. 25 Pa Code §131

25 Pa Code §131, *Ambient Air Quality Standards*, references National Ambient Air Quality Standards (NAAQS) for criteria pollutants and establishes State Ambient Air Quality Standards (SAAQS) for settled particulate, beryllium, fluorides, and hydrogen sulfide. As discussed in Section 3.3, the proposed project would not trigger NSR and the associated emissions of criteria pollutants would not reasonably be anticipated to exceed the corresponding NAAQS. The proposed project would not emit any quantifiable amount of beryllium, fluorides, or hydrogen sulfide, and as such the corresponding SAAQS would not apply.

3.3.11. 25 Pa Code §135

25 Pa Code §135, *Reporting of Sources*, includes requirements for submittal of emissions data to the Department for the purposes of evaluating the effectiveness of regulations, identifying available or potential emission offsets, and maintaining an accurate inventory of air contaminant emissions for air quality assessment and planning activities. As the proposed Quakertown CS would be considered part of an oil and natural gas system, emissions from the sources at the site would be subject to reporting and recordkeeping requirements under this section. As such, Adelphia would submit annual emissions inventory data by March 1 of year per the Department's requirements.

3.3.12. 25 Pa Code §137

25 Pa Code §137, *Air Pollution Episodes*, contains requirements intended to prevent the excessive buildup of air pollutants during air pollution episodes, thereby preventing the occurrence of an emergency due to the effects of

the pollutants on the health of persons. This chapter specifically addresses air pollution episodes and the Department's response to such episodes. §137.4 specifies certain industrial sources that must have standby plans, which includes coal- and oil-fired electric and steam generating facilities and other specific manufacturing industries (e.g., metals, refining, paper, etc.). The proposed Quakertown CS would be a natural gas transmission facility, which is not an industry specified by these regulations.

3.3.13. 25 Pa Code §139

25 Pa Code §139, *Sampling and Testing*, establishes requirements for source operators to provide adequate sampling ports, safe sampling platforms and adequate utilities, and establishes testing procedures to be followed, for performance testing when required by the Department. The proposed Quakertown CS would be designed and constructed to accommodate performance testing as required by applicable federal regulations (e.g., NSPS Subpart JJJJ) and any permit conditions set forth by the Department in the ensuing Plan Approval.

3.2 TITLE V AND STATE PERMITTING REQUIREMENTS

The Title V Operating Permit program applies to stationary sources with the potential to emit over 100 tons per year (tpy), or a lower major source threshold defined by nonattainment status, of any individual criteria air pollutant, 10 tpy of any individual Hazardous Air Pollutant (HAP), or 25 tpy of combined HAPs. Since this site would be in Bucks County, PA which is in the severe ozone transport region, a major source threshold of 25 tpy is applicable for VOC and NO_X. As shown in Appendix B, maximum potential emissions for NO_X, VOC, and total HAP from the Quakertown CS and the adjacent meter stations would not exceed the major source thresholds for Title V. Therefore, the Quakertown CS would be a minor source with respect to the Title V Program after the construction of the proposed project. Adelphia would apply for a State Only Operating Permit once the Plan Approval is issued and the facility is constructed.

With respect to greenhouse gases (GHGs), EPA had previously incorporated provisions into the existing Title V rules via the Greenhouse Gas Tailoring Rule. These included the specification of a major source threshold and subject to regulation/significant emission rate of 100,000 tpy and 75,000 tpy of carbon dioxide equivalent (CO_2e), respectively[1], for current projects. On June 23, 2014, the U.S Supreme Court decision in the case of *Utility Air Regulatory Group v. EPA* effectively changed the permitting procedures for greenhouse gases (GHGs) under the PSD and Title V programs[2]. In essence, GHGs remain "subject to regulation" but only for sources which otherwise trigger Title V requirements. As such, the Quakertown CS would not be subject to the regulation of GHG emissions, as it would not trigger Title V requirements.

---

[1] CO_2e is carbon dioxide equivalents calculated as the sum of the six well-mixed GHGs (CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6) with applicable global warming potentials per 40 CFR 98 applied.
[2] http://www.supremecourt.gov/opinions/13pdf/12-1146_4g18.pdf

4. BEST AVAILABLE TECHNOLOGY (BAT) ANALYSIS

Under PADEP air permitting regulations in 25 Pa Code §127.1, new sources of air emissions must implement Best Available Technology (BAT). The Quakertown CS would be installing new equipment, sources applicable to this requirement that must be deemed by PADEP to satisfy this requirement before a Plan Approval can be issued. The section addresses the proposed BAT for the various emission sources proposed as part of this project.

4.1 BAT FOR COMPRESSOR ENGINES

The proposed natural gas-fired compressor engines would be 1,875 bhp four stroke-lean burn Caterpillar G3606 engines. The engines would be equipped with air/fuel ratio control to reduce NO_X emissions. Caterpillar's specifications for this engine indicate an emission rate of 0.3 g/bhp-hr, which is much lower than the current applicable limit of 1.0 g/bhp-hr required by NSPS Subpart JJJJ for engines of this size, type, and use. Furthermore, this emission rate would be compliant with PADEP's BAT limit for compressor engines in the production/gathering segment of the industry authorized under GP-5 as finalized in February 2013. As such, Adelphia believes that the potential NO_X emissions rate of 0.3 g/bhp-hr complies with the BAT requirement in 25 Pa Code § 127.1 and as such, Adelphia would propose a limit of 0.3 g/bhp-hr.

A potential option to further reduce NO_X emissions is through the use of Selective Catalytic Reduction (SCR) control technology. The SCR process chemically reduces the NO_X molecule into molecular nitrogen and water vapor. A nitrogen-based reagent such as ammonia or urea is injected into the engine exhaust upstream of a catalyst bed. The exhaust gas mixes with the reagent and enters a reactor module containing catalyst. The hot flue gas and reagent diffuse through the catalyst. The reagent reacts selectively with the NO_X within a specific temperature range and in the presence of the catalyst and oxygen. The rate of reaction would depend on the type of catalyst, reagent, and the temperature. The reaction requires an optimum temperature range of 480 to 800 °F and fairly constant exhaust temperatures for best performance. [3]

SCR is not a widely used technology for natural gas-fired combustion engines like those proposed for this project. Although potentially technically feasible, SCR is very costly. Capital costs are significantly higher than other types of NO_X controls due to the volume of catalyst that is required. The Operating & Maintenance (O & M) costs of using SCR are driven by the reagent usage, catalyst replacement, and increased electrical power usage. The following shows budgetary cost estimates for installation of SCR for each of the compressor engines proposed for this project:

Capital Cost	~ $990,000
O & M Cost	~ $200,000
Annual Cost	~ $300,000

The compressor engines being proposed for the Quakertown CS are estimated with potential emissions at approximately 5.43 tpy each. At an estimated NO_X control efficiency of 90%, the cost effectiveness of SCR on the engines at the proposed Quakertown CS would be estimated to be greater than $60,000 per ton (see Appendix B for detailed cost-effectiveness calculations). Therefore, SCR is determined to be **economically infeasible** for this application. As such, Adelphia believes that the proposed NO_X emission rate of 0.3 g/bhp-hr complies with the BAT requirement in 25 Pa Code § 127.1.

[3] http://www.epa.gov/ttn/catc/dir1/fscr.pdf

Adelphia is proposing the use of an oxidation catalyst as BAT for controlling emissions of Carbon Monoxide (CO) and Volatile Organic Compounds (VOC) from the compressor engines. The rate of formation of CO during natural gas combustion depends primarily on the efficiency of combustion. The formation of CO occurs in small, localized areas inside the combustion chamber (engine cylinder) where oxygen levels cannot support the complete oxidation of carbon to CO_2. CO emissions resulting from natural gas combustion can be decreased via catalytic oxidation.

This reaction is promoted by several noble metal-enriched catalysts at high temperatures. The oxidation catalyst will be guaranteed a CO removal efficiency of 93% at this temperature, resulting in an emission rate of 0.17 g/bhp-hr. This emission rate is well below the current limit of 2.0 g/bhp-hr required by NSPS Subpart JJJJ for non-emergency lean burn natural gas engines ≥ 1,350 HP manufactured after July 1, 2010, and is less than the PADEP's BAT level for compressor engines under GP-5 (0.25 g/bhp-hr). As such, Adelphia believes that the potential CO emissions rate complies with the BAT requirement in 25 Pa Code § 127.1.

Catalytic oxidation also promotes the conversion of non-methane/non-ethane hydrocarbon (NMNEHC) and formaldehyde to carbon dioxide and water, over the face of the catalyst, thereby reducing emissions of these pollutants. The efficiency of the oxidation catalyst proposed for the Quakertown CS compressor engines is estimated to be at least 50% for NMNEHC emissions resulting in an emission rate of 0.16 g/bhp-hr, and at least 75% for formaldehyde emissions resulting in an emission rate of 0.04 g/bhp-hr. The engines' NMNEHC emission rate is well below the current limit of 0.7 g/bhp-hr required by NSPS Subpart JJJJ for non-emergency lean burn natural gas engines ≥ 1,350 HP manufactured after July 1, 2010, and the proposed NMNEHC and formaldehyde emission limits are compliant with PADEP's BAT limits in the recently finalized GP-5. Similar to CO and NO_X, Adelphia believes that the potential NMNEHC and formaldehyde emission rates comply with the BAT requirement in 25 Pa Code § 127.1.

Potential BAT options for both PM/PM_{10} and SO_2 emissions, based on a search in the EPA's Reasonably Available Control Technology (RACT)/Best Available Control Technology (BACT)/Lowest Achievable Emission Rate (LAER) Clearinghouse (RBLC) database, indicate that the only technologies used to reduce these pollutants from natural gas burning engines are good combustion practices and low-sulfur fuels. The sulfur content of the pipeline quality natural gas, which would be used in the engines, is very low. Adelphia would also operate the engines in accordance with the manufacturer's recommended practice to minimize emissions of particulate matter and SO_2. Both technologies are considered base-case and are equally effective. Adelphia proposes that the combination of good combustion practices and the firing of pipeline quality natural gas be considered BAT for the proposed compressor engines.

The proposed BAT levels for the new engines at the Quakertown CS are summarized below. These levels are at least as stringent as the presumptive BAT levels that PADEP established in the GP-5 permit conditions.

Table 4-1. Summary of Proposed BAT for Compressor Engines

Pollutant	Proposed BAT for Compressor Engines		
	Controls	Removal Efficiency	Emission Rate
NO_x	Lean-Burn, Air-to-Fuel Ratio Control	Inherent Design	0.3 g/bhp-hr
CO	Catalytic Oxidation	93 %	0.17 g/bhp-hr
NMNEHC	Catalytic Oxidation	~50 %	0.16 g/bhp-hr
HCHO	Catalytic Oxidation	75 %	0.04 g/bhp-hr

4.2 BAT FOR EMERGENCY GENERATOR ENGINE

The Cummins GTA28 emergency generator engine would be expected to operate less than 500 hours per year. Based on potential emissions from the unit, the emergency generator engine is exempt from Plan Approval permitting. The engine would be equipped with a non-selective catalytic reduction (NSCR or "three-way") catalyst for controlling emissions of NO_X, CO, and VOC. The engine will comply with Federal requirements of NSPS JJJJ.

4.3 BAT FOR TANKS

NSPS OOOOa regulates VOC emissions from storage tanks at oil and gas facilities. Emissions control is required for storage tanks with VOC emissions greater than 6.0 tpy, as EPA has deemed controls for such tanks to be cost effective. The proposed produced fluid tank for the Quakertown CS would be estimated to have potential VOC emissions from combined working, breathing, and flashing losses at 0.50 tpy. As such, the installation of add-on controls is believed to be economically infeasible for this tank. Potential emissions from all other storage tanks are even lower than the produced fluid tank.

4.4 BAT FOR GHG EMISSIONS SOURCES

While the proposed construction of the Quakertown CS and new M&R station would not trigger PSD permitting for any regulated pollutant based on maximum potential emission rates, Adelphia is including this discussion of BAT for GHG pollutants as requested by PADEP for similar projects. EPA has published white papers for different industries to discuss available GHG control technologies. However, at this time, there is no white paper specifically for the natural gas sector. In the permitting guidance, EPA agrees that energy efficiency improvements would satisfy the BACT requirements for GHGs in most cases. As such, GHG BAT would be expected to be limited to the use of energy efficient design and the minimization of GHG releases through good work practices for the natural gas industry.

Adelphia is proposing that 40 CFR 60 Subpart OOOOa requirements be utilized to satisfy Best Available Technology (BAT) requirements for fugitive emissions (as opposed to pulling in state-specific Leak Detection and Repair [LDAR] requirements such as GP-5), as the requirements would be stringent and prevent confusing regulatory overlap (at no additional environmental benefit). As noted in Section 3.3.2.4, the requirements of this regulation would apply to the Quakertown CS. The regulation does not distinguish between gathering and transmission facilities in terms of LDAR requirements; the Quakertown CS would be subject to OGI monitoring requirements as a transmission facility. Fugitive GHG (and to a lesser extent, VOC) leaks would be minimized by adhering to good operating and maintenance practices. Despite the lack of federal or PADEP guidance on conducting control technology reviews for GHGs, Adelphia believes the proposed project is designed to reduce GHG emissions where technically and economically feasible and, therefore, to a level that would be consistent with BACT or BAT.

In addition, Adelphia has reviewed EPA's voluntary Natural Gas Star program for potential emission reduction measures.[4] Total site-wide VOC and GHG emissions from fugitive and blowdown sources are estimated to be low. Therefore, any additional emission reduction would not be cost effective due to the minimal emission reductions achieved. Table 4-5 summarizes the evaluation of the Natural Gas Star program practices for the proposed compressor station.

[4] http://www.epa.gov/gasstar/

Table 4-5. Summary of Natural Gas Star Program

Energy Star Project[5]	Feasibility Assessment
Replace Gas Starters with Air or Nitrogen	Feasible – Engine gas starters may be replaced with air. However, this requires installation of a large compressed air system that is not practical.
Reduce Natural Gas Venting with Fewer Compressor Engine Startups and Improved Engine Ignition	Feasible – Engines are intended to operate at all times other than preventative maintenance shutdowns. Adelphia's preventative maintenance program would reduce engine starts related to unanticipated engine shutdown/repairs.
Reducing Methane Emissions from Compressor Rod Packing Systems	Not feasible – This reduction strategy is applicable to older compressors with potentially worn packing. Compressors are equipped with newly installed packing by design. Adelphia would follow the manufacturer's recommended procedures and Subpart OOOOa for proper maintenance and inspection of compressor rod packing systems.
Test and Repair Pressure Safety Valves	Feasible - Completed by Adelphia on periodic basis.
Eliminate Unnecessary Equipment and/or Systems	Adelphia would only be installing what is required for this application.
Install Automated Air/Fuel Ratio Controls	Feasible – Engines would be equipped with state-of-the art AFR (air-to-fuel-ratio) controllers.
Install Electric Motor Starters	Not feasible – these engines are intended to operate at all times therefore the number of starts is minimized and the potential methane reductions would be minimal.
Reducing Emissions When Taking Compressors Off-Line	Feasible - Blowdown gas may be injected into the fuel gas recovery system. However, the proposed facility is a transmission facility that is expected to operate at or near 100% capacity year round. Shutdown events are expected to be very infrequent, and the current design of the station does not allow for recycling of engine blowdowns.
Replace Compressor Cylinder Unloaders	Not Applicable.
Install Electric Compressors	Not Feasible - Electric compressors are cost prohibitive even if electric supply is available. As stated in the NG Star fact sheet "The capital costs and the electricity costs, however, are higher for an electric motor compared to those for a gas driven engine. The savings from maintenance costs relative to the cost of energy would not be justified unless the engine is at the end of its economic life."
Wet Seal Degassing Recovery System for Centrifugal Compressors	Not applicable to CAT engines - units are reciprocating compressors.

[5] http://epa.gov/gasstar/tools/recommended.html#compressors

5. SAMPLE EMISSION SOURCE CALCULATIONS

The characteristics of air emissions from the Quakertown CS, along with the methodology used for calculating emissions from the proposed sources, are described in narrative form below. Detailed supporting calculations are also provided in Appendix B.

Emissions from the Quakertown CS would result from natural gas combustion in the compressor and generator engines, and from flashing, working, and breathing losses from the produced fluid storage tank and other tanks. Finally, there would be fugitive emissions from process-related equipment. The methods by which emissions from each of these sources has been calculated are summarized below.

- **Compressor Engines:** Potential emissions of nitrogen oxides (NO_x), carbon monoxide (CO), non-methane/non-ethane hydrocarbon (NMNEHC), formaldehyde, and GHGs are calculated using factors provided by the engine manufacturer and the oxidation catalyst manufacturer where available. Potential emissions of other criteria pollutants and all other HAPs are calculated using U.S. EPA's AP-42 factors for natural gas-fired engines.[6] When needed to estimate emissions, calculations assume a site-specific heat content of natural gas.

- **Emergency Generator Engine:** Potential emissions of nitrogen oxides (NO_x), carbon monoxide (CO), non-methane/non-ethane hydrocarbon (NMNEHC), and GHGs are calculated using factors provided by the engine manufacturer. Potential emissions of other criteria pollutants and all other HAPs are calculated using U.S. EPA's AP-42 factors for natural gas-fired engines. Potential GHG emissions from the engine have been calculated using the relevant emission factors for natural gas combustion from 40 CFR 98, Subpart C. When needed to estimate emissions, calculations assume a site-specific heat content of natural gas

- **Process Fugitives:** Potential emissions of VOC and HAPs from process fugitives are calculated using estimated component counts of valves, connectors, flanges, open-ended lines, pump seals, etc. along with U.S. EPA's equipment leak emission factors.[7] In addition, potential VOC and HAP emissions from vented blowdown emissions have been estimated using the expected number of blowdown events and the volume of gas to be vented. Similarly, potential GHG emissions from process fugitives and blowdown events have been calculated using the relevant equations from 40 CFR 98, Subpart W.

- **Storage Tanks:** Potential emissions of VOC and HAP from the storage tanks have been estimated, although they are expected to be insignificant. Emissions from the TEG and oil tanks have been estimated using EPA's TANKS 4.0.9d software to evaluate working and breathing losses from the tanks. Emissions from the produced fluids tank have been estimated using E & P TANK software which includes flashing, working, and breathing losses.

[6] U.S. EPA, AP 42, Fifth Edition, Volume I, Chapter 3.2, *Natural Gas-Fired Reciprocating Engine*, July 2000.
[7] *Table 2-4 :Oil & Gas Production Operations Average Emission Factors, Protocol for Equipment Leak Emission Estimates*, EPA 453/R-95-017, November 1995. Emission factors based on average measured TOC from component types indicated in gas service at O&G Production Operations.

Section B - Processes Information

1. Source Information – Compressor Engines (S001 to S003)

Source Description (give type, use, raw materials, product, etc). Attach additional sheets as necessary.

Three (3) Caterpillar G3606 spark ignition 4-stroke lean burn engines (1,875 HP each) , **or equivalent**, that combust pipeline quality natural gas. The engines are used to boost the pressure for the pipeline transmission of natural gas.

Manufacturer Caterpillar	Model No. G3606	Number of Sources 3
Source Designation S001- S003	Maximum Capacity 1,875 HP (each)	Rated Capacity 1,875 HP (each)
Type of Material Processed Natural Gas		

Maximum Operating Schedule

Hours/Day	Days/Week	Days/Year	Hours/Year
24	7	365	8760

Operational restrictions existing or requested, if any (e.g., bottlenecks or voluntary restrictions to limit PTE)

Capacity (specify units)

Per Hour	Per Day	Per Week	Per Year

Operating Schedule

Hours/Day	Days/Week	Days/Year	Hours/Year
24	7	365	8760

Seasonal variations (Months) From to

If variations exist, describe them

2. Fuel – Compressor Engines (S001 to S003) - Each

Type	Quantity Hourly	Annually	Sulfur	% Ash (Weight)	BTU Content
Oil Number ____	GPH @ 60°F	$X 10^3$ Gal	% by wt		Btu/Gal. & Lbs./Gal. @ 60 °F
Oil Number ____	GPH @ 60°F	$X 10^3$ Gal	% by wt		Btu/Gal. & Lbs./Gal. @ 60 °F
Natural Gas	13,955 SCFH	$122 X 10^6$ SCF	NA grain/100 SCF	NA	1,030 Btu/SCF
Gas (other) ____	SCFH	$X 10^6$ SCF	grain/100 SCF		Btu/SCF
Coal ____	TPH	Tons	% by wt		Btu/lb
Other * ____					
____					
____					

*Note: Describe and furnish information separately for other fuels in Addendum B.

Section B - Processes Information

1. Source Information – Emergency Generator Engine (S004)

Source Description (give type, use, raw materials, product, etc). Attach additional sheets as necessary.

One (1) Cummins emergency generator engine (rated 701 hp), **or equivalent**, to provide emergency power at the facility.

Manufacturer	Model No.	Number of Sources
Cummins	GTA28	1
Source Designation	**Maximum Capacity**	**Rated Capacity**
S004	523 kilowatt (kW)	523 kW

Type of Material Processed
Natural Gas

Maximum Operating Schedule

Hours/Day	Days/Week	Days/Year	Hours/Year
As needed	As needed	As needed	500

Operational restrictions existing or requested, if any (e.g., bottlenecks or voluntary restrictions to limit PTE)

Capacity (specify units)

Per Hour	Per Day	Per Week	Per Year

Operating Schedule

Hours/Day	Days/Week	Days/Year	Hours/Year
As needed	As needed	As needed	500

Seasonal variations (Months) From to

If variations exist, describe them

2. Fuel – Emergency Generator (S004)

Type	Quantity Hourly	Annually	Sulfur	% Ash (Weight)	BTU Content
Oil Number ______	GPH @ 60°F	X 10^3 Gal	% by wt		Btu/Gal. & Lbs./Gal. @ 60 °F
Oil Number ______	GPH @ 60°F	X 10^3 Gal	% by wt		Btu/Gal. & Lbs./Gal. @ 60 °F
Natural Gas	5,699 SCFH	2.8 X 10^6 SCF	NA grain/100 SCF	NA	1,030 Btu/SCF
Gas (other) ______	SCFH	X 10^6 SCF	grain/100 SCF		Btu/SCF
Coal ______	TPH	Tons	% by wt		Btu/lb
Other * ______					
______					
______					

*Note: Describe and furnish information separately for other fuels in Addendum B.

Section B - Processes Information (Continued)

3. Burner N/A		
Manufacturer	Type and Model No.	Number of Burners
Description:		
Rated Capacity	Maximum Capacity	

4. Process Storage Vessels – Produced Fluids Tank (S005)		
A. For Liquids:		
Name of material stored Produced Fluids (from the pipeline)		
Tank I.D. No. S005	Manufacturer Tank Builders Inc (TBL)	Date Installed TBD
Maximum Pressure ~0.28 psia	Capacity (gallons/Meter^3) 1,000 gallons	
Type of relief device (pressure set vent/conservation vent/emergency vent/open vent) Pressure set vent		
Relief valve/vent set pressure (psig) 0.75	Vapor press. of liquid at storage temp. (psia/kPa) < 1.5 psia	
Type of Roof: Describe: Vertical Fixed Roof		
Total Throughput Per Year 24,000 gallons/year	Number of fills per day (fill/day): varies Filling Rate (gal./min.): varies Duration of fill hr./fill): varies	

4. Process Storage Vessels – Engine Oil Tank (S006)		
A. For Liquids:		
Name of material stored Engine Oil		
Tank I.D. No. S006	Manufacturer TBD	Date Installed TBD
Maximum Pressure ~0.0075 psia	Capacity (gallons/Meter^3) 500 gallons	
Type of relief device (pressure set vent/conservation vent/emergency vent/open vent) Pressure set vent		
Relief valve/vent set pressure (psig) Est. < 1 psig	Vapor press. of liquid at storage temp. (psia/kPa) Negligible	
Type of Roof: Describe: Horizontal Tank		
Total Throughput Per Year 6,000 gallons	Number of fills per day (fill/day): varies Filling Rate (gal./min.): varies Duration of fill hr./fill): varies	

4. Process Storage Vessels – TEG Tank (S007)			
A. For Liquids:			
Name of material stored Triethylene Tank			
Tank I.D. No. S007	Manufacturer TBD		Date Installed TBD
Maximum Pressure ~0.001 psia		Capacity (gallons/Meter^3) 500 gallons	
Type of relief device (pressure set vent/conservation vent/emergency vent/open vent) Pressure set vent			
Relief valve/vent set pressure (psig) Est. < 1 psig		Vapor press. of liquid at storage temp. (psia/kPa) Negligible	
Type of Roof: Describe: Horizontal Tank			
Total Throughput Per Year 6,000 gallons		Number of fills per day (fill/day): varies Filling Rate (gal./min.): varies Duration of fill hr./fill): varies	

5. Request for Confidentiality
Do you request any information on this application to be treated as "Confidential"? ☐ Yes ☒ No If yes, include justification for confidentiality. Place such information on separate pages marked **"confidential"**.

Section B - Processes Information (Continued)

6. Miscellaneous Information

Attach flow diagram of process giving all (gaseous, liquid and solid) flow rates. Also, list all raw materials charged to process equipment, and the amounts charged (tons/hour, etc.) at rated capacity (give maximum, minimum and average charges describing fully expected variations in production rates). Indicate (on diagram) all points where contaminants are controlled (location of water sprays, collection hoods, or other pickup points, etc.). Describe collection hoods location, design, airflow and capture efficiency. Describe any restriction requested and how it will be monitored.

See process flow diagram

Describe fully the facilities provided to monitor and to record process operating conditions, which may affect the emission of air contaminants. Show that they are reasonable and adequate.

Hours of operation will be monitored for all engines. Engine operating parameters such as RPM, percent load and fuel usage may be monitored for normal operating ranges while the station is manned.

Describe each proposed modification to an existing source.

NA

Identify and describe all fugitive emission points, all relief and emergency valves and any by-pass stacks.

Based on preliminary estimates, there will be a total of 279 valves, 1,596 connectors, 798 flanges, 45 open ended lines and 30 other miscellaneous fugitive emission points in the entire facility following the completion of this proposed project. The emissions from these points have been estimated in the site-wide emissions calculations.

Describe how emissions will be minimized especially during start up, shut down, process upsets and/or disruptions.

As the catalyst must be heated to a certain temperature before it reaches its rated reduction efficiency, emissions may be greater during startup of reciprocating engines. To ensure emissions will be minimized, the engines will be operated in accordance with manufacturer's specifications or recommendations.

There is no reason to anticipate excess emissions during shutdown of engines. The only reasonably anticipated upset condition would be malfunction of the catalyst. If such an upset were to occur, the engine would be shutdown until the catalyst was repaired or replaced.

In addition, all sources at the station will be operated in accordance with good engineering practices, according to manufacturer's specifications and in a manner which minimizes air pollution.

Anticipated Milestones:

i. Expected commencement date of construction/reconstruction/installation: Q4 2018
ii. Expected completion date of construction/reconstruction/installation: As soon as possible
iii. Anticipated date of start-up: 2019

Section C - Air Cleaning Device

1. Precontrol Emissions* – Compressor Engine (S001, S002 and S003)

Pollutant	Maximum Emission Rate - (each)				Calculation/ Estimation Method
	Specify Units	Pounds/Hour	Hours/Year	Tons/Year	
PM	0.01 lb/MMBtu	0.14	8,760	0.63	AP-42
PM_{10}	0.01 lb/MMBtu	0.14	8,760	0.63	AP-42
SO_x	0.001 lb/MMBtu	0.01	8,760	0.04	AP-42
CO	2.49 g/bhp-hr	10.29	8,760	45.08	Manufacturer
NO_x	0.3 g/bhp-hr	1.24	8,760	5.43	Manufacturer
VOC (NMNEHC)	0.32 g/bhp-hr	1.32	8,760	5.79	Manufacturer
Others: (e.g., HAPs)	-----	-----	-----	-----	-----
Formaldehyde	0.19 g/bhp-hr	0.79	8,760	3.44	Manufacturer

Emissions are based on current design. Final specifications will be at least equivalent.

* These emissions must be calculated based on the requested operating schedule and/or process rate, e.g., operating schedule for maximum limits or restricted hours of operation and/or restricted throughput. Describe how the emission values were determined. Attach calculations.

Section C - Air Cleaning Device (Continued)

10. ☐ **Selective Catalytic Reduction (SCR)**
☐ **Selective Non-Catalytic Reduction (SNCR)**
☒ **Non-Selective Catalytic Reduction (NSCR)**

Equipment Specifications

Manufacturer	Type	Model No.
Cummins	GTA28	523 kW

Design Inlet Volume (SCFM)	Design operating temperature (°F)
3,513 (actual)	1,227

Is the system equipped with process controls for proper mixing/control of the reducing agent in gas stream? If yes, give details.

Nonselective catalytic reduction uses a catalyst reaction to simultaneously reduce NOx, CO, and hydrocarbon (HC) to water, carbon dioxide, and nitrogen.

Attach efficiency and other pertinent information (e.g., ammonia slip)

Attached the generator set specifications

Operating Parameters

Volume of gases handled 3,513 (ACFM) @ 1,227 °F

Operating temperature range for the SCR/SNCR/NSCR system (°F) From 850 °F To 1250 °F

Reducing agent used, if any	Oxidation catalyst used, if any
None	Yes

State expected range of usage rate and concentration.

Catalyst reaction is continuous.

Service life of catalyst	Ammonia slip (ppm)
~2 years	N/A

Describe fully with a sketch giving locations of equipment, controls systems, important parameters and method of operation.

Nonselective catalytic reduction (NSCR) is an add-on NOx control technology for exhaust streams with low O2 content. Nonselective catalytic reduction uses a catalyst reaction to simultaneously reduce NOx, CO, and hydrocarbon (HC) to water, carbon dioxide, and nitrogen. The catalyst is usually a noble metal.

Describe the warning/alarm system that protects against operation when unit is not meeting design requirements.

The unit is guaranteed to meet the removal efficiency below throughout the unit's lifetime.

Emissions Data

Pollutant	Inlet	Outlet	Removal Efficiency (%)
NOx	~10.0 g/bhp-hr	2.0 g/bhp-hr	~80%
CO	~10.9 g/bhp-hr	4.0 g/bhp-hr	~60%

Section C - Air Cleaning Device (Continued)

11. Oxidizer/Afterburners – Oxidation Catalysts for Compressor Engines (S001 to S003)

Equipment Specifications

Manufacturer DCL	Type ☐ Thermal ☒ Catalytic	Model No. DC66-18 CC **(or equivalent)**
Design Inlet Volume (SCFM) ~11,972 CFM	Combustion chamber dimensions (length, cross-sectional area, effective chamber volume, etc.) NA	

Describe design features, which will ensure mixing in combustion chamber.

Oxidation catalysts consist of a substrate made up of thousands of small channels. Each channel is coated with a highly porous layer containing precious metal catalysts, such as platinum or palladium. As exhaust gas travels down the channel, hydrocarbons and carbon monoxide react with oxygen within the porous catalyst layer to form carbon dioxide and water vapor. The resulting gases then exit the channels and flow through the rest of the exhaust system.

Describe method of preheating incoming gases (if applicable). NA	Describe heat exchanger system used for heat recovery (if applicable). NA

Catalyst used See above	Life of catalyst 1 year or 8,760 operating hours	Expected temperature rise across catalyst (°F) Unknown	Dimensions of bed (in inches). Height: ~34" Diameter or Width: ~18" Depth: ~3.5"

Are temperature sensing devices being provided to measure the temperature rise across the catalyst? ☐ Yes ☒ No

If yes, describe.

Describe any temperature sensing and/or recording devices (including specific location of temperature probe in a drawing or sketch.

Burner Information

Burner Manufacturer NA	Model No.	Fuel Used
Number and capacity of burners	Rated capacity (each)	Maximum capacity (each)

Describe the operation of the burner	Attach dimensioned diagram of afterburner

Operating Parameters

Inlet flow rate (ACFM) 11,972 @ 812 °F	Outlet flow rate (ACFM) 11,972 (21857 lb/hr wet) @ 847 to 947 °F
State pressure drop range across catalytic bed (in. of water). 3.6	Describe the method adopted for regeneration or disposal of the used catalyst. Catalyst may be cleaned periodically, or when performance declines.

Describe the warning/alarm system that protects against operation when unit is not meeting design requirements.

As good practice, a high-temperature shutdown control or alarm may be in place to shut the engine down or warn the operator should the inlet exhaust temperature to the oxidation catalyst(s) approach a critical temperature.

Emissions Data			
Pollutant	**Inlet**	**Outlet**	**Removal Efficiency (%)**
CO	2.49 g/bhp-hr	0.17 g/bhp-hr	≥93%
NMNEHC (Non-methane non-ethane hydrocarbons excluding HCHO)	0.32 g/bhp-hr	0.16 g/bhp-hr	~50%
HCHO	0.19 g/bhp-hr	0.04 g/bhp-hr	~80%

Section C - Air Cleaning Device (Continued)

12. Flares N/A

Equipment Specifications

Manufacturer	Type ☐ Elevated flare ☐ Ground flare ☐ Other ____________ Describe	Model No.
Design Volume (SCFM)	Dimensions of stack (ft.) Diameter ________ Height ____________	
Residence time (sec.) and outlet temperature (°F) (minimum)	Turn down ratio	Burner details

Describe the flare design (air/steam-assisted or nonassisted), essential auxiliaries including pilot flame monitor of proposed flare with a sketch.

Describe the operation of the flare's ignition system.

Describe the provisions to introduce auxiliary fuel to the flare.

Operation Parameters

Detailed composition of the waste gas	Heat content	Exit velocity
Maximum and average gas flow burned (ACFM)	Operating temperature (°F)	

Describe the warning/alarm system that protects against operation when unit is not meeting design requirements.

Emissions Data

Pollutant	Inlet (tpy)	Outlet (tpy)	Removal Efficiency (%)

Section C - Air Cleaning Device (Continued)

13. Other Control Equipment N/A

Equipment Specifications

Manufacturer	Type	Model No.

Design Volume (SCFM)	Capacity

Describe pH monitoring and pH adjustment, if any.

Indicate the liquid flow rate and describe equipment provided to measure pressure drop and flow rate, if any.

Attach efficiency curve and/or other efficiency information.

Attach any additional date including auxiliary equipment and operation details to thoroughly evaluate the control equipment.

Operation Parameters

Volume of gas handled

_______________ ACFM @ _________________°F _______________% Moisture

Describe fully giving important parameters and method of operation.

Describe the warning/alarm system that protects against operation when unit is not meeting design requirements.

Emissions Data

Pollutant	Inlet	Outlet	Removal Efficiency (%)

Section C - Air Cleaning Device (Continued)

14. Costs N/A

Indicate cost associated with air cleaning device and its operating cost (attach documentation if necessary)

Device	Direct Cost	Indirect Cost	Total Cost	Annual Operating Cost

15. Miscellaneous

Describe in detail the removal, handling and disposal of dust, effluent, etc. from the air cleaning device including proposed methods of controlling fugitive emissions.

Non Applicable.

Attach manufacturer's performance guarantees and/or warranties for each of the major components of the control system (or complete system).

See Attached Specifications and Guarantees under Attachment C.

Attach the maintenance schedule for the control equipment and any part of the process equipment that if in disrepair would increase air contaminant emissions.

Adelphia will conduct maintenance on all control equipment as recommended by the respective manufacturer.

Section D - Additional Information

Will the construction, modification, etc. of the sources covered by this application increase emissions from other sources at the facility? If so, describe and quantify.

No - this is a greenfield construction project

If this project is subject to any one of the following, attach a demonstration to show compliance with applicable standards.

a. Prevention of Significant Deterioration permit (PSD), 40 CFR 52?	☐ YES	☒ NO
b. New Source Review (NSR), 25 Pa. Code Chapter 127, Subchapter E?	☐ YES	☒ NO
c. New Source Performance Standards (NSPS), 40 CFR Part 60? (If Yes, which subpart) JJJJ, OOOOa	☒ YES	☐ NO
d. National Emissions Standards for Hazardous Air Pollutants (NESHAP), 40 CFR Part 61? (If Yes, which subpart) ______	☐ YES	☒ NO
e. Maximum Achievable Control Technology (MACT) 40 CFR Part 63? (If Yes, which subpart) ZZZZ	☒ YES	☐ NO

Attach a demonstration showing that the emissions from any new sources will be the minimum attainable through the use of best available technology (BAT).

Please see Section 4 of Application Report.

Provide emission increases and decreases in allowable (or potential) and actual emissions within the last five (5) years for applicable PSD pollutant(s) if the facility is an existing major facility (PSD purposes).

N/A

Section D - Additional Information (Continued)

Indicate emission increases and decreases in tons per year (tpy), for volatile organic compounds (VOCs) and nitrogen oxides (NOx) for NSR applicability since January 1, 1991 or other applicable dates (see other applicable dates in instructions). The emissions increases include all emissions including stack, fugitive, material transfer, other emission generating activities, quantifiable emissions from exempted source(s), etc.

Permit number (if applicable)	Date issued	Indicate *Yes* or *No* if emission increases and decreases were used previously for netting	Source I. D. or Name	VOCs		NOx	
				Emission increases in potential to emit (tpy)	Creditable emission decreases in actual emissions (tpy)	Emission increases in potential to emit (tpy)	Creditable emission decreases in actual emissions (tpy)
N/A							

If the source is subject to 25 Pa. Code Chapter 127, Subchapter E, New Source Review requirements,

a. Identify Emission Reduction Credits (ERCs) for emission offsets or demonstrate ability to obtain suitable ERCs for emission offsets. N/A

b. Provide a demonstration that the lowest achievable emission rate (LAER) control techniques will be employed (if applicable). N/A

c. Provide an analysis of alternate sites, sizes, production processes and environmental control techniques demonstrating that the benefits of the proposed source outweigh the environmental and social costs (if applicable). N/A

Attach calculations and any additional information necessary to thoroughly evaluate compliance with all the applicable requirements of Article III and applicable requirements of the Clean Air Act adopted thereunder. The Department may request additional information to evaluate the application such as a standby plan, a plan for air pollution emergencies, air quality modeling, etc.

Section E - Compliance Demonstration (Compressor Engines - S001 to S003)

Note: Complete this section if source is not a Title V facility. Title V facilities must complete Addendum A.

Method of Compliance Type: Check all that apply and complete all appropriate sections below

☒ Monitoring ☒ Testing ☒ Reporting

☒ Recordkeeping ☐ Work Practice Standard

Monitoring:

a. Monitoring device type (Parameter, CEM, etc): Adelphia will track hours of operation of the compressor engines with a SCADA system as well as fuel using gas meters.

b. Monitoring device location: Fuel will be monitored via a master gas meter (for the site) as well as individual compressor engine meters.

c. Describe all parameters being monitored along with the frequency and duration of monitoring each parameter:

Fuel and operation will be continuously monitored using the instrumentation noted above.

Testing:

a. Reference Test Method: Citation 40 CFR 60.4243(b)(2)(ii) requires initial performance testing as well as subsequent compliance testing every 8,760 hours or three years, whichever comes first. Testing to be conducted in accordance with 40 CFR 60.4244.

b. Reference Test Method: Description EPA approved test methods - 7E (NOx concentration), 10 (CO concentration), 25A/320 (NMHC concentration), and 19 (exhaust mass emissions rate)

Recordkeeping:

Describe what parameters will be recorded and the recording frequency:

Records of all notifications submitted to comply with NSPS Subpart JJJJ, records of maintenance conducted on the engine and performance testing reports maintained in accordance with 40 CFR 60.4245(a).

Compressor engine fuel and hours of operation will be recorded on a calendar month basis.

Reporting:

a. Describe what is to be reported and frequency of reporting:

Initial Notification of the date construction commences no later than 30 days after such date in accordance with 40 CFR 60.7(a)(1) and 60.4245 (c) and performance testing results within 60 days of test completion in accordance with 40 CFR 60.4245(d).

b. Reporting start date: 60 days after first performance test

Work Practice Standard:

Describe each: Prepare and adhere to a maintenance plan to maintain and operate the engine, to the extent practicable, in a manner consistent with good air pollution control practices for minimizing emissions as required by 40 CFR 60.4243(b)(2)(ii).

Section F - Flue and Air Contaminant Emissions – Compressor Engine (S001 to S003)

1. Estimated Atmospheric Emissions* Post-Control @ 8760 hrs/yr (Each Engine)

Pollutant	Maximum emission rate			Calculation/ Estimation Method
	specify units	lbs/hr	tons/yr.	
PM	0.01 lb/MMBtu	0.14	0.63	AP-42
PM_{10}	0.01 lb/MMBtu	0.14	0.63	AP-42
SO_x	0.001 lb/MMBtu	0.01	0.04	AP-42
CO	0.17 g/bhp-hr	0.72	3.16	Vendor Guarantee
NO_x	0.30 g/bhp-hr	1.24	5.43	Vendor Guarantee
VOC (including formaldehyde	0.20 g/bhp-hr	0.82	3.58	Vendor Guarantee
Others: (e.g., HAPs)	-----	-----	-----	-----
Formaldehyde	0.04 g/bhp-hr	0.16	0.69	Vendor Guarantee

Final design specifications will be, at least, equivalent to those listed here.

* These emissions must be calculated based on the requested operating schedule and/or process rate e.g., operating schedule for maximum limits or restricted hours of operation and /or restricted throughput. Describe how the emission values were determined. Attach calculations.

2. Stack and Exhauster

Stack Designation/Number P001 – P003

List Source(s) or source ID exhausted to this stack: Three (3) CAT G3606 Compressor Engines (one stack per engine)	% of flow exhausted to stack: 100

Stack height above grade (ft.) ~30 Grade elevation (ft.) ~555	Stack diameter (ft) or Outlet duct area (sq. ft.) ~1.4	f. Weather Cap ☐ YES ☒ NO

Distance of discharge to nearest property line (ft.). Locate on topographic map.

TBD~30

Does stack height meet Good Engineering Practice (GEP)?

Yes

If modeling (estimating) of ambient air quality impacts is needed, attach a site plan with buildings and their dimensions and other obstructions. NA

Location of stack** Latitude/Longitude Point of Origin	Latitude			Longitude		
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds

Stack exhaust
Volume 11,972 ACFM   Temperature 847 °F   Moisture TBD, Design ongoing %

Indicate on an attached sheet the location of sampling ports with respect to exhaust fan, breeching, etc. Give all necessary dimensions.
TBD, design ongoing

Exhauster (attach fan curves) ________ in. of water ________ HP @ ________RPM.

** If the data and collection method codes differ from those provided on the General Information Form-Authorization Application, provide the additional detail required by that form on a separate form.

Section F - Flue and Air Contaminant Emissions – Emergency Generator (S004)

1. Estimated Atmospheric Emissions* Emergency Generator @ 500 hrs/yr

Pollutant	Maximum emission rate			Calculation/ Estimation Method
	specify units	lbs/hr	tons/yr.	
PM	9.50E-3 lb/MMbtu	0.11	0.03	AP-42
PM_{10}	9.50E-3 lb/MMbtu	0.11	0.03	AP-42
SO_x	0.003 lb/MMBtu	<0.01	<0.01	AP-42
CO	4.0 g/bhp-hr	6.18	1.55	Manufacturer's Spec
NO_x	2.0 g/bhp-hr	3.09	0.77	Manufacturer's Spec
VOC (including formaldehyde)	1.0 g/bhp-hr + formaldehyde	1.67	0.42	Manufacturer's Spec and AP-42
Others: (e.g., HAPs)	-----	-----	-----	-----
Formaldehyde	2.05E-02 lb/MMBtu	0.12	0.03	AP-42

Final design specifications will be, at least, equivalent to those listed here.

* These emissions must be calculated based on the requested operating schedule and/or process rate e.g., operating schedule for maximum limits or restricted hours of operation and /or restricted throughput. Describe how the emission values were determined. Attach calculations.

2. Stack and Exhauster

Stack Designation/Number P-004

List Source(s) or source ID exhausted to this stack:
One (1) Emergency Generator (S004)

% of flow exhausted to stack: 100

Stack height above grade (ft.) ~6
Grade elevation (ft.) ~560

Stack diameter (ft) or Outlet duct area (sq. ft.)
~1

f. Weather Cap
☐ YES ☒ NO

Distance of discharge to nearest property line (ft.). Locate on topographic map.

~30

Does stack height meet Good Engineering Practice (GEP)?
Yes

If modeling (estimating) of ambient air quality impacts is needed, attach a site plan with buildings and their dimensions and other obstructions. NA

Location of stack** Latitude/Longitude Point of Origin	Latitude			Longitude		
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds

Stack exhaust

Volume 3,513 ACFM Temperature 1,227 °F Moisture TBD, Design ongoing %

Indicate on an attached sheet the location of sampling ports with respect to exhaust fan, breeching, etc. Give all necessary dimensions.
TBD, design ongoing

Exhauster (attach fan curves) ____________________ in. of water ______________ HP @ ______________RPM.

** If the data and collection method codes differ from those provided on the General Information Form-Authorization Application, provide the additional detail required by that form on a separate form.

Company Name: **Adelphia Pipeline Company, LLC**
Facility Name: **Quakertown Compressor Station**
Project Description: **Plan Approval Emissions Calculations**

TABLE B-1. Internal Combustion (IC) Engine Emissions Calculations

Engine Information:

Source ID:	S001-S003
Manufacturer:	Caterpillar
Model No.:	G3606
Stroke Cycle:	4-stroke
Type of Burn:	Lean
Rated Horsepower (bhp) each:	1,875
Control Device:	Oxidation Catalyst
Stack Designation:	P001-P003
Number of Units:	3

Engine Fuel Information:

	Per Unit
Fuel Type:	Natural Gas
Higher Heating Value (HHV) (Btu/scf):	1,030
Specific Fuel Consumption (Btu/bhp-hr):	7,666
Maximum Fuel Consumption at 100% Load (scf/hr):	13,955
Engine Exhaust flow rate (cfm)	11,972
Heat Input (MMBtu/hr):	14.37
Potential Fuel Consumption (MMBtu/yr):	125,914
Max. Fuel Consumption (MMscf/yr):	122.2
Max. Annual Hours of Operation (hr/yr):	8,760

Engine Emissions Data:

Pollutant	Emission Factor	Units	Potential Emissions Per Unit		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
NO_X	0.30	g/bhp-hr	1.24	5.43	Manufacturer's Specifications
NMNEHC (Excludes HCHO)	0.16	g/bhp-hr	0.66	2.90	Vendor Guarantee
VOC (NMNEHC + Formaldehyde)	---	---	0.82	3.58	Vendor Guarantee (NMNEHC + HCHO)
CO	0.17	g/bhp-hr	0.72	3.16	Vendor Guarantee (93% control)
SO_X	0.001	lb/MMBtu	0.01	0.04	AP-42, Table 3.2-2 (Aug-2000)
PM_{10}	0.01	lb/MMBtu	0.14	0.63	AP-42, Table 3.2-2 (Aug-2000)
$PM_{2.5}$	0.01	lb/MMBtu	0.14	0.63	AP-42, Table 3.2-2 (Aug-2000)
Formaldehyde (HCHO)	0.04	g/bhp-hr	0.16	0.69	Vendor Guarantee
GHG (CO_2e)	See Table Below		2,359	10,333.13	Man. Specs. And 40 CFR 98, Table C-2
Other (Total HAP)	See Table Below		0.44	1.91	AP-42, Table 3.2-2 (Aug-2000)

Notes:
1. PM_{10} and $PM_{2.5}$ are total values (filterable + condensable).
2. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 25) + N_2O (GWP = 298).
3. Total HAP is the summation of all hazardous air pollutants for which there is a published emission factor for this source type
4. Vendor/manufacturer data are based on preliminary design. Bidding is still in process and as such emissions are current estimate and will be at least equivalent to final specifications

Greenhouse Gas (GHG) & Hazardous Air Pollutant (HAP) Emissions Calculations:

Pollutant	Emission Factor	Units	Potential Emissions Per Unit		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
GHGs:					
CO_2	454	g/bhp-hr	1876.65	8219.74	Manufacturer's Specifications
CH_4	4.66	g/bhp-hr	19.26	84.37	Manufacturer's Specifications (THC-NMHC)
N_2O	0.0001	kg/MMBtu	0.00	0.01	40 CFR 98, Table C-2
GHG (CO_2e)			**2,359**	**10,333**	
Organic HAPs:					
1,1,2,2-Tetrachloroethane	4.00E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
1,1,2-Trichloroethane	3.18E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
1,3-Butadiene	2.67E-04	lb/MMBtu	0.00	0.02	AP-42, Table 3.2-2 (Aug-2000)
1,3-Dichloropropene	2.64E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
2-Methylnaphthalene	3.32E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
2,2,4-Trimethlpentane	2.50E-04	lb/MMBtu	0.00	0.02	AP-42, Table 3.2-2 (Aug-2000)
Acenaphthene	1.25E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Acenaphthylene	5.53E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Acetaldehyde	8.36E-03	lb/MMBtu	0.12	0.53	AP-42, Table 3.2-2 (Aug-2000)
Acrolein	5.14E-03	lb/MMBtu	0.07	0.32	AP-42, Table 3.2-2 (Aug-2000)
Benzene	4.40E-04	lb/MMBtu	0.01	0.03	AP-42, Table 3.2-2 (Aug-2000)
Benzo(b)fluoranthene	1.66E-07	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Benzo(e)pyrene	4.15E-07	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Benzo(g,h,i)perylene	4.14E-07	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Biphenyl	2.12E-04	lb/MMBtu	0.00	0.01	AP-42, Table 3.2-2 (Aug-2000)
Carbon Tetrachloride	3.67E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Chlorobenzene	3.04E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Chloroform	2.85E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Chrysene	6.93E-07	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Ethylbenzene	3.97E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Ethylene Dibromide	4.43E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Fluoranthene	1.11E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Fluorene	5.67E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Methanol	2.50E-03	lb/MMBtu	0.04	0.16	AP-42, Table 3.2-2 (Aug-2000)
Methylene Chloride	2.00E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
n-Hexane	1.11E-03	lb/MMBtu	0.02	0.07	AP-42, Table 3.2-2 (Aug-2000)
Naphthalene	7.44E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
PAH	2.69E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Phenanthrene	1.04E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Phenol	2.40E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Pyrene	1.36E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Styrene	2.36E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Tetrachloroethane	2.48E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Toluene	4.08E-04	lb/MMBtu	0.01	0.03	AP-42, Table 3.2-2 (Aug-2000)
Vinyl Chloride	1.49E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Xylene	1.84E-04	lb/MMBtu	0.00	0.01	AP-42, Table 3.2-2 (Aug-2000)
Total HAP			**0.44**	**1.91**	

Company Name: Adelphia Pipeline Company, LLC
Facility Name: Quakertown Compressor Station
Project Description: Plan Approval Emissions Calculations

TABLE B-2. Generator Engine Emissions Calculations

Engine Information:

Source ID:	GEN-001
Manufacturer:	Cummins
Model No.:	GTA28
Stroke Cycle:	4-stroke
Type of Burn:	Rich
Rated Horsepower (bhp):	701

Engine Fuel Information:

Fuel Type:	Natural Gas
Higher Heating Value (HHV) (Btu/scf):	1,030
Specific Fuel Consumption (Btu/bhp-hr):	8,373
Max. Fuel Consumption at 100% (scf/hr):	5,699
Heat Input (MMBtu/hr):	5.87
Potential Fuel Consumption (MMBtu/yr):	2,935
Max. Fuel Consumption at 100% (MMscf/hr):	0.0057
Max. Fuel Consumption (MMscf/yr):	2.8
Max. Annual Hours of Operation (hr/yr):	500

Engine Emissions Data:

Pollutant	Post-Control Emissions		Maximum Potential Emissions		Estimation Basis / Emission Factor Source
	Emission Factor	Units	lbs/hr	tpy	
NO_X	2.00	g/bhp-hr	3.09	0.77	Manufacturer's Specifications
NMNEHC as propane (excludes HCHO)	1.00	g/bhp-hr	1.55	0.39	Manufacturer's Specifications
VOC (NMNEHC + Formaldehyde)	---	---	1.67	0.42	Manufacturer Specification (NMNEHC) + HCHO(AP-42)
CO	4.00	g/bhp-hr	6.18	1.55	Manufacturer's Specifications
SO_X	0.001	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
PM_{10}	0.02	lb/MMBtu	0.11	0.03	AP-42, Table 3.2-3 (Aug-2000)
$PM_{2.5}$	0.02	lb/MMBtu	0.11	0.03	AP-42, Table 3.2-3 (Aug-2000)
Formaldehyde (HCHO)	0.02	lb/MMBtu	0.12	0.03	AP-42, Table 3.2-3 (Aug-2000)
GHG (CO_2e)	See Table Below		857	214	40 CFR 98 and Manufacturer
Other (Total HAP, incl. HCHO)	See Table Below		0.19	0.05	AP-42, Table 3.2-3 (Aug-2000)

Notes:
1. PM_{10} and $PM_{2.5}$ are total values (filterable + condensable).
2. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 25) + N_2O (GWP = 298).
3. Total HAP is the summation of all hazardous air pollutants for which there is a published emission factor for this source type
4. Vendor/manufacturer data are based on preliminary design. Bidding is still in process and as such emissions are current estimate and will be at least equivalent to final specifications.

Greenhouse Gas (GHG) Emissions Calculations:

Pollutant	Emission Factor	Units	Maximum Potential Emissions		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
GHGs:					
CO_2	53.06	kg/MMBtu	687	172	40 CFR 98, Table C-1
CH_4	4.400	g/bhp-hr	6.80	1.70	Manufacturer's Specifications
N_2O	0.0001	kg/MMBtu	0.00	0.00	40 CFR 98, Table C-2
GHG (CO_2e)			857	214	

Hazardous Air Pollutant (HAP) Emissions Calculations:

Pollutant	Emission Factor	Units	Maximum Potential Emissions		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
Organic HAPs:					
1,1,2,2-Tetrachloroethane	2.53E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
1,1,2-Trichloroethane	1.53E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
1,3-Butadiene	6.63E-04	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
1,3-Dichloropropene	1.27E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Acetaldehyde	2.79E-03	lb/MMBtu	0.02	0.00	AP-42, Table 3.2-3 (Aug-2000)
Acrolein	2.63E-03	lb/MMBtu	0.02	0.00	AP-42, Table 3.2-3 (Aug-2000)
Benzene	1.58E-03	lb/MMBtu	0.01	0.00	AP-42, Table 3.2-3 (Aug-2000)
Carbon Tetrachloride	1.77E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Chlorobenzene	1.29E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Chloroform	1.37E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Ethylbenzene	2.48E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Ethylene Dibromide	2.13E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Methanol	3.06E-03	lb/MMBtu	0.02	0.00	AP-42, Table 3.2-3 (Aug-2000)
Methylene Chloride	4.12E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Naphthalene	9.71E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
PAH	1.41E-04	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Styrene	1.19E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Toluene	5.58E-04	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Vinyl Chloride	7.18E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Xylene	1.95E-04	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Total HAP (Excluding HCHO)			**0.07**	**0.02**	

Example Calculations:

Emission Rate (lbs/hr) = EF (g/bhp-hr) * Engine Power (hp) ÷ 453.592 (grams/lb)

Emission Rate (lbs/hr) = EF (lb/MMBtu) * Engine Heat Input (MMBtu/hr)

Emission Rate (lbs/hr) = EF (kg/MMBtu) * Engine Heat Input (MMBtu/hr) * 2.205 (lb/kg)

Emission Rate (tpy) = Emissions (lb/hr) * (hrs/yr) ÷ 2,000 (lbs/ton)

Company Name: **Adelphia Pipeline Company, LLC**
Facility Name: **Quakertown Compressor Station**
Project Description: **Plan Approval Emissions Calculations**

TABLE B-3. Storage Tank Emissions Calculations - Produced Fluids Tank

Storage Tank Information:

Source ID:	S005
Tank Capacity (gallons):	1,000
Tank Contents:	Produced Fluids
Annual Throughput (gallons/year):	24,000
Daily Throughput (bbl/day)	2
Percent Condensate	5%
Condensate Throughput (bbl/day)	0.1
Control Type:	None
Control Efficiency:	N/A
Max. Annual Hours of Operation (hr/yr):	8,760

Tank Emissions Data:

Pollutant	Emissions		Emissions Estimation Method
	lbs/hr	tpy	
VOC	0.05	0.23	E&P TANK 2.0
HAPs	0.01	0.02	E&P TANK 2.0
GHG (CO2e)	0.03	0.15	E&P TANK 2.0

E & P Tanks Emissions Data:

Pollutant	Total Emissions (Working + Breathing + Flashing)		
	lbs/hr	lbs/yr	tpy
VOC	0.05	455.52	0.23
HAPs	0.01	43.80	0.02
GHG (CO_2e)	0.03	219.00	0.15

Notes:
1. E & P TANK software estimates working, breathing, and flashing losses and reports as one total. Emissions are based on a conservative estimate of 95 % water and 5% condensate
2. This tank does contain hydrocarbons that could be flashed off at tank operating conditions.

Company Name:	Adelphia Pipeline Company, LLC
Facility Name:	Quakertown Compressor Station
Project Description:	Plan Approval Emissions Calculations

TABLE B-4. Miscellaneous Storage Tank Emissions Calculations

Storage Tank Information:

Source ID:	S006	S007
Tank Capacity (gallons):	500	500
Tank Contents:	Engine Oil	TEG
Annual Throughput (gallons/year):	6,000	6,000
Control Type:	None	None
Control Efficiency:	N/A	N/A
Max. Annual Hours of Operation (hr/yr):	8,760	8,760

Emissions Data:

Pollutant	Total Emissions (Working + Breathing)		Total Emissions (Working + Breathing)	
	lbs/hr	tpy	lbs/hr	tpy
VOC	3.42E-05	1.50E-04	2.28E-06	1.00E-05
HAPs	3.42E-05	1.50E-04	2.28E-06	1.00E-05

Notes:
1. EPA TANKS software run for engine oil is using properties of distillate fuel oil #2.
2. EPA TANKS software run for TEG is using properties of propylene glycol.

Tank Emissions Data:

Pollutant	Total Emissions		Emissions Estimation Method
	lbs/hr	tpy	
VOC	3.65E-05	1.60E-04	EPA TANKS 4.0.9d
HAPs	3.65E-05	1.60E-04	EPA TANKS 4.0.9d
Methane	0.00	0.00	EPA TANKS 4.0.9d

Company Name: Adelphia Pipeline Company, LLC
Facility Name: Quakertown Compressor Station
Project Description: Plan Approval Emissions Calculations

TABLE B-5. Fugitive Emissions Calculations

Fugitive Component Information:

Component Type	Estimated Component Count	Gas Leak Emission Factor (lb/hr/component)	Factor Source	Average Gas Leak Rate (lb/hr)	Max Gas Leak Rate (tpy)	Potential VOC Emissions (tpy)	Potential HAP Emissions (tpy)
Connectors	1,596	0.0004	EPA Protocol, Table 2-4	0.70	3.39	0.27	0.00
Flanges	798	0.001	EPA Protocol, Table 2-4	0.69	3.31	0.26	0.00
Open-Ended Lines	45	0.004	EPA Protocol, Table 2-4	0.20	0.96	0.08	0.00
Pump Seals	6	0.005	EPA Protocol, Table 2-4	0.03	0.15	0.01	0.00
Valves	279	0.010	EPA Protocol, Table 2-4	2.77	13.34	1.05	0.00
Other	24	0.019	EPA Protocol, Table 2-4	0.47	2.24	0.18	0.00
Total				**4.85**	**23.38**	**1.84**	**0.00**

Notes:
1. "Other" equipment types include compressor seals, relief valves, diaphragms, drains, meters, etc
2. The component count is a preliminary estimate based on the proposed design of the station
3. Conservatively assumed that maximum leak rate is 10% greater than measured average leak rate for the purposes of establishing PTE
4. VOC and HAP emissions are based on fractions of these pollutants in the site-specific gas analysis

Rod Packing Emissions

Number of Compressors	Number of Rods Per Compressor	Leak Rate (scf/hr/rod)	Total Volume NG Emitted (scf/yr)	Potential VOC Emissions (tpy)	Potential HAP Emissions (tpy)	Potential CO_2 Emissions (tpy)	Potential CH_4 Emissions (tpy)	Potential CO_2e Emissions (tpy)
3	4	15	1,576,800	1.84	0.00	0.00	32.60	814.96
Total				**1.84**	**0.00**	**0.00**	**32.60**	**814.96**

1. Caterpillar does not publish specific crankcase and rodpacking emission leak rates. The leak rates are based on engineering estimates on the operation of the engines

Engine Crankcase Emissions

Number of Engines	Engine Rating (hp)	Leak Rate (scf/bhp-hr)	Total Volume NG Emitted (scf/yr)	Potential VOC Emissions (tpy)	Potential HCHO Emissions (tpy)	Potential HAP Emissions (tpy)	Potential CO_2 Emissions (tpy)	Potential CH_4 Emissions (tpy)	Potential CO_2e Emissions (tpy)
3	1,875	0.5	24,637,500	0.04	0.01	0.02	32.18	0.33	40.44
Total				**0.04**	**0.01**	**0.02**	**32.18**	**0.33**	**40.44**

Flow Rate of Engine[1] 11,972 ft^3/min

1. From Vendor data sheet

Engine Crankcase Exhaust Composition

Constituent	Engine Exhaust Emissions (tpy)	Composition of Exhaust Gas (lb/MMscf)
VOC	9	2.93
HCHO	3	1.09
Total HAP	5	1.48
CO_2	8,220	2,613
CH_4	84	26.82

VOC and HAP Vented Blowdown Emissions

Blowdown Emissions Sources	Vented Gas Volume Per Blowdown Event (scf)	Number of Blowdown Events per year	Total Volume NG Emitted (scf/yr)	Potential VOC Emissions (tpy)	Potential HAP Emissions (tpy)
Station ESD Vent	1,000,000	1	1,000,000	1.17	0.00
Pigging and Pipeline Blowdowns	8,000	2	16,000	0.02	0.00
Reciprocating Compressors	10,000	24	240,000	0.28	0.00
Total				1.47	0.00

Density of natural gas: 0.05 lb/ft^3 @ STP (www.engineeringtoolbox.com)

GHG Vented Blowdown Emissions

Blowdown Emissions Sources	Vented Gas Volume Per Blowdown Event (scf)	Number of Blowdown Events per year	Total Volume NG Emitted (scf/yr)	Potential CH_4 Emissions[1] (tpy)	Potential CO_2 Emissions[1] (tpy)	Potential CO_2e Emissions (tpy)
Station ESD Vent	1,000,000	1	1,000,000	20.67	0.00	517
Pigging and Pipeline Blowdowns	8,000	2	16,000	0.33	0.00	8
Reciprocating Compressors	10,000	24	240,000	4.96	0.00	124
Total				26.0	0.00	649

1. Calculated in accordance with Equations W-14 and W-35, and W-36 in Subpart W of 40 CFR 98

GHG Fugitive Emissions from Component Leaks:

Component Type	Estimated Component Count	GHG Emission Factor		CH_4 Emissions	CO_2 Emissions	CO_2e Emissions
		(scf/hr/component)	Factor Source	(tpy)	(tpy)	(tpy)
Connectors	1,596	0.004	40 CFR 98, Table W-1A	1.16	0.000	28.90
Flanges	798	0.004	40 CFR 98, Table W-1A	0.58	0.000	14.45
Open-Ended Lines	45	0.061	40 CFR 98, Table W-1A	0.50	0.000	12.43
Pump Seals	6	13.3	40 CFR 98, Table W-1A	14.45	0.000	361.30
Valves	279	0.03	40 CFR 98, Table W-1A	1.36	0.000	34.11
Other	24	0.04	40 CFR 98, Table W-1A	0.17	0.000	4.35
Total				18.22	0.00	455.54

Notes:

1. The component count is a preliminary estimate based on the proposed design of the station
2. CH_4 and CO_2 emissions are based on fractions of these pollutants in the site-specific gas analysis
3. Emissions are calculated in accordance with Equations W-31, W-35 and W-36 in Subpart W of 40 CFR 98
4. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CC_2 (GWP = 1) + CH_4 (GWP = 25) + N_2O (GWP = 298).

Fugitive Component Emissions Data:

Pollutant	Atmospheric Emissions		Emissions Estimation Method
	lbs/hr	tpy	
VOC	1.18	5.19	EPA Protocol, Table 2-4 and Site-Specific Gas Analysis
HCHO	0.00	0.01	Concentration and Vented Volume
HAPs	0.00	0.02	EPA Protocol, Table 2-4 and Site-Specific Gas Analysis
CO_2	7.35	32.18	40 CFR 98, Table W-1A and Site-Specific Gas Analysis
CH_4	17.61	77.12	40 CFR 98, Table W-1A and Site-Specific Gas Analysis
GHG (CO_2e)	448	1,960	40 CFR 98, Table W-1A and Site-Specific Gas Analysis

Company Name: Adelphia Pipeline Company, LLC
Facility Name: Quakertown Compressor Station
Project Description: Plan Approval Emissions Calculations

TABLE B-6. Liquid Loading Emissions Calculations

Liquid Loading Information:

Parameter	Value	Description
S	1.45	saturation factor for splash loading (AP-42 Table 5.2-1)
Collection Efficiency	0%	
Control Efficiency	0%	
P	0.38	true vapor pressure of liquid loaded (psia) - TANKS Data
M	19.27	molecular weight of vapors (lb/lb-mol) - TANKS Data
T	517.0	temperature of liquids loaded (deg R) - TANKS Data

Description	Loading Losses	Maximum Throughput[2]	VOC Emissions	
	$(lb/10^3\ gal)$[1]	(gal)	(lb/hr)	(tpy)
Liquids Hauling	0.3	24,000	0.001	0.003

Notes:

1. Uncontrolled Loading Losses: $L_L\ (lb/10^3\ gal) = 12.46\ (SPM)/T$
2. Produced fluids throughput.

Company Name:	Adelphia Pipeline Company, LLC
Facility Name:	New Quakertown Meter Station
Project Description:	Adelphia Gateway Project

TABLE B-7. Fugitive Emissions Calculations

Fugitive Component Information:

Component Type	Component Count	Leak Emission Factor		Average Gas Leak Rate	Max Gas Leak Rate	Potential VOC Emissions	Potential HAP Emissions
		(lb/hr-component)	Service	(lb/hr)	(tpy)	(tpy)	(tpy)
Connectors	165	4.41E-04	Gas	0.07	0.32	0.03	0.00
Flanges	43	8.60E-04	Gas	0.04	0.16	0.01	0.00
Open-Ended Lines	6	4.41E-03	Gas	0.03	0.12	0.01	0.00
Pump Seals	0	5.29E-03	Gas	0.00	0.00	0.00	0.00
Valves	44	9.92E-03	Gas	0.44	1.91	0.15	0.00
Other	32	1.94E-02	Gas	0.62	2.72	0.21	0.00
Total				1.19	5.23	0.41	0.00

Notes:

1. All emission factors are from Table 2-4 of "Protocol for Equipment Leak Emission Estimates" (EPA-453/R-95-017, November 1995).
2. "Other" equipment types include compressor seals, relief valves, diaphragms, drains, meters, etc.
3. The component count is estimated based on proposed design.
4. VOC and HAP emissions are based on fractions of these pollutants in the site-specific gas analysis.

Constituent	Weight %
VOC	7.86
HAP	0.00

GHG Fugitive Emissions from Component Leaks:

Component Type	Component Count	GHG Emission Factor		CH_4 Emissions	CO_2 Emissions	CO_2e Emissions
		(scf/hr-component)	Service	(tpy)	(tpy)	(tpy)
Connectors	165	0.003	Gas	0.09	0.00	2.24
Flanges	43	0.003	Gas	0.02	0.00	0.58
Open-Ended Lines	6	0.061	Gas	0.07	0.00	1.66
Pump Seals	0	13.3	Gas	0.00	0.00	0.00
Valves	44	0.027	Gas	0.22	0.00	5.38
Other	32	0.04	Gas	0.23	0.00	5.80
Total				0.63	0.00	15.66

Notes:

1. All emission factors are from Table W-1A of 40 CFR 98 Subpart W (Eastern U.S. Region).
2. "Other" equipment types include compressor seals, relief valves, diaphragms, drains, meters, etc.
3. The component count is estimated based on proposed design.
4. CH_4 and CO_2 emissions are based on fractions of these pollutants in the site-specific gas analysis.
5. Emissions are calculated in accordance with Equations W-35 and W-36 in Subpart W of 40 CFR 98.
6. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 25) + N_2O (GWP = 298).

Constituent	Mole %
CH_4	97.68
CO_2	0.00

VOC/GHG Fugitive Emissions from Pneumatic Devices:

Component Type	Component Count	GHG Emission Factor		VOC Emissions	HAP Emissions	CH_4 Emissions	CO_2 Emissions	CO_2e Emissions
		(scf/hr-component)	Factor Source	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)
Pneumatic Devices	3	13.5	40 CFR 98	0.63	0.00	7.33	0.00	183.37
Total				0.63	0.00	7.33	0.00	183.37

Notes:

1. The component count is estimated based on proposed design.
2. VOC and HAP emissions are based on sum of the fractions of the pollutants in the site-specific gas analysis in those classifications, and are calculated in accordance with standard conversion methodology and factors.
3. CH_4 and CO_2 emissions are based on fractions of these pollutants in the site-specific gas analysis, and are calculated in accordance with Equations W-35 and W-36 in Subpart W of 40 CFR 98.
4. Emission Factor for Pneumatic Devices from 40 CFR 98, Subpart W (Table W-1A Intermittent Pneumatic Device Vents).
5. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 25) + N_2O (GWP = 298).

Constituent	Weight %
VOC	7.86
HAP	0.00
CH_4	91.68
CO_2	0.00

Fugitive Component Emissions Data:

Pollutant	Atmospheric Emissions		Emissions Estimation Method
	lbs/hr	tpy	
VOC	0.24	1.04	EPA Protocol, Table 2-4 and Site-Specific Gas Analysis
HAPs	0.00	0.00	EPA Protocol, Table 2-4 and Site-Specific Gas Analysis
GHG (CO_2e)	45	199	40 CFR 98, Table W-1A and Site-Specific Gas Analysis

Example Calculations:

Average gas leak rate (lb/hr) = gas leak emission factor (lb/hr-component) * number of components

Max gas leak rate (tpy) = Average gas leak rate (lb/hr) * 8,760 (hr/yr) ÷ 2,000 (lb/ton)

Potential emissions VOC/HAP (tpy) = Max gas leak rate (tpy) * Weight % VOC/HAP ÷ 100

Potential emissions VOC/HAP (tpy) = emission factor (scf/hr-component) * number of components * 8,760 (hr/yr) * Molar Weight of Gas (lb/lb-mol) * Wt. % VOC/HAP ÷ 100 ÷ 379 scf/lb-mol ÷ 2,000 (lb/ton

Potential emissions CH_4/CO_2 (tpy) = emission factor (scf/hr-component) * number of components * Mole % CH_4/CO_2 ÷ 100 * Density CH_4/CO_2 (kg/scf) * 1,000 (g/kg) ÷ 453.6 (g/lb) * 8,760 (hr/yr) ÷ 2,000 (lb/ton)

Company Name: **Adelphia Pipeline Company, LLC**
Facility Name: **New Quakertown Meter Station**
Project Description: **Adelphia Gateway Project**

TABLE B-8. Miscellaneous Gas Venting Emissions

Total Emissions from Gas Venting Sources:

Source	VOC Emissions (tpy)	HAP Emissions (tpy)	CH_4 Emissions (tpy)	CO_2 Emissions (tpy)	CO_2e Emissions (tpy)
Total Miscellaneous Gas Venting	0.24	0.00	2.85	0.00	71.32
Total	0.24	0.00	2.85	0.00	71.32

Emissions from Individual Sources:

Blowdown Type	Number of Events	Potential Gas Volume (scf/event)	Total Actual Gas Volume Emitted (scf/yr)	VOC Emissions (tpy)	HAP Emissions (tpy)	CH_4 Emissions (tpy)	CO_2 Emissions (tpy)	CO_2e Emissions (tpy)
Pig Launcher Receiver	1	88,000	88,000	0.16	0.00	1.82	0.00	45.48
Vessel Blowdowns	---	50,000	50,000	0.09	0.00	1.03	0.00	25.84
Total				0.24	0.00	2.85	0.00	71.32

Notes:
1. VOC and HAP emissions are based on sum of the fractions of the pollutants in the site-specific gas analysis in those classifications, and are calculated in accordance with standard engineering calculations (utilizing Equation W-14B from 40 CR 98 Subpart W where appropriate).
2. CH_4 and CO_2 emissions are based on fractions of these pollutants in the site-specific gas analysis, and are calculated in accordance with Equations W-35 and W-36 in Subpart W of 40 CFR 98.
3. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 25) + N_2O (GWP = 298).
4. The gas volume per event and number of events is conservatively estimated based on facility design and engineering personnel.
5. The number of pigging events conservatively assumes one time per year, when projections are for this to occur approximately every seven years.

Example Calculations:
Potential emissions VOC/HAP (tpy) = Gas volume vented (scf/yr) * Molar weight of natural gas (lb/lb-mol) * Weight % VOC/HAP ÷ 100 ÷ 379 (scf/lb-mol) ÷ 2,000 (lb/ton)
Potential emissions CH_4/CO_2 (tpy) = Gas volume vented (scf/yr) * Mole % CH_4/CO_2 ÷ 100 * Density CH_4/CO_2 (kg/scf) * 1,000 (g/kg) ÷ 453.6 (g/lb) ÷ 2,000 (lb/ton)

Company Name: **Adelphia Pipeline Company, LLC**
Facility Name: **Existing Quakertown Meter Station**
Project Description: **Adelphia Gateway Project**

TABLE B-9. Fugitive Emissions Calculations

Fugitive Component Information:

Component Type	Component Count	Leak Emission Factor		Average Gas Leak Rate	Max Gas Leak Rate	Potential VOC Emissions	Potential HAP Emissions
		(lb/hr-component)	Service	(lb/hr)	(tpy)	(tpy)	(tpy)
Connectors	325	4.41E-04	Gas	0.14	0.63	0.05	0.00
Flanges	71	8.60E-04	Gas	0.06	0.27	0.02	0.00
Open-Ended Lines	11	4.41E-03	Gas	0.05	0.21	0.02	0.00
Pump Seals	0	5.29E-03	Gas	0.00	0.00	0.00	0.00
Valves	90	9.92E-03	Gas	0.89	3.91	0.31	0.00
Other	27	1.94E-02	Gas	0.52	2.29	0.18	0.00
Total				1.67	7.31	0.57	0.00

Notes:
1. All emission factors are from Table 2-4 of "Protocol for Equipment Leak Emission Estimates" (EPA-453/R-95-017, November 1995).
2. "Other" equipment types include compressor seals, relief valves, diaphragms, drains, meters, etc.
3. The component count is estimated based on proposed design.
4. VOC and HAP emissions are based on fractions of these pollutants in the site-specific gas analysis.

Constituent	Weight %
VOC	7.86
HAP	0.00

GHG Fugitive Emissions from Component Leaks:

Component Type	Component Count	GHG Emission Factor		CH_4 Emissions	CO_2 Emissions	CO_2e Emissions
		(scf/hr-component)	Service	(tpy)	(tpy)	(tpy)
Connectors	325	0.003	Gas	0.18	0.00	4.41
Flanges	71	0.003	Gas	0.04	0.00	0.96
Open-Ended Lines	11	0.061	Gas	0.12	0.00	3.04
Pump Seals	0	13.3	Gas	0.00	0.00	0.00
Valves	90	0.027	Gas	0.44	0.00	11.00
Other	27	0.04	Gas	0.20	0.00	4.89
Total				0.97	0.00	24.31

Notes:
1. All emission factors are from Table W-1A of 40 CFR 98 Subpart W (Eastern U.S. Region).
2. "Other" equipment types include compressor seals, relief valves, diaphragms, drains, meters, etc.
3. The component count is estimated based on proposed design.
4. CH_4 and CO_2 emissions are based on fractions of these pollutants in the site-specific gas analysis.
5. Emissions are calculated in accordance with Equations W-35 and W-36 in Subpart W of 40 CFR 98.
6. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 25) + N_2O (GWP = 298).

Constituent	Mole %
CH_4	97.68
CO_2	0.00

VOC/GHG Fugitive Emissions from Pneumatic Devices:

Component Type	Component Count	GHG Emission Factor (scf/hr-component)	GHG Emission Factor Factor Source	VOC Emissions (tpy)	HAP Emissions (tpy)	CH_4 Emissions (tpy)	CO_2 Emissions (tpy)	CO_2e Emissions (tpy)
Pneumatic Devices	6	13.5	40 CFR 98	1.26	0.00	14.67	0.00	366.73
Total				1.26	0.00	14.67	0.00	366.73

Notes:

1. The component count is estimated based on proposed design.
2. VOC and HAP emissions are based on sum of the fractions of the pollutants in the site-specific gas analysis in those classifications, and are calculated in accordance with standard conversion methodology and factors.
3. CH_4 and CO_2 emissions are based on fractions of these pollutants in the site-specific gas analysis, and are calculated in accordance with Equations W-35 and W-36 in Subpart W of 40 CFR 98.
4. Emission Factor for Pneumatic Devices from 40 CFR 98, Subpart W (Table W-1A Intermittent Pneumatic Device Vents).
5. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 25) + N_2O (GWP = 298).

Constituent	Weight %
VOC	7.86
HAP	0.00
CH_4	91.68
CO_2	0.00

Fugitive Component Emissions Data:

Pollutant	Atmospheric Emissions lbs/hr	Atmospheric Emissions tpy	Emissions Estimation Method
VOC	0.42	1.83	EPA Protocol, Table 2-4 and Site-Specific Gas Analysis
HAPs	0.00	0.00	EPA Protocol, Table 2-4 and Site-Specific Gas Analysis
GHG (CO_2e)	89	391	40 CFR 98, Table W-1A and Site-Specific Gas Analysis

Example Calculations:

Average gas leak rate (lb/hr) = gas leak emission factor (lb/hr-component) * number of components
Max gas leak rate (tpy) = Average gas leak rate (lb/hr) * 8,760 (hr/yr) ÷ 2,000 (lb/ton)
Potential emissions VOC/HAP (tpy) = Max gas leak rate (tpy) * Weight % VOC/HAP ÷ 100
Potential emissions VOC/HAP (tpy) = emission factor (scf/hr-component) * number of components * 8,760 (hr/yr) * Molar Weight of Gas (lb/lb-mol) * Wt. % VOC/HAP ÷ 100 ÷ 379 scf/lb-mol ÷ 2,000 (lb/ton
Potential emissions CH_4/CO_2 (tpy) = emission factor (scf/hr-component) * number of components * Mole % CH_4/CO_2 ÷ 100 * Density CH_4/CO_2 (kg/scf) * 1,000 (g/kg) ÷ 453.6 (g/lb) * 8,760 (hr/yr) ÷ 2,000 (lb/ton)

Company Name: Adelphia Pipeline Company, LLC
Facility Name: Existing Quakertown Meter Station
Project Description: Adelphia Gateway Project

TABLE B-10. Miscellaneous Gas Venting Emissions

Total Emissions from Gas Venting Sources:

Source	VOC Emissions (tpy)	HAP Emissions (tpy)	CH_4 Emissions (tpy)	CO_2 Emissions (tpy)	CO_2e Emissions (tpy)
Total Miscellaneous Gas Venting	0.22	0.00	2.58	0.00	64.61
Total	0.22	0.00	2.58	0.00	64.61

Emissions from Individual Sources:

Blowdown Type	Number of Events	Potential Gas Volume (scf/event)	Total Actual Gas Volume Emitted (scf/yr)	VOC Emissions (tpy)	HAP Emissions (tpy)	CH_4 Emissions (tpy)	CO_2 Emissions (tpy)	CO_2e Emissions (tpy)
Pig Launcher Receiver	1	50,000	50,000	0.09	0.00	1.03	0.00	25.84
Filter Separator Blowdown	1	25,000	25,000	0.04	0.00	0.52	0.00	12.92
Vessel Blowdowns	---	50,000	50,000	0.09	0.00	1.03	0.00	25.84
Total				0.22	0.00	2.58	0.00	64.61

Notes:
1. VOC and HAP emissions are based on sum of the fractions of the pollutants in the site-specific gas analysis in those classifications, and are calculated in accordance with standard engineering calculations (utilizing Equation W-14B from 40 CR 98 Subpart W where appropriate).
2. CH_4 and CO_2 emissions are based on fractions of these pollutants in the site-specific gas analysis, and are calculated in accordance with Equations W-35 and W-36 in Subpart W of 40 CFR 98.
3. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 25) + N_2O (GWP = 298).
4. The gas volume per event and number of events is conservatively estimated based on facility design and engineering personnel.
5. The number of pigging events conservatively assumes one time per year, when projections are for this to occur approximately every seven years.

Example Calculations:
Potential emissions VOC/HAP (tpy) = Gas volume vented (scf/yr) * Molar weight of natural gas (lb/lb-mol) * Weight % VOC/HAP ÷ 100 ÷ 379 (scf/lb-mol) ÷ 2,000 (lb/ton)
Potential emissions CH_4/CO_2 (tpy) = Gas volume vented (scf/yr) * Mole % CH_4/CO_2 ÷ 100 * Density CH_4/CO_2 (kg/scf) * 1,000 (g/kg) ÷ 453.6 (g/lb) ÷ 2,000 (lb/ton)

Company Name: Adelphia Pipeline Company, LLC
Facility Name: Existing Quakertown Meter Station
Project Description: Plan Approval Emissions Calculations

TABLE B-11. Generator Engine Emissions Calculations

Engine Information:

Source ID:	MS_GEN-001
Manufacturer:	Generac
Model No.:	9/11 kW
Stroke Cycle:	4-stroke
Type of Burn:	Rich
Size (kW):	10
Rated Horsepower (bhp):	13

Engine Fuel Information:

Fuel Type:	Natural Gas
Higher Heating Value (HHV) (Btu/scf):	1,030
Specific Fuel Consumption (Btu/bhp-hr):	12,212
Max. Fuel Consumption at 100% (scf/hr):	159
Heat Input (MMBtu/hr):	0.16
Potential Fuel Consumption (MMBtu/yr):	82
Max. Fuel Consumption at 100% (MMscf/hr):	0.0002
Max. Fuel Consumption (MMscf/yr):	0.1
Max. Annual Hours of Operation (hr/yr):	500

Engine Emissions Data:

Pollutant	Post-Control Emissions		Maximum Potential Emissions		Estimation Basis / Emission Factor Source
	Emission Factor	Units	lbs/hr	tpy	
NO_x	2.21	lb/MMBtu	0.36	0.09	AP-42, Table 3.2-3 (Aug-2000)
NMNEHC as propane (excludes HCHO)	0.030	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
VOC (NMNEHC + Formaldehyde)	---	---	0.01	0.00	AP-42, Table 3.2-3 (Aug-2000)
CO	3.720	lb/MMBtu	0.61	0.15	AP-42, Table 3.2-3 (Aug-2000)
SO_x	0.001	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
PM_{10}	0.02	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
$PM_{2.5}$	0.02	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Formaldehyde (HCHO)	0.02	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
GHG (CO_2e)	See Table Below		19	5	40 CFR 98
Other (Total HAP, incl. HCHO)	See Table Below		0.01	0.00	AP-42, Table 3.2-3 (Aug-2000)

Notes:
1. PM_{10} and $PM_{2.5}$ are total values (filterable + condensable).
2. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 25) + N_2O (GWP = 298).
3. Total HAP is the summation of all hazardous air pollutants for which there is a published emission factor for this source type

Greenhouse Gas (GHG) Emissions Calculations:

Pollutant	Emission Factor	Units	Maximum Potential Emissions		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
GHGs:					
CO_2	53.06	kg/MMBtu	19	5	40 CFR 98, Table C-1
CH_4	0.0010	kg/MMBtu	0.00	0.00	40 CFR 98, Table C-2
N_2O	0.0001	kg/MMBtu	0.00	0.00	40 CFR 98, Table C-2
GHG (CO_2e)			**19**	**5**	

Hazardous Air Pollutant (HAP) Emissions Calculations:

Pollutant	Emission Factor	Units	Maximum Potential Emissions		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
Organic HAPs:					
1,1,2,2-Tetrachloroethane	2.53E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
1,1,2-Trichloroethane	1.53E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
1,3-Butadiene	6.63E-04	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
1,3-Dichloropropene	1.27E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Acetaldehyde	2.79E-03	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Acrolein	2.63E-03	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Benzene	1.58E-03	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Carbon Tetrachloride	1.77E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Chlorobenzene	1.29E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Chloroform	1.37E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Ethylbenzene	2.48E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Ethylene Dibromide	2.13E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Methanol	3.06E-03	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Methylene Chloride	4.12E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Naphthalene	9.71E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
PAH	1.41E-04	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Styrene	1.19E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Toluene	5.58E-04	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Vinyl Chloride	7.18E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Xylene	1.95E-04	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Total HAP (Excluding HCHO)			**0.00**	**0.00**	

Example Calculations:
Emission Rate (lbs/hr) = EF (lb/MMBtu) * Engine Heat Input (MMBtu/hr)
Emission Rate (lbs/hr) = EF (kg/MMBtu) * Engine Heat Input (MMBtu/hr) * 2.205 (lb/kg)
Emission Rate (tpy) = Emissions (lb/hr) * (hrs/yr) ÷ 2,000 (lbs/ton)

Company Name: **Adelphia Pipeline Company, LLC**
Facility Name: **Quakertown Compressor Station**
Project Description: **Plan Approval Emissions Calculations**

TABLE B-12. Atmospheric Emissions from Each Source at the Station

Source	Pollutants																							
	VOC		NO_X		CO		HCHO		Total HAPs		PM_{10}		$PM_{2.5}$		SO_X		CO_2		CH_4		N_2O		GHG (CO_2e)	
	(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)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
Caterpillar 3606 Engine 1 (S001)	0.82	3.58	1.24	5.43	0.72	3.16	0.16	0.69	0.44	1.91	0.14	0.63	0.14	0.63	0.01	0.04	1876.7	8219.7	19.26	84.37	0.00	0.01	2,359	10,333
Caterpillar 3606 Engine 2 (S002)	0.82	3.58	1.24	5.43	0.72	3.16	0.16	0.69	0.44	1.91	0.14	0.63	0.14	0.63	0.01	0.04	1876.7	8219.7	19.26	84.37	0.00	0.01	2,359	10,333
Caterpillar 3606 Engine 3 (S003)	0.82	3.58	1.24	5.43	0.72	3.16	0.16	0.69	0.44	1.91	0.14	0.63	0.14	0.63	0.01	0.04	1876.7	8219.7	19.26	84.37	0.00	0.01	2,359	10,333
Emegency Generator (S004)	1.67	0.42	3.09	0.77	6.18	1.55	0.12	0.03	0.19	0.05	0.11	0.03	0.11	0.03	0.00	0.00	686.6	171.6	6.80	1.70	0.00	0.00	857	214
Produced Fluids Tank (S005)	0.05	0.23	--	--	--	--	--	--	0.01	0.02	--	--	--	--	--	--	--	--	0.00	0.01	--	--	0.0	0.2
Misc Tanks Tank (S006-S007)	0.00	0.00	--	--	--	--	--	--	0.00	0.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fugitive Leaks	1.18	5.19	--	--	--	--	0.00	0.01	0.00	0.02	--	--	--	--	--	--	7.3	32.2	17.61	77.12	--	--	448	1,960
Liquid Loading	0.00	0.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Compressor Station Total	**5.36**	**16.59**	**6.81**	**17.07**	**8.34**	**11.01**	**0.59**	**2.11**	**1.51**	**5.81**	**0.54**	**1.91**	**0.54**	**1.91**	**0.03**	**0.11**	**6323.9**	**24863.1**	**82.20**	**331.93**	**0.01**	**0.04**	**8382**	**33174**
New Meter Station Fugitives	0.24	1.04	--	--	--	--	--	--	0.00	0.00	--	--	--	--	--	--	0.0	0.0	1.82	8	--	--	45	199
New Meter Station Gas Venting	0.06	0.24	--	--	--	--	--	--	0.00	0.00	--	--	--	--	--	--	0.0	0.0	0.65	3	--	--	16.28	71
New Meter Station Total	**0.29**	**1.28**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.0**	**0.0**	**2.47**	**10.81**	**0.00**	**0.00**	**62**	**270**
Existing Meter Station Fugitives	0.42	1.83	--	--	--	--	--	--	0.00	0.00	--	--	--	--	--	--	0.0	0.0	3.57	16	--	--	89	391
Existing Meter Station Gas Venting	0.05	0.22	--	--	--	--	--	--	0.00	0.00	--	--	--	--	--	--	0.0	0.0	0.59	3	--	--	14.75	65
Existing Meter Station Generator	0.01	0.00	0.36	0.09	0.61	0.15	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.2	4.8	0	0	0	0	19	5
New Meter Station Total	**0.48**	**2.06**	**0.36**	**0.09**	**0.61**	**0.15**	**0.00**	**0.00**	**0.01**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**19.2**	**4.8**	**4.16**	**18.23**	**0.00**	**0.00**	**123**	**460**
All Sources	**6.13**	**19.93**	**7.17**	**17.16**	**8.95**	**11.16**	**0.60**	**2.11**	**1.51**	**5.81**	**0.55**	**1.92**	**0.55**	**1.92**	**0.03**	**0.11**	**6343.1**	**24867.8**	**88.83**	**360.97**	**0.01**	**0.04**	**8567**	**33905**

Notes:
1. PM_{10} and $PM_{2.5}$ emissions are filterable + condensable.
2. VOC emissions for the engines are conservatively estimated as: VOC=NMNEHC+HCHO (Formaldehyde)

Company Name: **Adelphia Pipeline Company, LLC**
Facility Name: **Quakertown Compressor Station**
Project Description: **Plan Approval Emissions Calculations**

TABLE B-13. Total Emissions from All Sources at the Station

Pollutants	Estimated Site-Wide Emissions	
	lb/hr	tpy
VOC	6.13	19.93
NO_X	7.17	17.16
CO	8.95	11.16
Formaldehyde (HCHO)	0.60	2.11
Total HAPs	1.51	5.81
SO_X	0.03	0.11
PM_{10}	0.55	1.92
$PM_{2.5}$	0.55	1.92
CO_2	6343.06	24867.85
CH_4	88.83	360.97
N_2O	0.01	0.04
GHG (CO_2e)	8,567	33,905

Notes:
1. PM_{10} and $PM_{2.5}$ emissions are filterable + condensable.
2. Emissions from all sources at the facility are included above.

Adelphia Pipeline Company, LLC (Adelphia) is providing this response to address the Department's email dated on August 30, 2018, which outlined questions and comments identified during initial review of the Plan Approval Applications for the Marcus Hook Compressor Station (Marcus Hook CS, Plan Approval No. 23-0225, APS ID 969188, Auth ID 1230881), and Quakertown Compressor Station and associated meter station (Plan Approval No. 09-0242, APS ID 969182, Auth ID 1230871). The Department's comments are identified below in *italics*, with Adelphia's response following in normal text.

Section A – Emergency Generator Engine (Narrative: Sections 2, 2.2, 3.2.2.2, and 4.2, Appendix B, Table B-2, and Appendix C; Application: Section C, Item 10)

1. *Sections 2.2 and 3.2.2.2, and Appendix B, Table B-2, indicate that the proposed emergency generator engine is a rich-burn engine rated at 670 bhp. However, based on the manufacturer's specifications, presented in Appendix C, the engine is rated at 563 bkW, which equates to 755 bhp. Also, based on the percent oxygen in the exhaust, the engine appears to be a lean-burn engine. Please confirm the type and size of the engine, and revise the affected pages of the submittal.*

   At the time of the application, Adelphia was proposing to install a Caterpillar G3412C emergency generator rated at 500 kW (670 bhp) at each of the compressor stations. Since then, Adelphia has revised the proposed emergency generator at the facility, and will be installing a Cummins GTA28 rich burn emergency generator engine rated at 701 bhp (523 kw).

   We have attached the proposed emergency generator specification sheet for reference and the associated pages in the Plan Approval application have been updated.

2. *The manufacturer's specifications for the emergency generator engine indicate the following emissions data:*

   Nitrogen oxides (NO_x): 2.0 g/bhp-hr
   Carbon monoxide (CO): 1.8 g/bhp-hr
   Non-methane hydrocarbons (NMHCs): 0.8 g/bhp-hr

   In addition, Section 3.2.2.2 indicates that the engine would be equipped with a non-selective catalytic reduction (NSCR) catalyst. While Section 3.2.2.2, Table 3-2, indicates the same emissions data as the manufacturer's specifications after the application of NSCR, the manufacturer's specifications make no mention of NSCR or any other control technique. Please confirm whether the emissions levels indicated in the manufacturer's specifications are before or after the application of NSCR.

   The emission levels specified at the time of the application are representative of emission controls after the application of a NSCR.

   Since submittal of the application Adelphia has revised the proposed emergency generator for each facility and will be installing a Cummins GTA28 rich burn engine rated at 701 bhp (523 kW). The generator engine will be equipped with a MIRATECH NSCR catalyst, or equivalent, that is guaranteed to meet NSPS JJJJ limits for emergency SI engines HP ≥ 130

Please see the attached emergency generator specification sheet and catalyst vendor guarantee sheet for reference.

3. *The above notwithstanding, Section 3.2.2.2, Table 3-2, is correct that the emissions data indicated in the manufacturer's specifications demonstrate compliance with the applicable emission standards (i.e., for an emergency engine rated at equal to or greater than 130 bhp) indicated in 40 C.F.R. Subpart JJJJ (specifically § 60.4233(e)). However, Section 4.2 incorrectly states that "[t]hese rates are equivalent to [DEP's] [best available technology] (BAT) level for ... engines under [General Plan Approval and/or General Operating Permit BAQ-GPA/GP5] (GP-5)." Please be aware that, since the date that Adelphia submitted the Plan Approval application, DEP has revised the GP-5, including the BAT compliance requirements and emission standards. [Note: Pursuant to 25 Pa. Code § 127.1, [n]ew sources shall control the emission of air pollutants to the maximum extent, consistent with [BAT] as determined by [DEP] as of the date of issuance of the plan approval for the new source. Therefore, the facility is subject to all applicable BAT compliance requirements and emission standards specified in the GP-5.] For engines constructed and authorized to operate after August 8, 2018, the applicable BAT emission standards (for a lean-burn engine rated at greater than 500 bhp and less than 2,370 bhp), as indicated in Condition 1(c)(i), Section C, of the GP-5, are as follows:*

   NO_x: 0.50 g/bhp-hr
   CO: 0.25 g/bhp-hr
   Non-methane, non-ethane hydrocarbons (NMNEHCs): 0.25 g/bhp-hr (as propane)
   Formaldehyde (HCHO): 0.05 g/bhp-hr

   Pursuant to 25 Pa. Code § 127.12(a)(5), DEP requests that Adelphia conduct a BAT analysis for the emergency generator engine. The format of the BAT analysis may follow that of a "top-down" Best Available Control Technology (BACT) analysis, as follows:

   a. *Step 1: Identify Available Control Technologies*
   b. *Step 2: Eliminate Technically Infeasible Operation*
   c. *Step 3: Rank Remaining Control Technologies by Control Effectiveness*
   d. *Step 4: Evaluate Economic, Environmental, and Energy Impacts of Technically Feasible Control Technologies*
   e. *Step 5: Identify BAT*

   Please ensure that the BAT analysis addresses HCHO emissions from the emergency generator engine, which are not addressed in the manufacturer's specifications.

   The proposed emergency generator engine at each compressor station is a categorically exempt emissions unit per PA Code §127.14(a)(8) Category #6 which read as follows:

   > "(6) Internal combustion engines regardless of size, with combined NOx emissions less than 100 lbs/hr, 1000 lbs/day, 2.75 tons per ozone season and 6.6 tons per year on a 12-month rolling basis for all exempt engines at the site."[1]

   Potential NOx emissions from the proposed Cummins generator are estimated to be 3.1 lbs/hr and 0.8 tpy assuming 500 hours of operation and will therefore meet the specific exemption levels cited above. Emission Sources that meet 25 Pa. Code §127.14(a)(8) are

[1] Air Quality Permit Exemptions, Document # 275-2101-003, August 8, 2018.

exempt from the Plan Approval requirements of 25 Pa. Code §127.11 and §127.12, and therefore, are not subject to all applicable BAT compliance requirements and emissions standards for new sources.

Given this categorical exemption, Adelphia believes that the proposed emergency generator is exempt from the current BAT emission limits established under the current GP-5 for engines greater than 500 hp and less than 2,370 hp and as such does not require "top-down" BAT Analysis. Adelphia would reiterate that despite this exemption the generator is required to be meet NSPS standards.

4. *Please specify the following for the emergency generator engine:*

   a. *The life of the catalyst, as requested in Section C, Item 10, of the Plan Approval application.*
   b. *The stack diameter, height, elevation, and distance to nearest property line, exhaust moisture percentage, and location of sampling ports, as requested in Section F, Item 2, of the Plan Approval application.*

   Since the emergency generator is categorically exempt, this Plan Approval application information is not necessary. Furthermore, Adelphia is still finalizing certain details of the generator package that would have the potential to refine locations of sampling ports, etc. Nonetheless, for completeness and ease of the Departments review, Adelphia is able to provide the following information at this time:

   - *Life of catalyst is expected to be 2 years per attached literature;*
   - *The stack diameter is estimated at 1 ft;*
   - *The stack height is estimated at 6 ft; and*
   - *The distance to the property line is estimated at:*
     - *30 ft for the generator proposed at the Quakertown Compressor Station; and*
     - *130 ft for the generator proposed at the Marcus Hook Compressor Station.*

Section B – Compressor Engines and Associated Oxidation Catalyst Units (Narrative: Sections 3.2.2.2 and 4.1, Appendix B, Table B-1, Appendix C; Application: Section C, Item 11, Section E, Section F, Item 2)

1. *Section 3.2.2.2, Table 3-3, is correct that the post-catalyst emissions data indicated in the manufacturer's specifications for the oxidation catalyst units, presented in Appendix C, demonstrate compliance with the applicable emission standards (i.e., for non-emergency engines rated at equal to or greater than 1,350 bhp) indicated in 40 C.F.R. Subpart JJJJ (specifically § 60.4233(e)). However, the uncontrolled emissions data indicated for the compressor engines in the manufacturer's specifications for the oxidation catalyst units differs from that indicated in the manufacturer's specifications for the compressor engines, also presented in Appendix C, themselves (at 100% load), as follows:*

Pollutant	***Uncontrolled Emissions Data from Manufacturer Specifications for:***	
	Oxidation Catalyst	***Compressor Engines***
NO_X	*0.50 g/bhp-hr*	*0.30 g/bhp-hr*
CO	*2.20 g/bhp-hr*	*2.59 g/bhp-hr*
NMNEHCs	*0.29 g/bhp-hr*	*0.41 g/bhp-hr*
HCHO	*0.20 g/bhp-hr*	*0.21 g/bhp-hr*

DEP is uncertain why the uncontrolled NO_x emissions data indicated in the manufacturer's specifications for the oxidation catalyst units is higher than in those for the compressor engines. Nonetheless, since the oxidation catalyst does not provide any NO_x emission reduction, DEP will consider the NO_x emissions data indicated in the manufacturer's specifications for the compressor engines as representative. However, since the uncontrolled CO, NMNEHC, and HCHO emissions data indicated in the manufacturer's specifications for the compressor engines is higher than in those for the oxidation catalyst units, DEP must infer that the corresponding post-catalyst emissions data is also higher.

Moreover, please note that the compressor engines are subject to the same BAT emission standards as indicated for the emergency generator engine in deficiency A.3., above. While the post-catalyst emissions data indicated in the manufacturer's specifications for the oxidation catalyst units also demonstrates compliance with the BAT emission standards, this is not clear when projecting the post-catalyst emissions data higher. Please confirm the post-catalyst emissions data, and revise the affected page(s) of the submittal.

Lastly, DEP requests that Adelphia revise/expand upon the BAT analysis presented in Section 4.1. As indicated for the emergency generator engine in deficiency A.3., above, the format of the BAT analysis may follow that of a "top-down" BACT analysis.

Due to the ongoing nature of the design, the initial Plan Approval application did include inconsistencies with respect to the compressor engine specification sheet emission rates and the pre-control emission rates listed on catalyst specification sheets. This has been rectified since the initial submittal and the associated emissions calculations in Appendix B, Plan Approval forms and attached manufacturer specification have all been updated in the attached materials

With respect to BAT, the emissions from the proposed compressor engines are at or below those rates established by the Department as BAT. This includes the BAT determination just finalized by PADEP in its revised GP-5 that became effective in August 2018. As such, the Technical Support Document for the GP-5 should provide more than ample information with respect to the Department's request for a "top-down" BAT analysis. Nonetheless, Adelphia has provided the attached BAT "top-down" analysis table for the compressor engine. This attachment did not alter the ultimate conclusions from the prior BAT determination.

2. *Please specify the following for the oxidation catalyst units:*

   a. *The differential pressure range across the catalytic bed, as requested in Section C, Item 11, of the Plan Approval application.*

   b. *The outlet flow rate and temperature, as requested in Section C, Item 11, of the Plan Approval application.*

   c. *Whether Adelphia intends to install devices to monitor the differential pressure, inlet and outlet flow rate, and inlet and outlet temperature, and the corresponding monitoring and recordkeeping frequency, as referenced in Section E of the Plan Approval application.*

The Plan Approval application forms for both compressor stations have been updated to include the information requested by the Department under these bullet items. Please note that the design is ongoing and as such sampling port specifics have not been finalized. At this time, Adelphia does not plan to install devices to monitor the differential pressure, inlet and outlet flow rate, and inlet and outlet temperature for the oxidation catalysts.

3. *Please specify the following for the compressor engines:*

   a. *Whether Adelphia intends to install hour meters on each engine to monitor the operating hours, and the corresponding monitoring and recordkeeping frequency, as referenced in Section E of the Plan Approval application.*
   b. *Whether Adelphia intends to install natural gas meters on each engine, or a combined fuel meter, to monitor the natural gas consumption by the engines, and the corresponding monitoring and recordkeeping frequency, as referenced in Section E of the Plan Approval application.*
   c. *The stack diameter, height, elevation, and distance to nearest property line, exhaust moisture percentage, and location of sampling ports, as requested in Section F, Item 2, of the Plan Approval application.*

Adelphia has modified Section E of the Plan Approval forms for each site to reflect the following:
1) Adelphia will monitor each compressor engine's hour of operation using a SCADA system and will record the data on a monthly basis.
2) Adelphia will monitor the fuel consumption rate for each of the three compressor engines using a master meter as well as individual meters. Data will be recorded on a monthly basis

Adelphia has modified Section F of the Plan Approval forms to reflect the additional stack information, to the extent available for each of the compressor engines. Some information (location of sampling ports is still subject to change at this point of the design).

Section C – Pneumatic Controllers (Narrative: Section 3.2.2.4)

Part 1. As indicated in Section 3.2.2.4, all pneumatic controllers Adelphia intends to install at the facility will either be intermittent or have a bleed rate of less than 6 scfh. Please specify the quantity of each type of pneumatic controller, and provide calculations for the potential volatile organic compound (VOC), hazardous air pollutant (HAP), and greenhouse gas (GHG) emissions from the pneumatic controllers (in a similar manner to those presented in Appendix B, Tables B-8 and B-10, of Adelphia's Plan Approval application (No. 09-0242) for the compressor station and meter stations at its Quakertown facility), as these were omitted from the submittal.

The emissions calculations provided by Adelphia reflect the accurate number and types of natural gas-driven pneumatics proposed for the various project sites. They are as follows:

Quakertown CS: 0
Quakertown existing MS: 6 intermittent
Quakertown new MS: 3 intermittent
Marcus Hook MS: 0

The pneumatics at the compressor stations will be either electric or air. Therefore, there are no VOC, HAP or GHGs associated with this equipment. The emissions for the natural gas-driven pneumatics at the existing and new meter station at Quakertown can be found in the previously submitted Tables B-7 and B-9, respectively. No revisions were necessary.

Part 2. In addition, Section 3.2.2.4 states that the pneumatic controllers intended to be installed at the facility "would not be subject to the requirements of [40 C.F.R. Part 60,] Subpart OOOOa." This statement is not entirely correct. While intermittent pneumatic controllers are not subject to the provisions 40 C.F.R. Part 60, Subpart OOOOa, please be aware that all continuous bleed natural gas-driven pneumatic controllers are subject to the applicable provisions of the regulation, not only those with a bleed rate greater than 6 scfh.[1] *To this point, 40 C.F.R. § 60.5390a(c)(1) specifies that "[e]ach pneumatic controller affected facility at a location other than at a natural gas processing plant must have a bleed rate less than or equal to 6 [scfh]," which does not make sense if the term "pneumatic controller affected facility" only applies to units with a bleed rate greater than 6 scfh. For each different model of continuous bleed natural gas-driven pneumatic controllers intended to be installed at the facility (if any), DEP requests that Adelphia submit the manufacturer's specifications for the controller indicating a bleed rate of less than or equal to 6 scfh.*

Adelphia's design, as outlined in the natural gas-driven pneumatic count response provided, and the associated emissions calculations, does not call for the use of any continuous low-bleed natural gas-driven pneumatics. All pneumatics are either air, electric or intermittent natural gas devices. All of these categories are exempt from NSPS OOOOa. Since there are no continuous low bleed natural gas-driven pneumatic controllers, manufacturer specifications are not necessary per the Department's request.

Section D – Fugitive Emissions Sources (Narrative: Sections 3.2.2.4, 4.4, and 5, and Appendix B, Table B-5)

1. *As indicated in Section 3.2.2.4, Adelphia intends to comply with the timeframes for rod packing replacement specified in 40 C.F.R. § 60.5385a(a)(1) or (2). DEP understands this, and the inclusion of calculations for rod packing emissions in Appendix B, Table B-5, to mean that Adelphia does not intend to employ an emissions collection system to collect and control the rod packing emissions. Please confirm. Regarding the calculations themselves, based on information contained in an EPA document, entitled "Reducing Methane Emissions from Compressor Rod Packing Systems" (see third attachment), the rod packing leak rate does not appear to account for wear over time on the packing rings and piston rod. Please specify how the rod packing leak rate will be monitored (i.e., the type of monitoring equipment to be used and the frequency of monitoring) to ensure that it does not increase significantly from the estimated leak rate, and confirm whether Adelphia intends to replace the packing rings (and piston rod, if necessary) at an earlier timeframe than required in 40 C.F.R. § 60.5385a(a)(1) or (2) if the observed leak rate increases significantly from the estimated leak rate.*

   At this time Adelphia does not intend to employ an emissions collection system to collect and control the rod packing emissions. With respect to emissions and accounting for wear over time, there is no better information to utilize to account for this since leak rates vary over time (some may be above and some may be below). It is worth noting that the referenced document lists that a new packing system would be expected to leak at a rate of 11 scf/hr while the Appendix B calculations utilze a 15 scf/hr factor. Furthermore, in EPA's established methods for reporting greenhouse gas emissions under 40 CFR 98 Subpart W, the agency prescribes a factor that is lower than this rate (e.g., 9,480 scf/yr for CH_4 per compressor or approximately 0.2 tpy of CH_4 compared to our estimated 32 tpy of CH_4 in Appendix B).

Rod packing will be monitored and replacements made in accordance with EPA requirements contained within 40 CFR 98 Subpart W and 40 CFR Part 60, Subpart OOOOa. Such monitoring will include hours of operation for the associated engine/compressor. This is consistent with the Department's BAT conclusions as included in the GP5 permit that became effective August 2018.

2. *As indicated in Section 3.2.2.4, the fugitive emissions components of the proposed compressor station are subject to 40 C.F.R. Part 60, Subpart OOOOa, and Adelphia intends to conduct the monitoring surveys required under 40 C.F.R. § 60.5397a on a semi-annual basis. Please be aware that, pursuant to 40 C.F.R. § 60.5397a(g)(2), and in accordance with Condition 1(b)(ii), Section G, of the GP-5, monitoring surveys are required to be conducted on a quarterly basis. Therefore, DEP requests that you revise the affected page of the submittal to indicate the correct frequency for conducting the monitoring surveys.*

   The Department is correct and Adelphia concurs that the current requirement is for quarterly monitoring surveys as part of NSPS OOOOa for the compressor stations. Adelphia would note that current proposed revisions to NSPS OOOOa that were announced on September 11, 2018 propose either semiannual or annual surveys.

3. *There is a discrepancy between the emissions values indicated in Appendix B, Table B-5, under the headings "Engine Crankcase Emissions" and "Engine Crankcase Exhaust Composition." Please resolve. In addition, please provide the basis for the engine crankcase exhaust composition values (in units of lbs/mmscf) indicated under the latter heading.*

   No resolution is necessary with respect to the "Engine Crankcase Emissions" as this is different that "Engine Crankcase Exhaust *Composition*". The engine crankcase exhaust composition shown in Table B-5 is meant to provide estimates of the composition of the engine crankcase emissions/volumes; not magnitude of emissions directly from engine crankcase. This composition emission factor is calculated based on the uncontrolled potential to emit of each constituent and the exhaust flowrate of the engine (cfm). The resulting lb/MMscf exhaust gas composition factor is then applied to the total volume of engine crankcase emissions (i.e., 24.6375 MMscf/yr) to determine the pollutant-specific breakdown.

4. *Please provide the basis for the total volume of natural gas emitted from the station ESD venting, pigging and pipeline blowdowns, and reciprocating compressors, as indicated in Appendix B, Table B-5. Please also specify the intended pigging frequency.*

   The natural gas volumes for a station ESD and reciprocating engine venting are conservative estimates based on engineering judgement and based on experience with engine compressors. Note that a full ESD event is not expected every year as it is an emergency scenario. Nonetheless to ensure a complete set of emissions calculations that demonstrate the facilities are not major sources with respect to air permitting, these ESD-related emissions were included in Appendix B.

   With respect to pigging, predictable operations would occur under the following two scenarios:

- Normal operational and maintenance pigging that is usually performed once per year and intended to clean the pipeline by sweeping any liquid out of the line to improve overall flow efficiency. The volumes associated with this activity are:
  - 8,000 scf per event at Quakertown
  - 6,000 scf per event at Marcus Hook
- Required inline pigging with internal inspection tools in accordance with DOT integrity management tools every 5 to 7 years. During a year with one of these activities, and assuming one normal operational pigging event per year, the pigging volumes are predicted to be:
  - 16,000 scf per year at Quakertown
  - 12,000 scf per year at Marcus Hook

The emissions calculations found in Appendix B Table B-5 have been updated to reflect these revised pigging volumes for each compressor station.

5. *In accordance with Condition 1(a), Section K, of the GP-5, Adelphia is required to employ best management practices for the pigging operations at the facility, and specify the appropriate best management practices in the Plan Approval application. Please provide this information. [Note: Based on the calculations for pigging and pipeline blowdown emissions in Appendix B, Table B-5, the pigging operations do not figure to exceed the emission rates specified in Condition 1(b), Section K, of the GP-5, such that Adelphia would be required to control the emissions by at least 95%. Please be advised that, if any of these emission rates are exceeded, Adelphia would be subject to this requirement.]*

   O&M practices vary significantly from pipeline to pipeline and are often updated and changed based on operating history, quality of gas and its components, DOT classification, leak history, cathodic protection history, and other operating parameters. As noted above, the expected frequency for operational and inline inspection pigging frequency produces minimal emissions and is not anticipated to be more often than annually. In an emergency event a section of pipeline may be evacuated as rapidly as possible (per DOT requirements) in order to protect life and property. If the segment requires a "planned" outage, Adelphia plans to implement appropriate industry standards to minimize "gas loss" or emissions. This may include:

   - Running additional horsepower at its compressor stations to lower the line pressure
   - Using "Pump down" activities to evacuate a segment using a portable compressor and re-inject gas into the adjacent section
   - Stopple with bypass piping, which lets a segment of pipeline be depressurized for maintenance or repairs but installing temporary plugs with piping by-pass pipe to maintain service to its customers.

   Any or all of these techniques would be used to minimize emissions.

Section E – Produced Fluids, Engine Oil, and Triethylene Glycol (TEG) Tanks (Application: Section B, Item 4)

Please specify the following for the tanks, as requested in Section B, Item 4, of the Plan Approval application:

1. The maximum pressure of the produced fluids and engine oil tanks.
The tanks, each less than 1,000 gallons in capacity, will be atmospheric pressure tanks with pressure relief valves set to low levels (e.g., 1 psig). The maximum vapor pressure is estimated at 0.0075, 0.001, 0.28 psia for the oil, glycol and produced fluid tanks, respectively.

The type of pressure relief device for each of the tanks.

The tanks, each less than 1,000 gallons in capacity, will be atmospheric pressure tanks with pressure relief valves set to low levels (e.g., 1 psig).

Section F – Glycol Dehydration Units

Please confirm (and detail) whether the proposed installation of the TEG tank at the facility is associated with a glycol dehydration unit(s), an aftercooler(s) and sealed coolant system for the compressor stations, or another operation.

If the TEG tank is associated with a glycol dehydration unit(s), please be aware that Conditions 1–2, Section B, of the GP-5, include corresponding BAT compliance and recordkeeping requirements, respectively. At that point, DEP would request that you provide the following information:

1. *The anticipated natural gas throughput rate for the facility.*
2. *Calculations of the (pre-control) potential VOC, HAP (including benzene, toluene, ethylbenzene, and xylene [BTEX]), and GHG emissions from the glycol dehydration units.*
3. *A calculation of the optimum or alternative glycol circulation rate (if currently known).*
4. *A demonstration of how the glycol dehydration unit(s) satisfy the BAT compliance requirements. If an air cleaning device is required based on the emission rate thresholds specified in Condition 1(c), Section B, of the GP-5, please provide the following information:*

    a. *The type of air cleaning device proposed to be installed.*
    b. *Calculations of the post-control potential VOC, HAP (including BTEX), and GHG emissions from the glycol dehydration units.*

As noted in the application materials, there will not be a glycol dehydration unit as part of the project. The glycol is exclusively used with an engine cooling system. As such, no additional information is required under this comment.

Section G – Site-Specific Natural Gas Analysis (Narrative: Appendix B, Table B-9 [Marcus Hook]/Table B-14 [Quakertown])

Please provide the hydrogen sulfide (H_2S) or sulfur content, moisture content, and condensable compound content of the natural gas.

Since the project sites only involve pipeline quality gas, the gas must meet tariff requirements. The gas may include trace amounts of hydrogen sulfide (e.g., less than 0.5 grains per 100 cubic feet) and the water vapor will be less than 7 pounds per million cubic feet. Adelphia and its consultants are unsure exactly what the agency is looking for with respect to "condensable compound content". The information provided in this response, in addition to the gas quality data provided in the initial submittal should provide all information necessary, and available, for use by the Department.

Section H – Title V & New Source Review (NSR) Requirements (Narrative: Sections 3.2 and 3.3, and Appendix B, Tables B-7 and B-8 [Marcus Hook]/Tables B-12 and B-13 [Quakertown]; Application; Section D)

Based on the potential VOC emissions from the facility, as calculated in Appendix B, Tables B-7 and B-8 (Marcus Hook)/Tables B-12 and B-13 (Quakertown), approaching the major facility and NSR threshold of 25 tons/yr, and the deficiencies discussed in A.1., B.1., C., D.1. and 3., and F, above, DEP has significant concerns that the potential VOC emissions from the project/facility may exceed 25 tons/yr. DEP requests that Adelphia recalculate the potential VOC emissions from the project/facility and, if necessary, propose any enforceable operational restrictions necessary to maintain the potential VOC emissions at less than 25 tons/yr.

Unless Adelphia maintains the potential VOC emissions from the facility at less than 25 tons/yr, the project would be subject to NSR and Title V requirements. In addition to addressing the deficiencies indicated in, and providing the additional information requested in, this e-mail, such a confirmation would require Adelphia to submit a new Plan Approval application and fee, as well as to complete a NSR analysis under Section D, of the application, and an Addendum A form(s) under Section E, of the application.

Adelphia has addressed each of the Department's comment presented in the email and revised the emissions tables found in Appendix B of each Plan Approval Application accordingly. As can be seen in the revised materials, the potential to emit of VOC still remains below 25 tons per year and in fact has lowered since the prior submittal due to refinement to engine emissions factors and pigging volumes. Therefore, no enforceable operational restrictions are necessary to maintain the potential VOC emissions less than the 25 ton per year major source threshold.

Section I – Additional Information

DEP requests that you provide the following additional information for the facility:

1. *A detailed description of the Marcus Hook natural gas compressor station project, including the design natural gas throughput rate and anticipated inlet and outlet natural gas pressure.*

   The Marcus Hook CS is designed to receive up to 350 million cubic feet per day (mmcf/d) of pipeline quality natural gas from the existing 18" pipeline. However, this current project anticipates 250 mmcf/d with ability to expand in the future to 350 mmcf/d with a new mid-point compressor station. Natural gas enters the station and flows through a suction filter separator and into station suction piping. Three (3) 1,875 horsepower engines are to be installed to accommodate project volumes. Each engine is designed to compress approximately 125 mmcf/d of natural gas. In order to maintain firm service to customers and improve reliability, three engines are proposed to be installed. The natural gas is compressed from approximately 640 psig to 840 psig through the station. No process gas cooling is required. Gas is discharged into the discharge header, flows through a coalescing filter and exits the station into two 16" laterals that deliver natural gas to various downstream customers.

2. *A detailed site layout of all equipment proposed to be installed as part of the Marcus Hook natural gas compressor station project, including, but not limited to: compressors, the*

Guo, Jing

From:	Ian Donaldson <IDonaldson@trinityconsultants.com>
Sent:	Tuesday, October 30, 2018 7:40 AM
To:	Smith, David S
Cc:	Tulloch-Reid, Janine; Guo, Jing
Subject:	RE: Discrepancies with Revised Plan Approval Applications for Adelphia Pipeline Co., LLC—Marcus Hook (23-0225) & Quakertown (09-0242)
Attachments:	2018-1030_Marcus Hook_PlanApp_Section C Item 10.pdf; 2018-1030 _Quakertown_PlanApp__Section C Item 10.pdf

Hi David,

There are in fact different oxidation catalyst manufacturers, with the same performance guarantee, proposed for the two compressor stations. For Marcus Hook and Quakertown the manufacturers are Emit Technologies and DCL, respectively. Therefore, no changes as necessary for this observation.

However, I am attaching corrected Section C, Item 10 for each application.

Regards,

Ian Donaldson
Managing Consultant

Trinity Consultants
4500 Brooktree Road, Suite 103 | Wexford, Pennsylvania 15090

Office: **724-935-2611 Ext 103**
Email: idonaldson@trinityconsultants.com | LinkedIn: www.linkedin.com/in/idonaldstrinityconsultants/

Trinity Consultants

From: Smith, David S [mailto:dssmith@pa.gov]
Sent: Monday, October 29, 2018 11:18 AM
To: Ian Donaldson <IDonaldson@trinityconsultants.com>
Cc: Tulloch-Reid, Janine <jtullochre@pa.gov>; Guo, Jing <jguo@pa.gov>
Subject: Discrepancies with Revised Plan Approval Applications for Adelphia Pipeline Co., LLC—Marcus Hook (23-0225) & Quakertown (09-0242)

Hi Ian, in looking at the two applications, the oxidation catalyst manufacturer for the Quakertown compressor engines was changed to DCL, but remained as Emit Technologies for the Marcus Hook compressor engines. For both applications, please confirm the appropriate oxidation catalyst manufacturer and, where necessary, revise Section C, Item 11, of the application and the "G3606 specs" attachment.

In addition, the engine manufacturer/model information for the emergency generator sets was listed as the manufacturer/model information for the NSCR catalyst as well. Please correct Section C, Item 10, for both applications.

Thanks,

David S. Smith, E.I.T. | Air Quality Engineering Specialist
Pennsylvania Department of Environmental Protection
Southeast Regional Office
2 East Main Street | Norristown, PA 19401
Phone: 484.250.5064 | Fax: 484.250.5921
www.dep.pa.gov

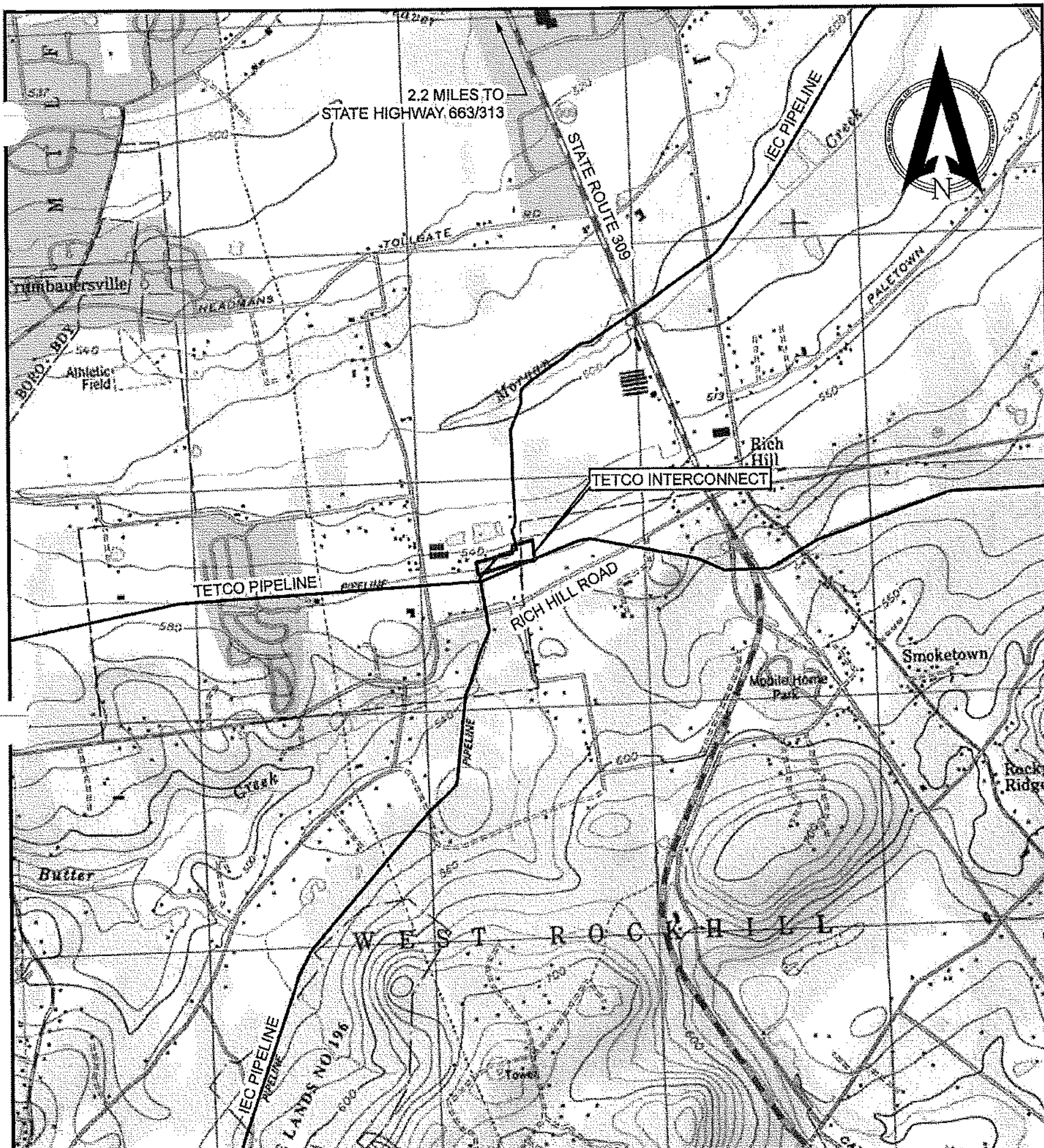
Quakertown Compressor Station

Draft Plan Approval No. 09-0242

Appendix B – Diagrams

B1 – Site Plan

B2 – Plot Plan



LEGEND

- TETCO INTERCONNECT
- EXISTING PIPELINE

0 — 2,000 — 4,000 Feet

NOTES

DRG 7.5 MIN. QUAD MAP:
-o40075d3 (QUAKERTOWN, PA)

RECEIVED MAY 16 2018

REV	DESCRIPTION	CHK	DATE	APP	DATE

DRAWN BY	PLH	07/18/17
DESIGNED BY	PLH	06/29/17
CHECKED BY	MEH	
APPROVED BY	RCH	
HGA JOB NO.	8.A17022.01.0	
PLOT SCALE	1:1	
MODEL ID	8.A17022	

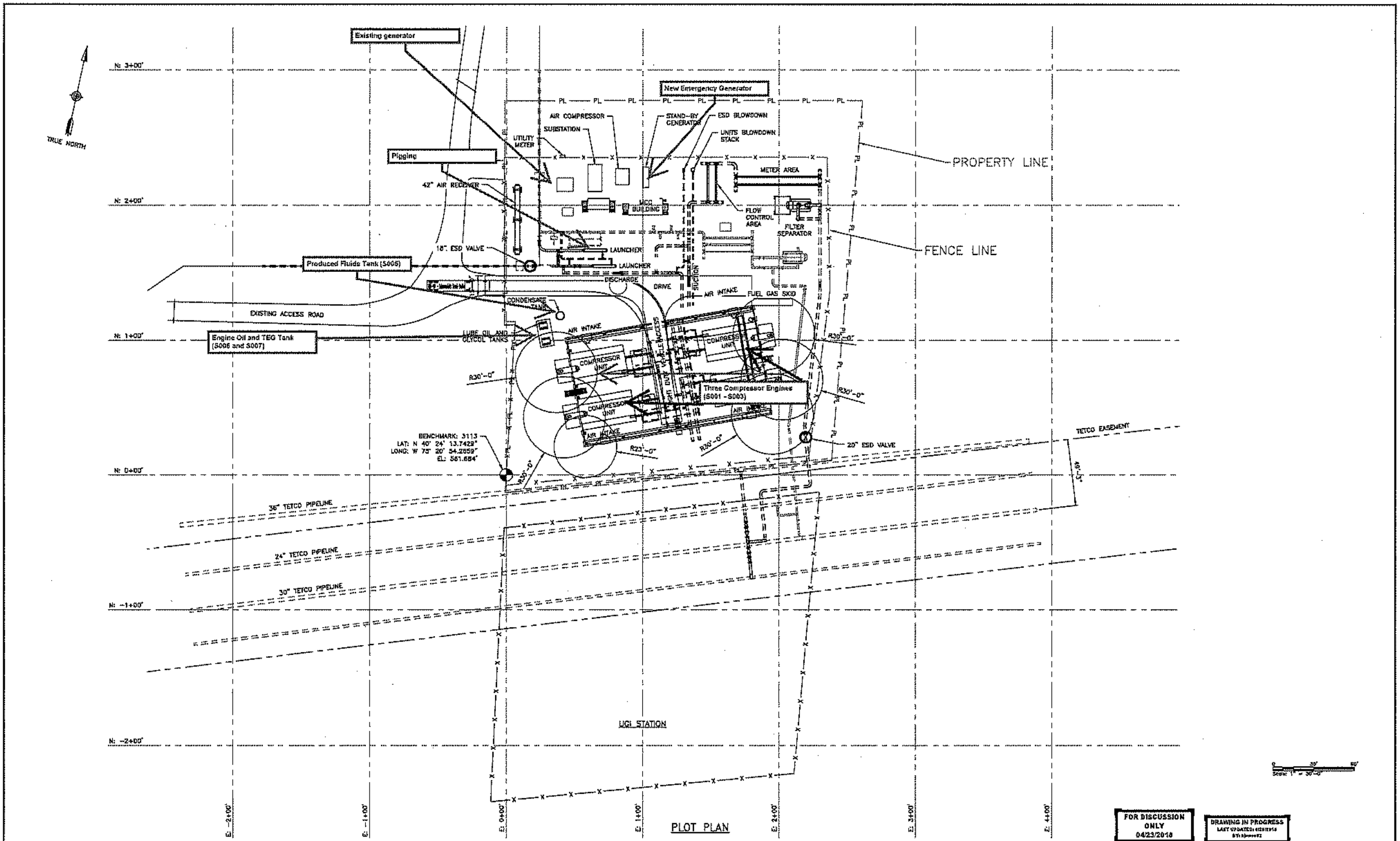
HGA

HUNT, GUILLOT & ASSOCIATES, LLC
ONE METROPLEX DRIVE, SUITE 100
BIRMINGHAM, AL 35209
PHONE:205-970-4977
FIRM # XX-XX-XXXX-X

NEW JERSEY RESOURCES
PROJECT LOCATION MAP
TETCO INTERCONNECT
BUCKS COUNTY, PENNSYLVANIA

SCALE	DRAWING NUMBER	REV
1" = 2000'	8.A17022.01-QUAD-TETCO	

phumphrey 7/18/2017 7:22:35 AM



FOR DISCUSSION ONLY 04/23/2018

DRAWING IN PROGRESS

CONFIDENTIAL

THESE DESIGNS AND DRAWINGS ARE CONFIDENTIAL & ARE THE EXCLUSIVE PROPERTY OF: HUNT, GUILLOT & ASSOCIATES, BIRMINGHAM, AL. NO COPY OR REPRODUCTION MAY BE MADE WITHOUT WRITTEN APPROVAL.

ADELPHIA GATEWAY

REV	DESCRIPTION	CHK	DATE	APP	DATE

REVISION

DRAWN BY	KDJ	02/15/18
DESIGNED BY	HGA	02/15/18
CHECKED BY		
APPROVED BY		
HGA JOB NO.	8.A17022.04	
PLOT SCALE		
MODEL ID		

HGA

ADELPHIA GATEWAY, LLC
QUAKERTOWN COMPRESSOR STATION
PLOT PLAN
BUCKS COUNTY, PENNSYLVANIA

SCALE	DRAWING NUMBER	REV
1"=30'-0"	QKTNMSR-M-101(ROTATED)	