SWN PRODUCTION COMPANY, LLC

WILLIAM RITCHEA PAD

GENERAL PERMIT G-70B
CONSTRUCTION PERMIT APPLICATION

SUBMITTED TO WVDEP DIVISION OF AIR QUALITY
DECEMBER 2015

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INTRODUCTION

SWN Production Company, LLC (SWN), submits this G70-B General Permit Construction Permit application for the William Ritchea Pad (William), a natural gas production facility in Wetzel County. SWN requests authorization with this submittal to construct and operate under the General Permit G-70B for Oil and Natural Gas Production Facilities. The equipment to be added includes the following:

- Two (2) Caterpillar G3306 NA Compressor Engines
- Five (5) 1.0-mmBtu/hr Gas Production Units (GPU)
- Two (2) 0.5-mmBtu/hr Heater Treaters
- Four (4) 400-bbl Condensate Tanks
- Four (4) 400-bbl Produced Water Tanks
- One (1) 15-mmBtu/hr Vapor Combustor with Pilot
- Condensate Loading
- Produced Water Loading
- Fugitive Emissions
- Fugitive Haul Road Emissions

Note that other small storage tanks may be present on site (i.e., methanol) but are considered de minimis sources per Table 45-13B and are listed on the application form.

Proposed Emissions

Emissions calculations for the facility are presented in Attachment S. A fuel heating value of 905 Btu/scf was used to calculate emissions from natural gas-fired equipment. Actual heating value may vary (generally 905 - 1,300) but using a lower heating value in the emissions calculations provides a more conservative (higher) estimate of fuel use. Emissions from the Caterpillar engines and heaters were calculated with manufacturer data when available and AP-42/EPA emissions factors for the remaining pollutants.

Condensate tank emissions were calculated by creating a profile in the EPA TANKS 4.0.9d model using properties obtained in a representative liquids analysis as the tank contents. Although produced water storage tanks contain primarily water, a profile was created in EPA TANKS 4.0.9d assuming 1% of the total throughput as condensate and 99% as water to provide a conservative emissions estimate of the trace hydrocarbons that may be entrained in the water. Flashing emissions were calculated using ProMax process simulation software. Condensate

loading has been calculated using the properties from EPA TANKS 4.0.9d and process simulation.

Fugitive emissions were calculated with a component count by equipment type from a similar facility, and representative extended gas and liquids analyses. Fugitive haul road emissions were calculated using EPA/AP-42 methodologies.

Greenhouse gas emissions were calculated with the latest EPA factors and manufacture data when available. Documents used as references for the emissions calculations, including engine specification sheets, AP-42 and EPA emission factor references, gas and liquids analyses, and process simulation results are included in Attachments L and N.

Regulatory Discussion

STATE

45 CSR 13 - PERMITS FOR CONSTRUCTION, MODIFICATION, RELOCATION AND OPERATION OF STATIONARY SOURCES OF AIR POLLUTANTS, NOTIFICATION REQUIREMENTS, ADMINISTRATIVE UPDATES, TEMPORARY PERMITS, GENERAL PERMITS, AND PROCEDURES FOR EVALUATION:

The facility requests to operate under the General Permit G70-B. Emissions of carbon monoxide and volatile organic compounds are less than 80 tons per year (TPY). Oxides of nitrogen emissions are less than 50 TPY and particulate matter 10/2.5 and sulfur dioxide emissions are each less than 20 TPY. Also, the facility will have less than 8 TPY for each hazardous air pollutant and less than 20 tons for total hazardous air pollutants. The engines are assumed to be subject to NSPS Subpart JJJJ and MACT Subpart ZZZZ.

45 CSR 22 - AIR QUALITY MANAGEMENT FEE PROGRAM:

The facility will be required to maintain a valid Certificate to Operate on the premises.

45 CSR 30 - REQUIREMENTS FOR OPERATING PERMITS:

Emissions from the facility do not exceed major source thresholds; therefore, this rule does not apply.

FEDERAL

40 CFR PART 60 SUBPART KB—STANDARDS OF PERFORMANCE FOR VOLATILE ORGANIC LIQUID STORAGE VESSELS (INCLUDING PETROLEUM LIQUID STORAGE VESSELS) FOR WHICH CONSTRUCTION, RECONSTRUCTION, OR MODIFICATION COMMENCED AFTER JULY 23, 1984

The affected facility to which this subpart applies is each storage vessel with a capacity greater than or equal to 75 cubic meters (m^3) that is used to store volatile organic liquids (VOL) for which construction, reconstruction, or modification is commenced after July 23, 1984. The tanks at this facility were constructed after the effective date of this subpart but are less than 75 m^3 (which equals approximately 471 bbl); therefore, this subpart does not apply.

40 CFR PART 60 SUBPART KKK - STANDARDS OF PERFORMANCE FOR STATIONARY FOR EQUIPMENT LEAKS OF VOC FROM ONSHORE NATURAL GAS PROCESSING PLANTS:

The facility is not considered an affected source (natural gas processing plant) and is therefore not subject to this Subpart.

40 CFR PART 60 SUBPART IIII - STANDARDS OF PERFORMANCE FOR STATIONARY COMPRESSION IGNITION INTERNAL COMBUSTION ENGINES:

The facility does not contain the affected source (diesel-fired engine) and is therefore not subject to this Subpart.

40 CFR PART 60 SUBPART JJJJ - STANDARDS OF PERFORMANCE FOR STATIONARY SPARK IGNITION INTERNAL COMBUSTION ENGINES:

The engines were manufactured after June 12, 2006 and are subject to the requirements of this subpart. The manufacture dates of the two Caterpillar G3306 NA engines are not yet known but are presumed to be subject to NSPS Subpart JJJJ as new engines.

40 CFR PART 60 SUBPART OOOO - STANDARDS OF PERFORMANCE FOR CRUDE OIL AND NATURAL GAS PRODUCTION, TRANSMISSION, AND DISTRIBUTION:

The emission sources affected by this Subpart include well completions, pneumatic controllers, equipment leaks from natural gas processing plants, sweetening units at natural gas processing plants, reciprocating compressors, centrifugal compressors and storage vessels which are constructed, modified or reconstructed after August 23, 2011.

Wells located at this production facility are not drilled principally to produce natural gas, therefore they are not affected sources subject to gas well completion requirements.

Pneumatic controllers affected by this Subpart include continuous bleed, natural gas-driven pneumatic controllers with a natural gas bleed rate greater than 6 SCFH. No pneumatic devices with a continuous bleed greater than 6 SCFH will be installed at this facility.

Storage vessels affected by this Subpart include those with VOC emissions greater than 6 TPY. The storage vessels have estimated VOC emissions below 6 TPY per tank and are not subject to this Subpart.

40 CFR PART 63 SUBPART HH - NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS FOR SOURCE CATEGORIES FROM OIL AND NATURAL GAS PRODUCTION FACILITIES:

The site is a minor (area) source of hazardous air pollutants. This subpart applies to affected emission points that are located at facilities that are major and area sources of HAP, and either

process, upgrade, or store hydrocarbon liquids prior to custody transfer or that process, upgrade, or store natural gas prior to entering the natural gas transmission and storage source category. For purposes of this subpart natural gas enters the natural gas transmission and storage source category after the natural gas processing plant, if present. The facility is a minor (area) source of HAP and does not have an affected facility as defined by the area source requirements (TEG dehydrators).

40 CFR PART 63 SUBPART HHH - NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS FOR SOURCE CATEGORIES FROM NATURAL TRANSMISSION AND STORAGE FACILITIES:

The facility is not a natural gas transmission and storage facility and is therefore not subject to this Subpart.

40 CFR PART 63 SUBPART ZZZZ - NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS FOR SOURCE CATEGORIES FROM STATIONARY RECIPROCATING INTERNAL COMBUSTION ENGINES - AREA SOURCE:

The original rule, published on February 26, 2004, initially affected new (constructed or reconstructed after December 19, 2002) reciprocating internal combustion engines (RICE) with a site-rating greater than 500 brake horsepower located at a major source of HAP emissions. On January 18, 2008, EPA published an amendment that promulgated standards for RICE constructed or reconstructed after June 12, 2006 with a site rating less than or equal to 500-hp located at major sources, and for engines constructed and reconstructed after June 12, 2006 located at area sources. On August 10, 2010, EPA published another amendment that promulgated standards for existing (constructed or reconstructed before June 12, 2006) RICE at area sources and existing RICE (constructed or reconstructed before June 12, 2006) with a site rating of less than or equal to 500-hp at major sources.

Owners and operators of new or reconstructed engines at area sources must meet the requirements of Subpart ZZZZ by complying with either 40 CFR Part 60 Subpart IIII (for CI engines) or 40 CFR Part 60 Subpart JJJJ (for SI engines). Based on emission calculations, this facility is a minor source of HAP. The engines are subject to NSPS Subpart JJJJ and comply with MACT Subpart ZZZZ by complying with the requirements of NSPS Subpart JJJJ.

APPLICATION FOR GENERAL PERMIT REGISTRATION

dep	**west virginia** department of environmental protection	Division of Air Quality 601 57th Street SE Charleston, WV 25304 Phone (304) 926-0475 Fax (304) 926-0479 www.dep.wv.gov

G70-B GENERAL PERMIT REGISTRATION APPLICATION

PREVENTION AND CONTROL OF AIR POLLUTION IN REGARD TO THE CONSTRUCTION, MODIFICATION, RELOCATION, ADMINISTRATIVE UPDATE AND OPERATION OF NATURAL GAS PRODUCTION FACILITIES LOCATED AT THE WELL SITE

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

SECTION 1. GENERAL INFORMATION

Name of Applicant (as registered with the WV Secretary of State's Office): SWN Production Company, LLC

Federal Employer ID No. (FEIN): 26-4388727

Applicant's Mailing Address: 10000 Energy Drive

City: Spring	State: TX	ZIP Code: 77389

Facility Name: William Ritchea Pad

Operating Site Physical Address: 1820 Harlan Ridge Road. Facility is located at 39.670670, -80.52959.
If none available, list road, city or town and zip of facility.

City: New Martinsville, WV	Zip Code: 26155	County: Wetzel

Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits):
Latitude: 39.670670
Longitude: -80.52959

SIC Code: 1311 NAICS Code: 211111	DAQ Facility ID No. (For existing facilities)

CERTIFICATION OF INFORMATION

This G70-B General Permit Registration Application shall be signed below by a Responsible Official. A Responsible Official is a President, Vice President, Secretary, Treasurer, General Partner, General Manager, a member of the Board of Directors, or Owner, depending on business structure. A business may certify an Authorized Representative who shall have authority to bind the Corporation, Partnership, Limited Liability Company, Association, Joint Venture or Sole Proprietorship. Required records of daily throughput, hours of operation and maintenance, general correspondence, compliance certifications and all required notifications must be signed by a Responsible Official or an Authorized Representative. If a business wishes to certify an Authorized Representative, the official agreement below shall be checked off and the appropriate names and signatures entered. **Any administratively incomplete or improperly signed or unsigned G70-B Registration Application will be returned to the applicant. Furthermore, if the G70-B forms are not utilized, the application will be returned to the applicant. No substitution of forms is allowed.**

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

I hereby certify that all information contained in this G70-B General Permit Registration Application and any supporting documents appended hereto is, to the best of my knowledge, true, accurate and complete, and that all reasonable efforts have been made to provide the most comprehensive information possible.

Responsible Official Signature: _____ 1-15-16
Name and Title: **Paul Geiger, Sr. Vice President Ops Management** Phone: 832-796-1000
Fax: 832-796-4818
Email: Paul_Geiger@swn.com Date: 1-11-16

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

If applicable:
Environmental Contact
Name and Title: Kristi Evans Phone: Fax:
Email: Kristi_Evans@swn.com Date:

OPERATING SITE INFORMATION
Briefly describe the proposed new operation and/or any change(s) to the facility: Two engines, seven heaters, four condensate tanks, four produced water tanks, and a vapor combustor will be added. Fugitive emissions, condensate loading, produced water loading and haul road emissions will also occur.
Directions to the facility: From New Martinsville, WV, head west on Virginia St. toward 3rd street for approx. 128 ft. Turn left at the 1st cross street onto WV-2 S/WV-7 E/3rd. St. and travel 0.5 miles. Turn left onto WV-7 E and travel 25.9 miles. Turn left onto Sugar Run Rd and travel 1.3 miles.

ATTACHMENTS AND SUPPORTING DOCUMENTS	
I have enclosed the following required documents:	
Check payable to WVDEP – Division of Air Quality with the appropriate application fee (per 45CSR13 and 45CSR22). ☒ Check attached to front of application. ☐ I wish to pay by electronic transfer. Contact for payment (incl. name and email address): ☐ I wish to pay by credit card. Contact for payment (incl. name and email address): ☒$500 (Construction, Modification, and Relocation) ☐$300 (Class II Administrative Update) ☒$1,000 NSPS fee for 40 CFR60, Subpart IIII, JJJJ and/or OOOO [1] ☐$2,500 NESHAP fee for 40 CFR63, Subpart ZZZZ and/or HH [2] [1] Only one NSPS fee will apply. [2] Only one NESHAP fee will apply. The Subpart ZZZZ NESHAP fee will be waived for new engines that satisfy requirements by complying with NSPS, Subparts IIII and/or JJJJ. *NSPS and NESHAP fees apply to new construction or if the source is being modified.*	
☒ Responsible Official or Authorized Representative Signature (if applicable)	
☒ Single Source Determination Form **(must be completed in its entirety)** – Attachment A	
☐ Siting Criteria Waiver (if applicable) – Attachment B	☒ Current Business Certificate – Attachment C
☒ Process Flow Diagram – Attachment D	☒ Process Description – Attachment E
☒ Plot Plan – Attachment F	☒ Area Map – Attachment G
☒ G70-B Section Applicability Form – Attachment H	☒ Emission Units/ERD Table – Attachment I
☒ Fugitive Emissions Summary Sheet – Attachment J	
☐ Gas Well Affected Facility Data Sheet (if applicable) – Attachment K	
☒ Storage Vessel(s) Data Sheet (include gas sample data, USEPA Tanks, simulation software (e.g. ProMax, E&P Tanks, HYSYS, etc.), etc. where applicable) – Attachment L	
☒ Natural Gas Fired Fuel Burning Unit(s) Data Sheet (GPUs, Heater Treaters, In-Line Heaters if applicable) – Attachment M	
☒ Internal Combustion Engine Data Sheet(s) (include manufacturer performance data sheet(s) if applicable) – Attachment N	
☒ Tanker Truck Loading Data Sheet (if applicable) – Attachment O	
☐ Glycol Dehydration Unit Data Sheet(s) (include wet gas analysis, GRI- GLYCalc™ input and output reports and information on reboiler if applicable) – Attachment P	
☒ Pneumatic Controllers Data Sheet – Attachment Q	
☒ Air Pollution Control Device/Emission Reduction Device(s) Sheet(s) (include manufacturer performance data sheet(s) if applicable) – Attachment R	
☒ Emission Calculations (please be specific and include all calculation methodologies used) – Attachment S	
☒ Facility-wide Emission Summary Sheet(s) – Attachment T	
☒ Class I Legal Advertisement – Attachment U	
☒ One (1) paper copy and two (2) copies of CD or DVD with pdf copy of application and attachments	

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

ATTACHMENT A: AGGREGATION ANALYSIS

ATTACHMENT A - SINGLE SOURCE DETERMINATION FORM

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

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

Is there a facility owned by or associated with the natural gas industry located within one (1) mile of the proposed facility? Yes ☐ No ☒

If Yes, please complete the questionnaire on the following page (Attachment A).

Please provide a source aggregation analysis for the proposed facility below:

The aggregation of facilities is appropriate only if separate emissions sources meet the following three-prong test:

1. The sources belong to a single major industrial grouping (same two-digit major SIC code);
2. The sources are under common control of the same person (or persons under common control); and
3. The sources are located on one or more "contiguous or adjacent" properties.

Under the third prong, SWN determined that there were no other facilities contiguous with or adjacent to William Ritchea to be permitted. Neither the WV DEP nor EPA have established a distance under which source aggregations are required, but the terms "contiguous" or "adjacent" require analyzing distances between operations. To be considered contiguous, two operations must share a common fence line. As for adjacent, operations located more than a quarter of a mile apart are clearly not adjacent, but operations within a quarter of a mile require an analysis to determine if they meet the common sense notion of a plant. No other SWN locations are located within a quarter mile of William Ritchea to be permitted; therefore, no additional facilities are contiguous or adjacent.

ATTACHMENT C: BUSINESS REGISTRATION CERTIFICATE

WEST VIRGINIA
STATE TAX DEPARTMENT
BUSINESS REGISTRATION CERTIFICATE

ISSUED TO:
SWN PRODUCTION COMPANY, LLC
5400D BIG TYLER RD
CHARLESTON, WV 25313-1103

BUSINESS REGISTRATION ACCOUNT NUMBER: **2307-3731**

This certificate is issued on: **12/8/2014**

This certificate is issued by
the West Virginia State Tax Commissioner
in accordance with Chapter 11, Article 12, of the West Virginia Code

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

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

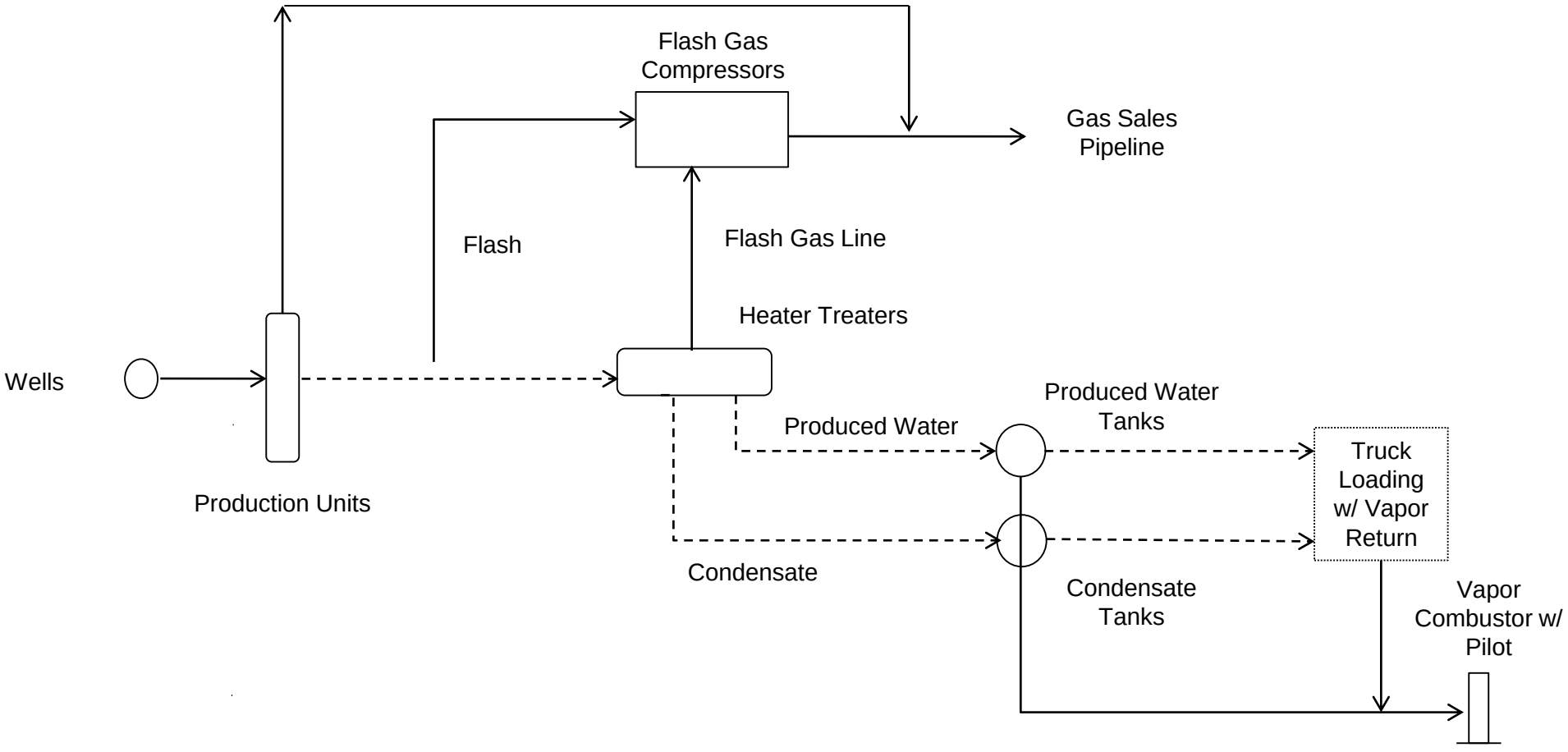
This certificate shall be permanent until cessation of the business for which the certificate of registration was granted or until it is suspended, revoked or cancelled by the Tax Commissioner.

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

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

atL006 v.4
L1160094016

ATTACHMENT D: PROCESS FLOW DIAGRAM



Gas/Vapor

Liquids (Condensate and Produced Water)

Note: Drawing is a depiction of general facility process and is not intended to represent facility and/or equipment layout.

SWN Production Company, LLC
William Ritchea Pad
Attachment D: Process Flow Diagram
December 2015

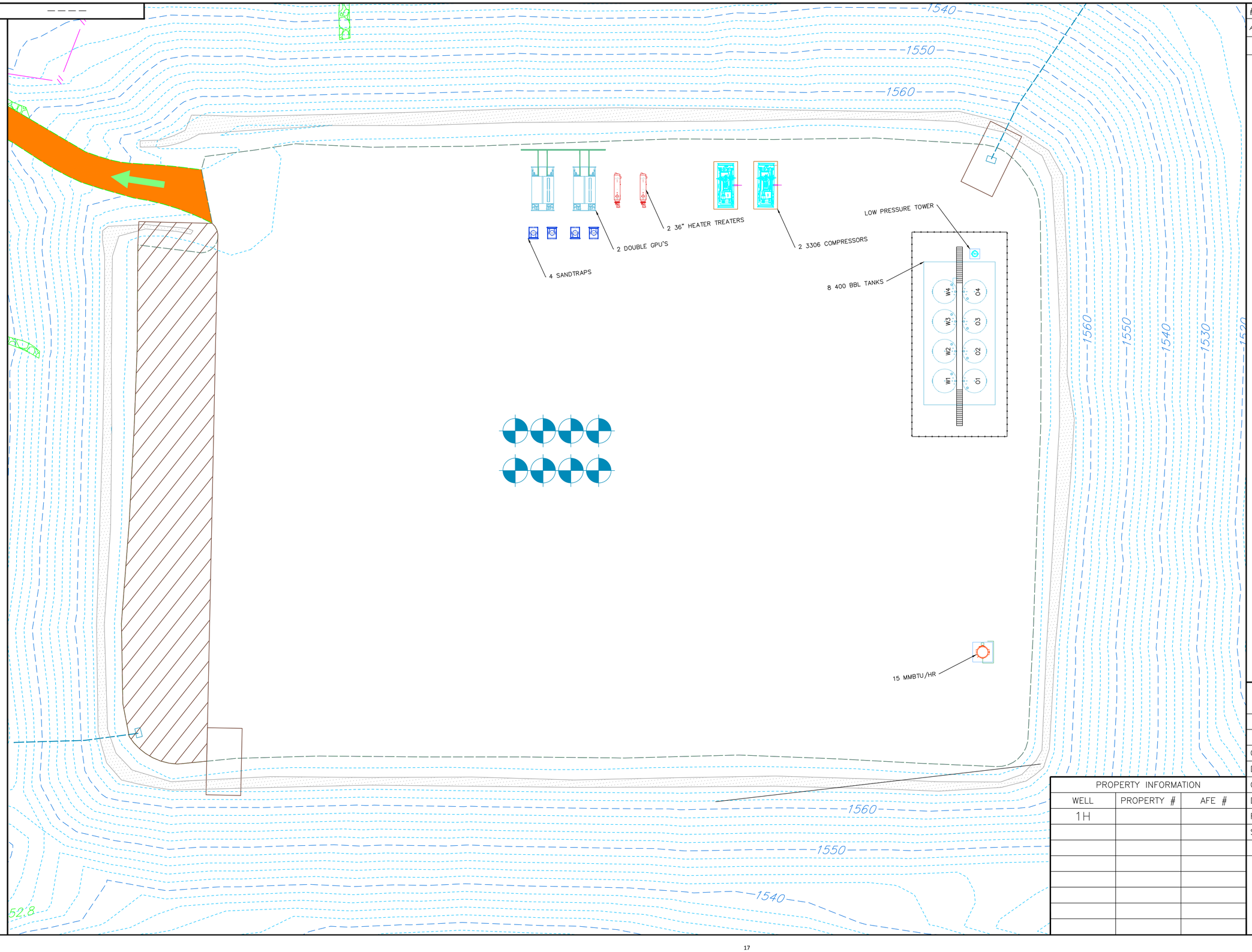
ATTACHMENT E: PROCESS DESCRIPTION

The facility is an oil and natural gas exploration and production facility, responsible for the production of condensate and natural gas. Storage of condensate and produced water will also occur on-site. A description of the facility process is as follows: Condensate, gas and water come from the wellhead(s) to the production unit(s), where the first stage of separation occurs. Fluids (condensate and produced water) will be sent to the heater treater(s). Produced water from the heater treater(s) flows into the produced water storage tank(s). Condensate flows into the condensate storage tank(s). Flash gases from the heater treater(s) are routed via hard-piping (with 100% capture efficiency) to the inlet of the flash gas compressor(s) to be compressed.

The natural gas stream will exit the facility for transmission via pipeline. Condensate and produced water are transported offsite via truck. Loading emissions will be controlled with vapor return, which has at least 70% capture efficiency, and will be routed to the vapor combustor for at least 98% destruction efficiency, for an overall control efficiency of 69%. Working, breathing and flashing vapors from the condensate and produced water storage tanks will be controlled by the combustor with 98% destruction efficiency. The vapor combustor has one (1) natural gas-fired pilot to ensure a constant flame for combustion.

A process flow diagram reflecting facility operations is shown in Attachment D.

ATTACHMENT F: PLOT PLAN



#	Revision Description	DATE DWN	CHK
A	INITIAL RELEASE	DRAWN BY: JJL	CHKD BY: CAF
		DRAWN BY:	CHKD BY:
		DRAWN BY:	CHKD BY:

PROPERTY INFORMATION		
WELL	PROPERTY #	AFE #
1H		

Facilites Layout

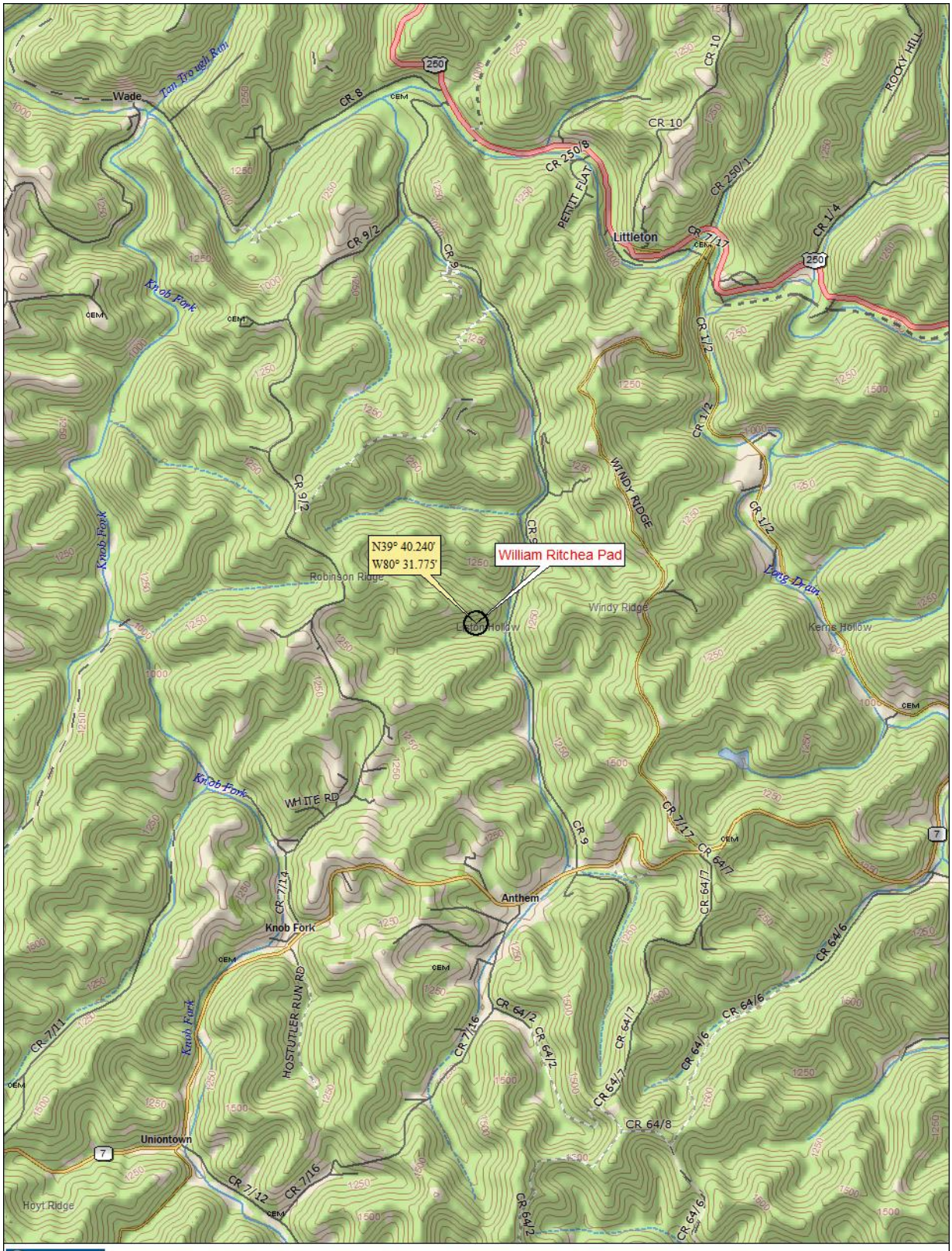
WILLIAM RITCHEA

WEST VIRGINIA DIVISION

COUNTY: WETZEL	PAD #:
DRAWN BY: AAA	DATE: 00/00/00
CHECKED BY: BBB	DATE: 00/00/00
DRAWING #:	
REVISION: A	SHEET #: 1 OF 1
SCALE:	SHEET SIZE: ANSI-D

DO NOT SCALE DRAWING

ATTACHMENT G: AREA MAP



William Ritchea Pad
Figure 1: Area Map
Wetzel County, West Virginia
December 2015

ATTACHMENT H: G70-B SECTION APPLICABILITY FORM

ATTACHMENT H – G70-B SECTION APPLICABILITY FORM

General Permit G70-B Registration
Section Applicability Form

General Permit G70-B was developed to allow qualified applicants to seek registration for a variety of sources. These sources include gas well affected facilities, storage vessels, gas production units, in-line heaters, heater treaters, glycol dehydration units and associated reboilers, pneumatic controllers, centrifugal compressors, reciprocating compressors, reciprocating internal combustion engines (RICEs), tank truck loading, fugitive emissions, completion combustion devices, flares, enclosed combustion devices, and vapor recovery systems. All registered facilities will be subject to Sections 1.0, 2.0, 3.0, and 4.0.

General Permit G70-B allows the registrant to choose which sections of the permit they are seeking registration under. Therefore, please mark which additional sections that you are applying for registration under. If the applicant is seeking registration under multiple sections, please select all that apply. Please keep in mind, that if this registration is approved, the issued registration will state which sections will apply to your affected facility.

GENERAL PERMIT G70-B APPLICABLE SECTIONS	
☐ Section 5.0	Gas Well Affected Facility (NSPS, Subpart OOOO)
☒ Section 6.0	Storage Vessels Containing Condensate and/or Produced Water[1]
☐ Section 7.0	Storage Vessel Affected Facility (NSPS, Subpart OOOO)
☒ Section 8.0	Control Devices and Emission Reduction Devices not subject to NSPS Subpart OOOO and/or NESHAP Subpart HH
☒ Section 9.0	Small Heaters and Reboilers not subject to 40CFR60 Subpart Dc
☐ Section 10.0	Pneumatic Controllers Affected Facility (NSPS, Subpart OOOO)
☐ Section 11.0	Centrifugal Compressor Affected Facility (NSPS, Subpart OOOO)[2]
☐ Section 12.0	Reciprocating Compressor Affected Facility (NSPS, Subpart OOOO)[2]
☒ Section 13.0	Reciprocating Internal Combustion Engines, Generator Engines, Microturbines
☒ Section 14.0	Tanker Truck Loading[3]
☐ Section 15.0	Glycol Dehydration Units[4]

1 *Applicants that are subject to Section 6 may also be subject to Section 7 if the applicant is subject to the NSPS, Subpart OOOO control requirements or the applicable control device requirements of Section 8.*

2 *Applicants that are subject to Section 11 and 12 may also be subject to the applicable RICE requirements of Section 13.*

3 *Applicants that are subject to Section 14 may also be subject to control device and emission reduction device requirements of Section 8.*

4 *Applicants that are subject to Section 15 may also be subject to the requirements of Section 9 (reboilers). Applicants that are subject to Section 15 may also be subject to control device and emission reduction device requirements of Section 8.*

ATTACHMENT I: EMISSIONS UNITS/ERD TABLE

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

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

Emission Unit ID[1]	Emission Point ID[2]	Emission Unit Description	Year Installed	Manufac. Date[3]	Design Capacity	Type[4] and Date of Change	Control Device(s)[5]	ERD(s)[6]
EU-ENG1	EP-ENG1	145-hp Caterpillar G3306 NA Engine w/ Catalytic Converter	TBD	TBD	145-hp	New	NSCR	NSCR
EU-ENG2	EP-ENG2	145-hp Caterpillar G3306 NA Engine w/ Catalytic Converter	TBD	TBD	145-hp	New	NSCR	NSCR
EU-GPU1 - EU-GPU5	EP-GPU1 - EP-GPU5	Five (5) 1.0-mmBtu/hr GPU Burners	TBD	TBD	1-mmBtu/hr	New	N/A	N/A
EU-HT1 - EU-HT2	EP-HT1 - EP-HT2	Two (2) 0.5-mmBtu/hr Heater Treaters	TBD	TBD	0.5-mmBtu/hr	New	N/A	N/A
EU-TANKS-COND	APC-COMB-TKLD	Four (4) 400-bbl Condensate Tanks Routed to Vapor Combustor	TBD	TBD	400-bbl	New	APC-COMB-TKLD	APC-VRU-TANKS
EU-TANKS-PW	APC-COMB-TKLD	Four (4) 400-bbl Produced Water Tanks Routed to Vapor Combustor	TBD	TBD	400-bbl	New	APC-COMB-TKLD	APC-VRU-TANKS
EU-LOAD-COND	APC-COMB-TKLD	Condensate Truck Loading w/ Vapor Return Routed to Combustor	TBD	TBD	12,478,620 gal/yr	New	Vapor Return and APC-COMB-TKLD	Vapor Return and APC-COMB-TKLD
EU-LOAD-PW	APC-COMB-TKLD	Produced Water Truck Loading w/ Vapor Return Routed to Combustor	TBD	TBD	12,923,190 gal/yr	New	Vapor Return and APC-COMB-TKLD	Vapor Return and APC-COMB-TKLD
APC-COMB-TKLD	APC-COMB-TKLD	One (1) 15.0-mmBtu/hr Vapor Combustor - Tank/Loading Stream	TBD	TBD	15-mmBtu/hr	New	N/A	N/A
EU-PILOT	APC-COMB-TKLD	Vapor Combustor Pilot	TBD	TBD	50-scfh	New	N/A	N/A
EU-HR	EP-HR	Fugitive Haul Road Emissions	TBD	TBD	N/A	New	N/A	N/A

[1] For Emission Units (or Sources) use the following numbering system:1S, 2S, 3S,... or other appropriate designation.

[2] For Emission Points use the following numbering system:1E, 2E, 3E, ... or other appropriate designation.

[3] When required by rule

[4] New, modification, removal, existing

[5] For Control Devices use the following numbering system: 1C, 2C, 3C,... or other appropriate designation.

[6] For ERDs use the following numbering system: 1D, 2D, 3D,... or other appropriate designation.

ATTACHMENT J: FUGITIVE EMISSIONS SUMMARY SHEET

Fugitive emissions at this site consist of haul road emissions, condensate and produced water loading operations, and equipment leaks.

ATTACHMENT J – FUGITIVE EMISSIONS SUMMARY SHEET

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

Source/Equipment: FUG

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

Component Type	Closed Vent System	Count	Source of Leak Factors (EPA, other (specify))	Stream type (gas, liquid, etc.)	Estimated Emissions (tpy)		
					VOC	HAP	GHG (CO_2e)
Pumps	☐ Yes ☐ No			☐ Gas ☐ Liquid ☐ Both			
Valves	☐ Yes ☐ No	77-gas 76-light oil	EPA	☐ Gas ☐ Liquid ☒ Both	0.68 – gas 1.73 – light oil	0.02 – gas 0.26 – light oil	
Safety Relief Valves	☐ Yes ☐ No			☐ Gas ☐ Liquid ☐ Both			
Open Ended Lines	☐ Yes ☐ No			☐ Gas ☐ Liquid ☐ Both			
Sampling Connections	☐ Yes ☐ No			☐ Gas ☐ Liquid ☐ Both			
Connections (Not sampling)	☐ Yes ☐ No			☐ Gas ☐ Liquid ☐ Both			
Compressors	☐ Yes ☐ No	6-gas	EPA	☒ Gas ☐ Liquid ☐ Both	0.10-gas	<0.01-gas	
Flanges	☐ Yes ☐ No	321-gas 298-light oil	EPA	☐ Gas ☐ Liquid ☒ Both	0.25-gas 0.30-light oil	0.01-gas 0.04-light oil	
Other[1]	☐ Yes ☐ No	28-gas	EPA	☒ Gas ☐ Liquid ☐ Both	0.48-gas	0.01-gas	

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

Please provide an explanation of the sources of fugitive emissions (e.g. pigging operations, equipment blowdowns, pneumatic controllers, etc.):
Equipment leaks

Please indicate if there are any closed vent bypasses (include component): N/A
Specify all equipment used in the closed vent system (e.g. VRU, ERD, thief hatches, tanker truck loading, etc.) N/A

ATTACHMENT L: STORAGE VESSELS DATA SHEET

REPRESENTATIVE GAS ANALYSES

TANKS 4.0.9D REPORTS

PROMAX PROCESS SIMULATION RESULTS

ATTACHMENT O – TANKER TRUCK LOADING DATA SHEET

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

Truck Loadout Collection Efficiencies

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

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

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

Emission Unit ID#: EU-LOAD-COND	Emission Point ID#: APC-COMB-TKLD	Year Installed/Modified: TBD
Emission Unit Description: Condensate Truck Loading Emissions		
Loading Area Data		
Number of Pumps: 1	Number of Liquids Loaded: 1	Max number of trucks loading at one (1) time: 1
Are tanker trucks pressure tested for leaks at this or any other location? ☐ Yes ☒ No ☐ Not Required If Yes, Please describe:		
Provide description of closed vent system and any bypasses. Vapors are collected and routed to a vapor combustor.		
Are any of the following truck loadout systems utilized? ☐ Closed System to tanker truck passing a MACT level annual leak test? ☐ Closed System to tanker truck passing a NSPS level annual leak test? ☐ Closed System to tanker truck not passing an annual leak test and has vapor return?		

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

Time	Jan – Mar	Apr - Jun	Jul – Sept	Oct - Dec
Hours/day	24	24	24	24
Days/week	5	5	5	5

Bulk Liquid Data (use extra pages as necessary)

Liquid Name	Condensate		
Max. Daily Throughput (1000 gal/day)	34.19		
Max. Annual Throughput (1000 gal/yr)	12,478.62		
Loading Method[1]	SUB		
Max. Fill Rate (gal/min)	125		
Average Fill Time (min/loading)	Approx 60		
Max. Bulk Liquid Temperature (°F)	50.33		
True Vapor Pressure[2]	11.7212		
Cargo Vessel Condition[3]	U		
Control Equipment or Method[4]	O = Vapor Return s/ Combustion Controls		
Max. Collection Efficiency (%)	70%		

Max. Control Efficiency (%)		98%		
Max.VOC Emission Rate	Loading (lb/hr)	19.37		
	Annual (ton/yr)	16.12		
Max.HAP Emission Rate	Loading (lb/hr)	2.73		
	Annual (ton/yr)	2.27		
Estimation Method[5]		EPA		

Emission Unit ID#: EU-LOAD-PW	Emission Point ID#: APC-COMB-TKLD	Year Installed/Modified: TBD
Emission Unit Description: Produced Water Truck Loading Emissions		
Loading Area Data		
Number of Pumps: 1	Number of Liquids Loaded: 1	Max number of trucks loading at one (1) time: 1
Are tanker trucks pressure tested for leaks at this or any other location? ☐ Yes ☒ No ☐ Not Required If Yes, Please describe:		
Provide description of closed vent system and any bypasses. Vapors are collected and routed to a vapor combustor.		
Are any of the following truck loadout systems utilized? ☐ Closed System to tanker truck passing a MACT level annual leak test? ☐ Closed System to tanker truck passing a NSPS level annual leak test? ☐ Closed System to tanker truck not passing an annual leak test and has vapor return?		

Projected Maximum Operating Schedule (for rack or transfer point as a whole)				
Time	Jan – Mar	Apr - Jun	Jul – Sept	Oct - Dec
Hours/day	24	24	24	24
Days/week	5	5	5	5

Bulk Liquid Data (use extra pages as necessary)				
Liquid Name		Produced Water		
Max. Daily Throughput (1000 gal/day)		35.41		
Max. Annual Throughput (1000 gal/yr)		12,923.19		
Loading Method[1]		SUB		
Max. Fill Rate (gal/min)		125		
Average Fill Time (min/loading)		Approx 60		
Max. Bulk Liquid Temperature (ºF)		50.33		
True Vapor Pressure[2]		0.2498		
Cargo Vessel Condition[3]		U		
Control Equipment or Method[4]		O = Vapor Return s/ Combustion Controls		
Max. Collection Efficiency (%)		70%		
Max. Control Efficiency (%)		98%		
Max.VOC Emission Rate	Loading (lb/hr)	0.18		
	Annual (ton/yr)	0.16		
Max.HAP Emission Rate	Loading (lb/hr)	0.03		
	Annual (ton/yr)	0.02		

Estimation Method[5]	EPA		

1 BF Bottom Fill SP Splash Fill SUB Submerged Fill

2 At maximum bulk liquid temperature

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

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

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

TABLE 1-B

COMPOSITIONAL ANALYSIS OF THE SEPARATOR GAS, OIL AND MATHEMATICALLY RECOMBINED WELLSTREAM THROUGH C_{11+}

SEPARATOR GOR.....: 63943 Scf/Sep Bbl
SEPARATOR PRESSURE.....: 415 psig
SEPARATOR TEMPERATURE.....: 94 °F

	SEPARATOR GAS		SEPARATOR OIL		WELLSTREAM	
Component	Mole%	* GPM	Mole %	Liquid Volume %	Mole %	* GPM
Hydrogen Sulfide	0.000	0.000	0.000	0.000	0.000	0.000
Nitrogen	0.433	0.000	0.073	0.021	0.427	0.000
Carbon Dioxide	0.180	0.000	0.043	0.019	0.178	0.000
Methane	77.380	0.000	10.266	4.552	76.241	0.000
Ethane	14.005	3.776	9.016	6.309	13.920	3.753
Propane	4.820	1.337	9.073	6.532	4.892	1.357
Iso-butane	0.622	0.205	2.569	2.198	0.655	0.216
N-butane	1.329	0.422	7.310	6.026	1.431	0.454
2-2 Dimethylpropane	0.018	0.007	0.085	0.085	0.019	0.007
Iso-pentane	0.350	0.129	4.143	3.966	0.414	0.153
N-pentane	0.366	0.134	5.507	5.219	0.453	0.166
2-2 Dimethylbutane	0.012	0.005	0.244	0.267	0.016	0.007
Cyclopentane	0.002	0.001	0.000	0.000	0.002	0.001
2-3 Dimethylbutane	0.014	0.006	0.493	0.529	0.022	0.009
2 Methylpentane	0.091	0.038	2.801	3.041	0.137	0.057
3 Methylpentane	0.054	0.022	1.916	2.046	0.086	0.035
Other Hexanes	0.000	0.000	0.000	0.000	0.000	0.000
n-Hexane	0.121	0.050	5.107	5.494	0.206	0.085
Methylcyclopentane	0.009	0.003	0.457	0.423	0.017	0.006
Benzene	0.002	0.001	0.088	0.065	0.003	0.001
Cyclohexane	0.012	0.004	0.763	0.679	0.025	0.008
2-Methylhexane	0.024	0.011	2.276	2.768	0.062	0.029
3-Methylhexane	0.024	0.011	2.356	2.829	0.064	0.029
2,2,4 Trimethylpentane	0.000	0.000	0.000	0.000	0.000	0.000
Other Heptanes	0.024	0.011	1.904	2.169	0.056	0.025
n-Heptane	0.034	0.016	4.255	5.135	0.106	0.049
Methylcyclohexane	0.020	0.008	2.539	2.670	0.063	0.025
Toluene	0.003	0.001	0.542	0.475	0.012	0.004
Other C-8's	0.031	0.015	7.178	8.802	0.152	0.072
n-Octane	0.008	0.004	2.750	3.684	0.055	0.028
Ethylbenzene	0.000	0.000	0.448	0.453	0.008	0.003
M&P-Xylene	0.002	0.001	0.585	0.594	0.012	0.005
O-Xylene	0.000	0.000	0.832	0.828	0.014	0.005
Other C-9's	0.007	0.004	3.645	4.992	0.069	0.036
n-Nonane	0.001	0.001	1.461	2.152	0.026	0.015
Other C10's	0.001	0.001	3.247	4.888	0.056	0.033
n-Decane	0.001	0.001	0.810	1.301	0.015	0.009
Undecanes Plus	0.000	0.000	5.216	8.794	0.089	0.058
TOTAL	100.000	6.223	100.000	100.000	100.000	6.741

TABLE 1-B

COMPOSITIONAL ANALYSIS OF THE SEPARATOR GAS, OIL AND MATHEMATICALLY RECOMBINED WELLSTREAM THROUGH C_{11+}

SEPARATOR GOR.....: 63943 Scf/Sep Bbl
SEPARATOR PRESSURE.....: 415 psig
SEPARATOR TEMPERATURE.....: 94 °F

UNDECANES PLUS (C_{11+}) FRACTION CHARACTERISTICS

COMPONENT	Specific Gravity °API	Specific Gravity **	Molecular Weight lb/lb-mole	Vapor Volume Scf/Gal	Gross Heating Value ***
Gas	N/A	0.8250	156.000	16.558	8,400
Oil	44.561	0.8037	163.500	15.391	128,193
Wellstream	N/A	0.8037	163.500	15.391	N/A

TOTAL SAMPLE CHARACTERISTICS

COMPONENT	Specific Gravity °API	Specific Gravity **	Molecular Weight lb/lb-mole	Vapor Volume Scf/Gal	Gross Heating Value Dry ***	Gross Heating Value Saturated ***
Gas	N/A	0.7304	21.074	160.700	1,287	1,266
Oil	84.807	0.6542	78.925	25.951	N/A	112,067
Wellstream	N/A	0.7615	22.056	50.390	N/A	N/A

* GPM (gallons per Mscf) determined at 14.85 psia and 60 °F

** Gas specific gravity and wellstream specific gravity determined relative to air (SG=1.000).
Oil specific gravity determined relative to water (SG=1.000).

*** Gross Heating Value units for gas (real basis) and oil are BTU/Scf and BTU/Gal, respectively.

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

Identification

User Identification:	William Ritchea Pad - 814 BOPD
City:	
State:	
Company:	
Type of Tank:	Vertical Fixed Roof Tank
Description:	

Tank Dimensions

Shell Height (ft):	20.00
Diameter (ft):	12.00
Liquid Height (ft) :	19.00
Avg. Liquid Height (ft):	10.00
Volume (gallons):	16,074.56
Turnovers:	776.30
Net Throughput(gal/yr):	12,478,620.00
Is Tank Heated (y/n):	N

Paint Characteristics

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

Roof Characteristics

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

Breather Vent Settings

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

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

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

William Ritchea Pad - 814 BOPD - Vertical Fixed Roof Tank

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
William Ritchea - Berisford No. 1-H	All	51.94	47.06	56.81	50.33	10.8833	10.0908	11.7212	50.1430			97.40	Option 4: RVP=14.4

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

Emissions Report for: Annual

William Ritchea Pad - 814 BOPD - Vertical Fixed Roof Tank

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
William Ritchea - Berisford No. 1-H	24,966.74	3,189.24	28,155.98

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

Identification

User Identification:	William Ritchea Pad - 843 BWPD
City:	
State:	
Company:	
Type of Tank:	Vertical Fixed Roof Tank
Description:	

Tank Dimensions

Shell Height (ft):	20.00
Diameter (ft):	12.00
Liquid Height (ft) :	19.00
Avg. Liquid Height (ft):	10.00
Volume (gallons):	16,074.56
Turnovers:	803.95
Net Throughput(gal/yr):	12,923,190.00
Is Tank Heated (y/n):	N

Paint Characteristics

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

Roof Characteristics

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

Breather Vent Settings

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

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

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

William Ritchea Pad - 843 BWPD - Vertical Fixed Roof Tank

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Produced Water	All	51.94	47.06	56.81	50.33	0.2110	0.1777	0.2498	21.1102			18.17	
Water						0.1911	0.1592	0.2284	18.0200	0.9900	0.7715	18.02	Option 2: A=8.10765, B=1750.286, C=235
William Ritchea - Berisford No. 1-H						10.8833	10.0908	11.7212	50.1430	0.0100	0.2285	97.40	Option 4: RVP=14.4

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

Emissions Report for: Annual

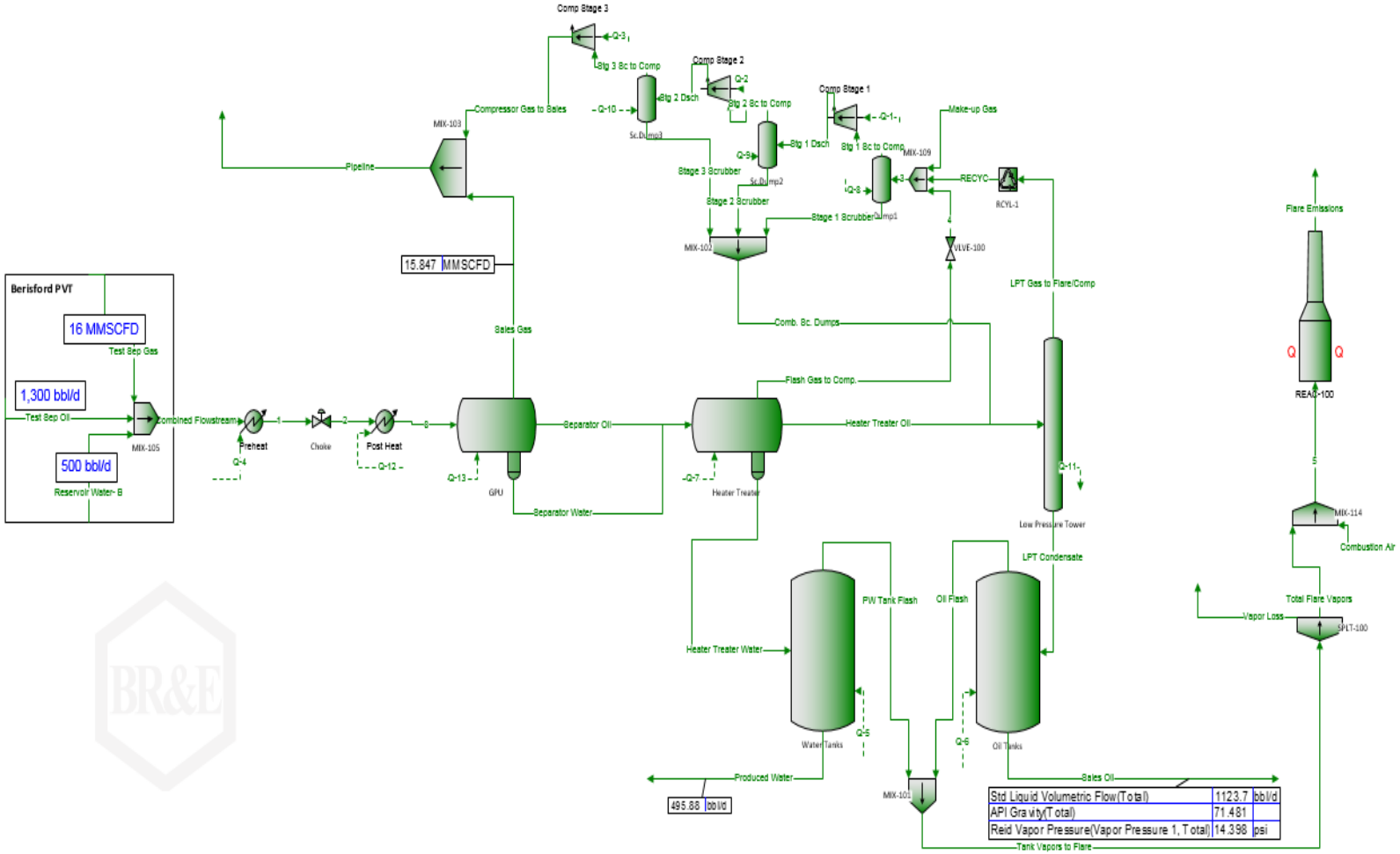
William Ritchea Pad - 843 BWPD - Vertical Fixed Roof Tank

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Produced Water	209.70	11.89	221.59
Water	161.79	9.17	170.96
William Ritchea - Berisford No. 1-H	47.92	2.72	50.63

Names	Units	Test Sep Gas	Test Sep Oil	Reservoir Water-B	Oil Flash	PW Tank Flash	Sales Oil	Sales Gas	Produced Water
Temperature	°F	94*	94*	94*	80#	85	80	70*	85#
Pressure	psia	429.7*	429.7*	429.7*	15.196	15.196	15.196*	364.7*	15.196*
Mole Fraction Vapor	%	100	0	0	100	100	0	100	0
Mole Fraction Light Liquid	%	0	100	100	0	0	99.091	0	100
Mole Fraction Heavy Liquid	%	0	0	0	0	0	0.90909	0	0
Molecular Weight	lb/lbmol	21.075	79.801	18.015	50.143	32.501	97.399	20.677	18.016
Molar Flow	lbmol/h	1756.8	153.17	404.94	2.6504	0.019209	116.38	1740	401.56
Mass Flow	lb/h	37024	12224	7295	132.9	0.62431	11335	35979	7234.4
Enthalpy	Btu/h	-6.0556e+007	-1.1833e+007	-4.9634e+007	-1.377e+005	-821.47	-1.063e+007	-6.0072e+007	-4.9291e+007
Nitrogen(Mole Fraction)	%	0.433*	0.073002*	0*	0.00057089	0.0397	8.9795e-007	0.44175	4.5719e-007
CO2(Mole Fraction)	%	0.18*	0.043001*	0*	0.054022	0.50713	0.00082491	0.17897	0.00023082
C1(Mole Fraction)	%	77.38*	10.266*	0*	1.9267	34.115	0.0098837	78.05	0.00080499
C2(Mole Fraction)	%	14.005*	9.0163*	0*	17.33	28.267	0.55183	13.988	0.00075813
C3(Mole Fraction)	%	4.82*	9.0733*	0*	32.668	18.728	3.6793	4.6546	0.00052138
Isobutane(Mole Fraction)	%	0.622*	2.5691*	0*	7.9542	1.7289	2.2715	0.56652	1.7065e-005
n-Butane(Mole Fraction)	%	1.329*	7.3102*	0*	19.297	7.8574	7.9233	1.1589	0.00017379
2,2-Dimethylpropane(Mole Fraction)	%	0.018*	0.085003*	0*	0.23934	0.04403	0.13364	0.013334	4.2574e-007
Isopentane(Mole Fraction)	%	0.35*	4.1431*	0*	5.4766	1.4993	5.7149	0.27133	2.1924e-005
n-Pentane(Mole Fraction)	%	0.366*	5.5072*	0*	5.6314	1.7494	7.8294	0.27005	2.6035e-005

Oil Flash Factor – 3.25 lb/bbl

Produced water – 0.02 lb/bbl


Comp Stage 3
Q-3
Stg 3 Bc to Comp
Comp Stage 2
Q-2
Stg 2 Disch
Stg 2 Bc to Comp
Comp Stage 1
Q-1
Make-up Gas
Compressor Gas to Sales
Q-10
MIX-103
Pipeline
Sc.Dump3
Stg 1 Disch
Stg 1 Bc to Comp
MIX-109
Q-9
Stage 3 Scrubber
Sc.Dump2
Q-8
RECYC
RCYL-1
Stage 2 Scrubber
Stage 1 Scrubber
Sc.Dump1
MIX-102
VLVE-100
15.847 MMSCFD
LPT Gas to Flare/Comp
Comb. Bc. Dumps
Sales Gas
Flash Gas to Comp.
Berisford PVT
16 MMSCFD
Test Sep Gas
1,300 bbl/d
Test Sep Oil
500 bbl/d
Reservoir Water- B
MIX-105
Combined Flowstream
Preheat
Q-4
Choke
Post Heat
Q-12
Q-13
GPU
Separator Oil
Separator Water
Q-7
Heater Treater
Heater Treater Oil
Q-11
Low Pressure Tower
Flare Emissions
Q
REAC-100
MIX-114
Combustion Air
LPT Condensate
PW Tank Flash
Oil Flash
Heater Treater Water
Water Tanks
Q-5
Q-6
Oil Tanks
Total Flare Vapors
Vapor Loss
SPLT-100
Produced Water
495.88 bbl/d
MIX-101
Sales Oil
Std Liquid Volumetric Flow(Total) 1123.7 bbl/d
API Gravity(Total) 71.481
Reid Vapor Pressure(Vapor Pressure 1, Total) 14.398 psi
Tank Vapors to Flare

ATTACHMENT M: NATURAL GAS FIRED FUEL BURNING UNITS DATA SHEET

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

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

Emission Unit ID#[1]	Emission Point ID#[2]	Emission Unit Description (manufacturer, model #)	Year Installed/ Modified	Type[3] and Date of Change	Maximum Design Heat Input (MMBTU/hr)[4]	Fuel Heating Value (BTU/scf)[5]
EU-GPU1	EP-GPU1	Gas Production Unit Burner	TBD	New	1.0	905
EU-GPU2	EP-GPU2	Gas Production Unit Burner	TBD	New	1.0	905
EU-GPU3	EP-GPU3	Gas Production Unit Burner	TBD	New	1.0	905
EU-GPU4	EP-GPU4	Gas Production Unit Burner	TBD	New	1.0	905
EU-GPU5	EP-GPU5	Gas Production Unit Burner	TBD	New	1.0	905
EU-HT1	EP-HT1	Heater Treater	TBD	New	0.5	905
EU-HT2	EP-HT2	Heater Treater	TBD	New	0.5	905

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

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

3 New, modification, removal

4 Enter design heat input capacity in MMBtu/hr.

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

ATTACHMENT N: INTERNAL COMBUSTION ENGINE DATA SHEETS

ENGINE SPECIFICATION SHEETS

AP-42 AND EPA EMISSION FACTORS

ATTACHMENT N – INTERNAL COMBUSTION ENGINE DATA SHEET

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

Emission Unit ID#[1]		EU-ENG1		EU-ENG2			
Engine Manufacturer/Model		Caterpillar G3306 NA		Caterpillar G3306 NA			
Manufacturers Rated bhp/rpm		145-hp/1,800-rpm		145-hp/1,800-rpm			
Source Status[2]		NS		NS			
Date Installed/ Modified/Removed/Relocated[3]		TBD		TBD			
Engine Manufactured /Reconstruction Date[4]		TBD		TBD			
Check all applicable Federal Rules for the engine (include EPA Certificate of Conformity if applicable)[5]		☒40CFR60 Subpart JJJJ ☐JJJJ Certified? ☐40CFR60 Subpart IIII ☐IIII Certified? ☒40CFR63 Subpart ZZZZ ☐ NESHAP ZZZZ/ NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources		☒40CFR60 Subpart JJJJ ☐JJJJ Certified? ☐40CFR60 Subpart IIII ☐IIII Certified? ☒40CFR63 Subpart ZZZZ ☐ NESHAP ZZZZ/ NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources		☐40CFR60 Subpart JJJJ ☐JJJJ Certified? ☐40CFR60 Subpart IIII ☐IIII Certified? ☐40CFR63 Subpart ZZZZ ☐ NESHAP ZZZZ/ NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources	
Engine Type[6]		4SRB		4SRB			
APCD Type[7]		NSCR		NSCR			
Fuel Type[8]		RG		RG			
H_2S (gr/100 scf)		Negligible		Negligible			
Operating bhp/rpm		145-hp/1,800-rpm		145-hp/1,800-rpm			
BSFC (BTU/bhp-hr)		8,625		8,625			
Hourly Fuel Throughput		1,382 ft^3/hr gal/hr		1,382 ft^3/hr gal/hr		ft^3/hr gal/hr	
Annual Fuel Throughput (Must use 8,760 hrs/yr unless emergency generator)		12.11 $MMft^3$/yr gal/yr		12.11 $MMft^3$/yr gal/yr		$MMft^3$/yr gal/yr	
Fuel Usage or Hours of Operation Metered		Yes ☐ No ☒		Yes ☐ No ☒		Yes ☐ No ☐	
Calculation Methodology[9]	**Pollutant[10]**	**Hourly PTE (lb/hr)[11]**	**Annual PTE (tons/year)[11]**	**Hourly PTE (lb/hr)[11]**	**Annual PTE (tons/year)[11]**	**Hourly PTE (lb/hr)[11]**	**Annual PTE (tons/year)[11]**
MD	NO_x	0.32	1.40	0.32	1.40		
MD	CO	0.64	2.80	0.64	2.80		
MD	VOC	0.24	1.05	0.24	1.05		
AP	SO_2	<0.01	<0.01	<0.01	<0.01		
AP	PM_{10}	0.01	0.04	0.01	0.04		
MD	Formaldehyde	0.02	0.09	0.02	0.09		
AP	Total HAPs	0.03	0.15	0.03	0.15		
MD and EPA	GHG (CO_2e)	155.19	679.73	155.19	679.73		

ATTACHMENT N – INTERNAL COMBUSTION ENGINE DATA SHEET

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

Emission Unit ID#[1]		EU-ENG4					
Engine Manufacturer/Model		Zenith ZPP-644 4.4L					
Manufacturers Rated bhp/rpm		103.3-hp/3,000-rpm					
Source Status[2]		NS					
Date Installed/ Modified/Removed/Relocated[3]		TBD					
Engine Manufactured /Reconstruction Date[4]		2014					
Check all applicable Federal Rules for the engine (include EPA Certificate of Conformity if applicable)[5]		☒40CFR60 Subpart JJJJ ☒JJJJ Certified? ☐40CFR60 Subpart IIII ☐IIII Certified? ☒40CFR63 Subpart ZZZZ ☐ NESHAP ZZZZ/ NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources		☐40CFR60 Subpart JJJJ ☐JJJJ Certified? ☐40CFR60 Subpart IIII ☐IIII Certified? ☐40CFR63 Subpart ZZZZ ☐ NESHAP ZZZZ/ NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources		☐40CFR60 Subpart JJJJ ☐JJJJ Certified? ☐40CFR60 Subpart IIII ☐IIII Certified? ☐40CFR63 Subpart ZZZZ ☐ NESHAP ZZZZ/ NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources	
Engine Type[6]		4SRB					
APCD Type[7]		NSCR					
Fuel Type[8]		RG					
H_2S (gr/100 scf)		Negligible					
Operating bhp/rpm		103.3-hp/3,000-rpm					
BSFC (BTU/bhp-hr)		11,149					
Hourly Fuel Throughput		707 ft^3/hr gal/hr		ft^3/hr gal/hr		ft^3/hr gal/hr	
Annual Fuel Throughput (Must use 8,760 hrs/yr unless emergency generator)		6.20 $MMft^3$/yr gal/yr		$MMft^3$/yr gal/yr		$MMft^3$/yr gal/yr	
Fuel Usage or Hours of Operation Metered		Yes ☐ No ☒		Yes ☐ No ☐		Yes ☐ No ☐	
Calculation Methodology[9]	**Pollutant[10]**	**Hourly PTE (lb/hr)[11]**	**Annual PTE (tons/year)[11]**	**Hourly PTE (lb/hr)[11]**	**Annual PTE (tons/year)[11]**	**Hourly PTE (lb/hr)[11]**	**Annual PTE (tons/year)[11]**
MD	NO_x	0.46	2.01				
MD	CO	0.75	3.29				
MD	VOC	0.46	2.01				
AP	SO_2	<0.01	<0.01				
AP	PM_{10}	0.01	0.04				
MD	Formaldehyde	0.01	0.06				
AP	Total HAPs	0.02	0.09				
MD and EPA	GHG (CO_2e)	74.96	297.87				

1 Enter the appropriate Source Identification Number for each natural gas-fueled reciprocating internal combustion compressor/generator engine located at the compressor station. Multiple compressor engines should be designated CE-1, CE-2, CE-3 etc. Generator engines should be designated GE-1, GE-2, GE-3 etc. Microturbine generator engines should be designated MT-1, MT-2, MT-3 etc. If more than three (3) engines exist, please use additional sheets.

2 Enter the Source Status using the following codes:

NS	Construction of New Source (installation)	ES	Existing Source
MS	Modification of Existing Source	RS	Relocated Source
REM	Removal of Source		

3 Enter the date (or anticipated date) of the engine's installation (construction of source), modification, relocation or removal.

4 Enter the date that the engine was manufactured, modified or reconstructed.

5 Is the engine a certified stationary spark ignition internal combustion engine according to 40CFR60 Subpart IIII/JJJJ? If so, the engine and control device must be operated and maintained in accordance with the manufacturer's emission-related written instructions. You must keep records of conducted maintenance to demonstrate compliance, but no performance testing is required. If the certified engine is not operated and maintained in accordance with the manufacturer's emission-related written instructions, the engine will be considered a non-certified engine and you must demonstrate compliance as appropriate.

Provide a manufacturer's data sheet for all engines being registered.

6 Enter the Engine Type designation(s) using the following codes:

2SLB	Two Stroke Lean Burn	4SRB	Four Stroke Rich Burn
4SLB	Four Stroke Lean Burn		

7 Enter the Air Pollution Control Device (APCD) type designation(s) using the following codes:

A/F	Air/Fuel Ratio	IR	Ignition Retard
HEIS	High Energy Ignition System	SIPC	Screw-in Precombustion Chambers
PSC	Prestratified Charge	LEC	Low Emission Combustion
NSCR	Rich Burn & Non-Selective Catalytic Reduction	OxCat	Oxidation Catalyst
SCR	Lean Burn & Selective Catalytic Reduction		

8 Enter the Fuel Type using the following codes:

PQ	Pipeline Quality Natural Gas	RG	Raw Natural Gas /Production Gas	D	Diesel

9 Enter the Potential Emissions Data Reference designation using the following codes. Attach all reference data used.

MD	Manufacturer's Data	AP	AP-42	
GR	GRI-HAPCalc™	OT	Other	(please list)

10 Enter each engine's Potential to Emit (PTE) for the listed regulated pollutants in pounds per hour and tons per year. PTE shall be calculated at manufacturer's rated brake horsepower and may reflect reduction efficiencies of listed Air Pollution Control Devices. Emergency generator engines may use 500 hours of operation when calculating PTE. PTE data from this data sheet shall be incorporated in the *Emissions Summary Sheet*.

11 PTE for engines shall be calculated from manufacturer's data unless unavailable.

Engine Air Pollution Control Device
(Emission Unit ID# APC-NSCR-ENGINES, use extra pages as necessary)

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

☒ NSCR ☐ SCR ☐ Oxidation Catalyst

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

Manufacturer: TBD	Model #: TBD
Design Operating Temperature: 1,101 ºF	Design gas volume: 1,018 scfm
Service life of catalyst:	Provide manufacturer data? ☒Yes ☐ No
Volume of gas handled: 678 acfm at 1,101 ºF	Operating temperature range for NSCR/Ox Cat: From 600 ºF to 1250 ºF
Reducing agent used, if any:	Ammonia slip (ppm):

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

Provide description of warning/alarm system that protects unit when operation is not meeting design conditions:

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

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

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

G3306 NA

GAS COMPRESSION APPLICATION

GAS ENGINE SITE SPECIFIC TECHNICAL DATA

CATERPILLAR®

ENGINE SPEED (rpm):	1800	FUEL SYSTEM:	LPG IMPCO
COMPRESSION RATIO:	10.5:1		WITH CUSTOMER SUPPLIED AIR FUEL RATIO CONTROL
JACKET WATER OUTLET (°F):	210	**SITE CONDITIONS:**	
COOLING SYSTEM:	JW+OC	FUEL:	Nat Gas
IGNITION SYSTEM:	MAG	FUEL PRESSURE RANGE(psig):	1.5-10.0
EXHAUST MANIFOLD:	WC	FUEL METHANE NUMBER:	84.8
COMBUSTION:	Catalyst	FUEL LHV (Btu/scf):	905
EXHAUST O2 EMISSION LEVEL %:	0.5	ALTITUDE(ft):	500
SET POINT TIMING:	30.0	MAXIMUM INLET AIR TEMPERATURE(°F):	77
		NAMEPLATE RATING:	145 bhp@1800rpm

			MAXIMUM RATING	SITE RATING AT MAXIMUM INLET AIR TEMPERATURE		
RATING	**NOTES**	**LOAD**	**100%**	**100%**	**75%**	**50%**
ENGINE POWER	(1)	bhp	145	145	109	72
INLET AIR TEMPERATURE		°F	77	77	77	77
ENGINE DATA						
FUEL CONSUMPTION (LHV)	(2)	Btu/bhp-hr	7775	7775	8318	9509
FUEL CONSUMPTION (HHV)	(2)	Btu/bhp-hr	8625	8625	9227	10548
AIR FLOW	(3)(4)	lb/hr	922	922	739	556
AIR FLOW WET (77°F, 14.7 psia)	(3)(4)	scfm	208	208	167	125
INLET MANIFOLD PRESSURE	(5)	in Hg(abs)	26.2	26.2	21.8	17.6
EXHAUST STACK TEMPERATURE	(6)	°F	1101	1101	1067	1037
EXHAUST GAS FLOW (@ stack temp, 14.5 psia)	(7)(4)	ft3/min	678	678	532	393
EXHAUST GAS MASS FLOW	(7)(4)	lb/hr	978	978	784	590
EMISSIONS DATA						
NOx (as NO2)	(8)	g/bhp-hr	13.47	13.47	12.15	9.76
CO	(8)	g/bhp-hr	13.47	13.47	11.44	9.56
THC (mol. wt. of 15.84)	(8)	g/bhp-hr	2.20	2.20	2.49	3.22
NMHC (mol. wt. of 15.84)	(8)	g/bhp-hr	0.33	0.33	0.37	0.48
NMNEHC (VOCs) (mol. wt. of 15.84)	(8)(9)	g/bhp-hr	0.22	0.22	0.25	0.32
HCHO (Formaldehyde)	(8)	g/bhp-hr	0.27	0.27	0.31	0.33
CO2	(8)	g/bhp-hr	485	485	525	601
EXHAUST OXYGEN	(10)	% DRY	0.5	0.5	0.5	0.5
HEAT REJECTION						
HEAT REJ. TO JACKET WATER (JW)	(11)	Btu/min	6049	6049	5237	4455
HEAT REJ. TO ATMOSPHERE	(11)	Btu/min	751	751	602	459
HEAT REJ. TO LUBE OIL (OC)	(11)	Btu/min	990	990	857	729

HEAT EXCHANGER SIZING CRITERIA			
TOTAL JACKET WATER CIRCUIT (JW+OC)	(12)	Btu/min	7842

CONDITIONS AND DEFINITIONS

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

For notes information consult page three.

PREPARED BY:
Data generated by Gas Engine Rating Pro Version 3.04.00
Ref. Data Set DM5053-07-000, Printed 31Jan2011

772 Airfield Lane
Sheridan, WY 82801
Office: 307.673.0883
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Prepared For:
Jason Stinson
MIDCON COMPRESSION, LP

MANUFACTURED ON OR AFTER 1/1/2011

INFORMATION PROVIDED BY CATERPILLAR

Engine:	G3306 NA
Horsepower:	145
RPM:	1800
Compression Ratio:	10.5:1
Exhaust Flow Rate:	678 CFM
Exhaust Temperature:	1101 °F
Reference:	DM5053-07
Fuel:	Natural Gas
Annual Operating Hours:	8760

Uncontrolled Emissions

NOx:	13.47 g/bhp-hr
CO:	13.47 g/bhp-hr
THC:	2.20 g/bhp-hr
NMHC:	0.33 g/bhp-hr
NMNEHC:	0.22 g/bhp-hr
HCHO:	0.27 g/bhp-hr
Oxygen:	0.50 %

POST CATALYST EMISSIONS

NOx:	<1.0 g/bhp-hr
CO:	<2.0 g/bhp-hr
VOC:	<0.7 g/bhp-hr

CONTROL EQUIPMENT

Catalytic Converter

Model:	**EAH-1200T-0404F-21CEE**
Catalyst Type:	NSCR, Precious group metals
Manufacturer:	EMIT Technologies, Inc.
Element Size:	Round 12 x 3.5
Catalyst Elements:	1
Housing Type:	2 Element Capacity
Catalyst Installation:	Accessible Housing
Construction:	10 gauge Carbon Steel
Sample Ports:	6 (0.5" NPT)
Inlet Connections:	4" Flat Face Flange
Outlet Connections:	4" Flat Face Flange
Configuration:	End In / End Out
Silencer:	Integrated
Silencer Grade:	Hospital
Insertion Loss:	35-40 dBA

Air Fuel Ratio Controller

Model:	**ENG-S-075-T**
Manufacturer:	EMIT Technologies, Inc.
Description:	EDGE NG Air Fuel Ratio Controller 4-Wire Narrowband O2 Sensor Digital Power Valve O2 Sensor Weldment Wiring Harness (2) 25' Type K Thermocouple
Digital Power Valve Size:	0.75" NPT

Table 3.2-3. UNCONTROLLED EMISSION FACTORS FOR 4-STROKE RICH-BURN ENGINES[a]
(SCC 2-02-002-53)

Pollutant	Emission Factor (lb/MMBtu)[b] (fuel input)	Emission Factor Rating
Criteria Pollutants and Greenhouse Gases		
NO_x[c] 90 - 105% Load	2.21 E+00	A
NO_x[c] <90% Load	2.27 E+00	C
CO[c] 90 - 105% Load	3.72 E+00	A
CO[c] <90% Load	3.51 E+00	C
CO_2[d]	1.10 E+02	A
SO_2[e]	5.88 E-04	A
TOC[f]	3.58 E-01	C
Methane[g]	2.30 E-01	C
VOC[h]	2.96 E-02	C
PM10 (filterable)[i,j]	9.50 E-03	E
PM2.5 (filterable)[j]	9.50 E-03	E
PM Condensable[k]	9.91 E-03	E
Trace Organic Compounds		
1,1,2,2-Tetrachloroethane[l]	2.53 E-05	C
1,1,2-Trichloroethane[l]	<1.53 E-05	E
1,1-Dichloroethane	<1.13 E-05	E
1,2-Dichloroethane	<1.13 E-05	E
1,2-Dichloropropane	<1.30 E-05	E
1,3-Butadiene[l]	6.63 E-04	D
1,3-Dichloropropene[l]	<1.27 E-05	E
Acetaldehyde[l,m]	2.79 E-03	C
Acrolein[l,m]	2.63 E-03	C
Benzene[l]	1.58 E-03	B
Butyr/isobutyraldehyde	4.86 E-05	D
Carbon Tetrachloride[l]	<1.77 E-05	E

Table 3.2-3. UNCONTROLLED EMISSION FACTORS FOR 4-STROKE RICH-BURN ENGINES (Concluded)

Pollutant	Emission Factor (lb/MMBtu)[b] (fuel input)	Emission Factor Rating
Chlorobenzene[l]	<1.29 E-05	E
Chloroform[l]	<1.37 E-05	E
Ethane[n]	7.04 E-02	C
Ethylbenzene[l]	<2.48 E-05	E
Ethylene Dibromide[l]	<2.13 E-05	E
Formaldehyde[l,m]	2.05 E-02	A
Methanol[l]	3.06 E-03	D
Methylene Chloride[l]	4.12 E-05	C
Naphthalene[l]	<9.71 E-05	E
PAH[l]	1.41 E-04	D
Styrene[l]	<1.19 E-05	E
Toluene[l]	5.58 E-04	A
Vinyl Chloride[l]	<7.18 E-06	E
Xylene[l]	1.95 E-04	A

[a] Reference 7. Factors represent uncontrolled levels. For NO_x, CO, and PM-10, "uncontrolled" means no combustion or add-on controls; however, the factor may include turbocharged units. For all other pollutants, "uncontrolled" means no oxidation control; the data set may include units with control techniques used for NOx control, such as PCC and SCR for lean burn engines, and PSC for rich burn engines. Factors are based on large population of engines. Factors are for engines at all loads, except as indicated. SCC = Source Classification Code. TOC = Total Organic Compounds. PM10 = Particulate Matter ≤ 10 microns (μm) aerodynamic diameter. A "<" sign in front of a factor means that the corresponding emission factor is based on one-half of the method detection limit.

[b] Emission factors were calculated in units of (lb/MMBtu) based on procedures in EPA Method 19. To convert from (lb/MMBtu) to (lb/10^6 scf), multiply by the heat content of the fuel. If the heat content is not available, use 1020 Btu/scf. To convert from (lb/MMBtu) to (lb/hp-hr) use the following equation:

$$\text{lb/hp-hr} = (\text{lb/MMBtu})(\text{heat input, MMBtu/hr})(\text{1/operating HP, 1/hp})$$

[c] Emission tests with unreported load conditions were not included in the data set.

[d] Based on 99.5% conversion of the fuel carbon to CO_2. CO_2 [lb/MMBtu] = (3.67)(%CON)(C)(D)(1/h), where %CON = percent conversion of fuel carbon to CO_2,

C = carbon content of fuel by weight (0.75), D = density of fuel, 4.1 E+04 lb/10^6 scf, and h = heating value of natural gas (assume 1020 Btu/scf at 60°F).

[e] Based on 100% conversion of fuel sulfur to SO_2. Assumes sulfur content in natural gas of 2,000 gr/10^6scf.

[f] Emission factor for TOC is based on measured emission levels from 6 source tests.

[g] Emission factor for methane is determined by subtracting the VOC and ethane emission factors from the TOC emission factor.

[h] VOC emission factor is based on the sum of the emission factors for all speciated organic compounds. Methane and ethane emissions were not measured for this engine category.

[i] No data were available for uncontrolled engines. PM10 emissions are for engines equipped with a PCC.

[j] Considered ≤ 1 μm in aerodynamic diameter. Therefore, for filterable PM emissions, PM10(filterable) = PM2.5(filterable).

[k] No data were available for condensable emissions. The presented emission factor reflects emissions from 4SLB engines.

[l] Hazardous Air Pollutant as defined by Section 112(b) of the Clean Air Act.

[m] For rich-burn engines, no interference is suspected in quantifying aldehyde emissions. The presented emission factors are based on FTIR and CARB 430 emissions data measurements.

[n] Ethane emission factor is determined by subtracting the VOC emission factor from the NMHC emission factor.

Table 1.4-1. EMISSION FACTORS FOR NITROGEN OXIDES (NO_x) AND CARBON MONOXIDE (CO) FROM NATURAL GAS COMBUSTION[a]

Combustor Type (MMBtu/hr Heat Input) [SCC]	NO_x[b]		CO	
	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating
Large Wall-Fired Boilers (>100) [1-01-006-01, 1-02-006-01, 1-03-006-01]				
Uncontrolled (Pre-NSPS)[c]	280	A	84	B
Uncontrolled (Post-NSPS)[c]	190	A	84	B
Controlled - Low NO_x burners	140	A	84	B
Controlled - Flue gas recirculation	100	D	84	B
Small Boilers (<100) [1-01-006-02, 1-02-006-02, 1-03-006-02, 1-03-006-03]				
Uncontrolled	100	B	84	B
Controlled - Low NO_x burners	50	D	84	B
Controlled - Low NO_x burners/Flue gas recirculation	32	C	84	B
Tangential-Fired Boilers (All Sizes) [1-01-006-04]				
Uncontrolled	170	A	24	C
Controlled - Flue gas recirculation	76	D	98	D
Residential Furnaces (<0.3) [No SCC]				
Uncontrolled	94	B	40	B

[a] Reference 11. Units are in pounds of pollutant per million standard cubic feet of natural gas fired. To convert from $lb/10^6$ scf to $kg/10^6$ m^3, multiply by 16. Emission factors are based on an average natural gas higher heating value of 1,020 Btu/scf. To convert from $1b/10^6$ scf to lb/MMBtu, divide by 1,020. The emission factors in this table may be converted to other natural gas heating values by multiplying the given emission factor by the ratio of the specified heating value to this average heating value. SCC = Source Classification Code. ND = no data. NA = not applicable.

[b] Expressed as NO_2. For large and small wall fired boilers with SNCR control, apply a 24 percent reduction to the appropriate NO_X emission factor. For tangential-fired boilers with SNCR control, apply a 13 percent reduction to the appropriate NO_X emission factor.

[c] NSPS=New Source Performance Standard as defined in 40 CFR 60 Subparts D and Db. Post-NSPS units are boilers with greater than 250 MMBtu/hr of heat input that commenced construction modification, or reconstruction after August 17, 1971, and units with heat input capacities between 100 and 250 MMBtu/hr that commenced construction modification, or reconstruction after June 19, 1984.

TABLE 1.4-3. EMISSION FACTORS FOR SPECIATED ORGANIC COMPOUNDS FROM NATURAL GAS COMBUSTION[a]

CAS No.	Pollutant	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating
91-57-6	2-Methylnaphthalene[b, c]	2.4E-05	D
56-49-5	3-Methylchloranthrene[b, c]	<1.8E-06	E
	7,12-Dimethylbenz(a)anthracene[b,c]	<1.6E-05	E
83-32-9	Acenaphthene[b,c]	<1.8E-06	E
203-96-8	Acenaphthylene[b,c]	<1.8E-06	E
120-12-7	Anthracene[b,c]	<2.4E-06	E
56-55-3	Benz(a)anthracene[b,c]	<1.8E-06	E
71-43-2	Benzene[b]	2.1E-03	B
50-32-8	Benzo(a)pyrene[b,c]	<1.2E-06	E
205-99-2	Benzo(b)fluoranthene[b,c]	<1.8E-06	E
191-24-2	Benzo(g,h,i)perylene[b,c]	<1.2E-06	E
205-82-3	Benzo(k)fluoranthene[b,c]	<1.8E-06	E
106-97-8	Butane	2.1E+00	E
218-01-9	Chrysene[b,c]	<1.8E-06	E
53-70-3	Dibenzo(a,h)anthracene[b,c]	<1.2E-06	E
25321-22-6	Dichlorobenzene[b]	1.2E-03	E
74-84-0	Ethane	3.1E+00	E
206-44-0	Fluoranthene[b,c]	3.0E-06	E
86-73-7	Fluorene[b,c]	2.8E-06	E
50-00-0	Formaldehyde[b]	7.5E-02	B
110-54-3	Hexane[b]	1.8E+00	E
193-39-5	Indeno(1,2,3-cd)pyrene[b,c]	<1.8E-06	E
91-20-3	Naphthalene[b]	6.1E-04	E
109-66-0	Pentane	2.6E+00	E
85-01-8	Phenanathrene[b,c]	1.7E-05	D

TABLE 1.4-3. EMISSION FACTORS FOR SPECIATED ORGANIC COMPOUNDS FROM NATURAL GAS COMBUSTION (Continued)

CAS No.	Pollutant	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating
74-98-6	Propane	1.6E+00	E
129-00-0	Pyrene[b, c]	5.0E-06	E
108-88-3	Toluene[b]	3.4E-03	C

[a] Reference 11. Units are in pounds of pollutant per million standard cubic feet of natural gas fired. Data are for all natural gas combustion sources. To convert from $lb/10^6$ scf to $kg/10^6$ m^3, multiply by 16. To convert from $1b/10^6$ scf to lb/MMBtu, divide by 1,020. Emission Factors preceeded with a less-than symbol are based on method detection limits.

[b] Hazardous Air Pollutant (HAP) as defined by Section 112(b) of the Clean Air Act.

[c] HAP because it is Polycyclic Organic Matter (POM). POM is a HAP as defined by Section 112(b) of the Clean Air Act.

[d] The sum of individual organic compounds may exceed the VOC and TOC emission factors due to differences in test methods and the availability of test data for each pollutant.

loading operation, resulting in high levels of vapor generation and loss. If the turbulence is great enough, liquid droplets will be entrained in the vented vapors.

A second method of loading is submerged loading. Two types are the submerged fill pipe method and the bottom loading method. In the submerged fill pipe method, the fill pipe extends almost to the bottom of the cargo tank. In the bottom loading method, a permanent fill pipe is attached to the cargo tank bottom. During most of submerged loading by both methods, the fill pipe opening is below the liquid surface level. Liquid turbulence is controlled significantly during submerged loading, resulting in much lower vapor generation than encountered during splash loading.

The recent loading history of a cargo carrier is just as important a factor in loading losses as the method of loading. If the carrier has carried a nonvolatile liquid such as fuel oil, or has just been cleaned, it will contain vapor-free air. If it has just carried gasoline and has not been vented, the air in the carrier tank will contain volatile organic vapors, which will be expelled during the loading operation along with newly generated vapors.

Cargo carriers are sometimes designated to transport only one product, and in such cases are practicing "dedicated service". Dedicated gasoline cargo tanks return to a loading terminal containing air fully or partially saturated with vapor from the previous load. Cargo tanks may also be "switch loaded" with various products, so that a nonvolatile product being loaded may expel the vapors remaining from a previous load of a volatile product such as gasoline. These circumstances vary with the type of cargo tank and with the ownership of the carrier, the petroleum liquids being transported, geographic location, and season of the year.

One control measure for vapors displaced during liquid loading is called "vapor balance service", in which the cargo tank retrieves the vapors displaced during product unloading at bulk plants or service stations and transports the vapors back to the loading terminal. Figure 5.2-5 shows a tank truck in vapor balance service filling a service station underground tank and taking on displaced gasoline vapors for return to the terminal. A cargo tank returning to a bulk terminal in vapor balance service normally is saturated with organic vapors, and the presence of these vapors at the start of submerged loading of the tanker truck results in greater loading losses than encountered during nonvapor balance, or "normal", service. Vapor balance service is usually not practiced with marine vessels, although some vessels practice emission control by means of vapor transfer within their own cargo tanks during ballasting operations, discussed below.

Emissions from loading petroleum liquid can be estimated (with a probable error of ±30 percent)[4] using the following expression:

$$L_L = 12.46 \frac{SPM}{T} \quad (1)$$

where:

L_L = loading loss, pounds per 1000 gallons ($lb/10^3$ gal) of liquid loaded

S = a saturation factor (see Table 5.2-1)
P = true vapor pressure of liquid loaded, pounds per square inch absolute (psia) (see Figure 7.1-5, Figure 7.1-6, and Table 7.1-2)
M = molecular weight of vapors, pounds per pound-mole (lb/lb-mole) (see Table 7.1-2)
T = temperature of bulk liquid loaded, °R (°F + 460)

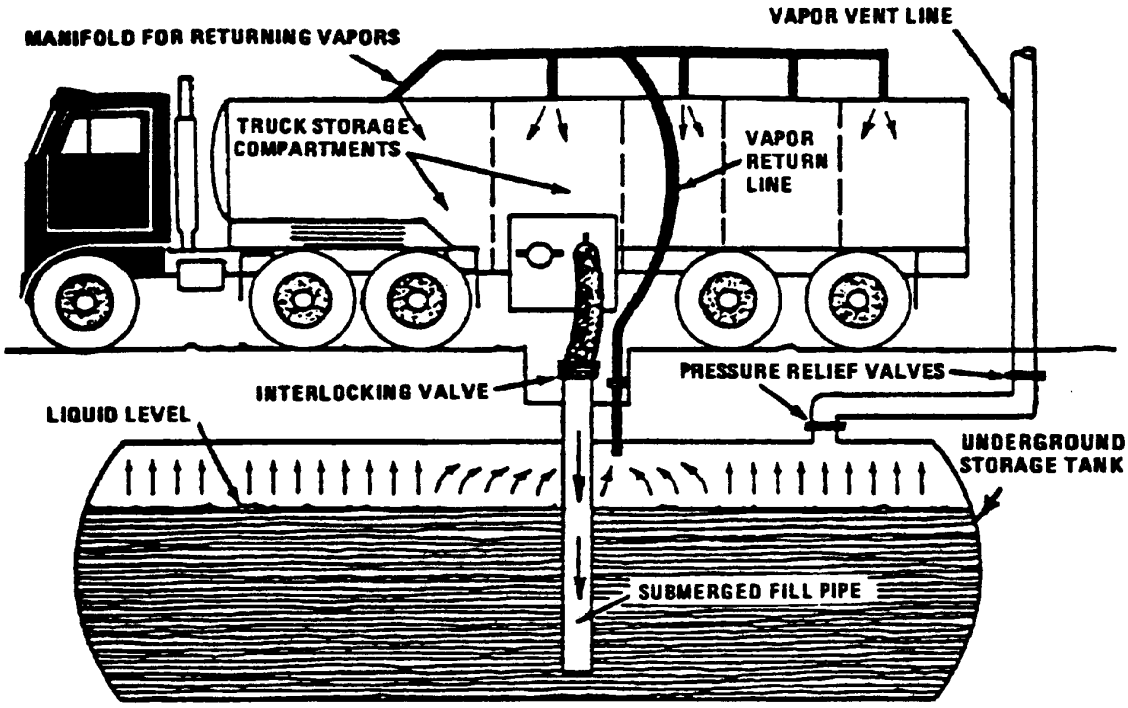

Figure 5.2-5. Tank truck unloading into a service station underground storage tank and practicing "vapor balance" form of emission control.

Table 5.2-1. SATURATION (S) FACTORS FOR CALCULATING PETROLEUM LIQUID LOADING LOSSES

Cargo Carrier	Mode Of Operation	S Factor
Tank trucks and rail tank cars	Submerged loading of a clean cargo tank	0.50
	Submerged loading: dedicated normal service	0.60
	Submerged loading: dedicated vapor balance service	1.00
	Splash loading of a clean cargo tank	1.45
	Splash loading: dedicated normal service	1.45
	Splash loading: dedicated vapor balance service	1.00
Marine vessels[a]	Submerged loading: ships	0.2
	Submerged loading: barges	0.5

[a] For products other than gasoline and crude oil. For marine loading of gasoline, use factors from Table 5.2-2. For marine loading of crude oil, use Equations 2 and 3 and Table 5.2-3.

Since flares do not lend themselves to conventional emission testing techniques, only a few attempts have been made to characterize flare emissions. Recent EPA tests using propylene as flare gas indicated that efficiencies of 98 percent can be achieved when burning an offgas with at least 11,200 kJ/m^3 (300 Btu/ft^3). The tests conducted on steam-assisted flares at velocities as low as 39.6 meters per minute (m/min) (130 ft/min) to 1140 m/min (3750 ft/min), and on air-assisted flares at velocities of 180 m/min (617 ft/min) to 3960 m/min (13,087 ft/min) indicated that variations in incoming gas flow rates have no effect on the combustion efficiency. Flare gases with less than 16,770 kJ/m^3 (450 Btu/ft^3) do not smoke.

Table 13.5-1 presents flare emission factors, and Table 13.5-2 presents emission composition data obtained from the EPA tests.[1] Crude propylene was used as flare gas during the tests. Methane was a major fraction of hydrocarbons in the flare emissions, and acetylene was the dominant intermediate hydrocarbon species. Many other reports on flares indicate that acetylene is always formed as a stable intermediate product. The acetylene formed in the combustion reactions may react further with hydrocarbon radicals to form polyacetylenes followed by polycyclic hydrocarbons.[2]

In flaring waste gases containing no nitrogen compounds, NO is formed either by the fixation of atmospheric nitrogen (N) with oxygen (O) or by the reaction between the hydrocarbon radicals present in the combustion products and atmospheric nitrogen, by way of the intermediate stages, HCN, CN, and OCN.[2] Sulfur compounds contained in a flare gas stream are converted to SO_2 when burned. The amount of SO_2 emitted depends directly on the quantity of sulfur in the flared gases.

Table 13.5-1 (English Units). EMISSION FACTORS FOR FLARE OPERATIONS[a]

EMISSION FACTOR RATING: B

Component	Emission Factor (lb/10^6 Btu)
Total hydrocarbons[b]	0.14
Carbon monoxide	0.37
Nitrogen oxides	0.068
Soot[c]	0 - 274

[a] Reference 1. Based on tests using crude propylene containing 80% propylene and 20% propane.
[b] Measured as methane equivalent.
[c] Soot in concentration values: nonsmoking flares, 0 micrograms per liter (µg/L); lightly smoking flares, 40 µg/L; average smoking flares, 177 µg/L; and heavily smoking flares, 274 µg/L.

TABLE 2-4. OIL AND GAS PRODUCTION OPERATIONS AVERAGE EMISSION FACTORS (kg/hr/source)

Equipment Type	Service[a]	Emission Factor (kg/hr/source)[b]
Valves	Gas	4.5E-03
	Heavy Oil	8.4E-06
	Light Oil	2.5E-03
	Water/Oil	9.8E-05
Pump seals	Gas	2.4E-03
	Heavy Oil	NA
	Light Oil	1.3E-02
	Water/Oil	2.4E-05
Others[c]	Gas	8.8E-03
	Heavy Oil	3.2E-05
	Light Oil	7.5E-03
	Water/Oil	1.4E-02
Connectors	Gas	2.0E-04
	Heavy Oil	7.5E-06
	Light Oil	2.1E-04
	Water/Oil	1.1E-04
Flanges	Gas	3.9E-04
	Heavy Oil	3.9E-07
	Light Oil	1.1E-04
	Water/Oil	2.9E-06
Open-ended lines	Gas	2.0E-03
	Heavy Oil	1.4E-04
	Light Oil	1.4E-03
	Water/Oil	2.5E-04

[a]Water/Oil emission factors apply to water streams in oil service with a water content greater than 50%, from the point of origin to the point where the water content reaches 99%. For water streams with a water content greater than 99%, the emission rate is considered negligible.

[b]These factors are for total organic compound emission rates (including non-VOC's such as methane and ethane) and apply to light crude, heavy crude, gas plant, gas production, and off shore facilities. "NA" indicates that not enough data were available to develop the indicated emission factor.

[c]The "other" equipment type was derived from compressors, diaphrams, drains, dump arms, hatches, instruments, meters, pressure relief valves, polished rods, relief valves, and vents. This "other" equipment type should be applied for any equipment type other than connectors, flanges, open-ended lines, pumps, or valves.

ATTACHMENT O: TANKER TRUCK LOADING DATA SHEET

ATTACHMENT O – TANKER TRUCK LOADING DATA SHEET

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

Truck Loadout Collection Efficiencies

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

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

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

Emission Unit ID#: EU-LOAD-COND	Emission Point ID#: APC-COMB-TKLD	Year Installed/Modified: TBD
Emission Unit Description: Condensate Truck Loading Emissions		
Loading Area Data		
Number of Pumps: 1	Number of Liquids Loaded: 1	Max number of trucks loading at one (1) time: 1
Are tanker trucks pressure tested for leaks at this or any other location? ☐ Yes ☒ No ☐ Not Required If Yes, Please describe:		
Provide description of closed vent system and any bypasses. Vapors are collected and routed to a vapor combustor.		
Are any of the following truck loadout systems utilized? ☐ Closed System to tanker truck passing a MACT level annual leak test? ☐ Closed System to tanker truck passing a NSPS level annual leak test? ☐ Closed System to tanker truck not passing an annual leak test and has vapor return?		

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

Time	Jan – Mar	Apr - Jun	Jul – Sept	Oct - Dec
Hours/day	24	24	24	24
Days/week	5	5	5	5

Bulk Liquid Data (use extra pages as necessary)

Liquid Name	Condensate		
Max. Daily Throughput (1000 gal/day)	34.19		
Max. Annual Throughput (1000 gal/yr)	12,479		
Loading Method[1]	SUB		
Max. Fill Rate (gal/min)	125		
Average Fill Time (min/loading)	Approx 60		
Max. Bulk Liquid Temperature (°F)	50.33		
True Vapor Pressure[2]	11.7212		
Cargo Vessel Condition[3]	U		
Control Equipment or Method[4]	O = Vapor Return s/ Combustion Controls		
Max. Collection Efficiency (%)	70%		

Max. Control Efficiency (%)		98%		
Max.VOC Emission Rate	Loading (lb/hr)	19.37		
	Annual (ton/yr)	16.12		
Max.HAP Emission Rate	Loading (lb/hr)	2.73		
	Annual (ton/yr)	2.27		
Estimation Method[5]		EPA		

Emission Unit ID#: EU-LOAD-PW	Emission Point ID#: APC-COMB-TKLD	Year Installed/Modified: TBD
Emission Unit Description: Produced Water Truck Loading Emissions		
Loading Area Data		
Number of Pumps: 1	Number of Liquids Loaded: 1	Max number of trucks loading at one (1) time: 1
Are tanker trucks pressure tested for leaks at this or any other location? ☐ Yes ☒ No ☐ Not Required If Yes, Please describe:		
Provide description of closed vent system and any bypasses. Vapors are collected and routed to a vapor combustor.		
Are any of the following truck loadout systems utilized? ☐ Closed System to tanker truck passing a MACT level annual leak test? ☐ Closed System to tanker truck passing a NSPS level annual leak test? ☐ Closed System to tanker truck not passing an annual leak test and has vapor return?		

Projected Maximum Operating Schedule (for rack or transfer point as a whole)				
Time	Jan – Mar	Apr - Jun	Jul – Sept	Oct - Dec
Hours/day	24	24	24	24
Days/week	5	5	5	5

Bulk Liquid Data (use extra pages as necessary)				
Liquid Name		Produced Water		
Max. Daily Throughput (1000 gal/day)		35.41		
Max. Annual Throughput (1000 gal/yr)		12,923		
Loading Method[1]		SUB		
Max. Fill Rate (gal/min)		125		
Average Fill Time (min/loading)		Approx 60		
Max. Bulk Liquid Temperature (ºF)		50.33		
True Vapor Pressure[2]		0.2498		
Cargo Vessel Condition[3]		U		
Control Equipment or Method[4]		O = Vapor Return s/ Combustion Controls		
Max. Collection Efficiency (%)		70%		
Max. Control Efficiency (%)		98%		
Max.VOC Emission Rate	Loading (lb/hr)	0.18		
	Annual (ton/yr)	0.16		
Max.HAP Emission Rate	Loading (lb/hr)	0.03		
	Annual (ton/yr)	0.02		

Estimation Method[5]	EPA		

1 BF Bottom Fill SP Splash Fill SUB Submerged Fill

2 At maximum bulk liquid temperature

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

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

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

ATTACHMENT Q: PNEUMATIC CONTROLLERS DATA SHEET

ATTACHMENT Q – PNEUMATIC CONTROLLERS DATA SHEET

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

☐ Yes ☒ No

Please list approximate number.

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

☐ Yes ☒ No

Please list approximate number.

ATTACHMENT R: AIR POLLUTION CONTROL DEVICE/EMISSION REDUCTION DEVICES SHEETS

VAPOR COMBUSTION

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

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

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

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

VAPOR COMBUSTION
(Including Enclosed Combustors)

General Information

Control Device ID#: APC-COMB-TKLD	Installation Date: TBD ☒ New ☐ Modified ☐ Relocated
Maximum Rated Total Flow Capacity 6,125 scfh 147,000 scfd	Maximum Design Heat Input (from mfg. spec sheet) 15.0 MMBTU/hr Design Heat Content 2,450 BTU/scf

Control Device Information

Type of Vapor Combustion Control?

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

Manufacturer: MRW Technologies Model: TBF-5.5-30-147000	Hours of operation per year? 8,760

List the emission units whose emissions are controlled by this vapor control device (Emission Point ID# APC-COMB-TKLD)

Emission Unit ID#	Emission Source Description	Emission Unit ID#	Emission Source Description
EU-TANKS-COND	Condensate Tanks	EU-LOAD-PW	Produced Water Truck Loading
EU-TANKS-PW	Produced Water Tanks		
EU-LOAD-COND	Condensate Truck Loading		

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

Assist Type (Flares only)	Flare Height	Tip Diameter	Was the design per §60.18?
☐ Steam ☐ Air ☐ Pressure ☒ Non	30 feet	N/A feet	☐ Yes ☒ No Provide determination.

Waste Gas Information

Maximum Waste Gas Flow Rate	Heat Value of Waste Gas Stream	Exit Velocity of the Emissions Stream
204.17 (scfm)	2,450 BTU/ft^3	(ft/s)

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

Pilot Gas Information

Number of Pilot Lights	Fuel Flow Rate to Pilot Flame per Pilot	Heat Input per Pilot	Will automatic re-ignition be used?
1	50 scfh	45,250 BTU/hr	☒ Yes ☐ No

If automatic re-ignition is used, please describe the method. **If the pilot flame is lost, the control system will automatically attempt to relight the pilot. If the re-ignition attempt fails, the pilot solenoid valve will automatically close and a local and remote alarm signal will be generated to indicate loss of pilot flame.**

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

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

Additional information attached? ☒ Yes ☐ No

Please attach copies of manufacturer's data sheets, drawings, flame demonstration per §60.18 or §63.11(b) and performance testing.

Tank Battery Combustor Specification Sheet
MRW Technologies, Inc.
Combustor Model Number: TBF-5.5-30-147000

Expected Destruction Removal Efficiency (DRE):	98% or Greater of Non-Methane Hydrocarbons
Unit Size:	5.5-foot Diameter 30-Foot Overall Height
Design Heat Input:	15 MMBTU/HR
Design Flow Rates:	147,000 SCFD
Design Heat Content:	2450 BTU/SCF
Waste Gas Flame Arrestor:	2" Enardo
Pilot Type:	MRW Electric Ignition
Pilot Operation (Continuous/Intermittent):	Continuous
Pilot Fuel Consumption:	50 SCFH or Less
Pilot Monitoring Device:	Flame Rod
Automatic Re-Ignition:	Included
Remote Alarm Indication:	Included

Description of Control Scheme:

The Combustor pilot is monitored via flame rod. If the pilot flame is lost, the control system will automatically attempt to relight the pilot. If the re-ignition attempt fails, the pilot solenoid valve will automatically close and a local & remote alarm signal will be generated to indicate loss of pilot flame.

ATTACHMENT S: EMISSIONS CALCULATIONS

SWN Production Company, LLC
William Ritchea Pad
Summary of Criteria Air Pollutant Emissions

Equipment	Unit ID	Emission Point ID	NOx		CO		Total VOC[1]		SO_2		PM Total	
			lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
145-hp Caterpillar G3306 NA Engine w/ Catalytic Converter	EU-ENG1	EP-ENG1	0.32	1.40	0.64	2.80	0.24	1.05	<0.01	<0.01	0.02	0.09
145-hp Caterpillar G3306 NA Engine w/ Catalytic Converter	EU-ENG2	EP-ENG2	0.32	1.40	0.64	2.80	0.24	1.05	0.01	0.04	0.02	0.09
Five (5) 1.0-mmBtu/hr GPU Burners	EU-GPU1 - EU-GPU5	EP-GPU1 - EP-GPU5	0.55	2.40	0.45	1.95	0.03	0.15	<0.01	0.01	0.04	0.18
Two (2) 0.5-mmBtu/hr Heater Treaters	EU-HT1 - EU-HT2	EP-HT1 - EP-HT2	0.12	0.52	0.10	0.44	0.01	0.02	<0.01	<0.01	0.01	0.04
Four (4) 400-bbl Condensate Tanks Routed to Vapor Combustor	EU-TANKS-COND	APC-COMB-TKLD	-	-	-	-	-	-	-	-	-	-
Four (4) 400-bbl Produced Water Tanks Routed to Vapor Combustor	EU-TANKS-PW	APC-COMB-TKLD	-	-	-	-	-	-	-	-	-	-
Condensate Truck Loading w/ Vapor Return Routed to Combustor	EU-LOAD-COND	APC-COMB-TKLD	-	-	-	-	3.68	16.12	-	-	-	-
Produced Water Truck Loading w/ Vapor Return Routed to Combustor	EU-LOAD-PW	APC-COMB-TKLD	-	-	-	-	0.04	0.16	-	-	-	-
One (1) 15.0-mmBtu/hr Vapor Combustor - Tank/Loading Stream	APC-COMB-TKLD	APC-COMB-TKLD	2.07	9.07	4.13	18.09	2.48	10.86	-	-	0.04	0.18
Vapor Combustor Pilot	EU-PILOT	APC-COMB-TKLD	0.01	0.04	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fugitive Emissions	EU-FUG	EP-FUG	-	-	-	-	0.81	3.54	-	-	-	-
Fugitive Haul Road Emissions	EU-HR	EP-HR	-	-	-	-	-	-	-	-	2.85	9.36
Total =			**3.39**	**14.83**	**5.96**	**26.10**	**7.52**	**32.95**	**0.01**	**0.06**	**2.98**	**9.94**

Notes:

[1] Total VOC includes all constituents heavier than Propane (C3+), including hazardous air pollutants (HAP). Speciated HAP presented in following table. Also note that Caterpillar engine manufacturer data for VOC does not include formaldehyde; therefore, total VOC emissions presented here are different than VOC emissions as defined and calculated in the engine calculations.

SWN Production Company, LLC
William Ritchea Pad
Summary of Hazardous Air Pollutants

Equipment	Unit ID	Estimated Emissions (lb/hr)									
		Acetalde-hyde	Acrolein	Benzene	Ethyl-benzene	Formalde-hyde	Methanol	n-Hexane	Toluene	Xylenes	Total HAP
145-hp Caterpillar G3306 NA Engine w/ Catalytic Converter	EU-ENG1	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	-	<0.01	<0.01	0.03
145-hp Caterpillar G3306 NA Engine w/ Catalytic Converter	EU-ENG2	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	-	<0.01	<0.01	0.03
Five (5) 1.0-mmBtu/hr GPU Burners	EU-GPU1 - EU-GPU5	-	-	<0.01	-	<0.01	-	0.01	<0.01	-	0.01
Two (2) 0.5-mmBtu/hr Heater Treaters	EU-HT1 - EU-HT2	-	-	<0.01	-	<0.01	-	<0.01	<0.01	-	<0.01
Four (4) 400-bbl Condensate Tanks Routed to Vapor Combustor	EU-TANKS-COND	-	-	-	-	-	-	-	-	-	-
Four (4) 400-bbl Produced Water Tanks Routed to Vapor Combustor	EU-TANKS-PW	-	-	-	-	-	-	-	-	-	-
Condensate Truck Loading w/ Vapor Return Routed to Combustor	EU-LOAD-COND	-	-	<0.01	0.02	-	-	0.40	0.02	0.07	0.52
Produced Water Truck Loading w/ Vapor Return Routed to Combustor	EU-LOAD-PW	-	-	<0.01	<0.01	-	-	<0.01	<0.01	<0.01	0.01
One (1) 15.0-mmBtu/hr Vapor Combustor - Tank/Loading Stream	APC-COMB-TKLD	-	-	<0.01	0.02	-	-	0.27	0.02	0.05	0.35
Vapor Combustor Pilot	EU-PILOT	-	-	<0.01	-	<0.01	-	<0.01	<0.01	-	<0.01
Fugitive Emissions	EU-FUG	-	-	<0.01	<0.01	-	-	0.06	<0.01	0.01	0.08
Fugitive Haul Road Emissions	EU-HR	-	-	-	-	-	-	-	-	-	-
	Total =	**0.01**	**0.01**	**0.01**	**0.04**	**0.04**	**0.01**	**0.75**	**0.04**	**0.13**	**1.03**

Continued on Next Page

SWN Production Company, LLC
William Ritchea Pad
Summary of Hazardous Air Pollutants (Continued)

Equipment	Unit ID	Estimated Emissions (TPY)									
		Acetalde-hyde	Acrolein	Benzene	Ethyl-benzene	Formalde-hyde	Methanol	n-Hexane	Toluene	Xylenes	Total HAP
145-hp Caterpillar G3306 NA Engine w/ Catalytic Converter	EU-ENG1	0.02	0.01	0.01	<0.01	0.09	0.02	-	<0.01	<0.01	0.15
145-hp Caterpillar G3306 NA Engine w/ Catalytic Converter	EU-ENG2	0.02	0.01	0.01	<0.01	0.09	0.02	-	<0.01	<0.01	0.15
Five (5) 1.0-mmBtu/hr GPU Burners	EU-GPU1 - EU-GPU5	-	-	<0.01	-	<0.01	-	0.04	<0.01	-	0.05
Two (2) 0.5-mmBtu/hr Heater Treaters	EU-HT1 - EU-HT2	-	-	<0.01	-	<0.01	-	0.01	<0.01	-	0.01
Four (4) 400-bbl Condensate Tanks Routed to Vapor Combustor	EU-TANKS-COND	-	-	-	-	-	-	-	-	-	-
Four (4) 400-bbl Produced Water Tanks Routed to Vapor Combustor	EU-TANKS-PW	-	-	-	-	-	-	-	-	-	-
Condensate Truck Loading w/ Vapor Return Routed to Combustor	EU-LOAD-COND	-	-	0.01	0.10	-	-	1.74	0.10	0.31	2.27
Produced Water Truck Loading w/ Vapor Return Routed to Combustor	EU-LOAD-PW	-	-	<0.01	<0.01	-	-	0.02	<0.01	<0.01	0.02
One (1) 15.0-mmBtu/hr Vapor Combustor - Tank/Loading Stream	APC-COMB-TKLD	-	-	0.01	0.07	-	-	1.18	0.07	0.22	1.55
Vapor Combustor Pilot	EU-PILOT	-	-	<0.01	-	<0.01	-	<0.01	<0.01	-	<0.01
Fugitive Emissions	EU-FUG	-	-	<0.01	0.01	-	-	0.27	0.01	0.04	0.35
Fugitive Haul Road Emissions	EU-HR	-	-	-	-	-	-	-	-	-	-
	Total =	**0.03**	**0.03**	**0.04**	**0.18**	**0.18**	**0.03**	**3.27**	**0.19**	**0.58**	**4.54**

SWN Production Company, LLC
William Ritchea Pad
Summary of Greenhouse Gas Emissions - Metric Tons per Year (Tonnes)

Equipment	Unit ID	Carbon Dioxide (CO_2)		Methane (CH_4)		Methane (CH_4) as $CO_{2\ Eq.}$		Nitrous Oxide (N_2O)		Nitrous Oxide (N_2O) as $CO_{2\ Eq.}$		Total CO_2 + $CO_{2\ Eq.}$ [1]	
		lb/hr	tonnes/yr	lb/hr	tonnes/yr	lb/hr	tonnes/yr	lb/hr	tonnes/yr	lb/hr	tonnes/yr	lb/hr	tonnes/yr
145-hp Caterpillar G3306 NA Engine w/ Catalytic Converter	EU-ENG1	155.04	616.04	<0.01	0.01	0.07	0.27	<0.01	<0.01	0.08	0.33	155.19	616.64
145-hp Caterpillar G3306 NA Engine w/ Catalytic Converter	EU-ENG2	155.04	616.04	<0.01	0.01	0.07	0.27	<0.01	<0.01	0.08	0.33	155.19	616.64
Five (5) 1.0-mmBtu/hr GPU Burners	EU-GPU1 - EU-GPU5	584.89	2,324.02	0.01	0.04	0.28	1.09	<0.01	<0.01	0.33	1.31	585.49	2,326.42
Two (2) 0.5-mmBtu/hr Heater Treaters	EU-HT1 - EU-HT2	116.98	464.80	<0.01	0.01	0.06	0.22	<0.01	<0.01	0.07	0.26	117.10	465.28
Four (4) 400-bbl Condensate Tanks Routed to Vapor Combustor	EU-TANKS-COND	-	-	-	-	-	-	-	-	-	-	-	-
Four (4) 400-bbl Produced Water Tanks Routed to Vapor Combustor	EU-TANKS-PW	-	-	-	-	-	-	-	-	-	-	-	-
Condensate Truck Loading w/ Vapor Return Routed to Combustor	EU-LOAD-COND	<0.01	<0.01	0.02	0.07	0.41	1.64	-	-	-	-	0.41	1.64
Produced Water Truck Loading w/ Vapor Return Routed to Combustor	EU-LOAD-PW	<0.01	0.02	0.30	1.20	7.57	30.09	-	-	-	-	7.58	30.11
One (1) 15.0-mmBtu/hr Vapor Combustor - Tank/Loading Stream	APC-COMB-TKLD	1,754.66	6,972.07	0.03	0.13	0.83	3.28	<0.01	0.01	0.99	3.92	1,756.47	6,979.27
Vapor Combustor Pilot	EU-PILOT	5.29	21.03	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	0.01	5.30	21.05
Fugitive Emissions	EU-FUG	0.01	0.03	1.03	4.07	25.75	101.83	-	-	-	-	25.76	101.86
Fugitive Haul Road Emissions	EU-HR	-	-	-	-	-	-	-	-	-	-	-	-
	Total =	**2,771.90**	**11,014.05**	**1.40**	**5.55**	**35.03**	**138.72**	**0.01**	**0.02**	**1.55**	**6.15**	**2,808.49**	**11,158.91**

Notes:

[1] CO_2 Equivalent = Pollutant times GWP multiplier. 40 CFR 98 Table A-1, Global Warming Potential (GWP) multiplier (100-Year Time Horizon): CO_2 = 1, CH_4 = 25, N_2O = 298

[2] Per API Compendium (2009) Chapter 5: Because most of the CH_4 and CO_2 emissions from storage tanks occur as a result of flashing (which is controlled by the vapor combustor in this case), working and breathing loss emissions of these gases are very small in production and virtually non-existent in the downstream segments. Vapors from the tanks are routed to the vapor combustor at this site. Therefore, GHG emissions from the condensate and produced water tanks are assumed to be negligible.

SWN Production Company, LLC
William Ritchea Pad
Summary of Greenhouse Gas Emissions - Short Tons per Year (Tons)

Equipment	Unit ID	Carbon Dioxide (CO_2)		Methane (CH_4)		Methane (CH_4) as $CO_{2\ Eq.}$		Nitrous Oxide (N_2O)		Nitrous Oxide (N_2O) as $CO_{2\ Eq.}$		Total CO_2 + $CO_{2\ Eq.}$[1]	
		lb/hr	tons/yr[2]	lb/hr	tons/yr[2]	lb/hr	tons/yr	lb/hr	tons/yr[2]	lb/hr	tons/yr	lb/hr	tons/yr
145-hp Caterpillar G3306 NA Engine w/ Catalytic Converter	EU-ENG1	155.04	679.06	<0.01	0.01	0.07	0.30	<0.01	<0.01	0.08	0.36	155.19	679.73
145-hp Caterpillar G3306 NA Engine w/ Catalytic Converter	EU-ENG2	155.04	679.06	<0.01	0.01	0.07	0.30	<0.01	<0.01	0.08	0.36	155.19	679.73
Five (5) 1.0-mmBtu/hr GPU Burners	EU-GPU1 - EU-GPU5	584.89	2,561.80	0.01	0.05	0.28	1.21	<0.01	<0.01	0.33	1.44	585.49	2,564.44
Two (2) 0.5-mmBtu/hr Heater Treaters	EU-HT1 - EU-HT2	116.98	512.36	<0.01	0.01	0.06	0.24	<0.01	<0.01	0.07	0.29	117.10	512.89
Four (4) 400-bbl Condensate Tanks Routed to Vapor Combustor	EU-TANKS-COND	-	-	-	-	-	-	-	-	-	-	-	-
Four (4) 400-bbl Produced Water Tanks Routed to Vapor Combustor	EU-TANKS-PW	-	-	-	-	-	-	-	-	-	-	-	-
Condensate Truck Loading w/ Vapor Return Routed to Combustor	EU-LOAD-COND	<0.01	<0.01	0.02	0.07	0.41	1.81	-	-	-	-	0.41	1.81
Produced Water Truck Loading w/ Vapor Return Routed to Combustor	EU-LOAD-PW	<0.01	0.02	0.30	1.33	7.57	33.17	-	-	-	-	7.58	33.19
One (1) 15.0-mmBtu/hr Vapor Combustor - Tank/Loading Stream	APC-COMB-TKLD	1,754.66	7,685.39	0.03	0.14	0.83	3.62	<0.01	0.01	0.99	4.32	1,756.47	7,693.33
Vapor Combustor Pilot	EU-PILOT	5.29	23.18	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	0.01	5.30	23.21
Fugitive Emissions	EU-FUG	0.01	0.03	1.03	4.49	25.75	112.25	-	-	-	-	25.76	112.28
Fugitive Haul Road Emissions	EU-HR	-	-	-	-	-	-	-	-	-	-	-	-
	Total =	**2,771.90**	**12,140.91**	**1.40**	**6.12**	**35.03**	**152.91**	**0.01**	**0.02**	**1.55**	**6.78**	**2,808.49**	**12,300.59**

Notes:

[1] CO_2 Equivalent = Pollutant times GWP multiplier. 40 CFR 98 Table A-1, Global Warming Potential (GWP) multiplier (100-Year Time Horizon): CO_2 = 1, CH_4 = 25, N_2O = 298

[2] EPA and API GHG calculation methodologies calculate emissions in metric tons (tonnes). These values have been converted to short tons for consistency with permitting threshold units.

[3] Per API Compendium (2009) Chapter 5: Because most of the CH_4 and CO_2 emissions from storage tanks occur as a result of flashing (which is controlled by the vapor combustor in this case), working and breathing loss emissions of these gases are very small in production and virtually non-existent in the downstream segments. Vapors from the tanks are routed to the vapor combustor at this site. Therefore, GHG emissions from the condensate and produced water tanks are assumed to be negligible.

SWN Production Company, LLC
William Ritchea Pad
Engine Emissions Calculations - Criteria Air Pollutants

Equipment Information

Unit ID:	**EU-ENG1**	**EU-ENG2**
Emission Point ID:	EP-ENG1	EP-ENG2
Make:	Caterpillar	Caterpillar
Model:	G3306 NA	G3306 NA
Design Class:	4S-RB	4S-RB
Controls:	NSCR	NSCR
Horsepower (hp):	145	145
Fuel Use (Btu/hp-hr):	8,625	8,625
Fuel Use (scfh):	1,382	1,382
Annual Fuel Use (mmscf):	12.11	12.11
Fuel Use (mmBtu/hr):	1.25	1.25
Exhaust Flow (acfm):	678	678
Exhaust Temp (°F):	1,101	1,101
Operating Hours:	8,760	8,760
Fuel Heating Value (Btu/scf):	905	905

Uncontrolled Manufacturer Emission Factors [1]

NOx (g/hp-hr):	13.47	13.47
CO (g/hp-hr):	13.47	13.47
NMNEHC/VOC (g/hp-hr):	0.22	0.22
Total VOC = NMNEHC + HCHO (g/hp-hr):	0.22	0.22

Post-Catalyst Emission Factors

NOx Control Eff. %	92.58%	92.58%
CO Control Eff. %	85.15%	85.15%
NOx (g/hp-hr):	1.00	1.00
CO (g/hp-hr):	2.00	2.00
NMNEHC/VOC (g/hp-hr):	0.70	0.70
Total VOC = NMNEHC + HCHO (g/hp-hr):	0.76	0.76

Uncontrolled Criteria Air Pollutant Emissions

Unit ID:	**EU-ENG1**		**EU-ENG2**	
Pollutant	**lb/hr**	**TPY**	**lb/hr**	**TPY**
NOx	4.31	18.88	4.31	18.88
CO	4.31	18.88	4.31	18.88
NMNEHC/VOC (does not include HCHO)	0.07	0.31	0.07	0.31
Total VOC (includes HCHO)	0.07	0.31	0.07	0.31
SO_2	<0.01	<0.01	0.01	0.04
$PM_{10/2.5}$	0.01	0.04	0.01	0.04
PM_{COND}	0.01	0.04	0.01	0.04
PM_{TOT}	0.02	0.09	0.02	0.09

SWN Production Company, LLC
William Ritchea Pad
Engine Emissions Calculations - Criteria Air Pollutants (Continued)

Proposed Criteria Air Pollutant Emissions[2]

Unit ID:	EU-ENG1		EU-ENG2	
Pollutant	**lb/hr**	**TPY**	**lb/hr**	**TPY**
NOx	0.32	1.40	0.32	1.40
CO	0.64	2.80	0.64	2.80
NMNEHC/VOC (does not include HCHO)	0.22	0.96	0.22	0.96
Total VOC (includes HCHO)	0.24	1.05	0.24	1.05
SO_2	<0.01	<0.01	<0.01	0.04
$PM_{10/2.5}$	0.01	0.04	0.01	0.04
PM_{COND}	0.01	0.04	0.01	0.04
PM_{TOT}	0.02	0.09	0.02	0.09

AP-42 Emission Factors (lb/mmBtu)[3]

	4S-RB
Pollutant	**3.2-3 (7/00)**
SO_2	5.88E-04
$PM_{10/2.5}$	9.50E-03
PM_{COND}	9.91E-03
PM_{TOT}	1.94E-02

Notes:

[1] Uncontrolled emission factors based on engine manufacturer data. Per Caterpillar, NMNEHC emission factor does not include formaldehyde (HCHO); therefore, NMNEHC and HCHO factors have been added to demonstrate total uncontrolled VOC.

[2] Post-catalyst emission factors based on catalyst manufacturer data and/or NSPS Subpart JJJJ limits, if applicable. Per NSPS Subpart JJJJ, VOC limit does not include HCHO; therefore, HCHO emissions have been added to the NSPS JJJJ VOC emission rates for demonstration

[3] Per AP-42, all particulate matter (PM) from combustion of natural gas (total, condensable and filterable PM) is presumed <1 micrometer in diameter.

SWN Production Company, LLC
William Ritchea Pad
Engine Emissions Calculations - Hazardous Air Pollutants

Equipment Information

Unit ID:	**EU-ENG1**	**EU-ENG2**
Emission Point ID:	EP-ENG1	EP-ENG2
Make:	Caterpillar	Caterpillar
Model:	G3306 NA	G3306 NA
Design Class:	4S-RB	4S-RB
Controls:	NSCR	NSCR
Horsepower (hp):	145	145
Fuel Use (Btu/hp-hr):	8,625	8,625
Fuel Use (scfh):	1,382	1,382
Annual Fuel Use (mmscf):	12.11	12.11
Fuel Use (mmBtu/hr):	1.25	1.25
Exhaust Flow (acfm):	678	678
Exhaust Temp (°F):	1,101	1,101
Operating Hours:	8,760	8,760

Manufacturer Formaldehyde Factor

Pre-Control (g/hp-hr):	0.27	0.27
Control Efficiency[1]:	76.00%	76.00%
Permit Factor (g/hp-hr):	0.06	0.06

Uncontrolled HAP Emissions

Unit ID:	**EU-ENG1**		**EU-ENG2**	
Pollutant	**lb/hr**	**TPY**	**lb/hr**	**TPY**
Acetaldehyde	<0.01	0.02	<0.01	0.02
Acrolein	<0.01	0.01	<0.01	0.01
Benzene	<0.01	0.01	<0.01	0.01
Ethylbenzene	<0.01	<0.01	<0.01	<0.01
Formaldehyde	0.09	0.38	0.09	0.38
Methanol	<0.01	0.02	<0.01	0.02
Toluene	<0.01	<0.01	<0.01	<0.01
Xylenes	<0.01	<0.01	<0.01	<0.01
Total HAPs =	**0.10**	**0.44**	**0.10**	**0.44**

SWN Production Company, LLC
William Ritchea Pad
Engine Emissions Calculations - Hazardous Air Pollutants

Proposed HAP Emissions

Unit ID:	EU-ENG1		EU-ENG2	
Pollutant	**lb/hr**	**TPY**	**lb/hr**	**TPY**
Acetaldehyde	<0.01	0.02	<0.01	0.02
Acrolein	<0.01	0.01	<0.01	0.01
Benzene	<0.01	0.01	<0.01	0.01
Ethylbenzene	<0.01	<0.01	<0.01	<0.01
Formaldehyde	0.02	0.09	0.02	0.09
Methanol	<0.01	0.02	<0.01	0.02
Toluene	<0.01	<0.01	<0.01	<0.01
Xylenes	<0.01	<0.01	<0.01	<0.01
Total HAPs =	**0.03**	**0.15**	**0.03**	**0.15**

AP-42 Emission Factors (lb/mmBtu)

	4S-RB
Pollutant	**3.2-3 (7/00)**
Acetaldehyde	2.79E-03
Acrolein	2.63E-03
Benzene	1.58E-03
Ethylbenzene	2.18E-05
Methanol	3.06E-03
Toluene	5.58E-04
Xylenes	1.95E-04

Notes:
[1] For conservative estimate, no reduction taken for any HAP other than formaldehyde.

SWN Production Company, LLC
William Ritchea Pad
Engine Emissions Calculations - Greenhouse Gases

Equipment Information

Unit ID:	**EU-ENG1**	**EU-ENG2**
Emission Point ID:	EP-ENG1	EP-ENG2
Make:	Caterpillar	Caterpillar
Model:	G3306 NA	G3306 NA
Design Class:	4S-RB	4S-RB
Controls:	NSCR	NSCR
Horsepower (hp):	145	145
Fuel Use (Btu/hp-hr):	8,625	8,625
Fuel Use (scfh):	1,382	1,382
Fuel Use (mmBtu/hr):	1.25	1.25
Exhaust Flow (acfm):	678	678
Exhaust Temp (°F):	1,101	1,101
Operating Hours:	8,760	8,760

Manufacturer data used to calculate CO_2 emissions (g/hp-hr):

	485	485

Greenhouse Gas (GHG) Emissions[1]

Unit ID:	**EU-ENG1**		**EU-ENG2**	
Pollutant	**lb/hr**	**tonnes/yr**	**lb/hr**	**tonnes/yr**
CO_2	155.04	616.04	155.04	616.04
CH_4	<0.01	0.01	<0.01	0.01
N_2O	<0.01	<0.01	<0.01	<0.01
CH_4 as CO_2e	0.07	0.27	0.07	0.27
N_2O as CO_2e	0.08	0.33	0.08	0.33
Total CO_2 + CO_2e =	**155.19**	**616.64**	**155.19**	**616.64**

40 CFR 98 Tables C-1 and C-2 Emission Factors (kg/mmBtu)[2]

Methane (CH_4)	1.00E-03
Nitrous Oxide (N_2O)	1.00E-04

Notes:
[1] Conversion to short tons (tons) found in site-wide Summary of Greenhouse Gases - Short Tons per Year (tons) table.
[2] CO_2e = CO_2 equivalent (Pollutant times GWP multiplier):

40 CFR 98 Table A-1, Global Warming Potential (GWP) multiplier: CO_2 = 1, CH_4 = 25, N_2O = 298

SWN Production Company, LLC
William Ritchea Pad
Gas Production Unit Burner Emissions Calculations - Criteria Air Pollutants

Equipment Information

Unit ID:	**EU-GPU1 - EU-GPU5 (EACH)**
Emission Point ID:	EP-GPU1 - EP-GPU5
Description:	Gas Production Unit Burner
Number of Units:	5
Burner Design (mmBtu/hr):	1.0
Fuel HHV (Btu/scf):	905
Annual Fuel Use (mmscf):	9.68
Annual Operating Hours:	8,760

Criteria Air Pollutant Emissions

Unit ID:	**EU-GPU1 - EU-GPU5 (EACH)**		**EU-GPU1 - EU-GPU5 (TOTAL)**	
Pollutant	**lb/hr**	**TPY**	**lb/hr**	**TPY**
NOx	0.11	0.48	0.55	2.40
CO	0.09	0.39	0.45	1.95
VOC	0.01	0.03	0.03	0.15
SO_2	<0.01	<0.01	<0.01	<0.01
$PM_{10/2.5}$	0.01	0.03	0.03	0.14
PM_{COND}	<0.01	0.01	<0.01	<0.05
PM_{TOT}	0.01	0.04	0.04	0.18

AP-42 Emission Factors for Units <100 mmBtu/hr (lb/mmscf)[1]

Pollutant	1.4-1, -2 (7/98)
NOx	100.0
CO	84.0
VOC	5.5
SO_2	0.6
$PM_{10/2.5}$	5.7
PM_{COND}	1.9
PM_{TOT}	7.6

Notes:
[1] All PM (total, condensable and filterable) is assumed to be <1 micrometer in diameter. Total PM is the sum of filterable PM and condensable PM.

SWN Production Company, LLC
William Ritchea Pad
Gas Production Unit Burner Emissions Calculations - Hazardous Air Pollutants

Equipment Information

Unit ID:	**EU-GPU1 - EU-GPU5 (EACH)**
Emission Point ID:	EP-GPU1 - EP-GPU5
Description:	Gas Production Unit Burner
Number of Units:	5
Burner Design (mmBtu/hr):	1.0
Fuel HHV (Btu/scf):	905
Annual Fuel Use (mmscf):	9.68
Annual Operating Hours:	8,760

Hazardous Air Pollutant Emissions

Unit ID:	**EU-GPU1 - EU-GPU5 (EACH)**		**EU-GPU1 - EU-GPU5 (TOTAL)**	
Pollutant	**lb/hr**	**TPY**	**lb/hr**	**TPY**
n-Hexane	<0.01	0.01	<0.01	<0.04
Formaldehyde	<0.01	<0.01	<0.01	<0.01
Benzene	<0.01	<0.01	<0.01	<0.01
Toluene	<0.01	<0.01	<0.01	<0.01
Total HAPs =	**<0.01**	**0.01**	**0.01**	**0.05**

AP-42 Emission Factors (lb/mmscf)

Pollutant	1.4-3 (7/98)
n-Hexane	1.80E+00
Formaldehyde	7.50E-02
Benzene	2.10E-03
Toluene	3.40E-03

SWN Production Company, LLC
William Ritchea Pad
Gas Production Unit Burner Emissions Calculations - Greenhouse Gases

Equipment Information

Unit ID:	**EU-GPU1 - EU-GPU5 (EACH)**
Emission Point ID:	EP-GPU1 - EP-GPU5
Description:	Gas Production Unit Burner
Number of Units:	5
Burner Design (mmBtu/hr):	1.0
Fuel HHV (Btu/scf):	905
Annual Fuel Use (mmscf):	9.68
Annual Operating Hours:	8,760

Greenhouse Gas (GHG) Emissions[1]

Unit ID:	**EU-GPU1 - EU-GPU5 (EACH)**		**EU-GPU1 - EU-GPU5 (TOTAL)**	
Pollutant	**lb/hr**	**tonnes/yr**	**lb/hr**	**tonnes/yr**
CO_2	116.98	464.80	584.89	2,324.02
CH_4	<0.01	0.01	<0.01	<0.04
N_2O	<0.01	<0.01	<0.01	<0.01
CH_4 as CO_2e	0.06	0.22	0.28	1.09
N_2O as CO_2e	0.07	0.26	0.33	1.31
Total CO_2 + CO_2e =	**117.10**	**465.28**	**585.49**	**2,326.42**

40 CFR 98 Tables C-1 and C-2 Emission Factors (kg/mmBtu)[2]

Carbon Dioxide (CO_2)	53.06
Methane (CH_4)	1.00E-03
Nitrous Oxide (N_2O)	1.00E-04

Notes:
[1] Conversion to short tons (tons) found in site-wide Summary of Greenhouse Gases - Short Tons per Year (tons) table.
[2] CO_2e = CO_2 equivalent (Pollutant times GWP multiplier):
40 CFR 98 Table A-1, Global Warming Potential (GWP) multiplier: CO_2 = 1, CH_4 = 25, N_2O = 298

SWN Production Company, LLC
William Ritchea Pad
Heater Treater Emissions Calculations - Criteria Air Pollutants

Equipment Information

Unit ID:	**EU-HT1 - EU-HT2 (EACH)**
Emission Point ID:	EP-HT1 - EP-HT2
Description:	Heater Treater
Number of Units:	2
Burner Design (mmBtu/hr):	0.5
Fuel HHV (Btu/scf):	905
Annual Fuel Use (mmscf):	4.84
Annual Operating Hours:	8,760

Criteria Air Pollutant Emissions

Unit ID:	**EU-HT1 - EU-HT2 (EACH)**		**EU-HT1 and EU-HT2 (TOTAL)**	
Pollutant	**lb/hr**	**TPY**	**lb/hr**	**TPY**
NOx	0.06	0.26	0.12	0.52
CO	0.05	0.22	0.10	0.44
VOC	<0.01	0.01	0.01	0.02
SO_2	<0.01	<0.01	<0.01	<0.01
$PM_{10/2.5}$	<0.01	0.01	0.01	0.03
PM_{COND}	<0.01	<0.01	<0.01	0.01
PM_{TOT}	<0.01	0.02	0.01	0.04

AP-42 Emission Factors for Units <100 mmBtu/hr (lb/mmscf)[1]

Pollutant	1.4-1, -2 (7/98)
NOx	100.0
CO	84.0
VOC	5.5
SO_2	0.6
$PM_{10/2.5}$	5.7
PM_{COND}	1.9
PM_{TOT}	7.6

Notes:
[1] All PM (total, condensable and filterable) is assumed to be <1 micrometer in diameter. Total PM is the sum of filterable PM and condensable PM.

SWN Production Company, LLC
William Ritchea Pad
Heater Treater Emissions Calculations - Hazardous Air Pollutants

Equipment Information

Unit ID:	**EU-HT1 - EU-HT2 (EACH)**
Emission Point ID:	EP-HT1 - EP-HT2
Description:	Heater Treater
Number of Units:	2
Burner Design (mmBtu/hr):	0.5
Fuel HHV (Btu/scf):	905
Annual Fuel Use (mmscf):	4.84
Annual Operating Hours:	8,760

Hazardous Air Pollutant Emissions

Unit ID:	**EU-HT1 - EU-HT2 (EACH)**		**EU-HT1 and EU-HT2 (TOTAL)**	
Pollutant	**lb/hr**	**TPY**	**lb/hr**	**TPY**
n-Hexane	<0.01	<0.01	<0.01	0.01
Formaldehyde	<0.01	<0.01	<0.01	<0.01
Benzene	<0.01	<0.01	<0.01	<0.01
Toluene	<0.01	<0.01	<0.01	<0.01
Total HAPs =	**<0.01**	**<0.01**	**<0.01**	**0.01**

AP-42 Emission Factors (lb/mmscf)

Pollutant	1.4-3 (7/98)
n-Hexane	1.80E+00
Formaldehyde	7.50E-02
Benzene	2.10E-03
Toluene	3.40E-03

SWN Production Company, LLC
William Ritchea Pad
Heater Treater Emissions Calculations - Greenhouse Gases

Equipment Information

Unit ID:	**EU-HT1 - EU-HT2 (EACH)**
Emission Point ID:	EP-HT1 - EP-HT2
Description:	Heater Treater
Number of Units:	2
Burner Design (mmBtu/hr):	0.5
Fuel HHV (Btu/scf):	905
Annual Fuel Use (mmscf):	4.84
Annual Operating Hours:	8,760

Greenhouse Gas (GHG) Emissions[1]

Unit ID:	**EU-HT1 - EU-HT2 (EACH)**		**EU-HT1 and EU-HT2 (TOTAL)**	
Pollutant	**lb/hr**	**tonnes/yr**	**lb/hr**	**tonnes/yr**
CO_2	58.49	232.40	116.98	464.80
CH_4	<0.01	<0.01	<0.01	<0.01
N_2O	<0.01	<0.01	<0.01	<0.01
CH_4 as CO_2e	0.03	0.11	0.06	0.22
N_2O as CO_2e	0.03	0.13	0.07	0.26
Total CO_2 + CO_2e =	**58.55**	**232.64**	**117.10**	**465.28**

40 CFR 98 Tables C-1 and C-2 Emission Factors (kg/mmBtu)[2]

Carbon Dioxide (CO_2)	53.06
Methane (CH_4)	1.00E-03
Nitrous Oxide (N_2O)	1.00E-04

Notes:
[1] Conversion to short tons (tons) found in site-wide Summary of Greenhouse Gases - Short Tons per Year (tons) table.
[2] CO_2e = CO_2 equivalent (Pollutant times GWP multiplier):
40 CFR 98 Table A-1, Global Warming Potential (GWP) multiplier: CO_2 = 1, CH_4 = 25, N_2O = 298

SWN Production Company, LLC
William Ritchea Pad
Storage Tank Emissions - Criteria Air Pollutants

Tank Information

Unit ID:	EU-TANKS-COND	EU-TANKS-PW
Emission Point ID:	APC-COMB-TKLD	APC-COMB-TKLD
Contents: [1]	Condensate	Produced Water
Number of Tanks: [2]	4	4
Capacity (bbl) - Per Tank:	400	400
Capacity (gal) - Per Tank:	16,800	16,800
Total Throughput (bbl/yr):	297,110	307,695
Total Throughput (gal/yr):	12,478,620	12,923,190
Total Throughput (bbl/d):	814	843
Tank Flashing Emission Factor (lb/bbl):	3.25	0.02
Total Working Losses (lb/yr): [3]	24,966.74	209.70
Breathing Losses per Tank (lb/yr): [3]	3,189.24	11.89
Tank Vapor Capture Efficiency:	100%	100%
Captured Vapors Routed to:	Vapor Combustor	Vapor Combustor

Uncontrolled Storage Tank Emissions

Unit ID:	EU-TANKS-COND		EU-TANKS-PW	
Emissions	**lb/hr**	**TPY**	**lb/hr**	**TPY**
Working Losses	2.85	12.48	0.02	0.10
Breathing Losses	1.45	6.36	0.01	0.04
Flashing Losses	110.23	482.80	0.70	3.08
Total VOC =	**114.53**	**501.64**	**0.74**	**3.22**

Notes:

[1] Produced water tanks assumed to contain 99% produced water and 1% condensate.

[2] SWN requests to combine working, breathing and flashing emissions from each tank type to be combined into one emissions point with a total throughput limit rather than an individual tank limit.

[3] Tank working and breathing emissions were calculated using maximum throughput in EPA TANKS 4.0.9d for working losses and multiplying results for breathing losses by the number of tanks for total potential evaporative losses from all tanks. Flashing calculated using Promax process simulation. Reports located in Appendix A. Uncontrolled tank working/breathing/flashing emissions are routed to a vapor combustor with 100% capture efficiency.

Total Annual Emissions (TPY) = Tank Working + Breathing + Flashing Emissions (TPY) * (1 - Capture Efficiency (%))

SWN Production Company, LLC
William Ritchea Pad
Storage Tank Emissions - Hazardous Air Pollutants

Uncontrolled Storage Tank Emissions

Unit ID:	EU-TANKS-COND		EU-TANKS-PW	
Pollutant	**lb/hr**	**TPY**	**lb/hr**	**TPY**
Total VOC = [1]	**114.53**	**501.64**	**0.74**	**3.22**
n-Hexane	12.40	54.31	0.08	0.35
Benzene	0.10	0.44	<0.01	<0.01
Toluene	0.73	3.20	<0.01	0.02
Ethylbenzene	0.70	3.05	<0.01	0.02
Xylenes	2.20	9.65	0.01	0.06
Total HAP =	**16.13**	**70.65**	**0.10**	**0.45**

Estimated HAP Composition (% by Weight)[3]

Pollutant	Wt%
n-Hexane	10.826%
Benzene	0.088%
Toluene	0.639%
Ethylbenzene	0.608%
Xylenes	1.924%
Total HAP =	**14.084%**

Notes:

[1] VOC emissions calculated in Criteria Air Pollutant calculations.

[2] Uncontrolled tank working/breathing/flashing emissions are routed to a vapor combustor with 100% capture efficiency.

[3] Speciated liquids analysis located in Fugitive Emissions Calculations. HAP weight % calculated as % of total hydrocarbons in the sample. All HAP assumed to volatilize from liquids for most conservative emissions estimate.

SWN Production Company, LLC
William Ritchea Pad
Condensate Truck Loading Emissions - Criteria and Hazardous Air Pollutants

Loading Information

Unit ID:	**EU-LOAD-COND**
Emission Point ID:	APC-COMB-TKLD
Fill Method:	Submerged
Type of Service:	Dedicated
Mode of Operation:	Normal
Saturation Factor:	0.6
Em. Factor (lb/1000 gal): [1]	8.61
Throughput (1000 gal):	12,479
Control Type:	Vapor Return/Combustion
Vapor Capture Efficiency: [2]	70%
Average Fill Rate (gal/hr):	7,500
Captured Vapors Routed to:	Vapor Combustor

11.7212	= P, True vapor pressure of liquid loaded (max. psia)[3]
50.143	= M, Molecular weight of vapor (lb/lb-mol)
50.33	= T, Temperature of bulk liquid loaded (average °F)
510.33	= T, Temperature of bulk liquid loaded (°F + 460 = °R)

Uncontrolled Loading Emissions[4]

Pollutant	Max. lb/hr	Avg. lb/hr	TPY
VOC =	**64.58**	**12.26**	**53.72**
n-Hexane	6.99	1.33	5.81
Benzene	0.06	0.01	0.05
Toluene	0.41	0.08	0.34
Ethylbenzene	0.39	0.07	0.33
Xylenes	1.24	0.24	1.03
Total HAP [5] =	**9.10**	**1.73**	**7.56**

SWN Production Company, LLC
William Ritchea Pad
Condensate Truck Loading Emissions - Criteria and Hazardous Air Pollutants (Continued)

Uncaptured Loading Emissions[4]

Pollutant	Max. lb/hr	Avg. lb/hr	TPY
VOC =	**19.37**	**3.68**	**16.12**
n-Hexane	2.10	0.40	1.74
Benzene	0.02	<0.01	0.01
Toluene	0.12	0.02	0.10
Ethylbenzene	0.12	0.02	0.10
Xylenes	0.37	0.07	0.31
Total HAP [5] =	**2.73**	**0.52**	**2.27**

Notes:

[1] AP-42 5.2-4 Eq.1: Loading Loss (lb/1000 gal) = 12.46 *S*P*M/T.

[2] Uncontrolled emissions that are captured by the collection system are routed to a vapor combustor. Per AP-42 5.2-6, 70% capture efficiency can be assumed for trucks not subject to NSPS. Uncaptured emissions shown represent those not captured by the collection system or controlled by the vapor combustor.

[3] AP-42 Section 7.1 - Properties of Selected Petroleum Liquids correlation with RVP estimated based on stabilization process.

[4] Maximum lb/hr based on average hourly truck loading rate. Average lb/hr based on TPY conversion assuming continuous operation.

[5] Speciated liquids analysis located in Fugitive Emissions Calculations. HAP weight % calculated as % of total hydrocarbons in the sample. All HAP assumed to volatilize from liquids for most conservative emissions estimate.

Pollutant	Wt%
n-Hexane	10.826%
Benzene	0.088%
Toluene	0.639%
Ethylbenzene	0.608%
Xylenes	1.924%
Total HAPs =	**14.084%**

SWN Production Company, LLC
William Ritchea Pad
Condensate Truck Loading Emissions - Greenhouse Gases

Loading Information

Unit ID:	**EU-LOAD-COND**
Fill Method:	APC-COMB-TKLD
Fill Method:	Submerged
Type of Service:	Dedicated
Mode of Operation:	Normal
TOC Em. Factor (tonne/10^6 gal): [1]	0.91
Throughput (10^6 gal):	12.479
Control Type:	Vapor Return/Combustion
Vapor Capture Efficiency: [2]	70.00%
Average Fill Rate (gal/hr):	7,500
Captured Vapors Routed to:	Vapor Combustor

Input CH_4 from Promax =	1.9267%
Input CO_2 from Promax =	0.0540%

Uncontrolled Loading Emissions[3, 4]

Pollutant	Max. lb/hr	Avg. lb/hr	tonnes/yr	tons/yr
CH_4	0.29	0.06	0.22	0.24
CH_4 as CO_2e	7.25	1.38	5.47	6.03
CO_2	0.01	<0.01	0.01	0.01
Total CO_2 + CO_2e =	**7.26**	**1.38**	**5.48**	**6.04**

SWN Production Company, LLC
William Ritchea Pad
Condensate Truck Loading Emissions - Greenhouse Gases (Continued)

Uncaptured Loading Emissions[3, 4]

Pollutant	Max. lb/hr	Avg. lb/hr	tonnes/yr	tons/yr
CH_4	0.09	0.02	0.07	0.07
CH_4 as CO_2e	2.17	0.41	1.64	1.81
CO_2	<0.01	<0.01	<0.01	<0.01
Total CO_2 + CO_2e =	**2.18**	**0.41**	**1.64**	**1.81**

API Compendium Table 5-12

Loading Type	Emission Factor (tonne TOC/10^6 gal)
Rail/Truck - Submerged Loading - Dedicated Normal Service	0.91
Rail/Truck - Submerged Loading - Vapor Balance Service	1.51
Rail/Truck - Splash Loading - Dedicated Normal Service	2.20
Rail/Truck - Splash Loading - Vapor Balance Service	1.51
Marine Loading - Ships/Ocean Barges	0.28
Marine Loading - Barges	0.45

Notes:

[1] API Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Gas Industry, Table 5-12.

[2] Uncontrolled emissions that are captured by the collection system are routed to a vapor combustor. Per AP-42 5.2-6, 70% capture efficiency can be assumed for trucks not subject to NSPS. Uncaptured emissions shown represent those not captured by the collection system or controlled by the vapor combustor.

[3] Maximum lb/hr based on average hourly truck loading rate. Average lb/hr based on TPY conversion assuming continuous operation.

[4] CO_2e = CO_2 equivalent (Pollutant times GWP multiplier):

40 CFR 98 Table A-1, Global Warming Potential (GWP) multiplier: CO_2 = 1, CH_4 = 25

SWN Production Company, LLC
William Ritchea Pad
Produced Water Truck Loading Emissions - Criteria and Hazardous Air Pollutants

Loading Information

Unit ID:	**EU-LOAD-PW**
Emission Point ID:	APC-COMB-TKLD
Fill Method:	Submerged
Type of Service:	Dedicated
Mode of Operation:	Normal
Saturation Factor:	0.6
Em. Factor (lb/1000 gal): [1]	0.08
Throughput (1000 gal):	12,923
Control Type:	Vapor Return/Combustion
Vapor Capture Efficiency: [2]	70%
Average Fill Rate (gal/hr):	7,500
Captured Vapors Routed to:	Vapor Combustor

0.2498	= P, True vapor pressure of liquid loaded (max. psia)
21.1102	= M, Molecular weight of vapor (lb/lb-mol)
50.33	= T, Temperature of bulk liquid loaded (average °F)
510.33	= T, Temperature of bulk liquid loaded (°F + 460 = °R)

Uncontrolled Loading Emissions[3]

Pollutant	Max. lb/hr	Avg. lb/hr	TPY
VOC =	**0.60**	**0.12**	**0.52**
n-Hexane	0.06	0.01	0.06
Benzene	<0.01	<0.01	<0.01
Toluene	<0.01	<0.01	<0.01
Ethylbenzene	<0.01	<0.01	<0.01
Xylenes	0.01	<0.01	0.01
Total HAP[4] =	**0.08**	**0.02**	**0.07**

SWN Production Company, LLC
William Ritchea Pad
Produced Water Truck Loading Emissions - Criteria and Hazardous Air Pollutants (Continued)

Uncaptured Loading Emissions[3]

Pollutant	Max. lb/hr	Avg. lb/hr	TPY
VOC =	**0.18**	**0.04**	**0.16**
n-Hexane	0.02	<0.01	0.02
Benzene	<0.01	<0.01	<0.01
Toluene	<0.01	<0.01	<0.01
Ethylbenzene	<0.01	<0.01	<0.01
Xylenes	<0.01	<0.01	<0.01
Total HAP[4] =	**0.03**	**0.01**	**0.02**

Notes:

[1] AP-42 5.2-4 Eq.1: Loading Loss (lb/1000 gal) = 12.46 *S*P*M/T. Properties based on mixture of 99% water and 1% condensate.

[2] Uncontrolled emissions that are captured by the collection system are routed to a vapor combustor. Per AP-42 5.2-6, 70% capture efficiency can be assumed for trucks not subject to NSPS. Uncaptured emissions shown represent those not captured by the collection system or controlled by the vapor combustor.

[3] Maximum lb/hr based on average hourly truck loading rate. Average lb/hr based on TPY conversion assuming continuous operation.

[4] Speciated liquids analysis located in Fugitive Emissions Calculations. HAP weight % calculated as % of total hydrocarbons in the sample. All HAP assumed to volatilize from liquids for most conservative emissions estimate.

Pollutant	Wt%
n-Hexane	10.826%
Benzene	0.088%
Toluene	0.639%
Ethylbenzene	0.608%
Xylenes	1.924%
Total HAPs =	**14.084%**

SWN Production Company, LLC
William Ritchea Pad
Produced Water Truck Loading Emissions - Greenhouse Gases

Loading Information

Unit ID:	**EU-LOAD-PW**
Fill Method:	APC-COMB-TKLD
Fill Method:	Submerged
Type of Service:	Dedicated
Mode of Operation:	Normal
TOC Em. Factor (tonne/10^6 gal): [1]	0.91
Throughput (10^6 gal):	12.923
Control Type:	Vapor Return/Combustion
Vapor Capture Efficiency: [2]	70.00%
Average Fill Rate (gal/hr):	7,500
Captured Vapors Routed to:	Vapor Combustor

Input CH_4 from Promax =	34.1150%
Input CO_2 from Promax =	0.5071%

Uncontrolled Loading Emissions[3, 4]

Pollutant	Max. lb/hr	Avg. lb/hr	tonnes/yr	tons/yr
CH_4	5.13	1.01	4.01	4.42
CH_4 as CO_2e	128.33	25.24	100.30	110.56
CO_2	0.08	0.02	0.06	0.07
Total CO_2 + CO_2e =	**128.40**	**25.26**	**100.36**	**110.63**

SWN Production Company, LLC
William Ritchea Pad
Produced Water Truck Loading Emissions - Greenhouse Gases (Continued)

Uncaptured Loading Emissions[3, 4]

Pollutant	Max. lb/hr	Avg. lb/hr	tonnes/yr	tons/yr
CH_4	1.54	0.30	1.20	1.33
CH_4 as CO_2e	38.50	7.57	30.09	33.17
CO_2	0.02	<0.01	0.02	0.02
Total CO_2 + CO_2e =	**38.52**	**7.58**	**30.11**	**33.19**

API Compendium Table 5-12

Loading Type	Emission Factor (tonne TOC/10^6 gal)
Rail/Truck - Submerged Loading - Dedicated Normal Service	0.91
Rail/Truck - Submerged Loading - Vapor Balance Service	1.51
Rail/Truck - Splash Loading - Dedicated Normal Service	2.20
Rail/Truck - Splash Loading - Vapor Balance Service	1.51
Marine Loading - Ships/Ocean Barges	0.28
Marine Loading - Barges	0.45

Notes:

[1] API Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Gas Industry, Table 5-12.

[2] Uncontrolled emissions that are captured by the collection system are routed to a vapor combustor. Per AP-42 5.2-6, 70% capture efficiency can be assumed for trucks not subject to NSPS. Uncaptured emissions shown represent those not captured by the collection system or controlled by the vapor combustor.

[3] Maximum lb/hr based on average hourly truck loading rate. Average lb/hr based on TPY conversion assuming continuous operation.

[4] CO_2e = CO_2 equivalent (Pollutant times GWP multiplier):
40 CFR 98 Table A-1, Global Warming Potential (GWP) multiplier: CO_2 = 1, CH_4 = 25

SWN Production Company, LLC
William Ritchea Pad
Tanks/Loading Vapor Combustor Emissions Calculations - Criteria and Hazardous Air Pollutants

Criteria and Hazardous Air Pollutant Emissions

Unit ID	Pollutant	Emission Factors[1]	Total Captured Emissions[2]		Combustor Destruction Efficiency	Total Controlled Emissions (Post-Capture and Combustion)	
			lb/hr	TPY	%	lb/hr	TPY
APC-COMB-TKLD	NOx	0.138	-	-	-	2.07	9.07
	CO	0.2755	-		-	4.13	18.09
	PM	7.6	-		-	0.04	0.18
	VOC	Mass Balance	123.93	542.82	98.00%	2.48	10.86
	n-Hexane	Mass Balance	13.42	58.77	98.00%	0.27	1.18
	Benzene	Mass Balance	0.11	0.48	98.00%	<0.01	0.01
	Toluene	Mass Balance	0.79	3.46	98.00%	0.02	0.07
	Ethylbenzene	Mass Balance	0.76	3.30	98.00%	0.02	0.07
	Xylenes	Mass Balance	2.38	10.44	98.00%	0.05	0.22

Notes:

[1] Although a vapor combustor is not considered a flare by design, the function is consistent in that it combusts a waste stream for the purpose of reducing emissions; therefore, flare emission factors for NOx and CO were used to provide the most accurate emissions estimates. Although the combustor is designed to be smokeless, PM emissions have been estimated using AP-42 Table 1.4-1 factor (lb/mmscf) for a conservative estimate.

Hours per Year: 8,760
Number of Combustors: 1

NOx and CO emission factors (lb/mmBtu): *TCEQ Air Permit Technical Guidance for Chemical Sources: Flares and Vapor Oxidizers:* High Btu waste streams (>1,000 Btu/scf) based on heat input to the combustor = 15.00 mmBtu/hr Total Heat Input

[2] Total captured emissions are based on 100% capture efficiency from storage tanks and 70% capture efficiency from truck loading with 98% destruction efficiency from the vapor combustor based on 8,760 hours of operation per year. Uncaptured vapors reported at loading emission units. Captured emissions from sources controlled by VOC combustor shown in following tables.

SWN Production Company, LLC
William Ritchea Pad
Tanks/Loading Vapor Combustor Emissions Calculations - Criteria and Hazardous Air Pollutants (Continued)

Source	Captured VOC Emissions	
	lb/hr	TPY
Condensate Storage Tanks	114.53	501.64
Produced Water Storage Tanks	0.74	3.22
Condensate Truck Loading	8.58	37.60
Produced Water Truck Loading	0.08	0.36
Total VOC =	**123.93**	**542.82**

Source	Captured HAP Emissions (lb/hr)				
	n-Hexane	Benzene	Toluene	Ethylbenzene	Xylenes
Condensate Storage Tanks	12.40	0.10	0.73	0.70	2.20
Produced Water Storage Tanks	0.08	<0.01	<0.01	<0.01	0.01
Condensate Truck Loading	0.93	0.01	0.05	0.05	0.17
Produced Water Truck Loading	0.01	<0.01	<0.01	<0.01	<0.01
Total HAP =	**13.42**	**0.11**	**0.79**	**0.76**	**2.38**

Source	Captured HAP Emissions (TPY)				
	n-Hexane	Benzene	Toluene	Ethylbenzene	Xylenes
Condensate Storage Tanks	54.31	0.44	3.20	3.05	9.65
Produced Water Storage Tanks	0.35	<0.01	0.02	0.02	0.06
Condensate Truck Loading	4.07	0.03	0.24	0.23	0.72
Produced Water Truck Loading	0.04	<0.01	<0.01	<0.01	0.01
Total HAP =	**58.77**	**0.48**	**3.46**	**3.30**	**10.44**

SWN Production Company, LLC
William Ritchea Pad
Tanks/Loading Vapor Combustor Emissions Calculations - Greenhouse Gases

Equipment Information

Unit ID:	**APC-COMB-TKLD**
Description:	Vapor Combustor
Number of Combustors:	1
Burner Design Capacity (mmBtu/hr):	15.00
Stream HHV (Btu/scf):	2,682
Annual Throughput (mmscf):	48.99
Annual Operating Hours:	8,760

Greenhouse Gas (GHG) Emissions

Pollutant	lb/hr	tonnes/yr	tons/yr
CO_2	1,754.66	6,972.07	7,685.39
CH_4	0.03	0.13	0.14
N_2O	<0.01	0.01	0.01
CH_4 as CO_2e	0.83	3.28	3.62
N_2O as CO_2e	0.99	3.92	4.32
Total CO_2 + CO_2e =	**1,756.47**	**6,979.27**	**7,693.33**

40 CFR 98 Tables C-1 and C-2 Emission Factors (kg/mmBtu)[1]

Carbon Dioxide (CO_2)	53.06
Methane (CH_4)	1.00E-03
Nitrous Oxide (N_2O)	1.00E-04

Notes:
[1] CO_2e = CO_2 equivalent (Pollutant times GWP multiplier):
40 CFR 98 Table A-1, Global Warming Potential (GWP) multiplier: CO_2 = 1, CH_4 = 25, N_2O = 298

SWN Production Company, LLC
William Ritchea Pad
Vapor Combustor Pilot Emissions Calculations - Criteria Air Pollutants

Criteria Air Pollutant Emissions

Unit ID	Pollutant	Emission Factors [1] (lb/mmscf)	Emissions lb/hr	Emissions TPY
EU-PILOT APC-COMB-TKLD	NOx	100	0.01	0.04
	CO	84	<0.01	0.02
	VOC	5.5	<0.01	<0.01
	SO_2	0.6	<0.01	<0.01
	PM	7.6	<0.01	<0.01

905	Pilot Stream Heat Content (Btu/SCF)
8,760	Pilot Hours/Yr
50	Pilot Gas Flow Rate (SCFH)[2]
45,250	Total Pilot Gas Fuel Use (Btu/hr)
0.44	Total Annual Fuel Use (MMSCF)

Notes:

[1] AP-42 Table 1.4-1, -2 (7/98)

[2] Combustor is equipped with one (1) pilot with a pilot fuel consumption of 50 SCFH.

SWN Production Company, LLC
William Ritchea Pad
Vapor Combustor Pilot Emissions Calculations - Hazardous Air Pollutants

Hazardous Air Pollutant Emissions

Unit ID	Pollutant	Emission Factors [1] (lb/mmscf)	Emissions lb/hr	Emissions TPY
EU-PILOT APC-COMB-TKLD	n-Hexane	1.8	<0.01	<0.01
	Formaldehyde	0.075	<0.01	<0.01
	Benzene	0.0021	<0.01	<0.01
	Toluene	0.0034	<0.01	<0.01
		Total HAPs =	**<0.01**	**<0.01**

905	Pilot Stream Heat Content (Btu/SCF)
8,760	Pilot Hours/Yr
50	Pilot Gas Flow Rate (SCFH)[2]
45,250	Total Pilot Gas Fuel Use (Btu/hr)
0.44	Total Annual Fuel Use (MMSCF)

Notes:

[1] AP-42 Table 1.4-3 (7/98)

[2] Combustor is equipped with one (1) pilot with a pilot fuel consumption of 50 SCFH.

SWN Production Company, LLC
William Ritchea Pad
Vapor Combustor Pilot Emissions Calculations - Greenhouse Gases

Greenhouse Gas (GHG) Emissions

Unit ID	Pollutant	Emissions		
		lb/hr	tonnes/yr	tons/yr
EU-PILOT	CO_2	5.29	21.03	23.18
APC-COMB-TKLD	CH_4	<0.01	<0.01	<0.01
	N_2O	<0.01	<0.01	<0.01
	CH_4 as CO_2e	<0.01	0.01	0.01
	N_2O as CO_2e	<0.01	0.01	0.01
Total CO_2 + CO_2e =		**5.30**	**21.05**	**23.21**

905	Pilot Stream Heat Content (Btu/SCF)
8,760	Pilot Hours/Yr
50	Pilot Gas Flow Rate (SCFH)[2]
45,250	Total Pilot Gas Fuel Use (Btu/hr)
0.44	Total Annual Fuel Use (MMSCF)

40 CFR 98 Tables C-1 and C-2 Emission Factors (kg/mmBtu)[1]

Carbon Dioxide (CO_2)	53.06
Methane (CH_4)	1.00E-03
Nitrous Oxide (N_2O)	1.00E-04

Notes:

[1] CO_2e = CO_2 equivalent (Pollutant times GWP multiplier):

40 CFR 98 Table A-1, Global Warming Potential (GWP) multiplier: CO_2 = 1, CH_4 = 25, N_2O = 298

[2] Combustor is equipped with one (1) pilot with a pilot fuel consumption of 50 SCFH.

SWN Production Company, LLC
William Ritchea Pad
Fugitive Emissions Calculations - Criteria and Hazardous Air Pollutants and Greenhouse Gases

Equipment Information

Source Type/Service	Number of Sources[1]	Em. Factor (lb/hr/source)[2]	Control Efficiency	TOC lb/hr	TOC TPY	VOC Wt %
Valves - Gas	77	9.92E-03	0.00%	0.76	3.33	20.36%
Flanges - Gas	321	8.60E-04	0.00%	0.28	1.23	20.36%
Compressor Seals - Gas	6	1.94E-02	0.00%	0.12	0.53	20.36%
Relief Valves - Gas	28	1.94E-02	0.00%	0.54	2.37	20.36%
Open-Ended Lines - Gas	0	4.41E-03	0.00%	0.00	0.00	20.36%
Total TOC (Gas Components) =				**1.70**	**7.46**	-
Valves - Light Oil	76	5.51E-03	0.00%	0.42	1.84	94.43%
Flanges - Light Oil	298	2.43E-04	0.00%	0.07	0.31	94.43%
Pump Seals - Light Oil	0	2.87E-02	0.00%	0.00	0.00	94.43%
Other - Light Oil	0	1.65E-02	0.00%	0.00	0.00	94.43%
Total TOC (Liquid Components) =				**0.49**	**2.15**	-

VOC and Greenhouse Gas Emissions

Source Type/Service	VOC			CH_4		CO_2	
	lb/hr	TPY	lb/yr	lb/hr	TPY	lb/hr	TPY
Valves - Gas	0.16	0.68	1,362.21	0.45	1.98	<0.01	0.01
Flanges - Gas	0.06	0.25	492.17	0.17	0.73	<0.01	<0.01
Compressor Seals - Gas	0.02	0.10	207.58	0.07	0.32	<0.01	<0.01
Relief Valves - Gas	0.11	0.48	968.69	0.32	1.41	<0.01	0.01
Open-Ended Lines - Gas	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Components in Gas Service =	**0.35**	**1.51**	**3,030.64**	**1.01**	**4.44**	**0.01**	**0.03**
Valves - Light Oil	0.40	1.73	3,464.83	0.01	0.04	<0.01	<0.01
Flanges - Light Oil	0.07	0.30	597.77	<0.01	0.01	<0.01	<0.01
Pump Seals - Light Oil	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other - Light Oil	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Components in Liquid Service =	**0.46**	**2.03**	**4,029.60**	**0.01**	**0.05**	**<0.01**	**<0.01**
Total (Gas + Liquid Components) =	**0.81**	**3.54**	**7,060.24**	**1.03**	**4.49**	**0.01**	**0.03**

SWN Production Company, LLC
William Ritchea Pad
Fugitive Emissions Calculations (Continued)

Hazardous Air Pollutant (HAP) Emissions (lb/hr)

Source Type/Service	n-Hexane	Benzene	Toluene	Ethylbenzene	Xylenes	2,2,4-Tri.	Total
Valves - Gas	<0.01	<0.01	<0.01	0.00	<0.01	0.00	<0.01
Flanges - Gas	<0.01	<0.01	<0.01	0.00	<0.01	0.00	<0.01
Compressor Seals - Gas	<0.01	<0.01	<0.01	0.00	<0.01	0.00	<0.01
Relief Valves - Gas	<0.01	<0.01	<0.01	0.00	<0.01	0.00	<0.01
Open-Ended Lines - Gas	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Components in Gas Service =	**0.01**	**<0.01**	**<0.01**	**0.00**	**<0.01**	**0.00**	**0.01**
Valves - Light Oil	0.05	<0.01	<0.01	<0.01	0.01	0.00	0.06
Flanges - Light Oil	0.01	<0.01	<0.01	<0.01	<0.01	0.00	0.01
Pump Seals - Light Oil	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other - Light Oil	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Components in Liquid Service =	**0.05**	**<0.01**	**<0.01**	**<0.01**	**0.01**	**0.00**	**0.07**
Total (Gas + Liquid Components) =	**0.06**	**<0.01**	**<0.01**	**<0.01**	**0.01**	**0.00**	**0.08**

Hazardous Air Pollutant (HAP) Emissions (TPY)

Source Type/Service	n-Hexane	Benzene	Toluene	Ethylbenzene	Xylenes	2,2,4-Tri.	Total
Valves - Gas	0.02	<0.01	<0.01	0.00	<0.01	0.00	0.02
Flanges - Gas	0.01	<0.01	<0.01	0.00	<0.01	0.00	0.01
Compressor Seals - Gas	<0.01	<0.01	<0.01	0.00	<0.01	0.00	<0.01
Relief Valves - Gas	0.01	<0.01	<0.01	0.00	<0.01	0.00	0.01
Open-Ended Lines - Gas	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Components in Gas Service =	**0.04**	**<0.01**	**<0.01**	**0.00**	**<0.01**	**0.00**	**0.04**
Valves - Light Oil	0.20	<0.01	0.01	0.01	0.04	0.00	0.26
Flanges - Light Oil	0.03	<0.01	<0.01	<0.01	0.01	0.00	0.04
Pump Seals - Light Oil	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other - Light Oil	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Components in Liquid Service =	**0.23**	**<0.01**	**0.01**	**0.01**	**0.04**	**0.00**	**0.30**
Total (Gas + Liquid Components) =	**0.27**	**<0.01**	**0.01**	**0.01**	**0.04**	**0.00**	**0.35**

SWN Production Company, LLC
William Ritchea Pad
Fugitive Emissions Calculations (Continued)

Typical Component Count per Equipment Type based on Representative Facility[3]

Source Type/Service	WH	GPU	HT	LPT	FGC	OT	TT-O
Valves - Gas	12	3	2	5	5	0	0
Flanges - Gas	37	15	9	24	33	3	2
Compressor Seals - Gas	0	0	0	0	3	0	0
Relief Valves - Gas	1	3	1	1	1	1	1
Open-Ended Lines - Gas	0	0	0	0	0	0	0
Valves - Light Oil	0	5	6	12	3	6	9
Connectors - Light Oil	0	20	24	48	12	24	30
Pump Seals - Light Oil	0	0	0	0	0	0	0
Other - Light Oil	0	0	0	0	0	0	0

Equipment Type	WH	GPU	HT	LPT	FGC	OT	TT-O
Number of Each Type On Pad =	4	5	2	0	2	4	1

SWN Production Company, LLC
William Ritchea Pad
Fugitive Emissions Calculations (Continued)

Speciated Gas Analysis[4]

Component	Molecular Weight	Mole %	Equiv. Wt. Basis	Weight %	HC Weight %	lb/hr	TPY
Hydrogen Sulfide	34.082	0.000%	0.000	0.000%	-	0.00	0.00
Carbon Dioxide	44.010	0.180%	0.079	0.376%	-	0.01	0.03
Nitrogen	28.013	0.433%	0.121	0.576%	-	0.01	0.04
Methane	16.042	77.380%	12.413	58.903%	59.469%	1.01	4.44
Ethane	30.069	14.005%	4.211	19.983%	20.175%	0.34	1.51
Propane	44.096	4.820%	2.125	10.085%	10.182%	0.17	0.76
i-Butane	58.122	0.622%	0.362	1.715%	1.732%	0.03	0.13
n-Butane	58.122	1.329%	0.772	3.665%	3.701%	0.06	0.28
i-Pentane	72.149	0.350%	0.253	1.198%	1.210%	0.02	0.09
n-Pentane	72.149	0.395%	0.285	1.352%	1.365%	0.02	0.10
n-Hexane	86.175	0.121%	0.104	0.495%	0.500%	0.01	0.04
Other Hexanes	86.175	0.183%	0.158	0.748%	0.755%	0.01	0.06
Heptanes (as n-Heptane)	100.202	0.126%	0.126	0.599%	0.605%	0.01	0.05
Benzene	78.114	0.002%	0.002	0.007%	0.007%	<0.01	<0.01
Toluene	92.141	0.003%	0.003	0.013%	0.013%	<0.01	<0.01
Ethylbenzene	106.167	0.000%	0.000	0.000%	0.000%	0.00	0.00
Xylenes	106.167	0.002%	0.002	0.010%	0.010%	<0.01	<0.01
2,2,4-Trimethylpentane	114.230	0.000%	0.000	0.000%	0.000%	0.00	0.00
Octanes (as n-Octane)	114.229	0.039%	0.045	0.211%	0.213%	<0.01	0.02
Nonanes (as n-Nonane)	128.255	0.008%	0.010	0.049%	0.049%	<0.01	<0.01
Decanes (as n-Decane)	142.282	0.002%	0.003	0.014%	0.014%	<0.01	<0.01
TOTAL =		**100.00%**	**21.07**	**100.00%**	**100.00%**	**1.72**	**7.53**
		TOTAL HC =	**20.87**	**TOTAL VOC =**	**20.36%**	**0.34**	**1.52**
				TOTAL HAP =	**0.53%**	**0.01**	**0.04**

SWN Production Company, LLC
William Ritchea Pad
Fugitive Emissions Calculations (Continued)

Speciated Liquids Analysis[4]

Component	Molecular Weight	Mole %	Equiv. Wt. Basis	Weight %	HC Weight %	lb/hr	TPY
Hydrogen Sulfide	34.082	0.000%	0.000	0.000%	-	0.00	0.00
Carbon Dioxide	44.010	0.043%	0.019	0.024%	-	<0.01	<0.01
Nitrogen	28.013	0.073%	0.020	0.026%	-	<0.01	<0.01
Methane	16.042	10.266%	1.647	2.105%	2.106%	0.01	0.05
Ethane	30.069	9.016%	2.711	3.465%	3.467%	0.02	0.07
Propane	44.096	9.073%	4.001	5.114%	5.116%	0.03	0.11
i-Butane	58.122	2.569%	1.493	1.908%	1.909%	0.01	0.04
n-Butane	58.122	7.310%	4.249	5.430%	5.433%	0.03	0.12
i-Pentane	72.149	4.143%	2.989	3.820%	3.822%	0.02	0.08
n-Pentane	72.149	6.049%	4.364	5.578%	5.581%	0.03	0.12
n-Hexane	86.175	9.824%	8.466	10.820%	10.826%	0.05	0.23
Other Hexanes	86.175	1.500%	1.293	1.652%	1.653%	0.01	0.04
Heptanes (as n-Heptane)	100.202	13.330%	13.357	17.072%	17.080%	0.08	0.37
Benzene	78.114	0.088%	0.069	0.088%	0.088%	<0.01	<0.01
Toluene	92.141	0.542%	0.499	0.638%	0.639%	<0.01	0.01
Ethylbenzene	106.167	0.448%	0.476	0.608%	0.608%	<0.01	0.01
Xylenes	106.167	1.417%	1.504	1.923%	1.924%	0.01	0.04
2,2,4-Trimethylpentane	114.230	0.000%	0.000	0.000%	0.000%	0.00	0.00
Octanes (as n-Octane)	114.229	9.928%	11.341	14.495%	14.502%	0.07	0.31
Nonanes (as n-Nonane)	128.255	5.106%	6.549	8.370%	8.374%	0.04	0.18
Decanes (as n-Decane)	142.282	9.273%	13.194	16.863%	16.872%	0.08	0.36
TOTAL =		**100.00%**	**78.24**	**100.00%**	**100.00%**	**0.49**	**2.15**
		TOTAL HC =	**78.20**	**TOTAL VOC =**	**94.43%**	**0.46**	**2.03**
				TOTAL HAP =	**14.08%**	**0.07**	**0.30**

Notes:

[1] Component counts taken by equipment type at representative facility and made site-specific according to the number of each equipment type at this site.

[2] Emission Factor Source: EPA-453/R-95-017. TOC multiplied by pollutant content of streams (weight %) to obtain pollutant emissions.

[3] Equipment Type Key: WH = Well Head, GPU = Gas Production Unit, HT = Heater Treater, LPT = Low-Pressure Tower, FGC = Flash Gas Compressor, OT = Oil Tank, TT-O = Tank Truck - Oil

[4] Analyses located in Appendix A.

SWN Production Company, LLC
William Ritchea Pad
Fugitive Unpaved Haul Road Emissions Calculations

Facility Data [1]

Vehicle Type	Light Vehicles (Pick-ups and Cars)	Medium Trucks (Service Trucks)	Heavy Trucks (Tanker Trucks)[2]
Average vehicle weight ((empty + full)/2) (tons)	2	15	23.5
Number of wheels per vehicle type (w)	4	10	18
Average number of round trips/day/vehicle type	5	3	9
Distance per round trip (miles/trip)	1.11	1.11	1.11
Vehicle miles travelled (miles/day)	5.55	3.33	9.69
Number of days operational (days/yr)	365	365	365
Vehicle miles travelled VMT (miles/yr)	2,027.55	1,216.53	3,536.47
Average vehicle speed S (mph)	10	10	10
Average number of round trips/hour/vehicle type	0.28	0.17	0.48
Average number of round trips/year/vehicle type	1,825	1,095	3,183
Estimated maximum number of round trips/hour/vehicle type	3	3	2
Estimated maximum number of round trips/day/vehicle type	7	4	11
Estimated maximum number of round trips/year/vehicle type	2,683	1,533	4,216

190	Average Tanker Volume (bbl)
7,980	Gallons Tanker Volume
843	bwpd
814	bopd
8.72	Tanker Trucks per Day
2,525	Length Leased Access Road (ft)
408	Longest Pad Side (ft)
5,866	Total Round Trip Feet

Formula & Calculation Inputs

$E=k(s/12)^a * (W/3)^b * ((365-P) / 365)$ *Reference : AP-42, Section 13.2.2 (11/06), Equation 1a and 2*

where:

	Rate	Units	Comment
Days per year	365		
Annual average hours per day of road operations	18		
k = PM Particle Size Multiplier	4.90	lb/VMT	AP-42 Section 13.2.2 (11/06), Table 13.2.2-2 (PM)
k = PM10 Particle Size Multiplier	1.50	lb/VMT	AP-42 Section 13.2.2 (11/06), Table 13.2.2-2 (PM_{10})
k = PM2.5 Particle Size Multiplier	0.15	lb/VMT	AP-42 Section 13.2.2 (11/06), Table 13.2.2-2 ($PM_{2.5}$)
s = Surface Material Silt Content	3.9	%	State Default Data from AP-42 Data (1999 NEI Data)
P = Number of days > 0.01 inch of rain	150	days/year	AP-42 Section 13.2.2 (11/06), Figure 13.2.2-1
a = PM Constant	0.70	unitless	AP-42 Section 13.2.2 (11/06), Table 13.2.2-2 (PM)
a = PM10 & PM2.5 Constant	0.90	unitless	AP-42 Section 13.2.2 (11/06), Table 13.2.2-2 (PM_{10} & $PM_{2.5}$)
b = PM, PM10, & PM2.5 Constant	0.45	unitless	AP-42 Section 13.2.2 (11/06), Table 13.2.2-2
Total hourly fleet vehicle miles travelled (miles/hr)	1.03	VMT/hr	
Total annual fleet vehicle miles travelled (miles/yr)[3]	6,780.55	VMT/yr	
Average wheels[4]	12		
Average vehicle weight of the fleet (W)[5]	15.5	tons	
Moisture Ratio	1.00		Estimated based on 0.2% uncontrolled surface water content assuming no watering
Control Efficiency (CF)	0.00	%	Based on Moisture Ratio and Figure 13.2.2-2 Control

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SWN Production Company, LLC
William Ritchea Pad
Fugitive Unpaved Haul Road Emissions Calculations

Emission Calculations

	Emission Factors			Control Efficiency	Total Vehicle Miles Travelled		Uncontrolled Emission Rates			Uncontrolled Emission Rates		
	PM	PM_{10}	$PM_{2.5}$				Total PM	Total PM_{10}	$PM_{2.5}$	Total PM	Total PM_{10}	$PM_{2.5}$
Vehicle Type	**(lbs/VMT)**	**(lbs/VMT)**	**(lbs/VMT)**	**(%)**	**(VMT/hr)**	**(VMT/yr)**	**(lb/hr)**	**(lb/hr)**	**(lb/hr)**	**(tons/yr)**	**(tons/yr)**	**(tons/yr)**
Light Vehicles	2.76	0.67	0.07	0.00	0.31	2,027.55	0.85	0.21	0.02	2.80	0.68	0.07
Medium Trucks	2.76	0.67	0.07	0.00	0.19	1,216.53	0.51	0.12	0.01	1.68	0.41	0.04
Heavy Trucks	2.76	0.67	0.07	0.00	0.54	3,536.47	1.49	0.36	0.04	4.88	1.18	0.12
			Total =	**0.00**	**1.04**	**6,780.55**	**2.85**	**0.69**	**0.07**	**9.36**	**2.27**	**0.23**

Notes:

1) Facility vehicle data based on estimates, GP5.1 and AP-42 13.2.2-2 defaults for industrial unpaved roads

2) Tank trucker average vehicle weight as $(W_{(empty)}+W_{(full)})/2 = (7 + 40)/2 = 23.7$ tons

3) Average vehicle miles travelled (VMT/yr) as (No. of round trip/vehicle * No. of vehicles/type * Roundtrip miles/trip)* 365 days/yr * No. of vehicle type)

4) Average wheels calculated as average of (No. of wheels per vehicle type * No. of vehicle/type)

5) Average vehicle fleet calculated as (Average weight of vehicle type * Percentage of each vehicle type on unpaved surface). Percentage of each vehicle type= $VMT_{vehicle\ type}$/VMT

6) Minimum one-per-day average pick-up trucks and service trucks even if tanker not required every day.

7) Per EPA BID calculations, all emissions based on average trips. Estimated maximum hourly, daily and yearly trips provided for information only.

Calculation of Emission Factors (AP-42, 13.2.2)

Equation 1a: $EF = k(s/12)^a (W/3)^b$ *where k, a, and b are empirical constants and*

EF = size-specific emission factor (lb/VMT)

s = surface material silt content %

W = mean vehicle weight (tons)

Equation 2: $EF_{ext} = EF*((365-P)/365)$ *where:*

EF_{ext} *= annual size-specific emission factor extrapolated for natural mitigation, lb/VMT*

EF = emission factor from Equation 1a

P = number of days in a year with at least 0.01 inches of precipitation

Calculation of Emissions

$E = EF_{ext} * VMT/yr * ((1-CF)/100) * 1\ ton/2000\ lbs$ *where:*

E = annual emissions (tons/yr)

EF_{ext} *= annual size-specific emission factor extrapolated for natural mitigation, lb/VMT*

CF = control efficiency (%)

ATTACHMENT T: FACILITY-WIDE EMISSION SUMMARY SHEETS

ATTACHMENT T – FACILITY-WIDE CONTROLLED EMISSIONS SUMMARY SHEET														
List all sources of emissions in this table. Use extra pages if necessary.														
Emission Point ID #	NO_X		CO		VOC		SO_2		PM_{10}		$PM_{2.5}$		GHG (CO_2e)	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
EP-ENG1	0.32	1.40	0.64	2.80	0.24	1.05	<0.01	<0.01	0.02	0.09	0.02	0.09	155.19	679.73
EP-ENG2	0.32	1.40	0.64	2.80	0.24	1.05	0.01	0.04	0.02	0.09	0.02	0.09	155.19	679.73
EP-GPU1 - EP-GPU5	0.55	2.40	0.45	1.95	0.03	0.15	<0.01	0.01	0.04	0.18	0.04	0.18	585.49	2,564.44
EP-HT1 - EP-HT2	0.12	0.52	0.10	0.44	0.01	0.02	<0.01	<0.01	0.01	0.04	0.01	0.04	117.10	512.89
APC-COMB-TKLD	2.08	9.11	4.13	18.11	6.20	27.14	<0.01	<0.01	0.04	0.18	0.04	0.18	1,769.76	7,751.54
TOTAL	3.39	14.83	5.96	26.10	6.71	29.41	0.01	0.06	0.13	0.58	0.13	0.58	2,782.73	12,188.33

Annual emissions shall be based on 8,760 hours per year of operation for all emission units except emergency generators.

According to 45CSR14 Section 2.43.e, fugitive emissions are not included in the major source determination because it is not listed as one of the source categories in Table 1. Therefore, fugitive emissions shall not be included in the PTE above.

Note that the emissions from the APC-COMB-TKLD includes uncaptured emissions from loading operations, uncombusted emissions from the tanks and loading operations, as well as combustor pilot emissions.

ATTACHMENT T – FACILITY-WIDE HAP CONTROLLED EMISSIONS SUMMARY SHEET														
List all sources of emissions in this table. Use extra pages if necessary.														
Emission Point ID #	Formaldehyde		Benzene		Toluene		Ethylbenzene		Xylenes		Hexane		Total HAPs	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
EP-ENG1	0.02	0.09	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	0.03	0.15
EP-ENG2	0.02	0.09	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	0.03	0.15
EP-GPU1 - EP-GPU5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	-	0.01	0.04	0.01	0.05
EP-HT1 - EP-HT2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	-	<0.01	0.01	<0.01	0.01
APC-COMB-TKLD	<0.01	<0.01	0.01	0.02	0.04	0.17	0.04	0.17	0.12	0.53	0.67	2.95	0.88	3.84
TOTAL	0.04	0.18	0.01	0.04	0.04	0.18	0.04	0.17	0.12	0.53	0.68	3.00	0.95	4.19

Annual emissions shall be based on 8,760 hours per year of operation for all emission units except emergency generators.

According to 45CSR14 Section 2.43.e, fugitive emissions are not included in the major source determination because it is not listed as one of the source categories in Table 1. Therefore, fugitive emissions shall not be included in the PTE above.

Note that the emissions from the APC-COMB-TKLD includes uncaptured emissions from loading operations, uncombusted emissions from the tanks and loading operations, as well as combustor pilot emissions.

ATTACHMENT U: CLASS I LEGAL ADVERTISEMENT

Note: Affidavit of Publication will be submitted upon receipt by SWN from the publisher.

AIR QUALITY PERMIT NOTICE
Notice of Application

Notice is given that SWN Production Company, LLC has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a G70-B general permit registration for a natural gas production facility (William Ritchea Pad) located off Harlan Ridge Rd, near New Martinsville, in Wetzel County, West Virginia. From New Martinsville, WV, head west on Virginia St. toward 3rd street for approx. 128 ft. Turn left at the 1st cross street onto WV-2 S/WV-7 E/3rd. St. and travel 0.5 miles. Turn left onto WV-7 E and travel 25.9 miles. Turn left onto Sugar Run Rd and travel 1.3 miles. The latitude and longitude coordinates are: 39.670670, -80.52959.

The applicant estimates the potential to discharge the following Regulated Air Pollutants will be:

Nitrogen Oxides (NOx)	14.83 tons/yr
Carbon Monoxide (CO)	26.10 tons/yr
Volatile Organic Compounds (VOC)	32.95 tons/yr
Sulfur Dioxide (SO_2)	0.06 tons/yr
Particulate Matter (PM)	9.94 tons/yr
Acetaldehyde	0.03 tons/yr
Acrolein	0.03 tons/yr
Benzene	0.04 tons/yr
Ethylbenzene	0.18 tons/yr
Formaldehyde	0.18 tons/yr
Methanol	0.03 tons/yr
n-Hexane	3.27 tons/yr
Toluene	0.19 tons/yr
Xylenes	0.58 tons/yr
Carbon Dioxide	12,140.91 tons/yr
Methane	6.12 tons/yr
Nitrous Oxide	0.02 tons/yr
CO_2 Equivalent	12,300.59 tons/yr

The change in equipment and operations is planned to begin on or about February 4, 2016. Written comments will be received by the West Virginia Department of Environmental Protection, Division of Air Quality, 601 57th Street, SE, Charleston, WV 25304, for at least 30 calendar days from the date of publication of this notice.

Any questions regarding this permit application should be directed to the DAQ at (304) 926-0499, extension 1250, during normal business hours.

Dated this the xx of December, 2015

By: SWN Production Company, LLC
Paul Geiger
Senior Vice President – Ops Management
10000 Energy Drive
Spring, TX 77389