August 25, 2017

Mr. William F. Durham
Director
WVDEP, Division of Air Quality
601 – 57th Street SE
Charleston, West Virginia 25304

Re: Tug Hill Operating, LLC, G70-D General Permit Application – Greer Well Pad

Dear Mr. Durham,

Tug Hill Operating, LLC (Tug Hill) and SLR International Corporation (SLR) have prepared the attached G70-D General Permit Application for the Greer well pad located in Marshall County, West Virginia. This application reflects the construction of the following: (10) Marcellus wells, (10) 1 MMBtu/hr gas processing units, (1) 5 MMBtu/hr condensate stabilization unit, (16) 500 bbl condensate storage tanks, (4) 500bbl produced water storage tanks, (1) 690 HP compressor engine, and (1) 118 HP generator. All site emissions have been evaluated and are attached for your review within this application.

The public notice was delivered to the *Moundsville Daily Echo* for publication. The legal advertisement will be forwarded to your office as soon as SLR received the original affidavit from the newspaper.

If any additional information is needed, please feel free to contact me by telephone at (304) 545-8563 or by e-mail at jhanshaw@slrconsulting.com

Sincerely,
SLR International Corporation

Jesse Hanshaw

Jesse Hanshaw, P.E.
Principal Engineer

Tug Hill Operating, LLC

Greer Well Pad

Proctor, West Virginia

G70-D General Permit Application

SLR Ref: 116.01631.00006

July 2017

Greer Well Pad G70-D General Permit Application

Prepared for:

Tug Hill Operating, LLC
380 Southpointe Blvd., Suite 200
Canonsburg, PA 15317

This document has been prepared by SLR International Corporation. The material and data in this Permit application were prepared under the supervision and direction of the undersigned.

Chris Boggess
Associate Engineer

Jesse Hanshaw, P.E.
Principal Engineer

TUG HILL OPERATING

CONTENTS

Section

Notes:
ATTACHMENT B – N/A – No dwellings or businesses located within 300’ of the facility.
ATTACHMENT P – N/A - No glycol dehydration unit in use at the facility.

SECTION 1.

TECHNICAL SUPPORT DOCUMENT

General G70-D Permit Application

Greer Well Pad
Proctor, West Virginia

Tug Hill Operating, LLC
380 Southpointe Blvd., Suite 200
Canonsburg, PA 15317

1.1 INTRODUCTION

Tug Hill Operating, LLC has prepared this application to reflect the new construction of wells and equipment at the Greer well pad, and is seeking coverage under the G70-D General Permit. This document contains all applicable application forms in accordance with 45CSR13.

The site as evaluated has been classified as a minor NSR and Title V facility. The details of this evaluation are provided in section 2.0 with supporting documentation presented within the calculations section.

1.2 DESCRIPTION OF FACILITY

Tug Hill Operating, LLC is applying for a General Permit Registration under G70-D for the new construction and operation of equipment at the Greer well pad. The site is planned to consist of (10) Marcellus wells, (10) 1 MMBtu/hr gas processing units, (1) 5 MMBtu/hr condensate stabilization unit, (16) 500 bbl condensate tanks, (4) 500 bbl produced water tanks, (1) 690 HP 4SLB compressor engine (G3508BLE), and (1) 118 HP 8.1LNA generator. Emissions from the tanks and truck loading will be controlled by an 8 MMBtu/hr combustion unit.

DESCRIPTION OF PROCESS

Natural gas, condensate and produced water will be collected from ten horizontal wells located onsite producing from the Marcellus formation. The well stream will first pass though one of ten (10) 1 MMBtu/hr gas processing units (GPU-1 through GPU-10).

The gas exiting the gas processing units will be routed into a sales gas pipeline. The water will be sent into one of four (4) 500 bbl produced water tanks. The condensate is sent into a 5 MMBtu/hr stabilization unit (SH-1) to increase the amount of gas recovered. The recovered gas will be compressed and sent into the gas pipeline while the condensate will flow into one of sixteen (16) 500 bbl storage tanks.

The emissions from all storage tanks are directed to an 8 MMBtu/hr enclosed vapor combustor (VDU-1) for VOC and methane destruction. The produced water and condensate are hauled offsite by 140 bbl pump trucks. The displaced emissions from truck loading will also be controlled by the enclosed vapor combustor with 70% capture efficiency.

The site will also utilize an existing 118 HP generator (G-1) to provide prime power to the site. The generator engine is certified by the manufacturer to EPA standards for prime power generation.

1.3 FEDERAL AND STATE REQUIREMENT

APPLICABLE REGULATIONS

This facility is subject to the following applicable rules and regulations:

Federal and State:

45 CSR 2 – Particulate Matter Standards from Combustion of Fuel in Indirect Heat Exchangers

The indirect heat exchangers consisting of a stabilizer and GPU heaters are subject to the visible emission standard of §45-2-3 as follows:

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

However, in accordance with the exemptions defined with §45-2-11 these sources have limited requirements as follows:

11.1. Any fuel burning unit(s) having a heat input less than ten (10) million B.T.U.'s per hour will be exempt from sections 4, 5, 6, 8 and 9. However, failure to attain acceptable air quality in parts of some urban areas may require the mandatory control of these sources at a later date.

Therefore, the GPU heaters and the stabilizer heater at this site are exempt from the weight emission standards of section 4 and the control of fugitive particulate matter standards of section 5. The additionally exempt sections of this rule, section 6, 8, and 9 pertain to registration, testing, monitoring, recordkeeping, and reporting as well as startup, shutdown and malfunctions.

As a result, each combustion source will use Method 9 to determine compliance with the 10% opacity limitation, but this monitoring should only be implemented upon a request by the Director or his duly authorized representative.

45 CSR 6 - Open Burning Prohibited

This state rule is geared towards reducing particulate matter emissions from the combustion of refuse and is specific to burning solid waste such as trash, but also includes combustion of waste gas in flares. The rule sets PM limits and establishes a 20% visible emission limit, both of which shouldn’t be any problem for the gas fired flare to meet.

45 CSR 10 - Emission of Sulfur Oxides

The facility evaluated within this application utilizes fuel burning units, but they are all below the exemption threshold of 10 MMBtu/hr as stated in 45CSR§10-10.1:

10.1 Any fuel burning units having a design heat input under ten (10) million BTU's per hour will be exempt from section 3 and sections 6 through 8. However, failure to attain acceptable air quality in parts of some urban areas may require the mandatory control of these sources at a later date.

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

The EPA Certified natural gas generator (G-1) is a 118 HP 4SLB PSI 8.1LNA and was manufactured on 12/31/2016. Since the engines Mfg. date is after 1/1/2011 the corresponding emission limits for the unit are represented as follows:

Table 1 Emission Limits – S SLB 100 HP 500 HP installed a ter 1-1-2011

g/Hp-hr			ppmvd at 15% O2		
NOx	CO	VOC	NOx	CO	VOC
1	2	0.7	82	270	60

The natural gas fired flash gas compressor (CE-1) is a 690 HP Caterpillar 3508BLE and was manufactured on 1-27-2012. Since the engines Mfg. date is after 7-1-2010 the corresponding emission limits for this unit are represented as follows:

Table 1 Emission Limits – SI 4SLB 500 HP 1350 HP installed after 7-1-2010

g/Hp-hr			ppmvd at 15% O2		
NOx	CO	VOC	NOx	CO	VOC
1	2	0.7	82	270	60

40 CFR 60 Subpart OOOO – Reciprocating Compressor Engines

The sales gas compressor CE-1 was constructed after 8/23/2011 and therefore is subject to the rod packing requirements of this regulation.

40 CFR 60 Subpart OOOOa – Flow Back Requirements for Hydraulically Fractured Well(s)

The ten (10) new gas wells to be completed by Tug Hill on this site will be subject to the flow back requirements and shall comply by conducting green completions. Therefore they are required to follow the standards of flow back dictated within §60.5375a (a)(3) and (4) for sources that commence construction after September 18, 2015.

40 CFR 60 Subpart OOOOa - Storage Vessel NSPS Requirements

The storage vessels located on the pad have been demonstrated to have a controlled PTEs for VOC < 6 tpy with the use of a permitted VDU enclosed combustor. Therefore, they are not considered affected sources under this regulation.

40 CFR 60 Subpart OOOOa – Fugitive Component Leak Monitoring

The site is classified as a well pad facility, which will be subject to the semiannual monitoring requirement. The site will develop a monitoring plan in accordance with the regulation in according to the specifications of this Regulation. Initial monitoring shall be conducted and documented within 60 days of startup or by the extended compliance date of September 1, 2017, which date comes first.

40 CFR 63 Subpart ZZZZ - National Emission Standards for Hazardous Air Pollutants from Stationary Reciprocating Internal Combustion Engines

This facility is considered an area source of HAPs and therefore certain engines located at this facility would be considered subject to the rule, but they are all considered new sources so they are directed to comply with NSPS JJJJ.

40 CFR 61 - This facility is subject to the asbestos inspection and notification requirements related to construction activities containing asbestos.

45 CSR 4 - No Objectionable Odors

45 CSR 11 - Standby Plans for Emergency Episodes.

45 CSR 13 - Permits for Construction, Modification, Relocation, and Operation of Stationary Source of Air Pollutants

The company has applied to receive coverage of a minor source NSR Rule 13 permit for the construction of the Greer Well Pad.

WV Code § 22-5-4 (a) (14)

The Secretary can request any pertinent information such as annual emission inventory reporting. This station is required to submit an annual air emission inventory.

45 CSR 17 - Fugitive Particulate Emissions

NON-APPLICABILITY DETERMINATIONS

The following requirements have been determined “not applicable” due to the following:

45 CSR 27 - To Prevent and Control the Emissions of Toxic Air Pollutants

This rule is not applicable because natural gas is included as a petroleum product and contains less than 5% benzene by weight. 45CSR § 27-2.4 exempts equipment “used in the production and distribution of petroleum products providing that such equipment does not produce or contact materials containing more than 5% benzene by weight.”

45 CSR 30 – Requirements for Operating Permits – Title V of the Clean Air Act

This facility does not meet the emission threshold to trigger a 45 CSR 30 Title V Operating Permit nor is it subject to any Federal Standards that trigger the need for a Title V Permit.

40 CFR 60 Subpart OOOO – Pneumatic Control Valve NSPS

The site was evaluated and found to contain only intermittent venting pneumatic control valves rated at less than 6 SCF/hr. Therefore the site is not proposing to install or operate any affected continuous bleed pneumatic devices defined by this NSPS for control valves.

40 CFR 63 Subpart HH - National Emission Standards for Hazardous Air Pollutants from Oil and Natural Gas Production Facilities

There is no dehydration unit at this site.

40 CFR 63 HHH - National Emission Standards for Hazardous Air Pollutants from Natural Gas Transmission and Storage Facilities

This subpart is related to Natural Gas Transmission Facilities which are major sources of HAPs. This federal regulation is not applicable since this facility is neither a transmission facility nor is it a major source of HAPs.

40 CFR 60 Subpart KKK - Natural Gas Processing Plant NSPS

This subpart is not applicable because this station is not a processing site engaged in extracting natural gas liquids by fractionation from natural gas.

> *Natural gas processing plant (gas plant) means any processing site engaged in the extraction of natural gas liquids from field gas, fractionation of mixed natural gas liquids to natural gas products, or both.*

40 CFR 60 Subpart K, Ka, Kb - Storage Vessel NSPS

The produced water and condensate storage tanks are exempt under 60.110b(d)(4) in accordance with the following: Vessels with a design capacity less than or equal to 1,589.874 m^3 (approx 420,000 gallons) used for petroleum or condensate stored, processed, or treated prior to custody transfer.

40 CFR 63 Subpart DDDDD - Boilers & Process Heaters Located at Major Sources of HAPs

This subpart is not applicable because this facility is not a major source of HAPs.

40 CFR 63 Subpart JJJJJJ - Boilers & Process Heaters Located at Area Sources of HAPs

This subpart is not applicable because the process heaters are exempt from regulation under this area source GACT standard.

40 CFR 82 Subpart F - Ozone Depleting Substances

The purpose of this subpart is to reduce emissions of class I and class II refrigerants and their substitutes. The facility does not utilize class I and class II refrigerants and their substitutes.

Aggregation Discussion (Facility Determination)

The Greer well pad is operated solely by Tug Hill Operating, LLC. This well pad facility has the ability to transfer its products via pipeline to midstream compression companies, which are located on non-contiguous sites over a mile away. Additionally, these sources are not under common control nor is there any support and/or dependency relationship between the midstream companies and Tug Hill Operating, LLC.

Tug Hill Operating, LLC operated other well pads in the area, the closes being the Yoder Pad, which has a straight line distance of 1.54 miles away. Therefore, no other facilities operated by Tug Hill Operating, LLC are within a quarter-mile radius and as a result this pad should be considered a single facility as defined within this application.

SECTION 2.

APPLICATION FOR PERMIT

General G70-D Permit Application

Greer Well Pad
Proctor, West Virginia

Tug Hill Operating, LLC
380 Southpointe Blvd., Suite 200
Canonsburg, PA 15317

west virginia department of environmental protection

Division of Air Quality
601 57th Street SE
Charleston, WV 25 4
Phone (304) 926-0475
Fax (304) 926-0479
www.dep.wv.gov

G70-D GENERAL PERMIT REGISTRATION APPLICATION

PREVENTION AND CONTROL OF AIR POLLUTION IN REGARD TO THE CONSTRUCTION, MODIFICATION, RELOCATION, ADMINISTRATIVE UPDATE AND OPERATION OF NATURAL GAS 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): Tug Hill Operating, LLC

Federal Employer ID No. (FEIN): 26-2056245

Applicant's Mailing Address:
380 Southpointe Blvd., Suite 200

City: Canonsburg	State: PA	ZIP Code: 15317

Facility Name: Greer Well Pad

Operating Site Physical Address: Buffalo Run Rd.
If none available, list road, city or town and zip of facility.

City: Jacksonburg	Zip Code: 26377	County: Wetzel

Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits):
Latitude: 39.52321
Longitude: -80.64768

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

CERTIFICATION OF INFORMATION

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

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

Responsible Official Signature: S.K.W.H.
Name and Title: Sean Willis Vice President
Email: swillis@tug-hilltop.com
Phone: 817-632-5200
Fax:
Date: 08/24/2017

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

If applicable:
Environmental Contact
Name and Title: Jerry V. DeRosa Director, EH&S Affairs
Email: jderosa@tug-hilltop.com
Phone: (412) 736-5767
Fax:
Date:

OPERATING SITE INFORMATION
Briefly describe the proposed new operation and/or any change(s) to the facility: This site will encompass 10 new Marcellus wells and associated separation and gas compression equipment. The facility will also utilize a condensate stabilization system and liquid storage vessels.
Directions to the facility: In Proctor travel southeast on Plum St. toward WV-2 S. Turn left onto WV-2 N and travel 1.5 miles. Turn right onto Wells Hill Rd. and travel 2.4 miles. Turn left onto Waynes Ridge and travel 1.9 miles. Turn left (West) onto the dirt access road and travel 0.35 miles. The well site will be located 0.16 miles down the hill (Southwest) from the access road.

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, OOOO and/or OOOOa [1] ☐$2,500 NESHAP fee for 40 CFR63, Subpart ZZZZ and/or HH [2] [1] Only one NSPS fee will apply. [2] Only one NESHAP fee will apply. The Subpart ZZZZ NESHAP fee will be waived for new engines that satisfy requirements by complying with NSPS, Subparts IIII and/or JJJJ. *NSPS and NESHAP fees apply to new construction or if the source is being modified.*	
☐ Responsible Official or Authorized Representative Signature (if applicable)	
☒ Single Source Determination Form **(must be completed)** – 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-D 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/Rail Car 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	
☒ Pneumatic Pump Data Sheet – Attachment R	
☒ Air Pollution Control Device/Emission Reduction Device(s) Sheet(s) (include manufacturer performance data sheet(s) if applicable) – Attachment S	
☒ Emission Calculations (please be specific and include all calculation methodologies used) – Attachment T	
☒ Facility-wide Emission Summary Sheet(s) – Attachment U	
☒ Class I Legal Advertisement – Attachment V	
☒ One (1) paper copy and two (2) copies of CD or DVD with pdf copy of application and attachments	

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

ATTACHMENT A

SINGLE SOURCE DETERMIATION FORM

General G70-D Permit Application

Greer Well Pad
Proctor, West Virginia

Tug Hill Operating, LLC
380 Southpointe Blvd., Suite 200
Canonsburg, PA 15317

July 2017

ATTACHMENT A - SINGLE SOURCE DETERMINATION FORM

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

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

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

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

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

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

ATTACHMENT B

SITING CRITERIA WAIVER

NOT APPLICABLE – No dwellings or businesses located within 300’ of the facility

General G70-D Permit Application

Greer Well Pad
Proctor, West Virginia

Tug Hill Operating, LLC
380 Southpointe Blvd., Suite 200
Canonsburg, PA 15317

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ATTACHMENT C

BUSINESS CERTIFICATE

General G70-D Permit Application

Greer Well Pad
Proctor, West Virginia

Tug Hill Operating, LLC
380 Southpointe Blvd., Suite 200
Canonsburg, PA 15317

July 2017

ATTACHMENT D

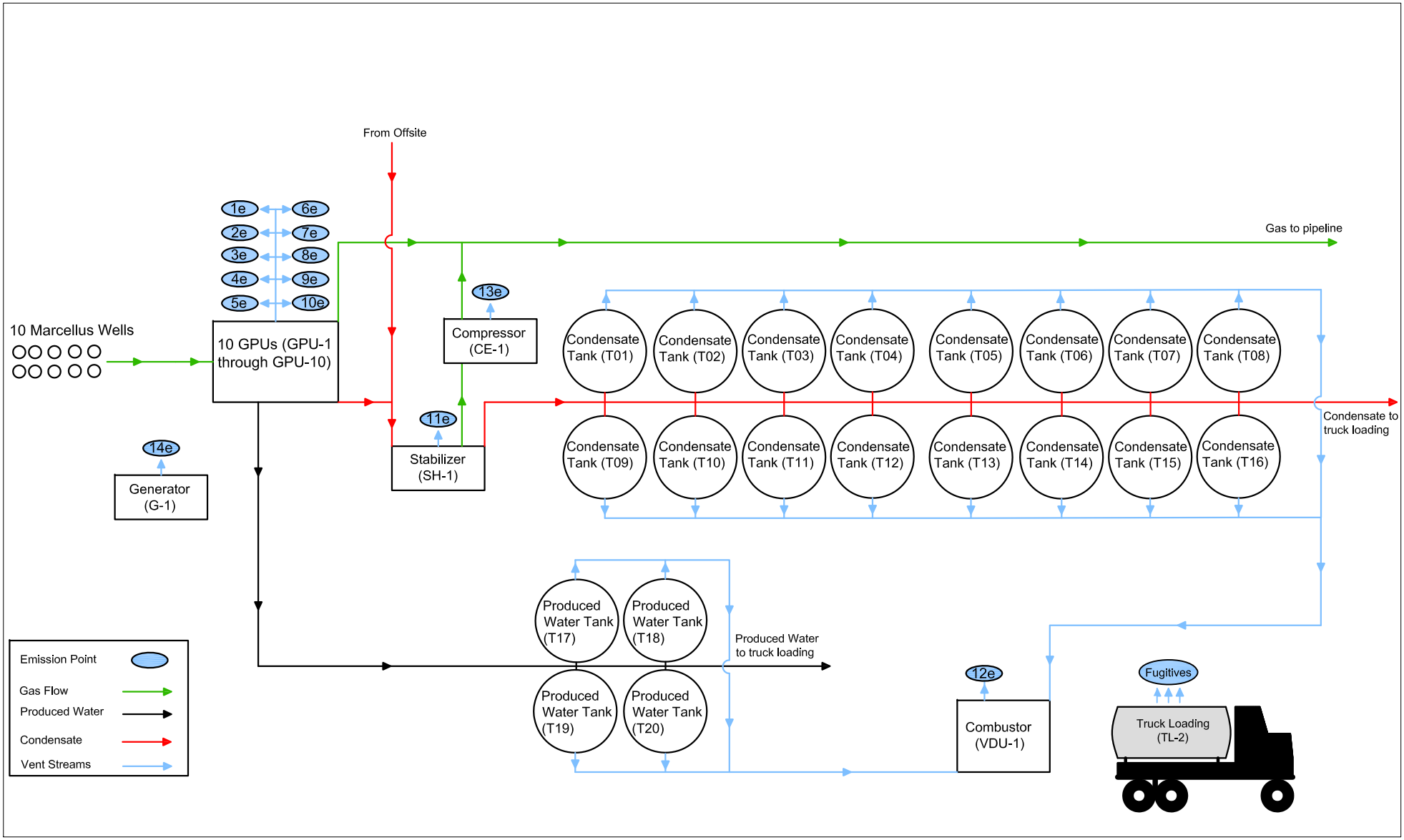
PROCESS FLOW DIAGRAM

General G70-D Permit Application

Greer Well Pad
Proctor, West Virginia

Tug Hill Operating, LLC
380 Southpointe Blvd., Suite 200
Canonsburg, PA 15317

July 2017



SLR

Tug Hill Operating, LLC

Attachment D - Process Flow Diagram

Greer Well Pad

July 2017

ATTACHMENT E

PROCESS DESCRIPTION

General G70-D Permit Application

Greer Well Pad
Proctor, West Virginia
Tug Hill Operating, LLC
380 Southpointe Blvd.,Suite 200
Canonsburg, PA 15317

July 2017

PROCESS DESCRIPTION

Tug Hill Operating, LLC is applying for a General Permit Registration under G70-D for the new construction and operation of equipment at the Greer well pad. The site is planned to consist of (10) Marcellus wells, (10) 1 MMBtu/hr. gas processing units, (1) 5 MMBtu/hr condensate stabilization unit, (16) 500 bbl condensate tanks, (4) 500 bbl produced water tanks, (1) 690 HP 4SLB compressor engine (G3508BLE), and (1) 118 HP 8.1LNA generator. Emissions from the tanks and truck loading will be controlled by an 8 MMBtu/hr combustion unit.

DESCRIPTION OF PROCESS

Natural gas, condensate and produced water will be collected from ten horizontal wells located onsite producing from the Marcellus formation. The well stream will first pass though one of ten (10) 1 MMBtu/hr. gas processing units (GPU-1 through GPU-10).

The gas exiting the gas processing units will be routed into a sales pipeline. The water will be sent into one of four (4) 500 bbl produced water tanks. The condensate is sent into a 5 MMBtu/hr stabilization unit (SH-1) to increase the amount of gas recovered. The recovered gas will be compressed and sent into the gas pipeline while the condensate will flow into one of sixteen (16) 500 bbl storage tanks.

The emissions from all storage tanks are directed to an 8 MMBtu/hr. enclosed vapor combustor (VDU-1) for VOC and methane destruction. The produced water and condensate are hauled offsite by 140 bbl pump trucks. The displaced emissions from truck loading will also be controlled by the enclosed vapor combustor with 70% capture efficiency.

The site will also utilize an existing 118 HP generator (G-1) to provide prime power to the site. The generator engine is certified by the manufacturer to EPA standards for prime power generation.

ATTACHMENT F

PLOT PLAN

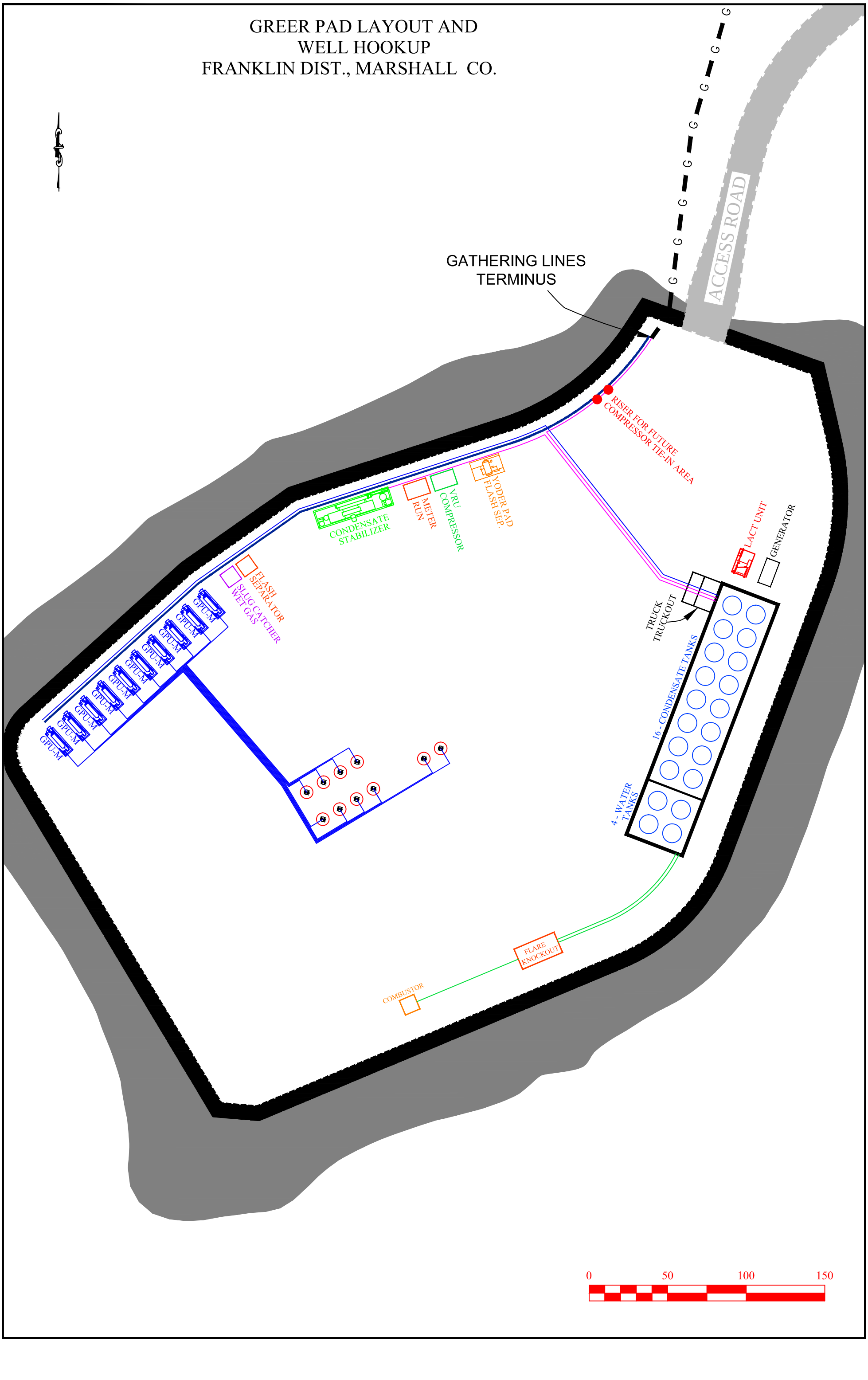
General G70-D Permit Modification Application

Greer Well Pad
Proctor, West Virginia

Tug Hill Operating, LLC
380 Southpointe Blvd., Suite 200
Canonsburg, PA 15317

July 2017

GREER PAD LAYOUT AND
WELL HOOKUP
FRANKLIN DIST., MARSHALL CO.



ATTACHMENT G

AREA MAP

General G70-D Permit Application

Greer Well Pad
Proctor, West Virginia

Tug Hill Operating, LLC
380 Southpointe Blvd., Suite 200
Canonsburg, PA 15317

July 2017

Attachment G - Maps

Tug Hill Operating, LLC
Greer Well Pad

Decimal Coordinates of Site:
Lat: 39.75716, Lon: -80.83611

ATTACHMENT H

G70-D SECTION APPLICABILITY FORM

General G70-D Permit Application

Greer Well Pad
Proctor, West Virginia

Tug Hill Operating, LLC
380 Southpointe Blvd., Suite 200
Canonsburg, PA 15317

July 2017

General Permit G70-D Registration
Section Applicability Form

General Permit G70-D 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, pneumatic pumps, reciprocating internal combustion engines (RICEs), tank truck/rail car 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-D allows the registrant to choose which sections of the permit they are seeking registration under. Therefore, please mark which additional sections that you are applying for registration under. If the applicant is seeking registration under multiple sections, please select all that apply. Please keep in mind, that if this registration is approved, the issued registration will state which sections will apply to your affected facility.

GENERAL PERMIT G70-D APPLICABLE SECTIONS	
☒Section 5.0	Gas and Oil Well Affected Facility (NSPS, Subpart OOOO/OOOOa)
☒Section 6.0	Storage Vessels Containing Condensate and/or Produced Water[1]
☐Section 7.0	Storage Vessel Affected Facility (NSPS, Subpart OOOO/OOOOa)
☒Section 8.0	Control Devices and Emission Reduction Devices not subject to NSPS Subpart OOOO/OOOOa 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/OOOOa)
☐Section 11.0	Pneumatic Pump Affected Facility (NSPS, Subpart OOOOa)
☒Section 12.0	Fugitive Emissions GHG and VOC Standards (NSPS, Subpart OOOOa)
☒Section 13.0	Reciprocating Internal Combustion Engines, Generator Engines
☒Section 14.0	Tanker Truck/Rail Car Loading[2]
☐Section 15.0	Glycol Dehydration Units[3]

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

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

3 *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

EMISSION UNITS / ERD TABLE

General G70-D Permit Application

Greer Well Pad
Proctor, West Virginia

Tug Hill Operating, LLC
380 Southpointe Blvd., Suite 200
Canonsburg, PA 15317

July 2017

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]
GPU-1	1e	GPU Heater	2017	1 MMBtu/hr	New	None	None	None
GPU-2	2e	GPU Heater	2017	1 MMBtu/hr	New	None	None	None
GPU-3	3e	GPU Heater	2017	1 MMBtu/hr	New	None	None	None
GPU-4	4e	GPU Heater	2017	1 MMBtu/hr	New	None	None	None
GPU-5	5e	GPU Heater	2017	1 MMBtu/hr	New	None	None	None
GPU-6	6e	GPU Heater	2017	1 MMBtu/hr	New	None	None	None
GPU-7	7e	GPU Heater	2017	1 MMBtu/hr	New	None	None	None
GPU-8	8e	GPU Heater	2017	1 MMBtu/hr	New	None	None	None
GPU-9	9e	GPU Heater	2017	1 MMBtu/hr	New	None	None	None
GPU-10	10e	GPU Heater	2017	1 MMBtu/hr	New	None	None	None
SH-1	11e	Condensate Stabilizer Heater	2017	5 MMBtu/hr	New	None	None	None
VDU-1	12e	Vapor Combustion Unit	2017	8 MMBtu/hr	New	APCD	None	None
T01-T16	12e	Condensate Tanks	2017	500 bbl each	New	VDU-1	VDU-1	None
T17-T20	12e	Produced Water Tanks	2017	500 bbl each	New	VDU-1	VDU-1	None
CE-1	13e	Flash Gas Compressor	2017	690 Hp	New	None	C-1	None
G-1	14e	Prime Power Generator	2017	118 Hp	New	None	None	None

[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 EMISSION SUMMARY SHEET(S)

General G70-D Permit Application

Greer Well Pad
Proctor, West Virginia

Tug Hill Operating, LLC
380 Southpointe Blvd., Suite 200
Canonsburg, PA 15317

July 2017

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: Fugitives

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 (methane, CO_2e)
Pumps	☐ Yes ☐ No	--	--	☐ Gas ☐ Liquid ☐ Both	--	--	--
Valves	☐ Yes ☒ No	376	*1995 EPA Protocol for Equipment Leak Emission Estimates* - Table 2-4, Oil & Gas Production Operations Average Emission Factors (kg/hr/source) (4.5E-03)	☒ Gas ☐ Liquid ☐ Both	3.47	0.04	49.00
Safety Relief Valves	☐ Yes ☒ No	10	*1995 EPA Protocol for Equipment Leak Emission Estimates* - Table 2-4, Oil & Gas Production Operations Average Emission Factors (kg/hr/source) (8.8E-03)	☒ Gas ☐ Liquid ☐ Both	0.18	<0.01	2.55
Open Ended Lines	☐ Yes ☒ No	20	*1995 EPA Protocol for Equipment Leak Emission Estimates* - Table 2-4, Oil & Gas Production Operations Average Emission Factors (kg/hr/source) (2.0E-03)	☒ Gas ☐ Liquid ☐ Both	0.08	<0.01	1.16
Sampling Connections	☐ Yes ☐ No	--	--	☐ Gas ☐ Liquid ☐ Both	--	--	--
Connections (Not sampling)	☐ Yes ☒ No	1,662	*1995 EPA Protocol for Equipment Leak Emission Estimates* - Table 2-4, Oil & Gas Production Operations Average Emission Factors (kg/hr/source) (3.9E-03)	☒ Gas ☐ Liquid ☐ Both	1.33	0.02	18.77
Compressors	☐ Yes ☒ No	1	*1995 EPA Protocol for Equipment Leak Emission Estimates* - Table 2-4, Oil & Gas Production Operations Average Emission Factors (kg/hr/source) (8.8E-03)	☒ Gas ☐ Liquid ☐ Both	<0.01	<0.01	<0.01
Flanges	☐ Yes ☒ No	See Notes Below (2)	See Notes Below (2)	☐ Gas ☐ Liquid ☐ Both	--	--	--
Other[1]	☐ Yes ☐ No	--	--	☐ Gas ☐ Liquid ☐ Both	--	--	--

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

[2] Assumption made that flange connections are included in connections (not sampling) count

Please provide an explanation of the sources of fugitive emissions (e.g. pigging operations, equipment blowdowns, pneumatic controllers, etc.):
Please indicate if there are any closed vent bypasses (include component):
Specify all equipment used in the closed vent system (e.g. VRU, ERD, thief hatches, tanker truck/rail car loading, etc.) VDU-1, T01-T20, Truck Loading

ATTACHMENT K

GAS WELL AFFECTED FACILITY DATA SHEET(S)

General G70-D Permit Application

Greer Well Pad
Proctor, West Virginia

Tug Hill Operating, LLC
380 Southpointe Blvd., Suite 200
Canonsburg, PA 15317

July 2017

ATTACHMENT K – GAS WELL AFFECTED FACILITY DATA SHEET

Complete this data sheet if you are the owner or operator of a gas well affected facility for which construction, modification or reconstruction commenced after August 23, 2011. This form must be completed for natural gas well affected facilities regardless of when flowback operations occur (or have occurred).

API Number	Date of Flowback	Date of Well Completion	Green Completion and/or Combustion Device	Subject to OOOO or OOOOa?
47-051-01757	1/1/2018	10/1/2017	Green	OOOOa
47-051-01758	1/1/2018	10/1/2017	Green	OOOOa
47-051-01890	1/1/2018	10/1/2017	Green	OOOOa
47-051-01891	1/1/2018	10/1/2017	Green	OOOOa
47-051-01892	1/1/2018	10/1/2017	Green	OOOOa
47-051-01894	1/1/2018	10/1/2017	Green	OOOOa
47-051-01888	1/1/2018	10/1/2017	Green	OOOOa
47-051-01889	1/1/2018	10/1/2017	Green	OOOOa
TBD	1/1/2018	10/1/2017	Green	OOOOa
TBD	1/1/2018	10/1/2017	Green	OOOOa

Note: If future wells are planned and no API number is available please list as PLANNED.
If there are existing wells that commenced construction prior to August 23, 2011, please acknowledge as existing.

This is the same API (American Petroleum Institute) well number(s) provided in the well completion notification and as provided to the WVDEP, Office of Oil and Gas for the well permit. The API number may be provided on the application without the state code (047).

Every oil and gas well permitted in West Virginia since 1929 has been issued an API number. This API is used by agencies to identify and track oil and gas wells.

The API number has the following format: 047-001-00001

Where,

047 = State code. The state code for WV is 047.
001 = County Code. County codes are odd numbers, beginning with 001 (Barbour) and continuing to 109 (Wyoming).
00001= Well number. Each well will have a unique well number.

ATTACHMENT L

STORAGE VESSEL(S) DATA SHEET(S)

General G70-D Permit Application

Greer Well Pad
Proctor, West Virginia

Tug Hill Operating, LLC
380 Southpointe Blvd., Suite 200
Canonsburg, PA 15317

July 2017

ATTACHMENT L – STORAGE VESSEL DATA SHEET

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

The following information is REQUIRED:

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

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

Additional information may be requested if necessary.

GENERAL INFORMATION (REQUIRED)

1. Bulk Storage Area Name: Greer Well Pad	2. Tank Name Condensate Tank
2. Emission Unit ID number: T01-T16	3.Emission Point ID number: 10e
5. Date Installed , Modified or Relocated *(for existing tanks)* Was the tank manufactured after August 23, 2011 and on or before September 18, 2015? ☐ Yes ☒ No Was the tank manufactured after September 18, 2015? ☒ Yes ☐ No	6. Type of change: ☒ New construction ☐ New stored material ☐ Other ☐ Relocation
7A. Description of Tank Modification *(if applicable)*	
7B. Will more than one material be stored in this tank? *If so, a separate form must be completed for each material.* ☐ Yes ☒ No	
7C. Was USEPA Tanks simulation software utilized? ☐ Yes ☒ No ProMax Model Simulation Report Ran (See Calculations) ***If Yes, please provide the appropriate documentation and items 8-42 below are not required.***	

TANK INFORMATION

8. Design Capacity *(specify barrels or gallons).* Use the internal cross-sectional area multiplied by internal height. 500 bbl	
9A. Tank Internal Diameter (ft.) 12	9B. Tank Internal Height (ft.) 25
10A. Maximum Liquid Height (ft.) 25	10B. Average Liquid Height (ft.) 12.5
11A. Maximum Vapor Space Height (ft.) 25	11B. Average Vapor Space Height (ft.) 12.5
12. Nominal Capacity *(specify barrels or gallons).* This is also known as "working volume".	
13A. Maximum annual throughput (gal/yr) 3,599,484 per tank	13B. Maximum daily throughput (gal/day) 9,861.60 per tank
14. Number of tank turnovers per year 365 per tank	15. Maximum tank fill rate (gal/min) 6.85 per tank
16. Tank fill method ☒ Submerged ☐ Splash ☐ Bottom Loading	
17. Is the tank system a variable vapor space system? ☐ Yes ☒ No If yes, (A) What is the volume expansion capacity of the system (gal)? (B) What are the number of transfers into the system per year?	
18. Type of tank (check all that apply): ☒ Fixed Roof ☐ vertical ☐ horizontal ☐ flat roof ☒ cone roof ☐ dome roof ☐ other (describe) ☐ External Floating Roof ☐ pontoon roof ☐ double deck roof ☐ Domed External (or Covered) Floating Roof ☐ Internal Floating Roof ☐ vertical column support ☐ self-supporting ☐ Variable Vapor Space ☐ lifter roof ☐ diaphragm ☐ Pressurized ☐ spherical ☒ cylindrical ☐ Other (describe)	

PRESSURE/VACUUM CONTROL DATA

19. Check as many as apply:

☐ Does Not Apply ☐ Rupture Disc (psig)

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

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

☒ Conservation Vent (psig) ☐ Condenser[1]

-0.03 Vacuum Setting 0.88 Pressure Setting

☒ Emergency Relief Valve (psig)

-0.03 Vacuum Setting 0.88 Pressure Setting

☐ Thief Hatch Weighted ☐ Yes ☒ No

[1] Complete appropriate Air Pollution Control Device Sheet

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

Material Name	**Flashing Loss**		**Working/ Breathing Loss**		**Total Emissions Loss**		**Estimation Method[1]**
	lb/hr	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**	
VOC (All tanks-Uncontrolled)	0.00	0.00	16.61	72.77	16.61	72.77	O - ProMax

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

TANK CONSTRUCTION AND OPERATION INFORMATION		
21. Tank Shell Construction: ☐ Riveted ☐ Gunite lined ☐ Epoxy-coated rivets ☒ Other (describe) Welded		
21A. Shell Color: Green	21B. Roof Color: Green	21C. Year Last Painted: 2018
22. Shell Condition (if metal and unlined): ☒ No Rust ☐ Light Rust ☐ Dense Rust ☐ Not applicable		
22A. Is the tank heated? ☐ Yes ☒ No	22B. If yes, operating temperature:	22C. If yes, how is heat provided to tank?

23. Operating Pressure Range (psig): 0.88 **Must be listed for tanks using VRUs with closed vent system.**		
24. Is the tank a **Vertical Fixed Roof Tank**? ☒ Yes ☐ No	24A. If yes, for dome roof provide radius (ft):	24B. If yes, for cone roof, provide slop (ft/ft): 0.17
25. Complete item 25 for **Floating Roof Tanks** ☐ Does not apply ☒		
25A. Year Internal Floaters Installed:		
25B. Primary Seal Type *(check one):* ☐ Metallic (mechanical) shoe seal ☐ Liquid mounted resilient seal ☐ Vapor mounted resilient seal ☐ Other (describe):		
25C. Is the Floating Roof equipped with a secondary seal? ☐ Yes ☐ No		
25D. If yes, how is the secondary seal mounted? *(check one)* ☐ Shoe ☐ Rim ☐ Other (describe):		
25E. Is the floating roof equipped with a weather shield? ☐ Yes ☐ No		
25F. Describe deck fittings:		
26. Complete the following section for **Internal Floating Roof Tanks** ☒ Does not apply		
26A. Deck Type: ☐ Bolted ☐ Welded	26B. For bolted decks, provide deck construction:	
26C. Deck seam. Continuous sheet construction: ☐ 5 ft. wide ☐ 6 ft. wide ☐ 7 ft. wide ☐ 5 x 7.5 ft. wide ☐ 5 x 12 ft. wide ☐ other (describe)		
26D. Deck seam length (ft.):	26E. Area of deck (ft^2):	26F. For column supported tanks, # of columns:	26G. For column supported tanks, diameter of column:
27. Closed Vent System with VRU? ☐ Yes ☐ No		
28. Closed Vent System with Enclosed Combustor? ☒ Yes ☐ No		
SITE INFORMATION		
29. Provide the city and state on which the data in this section are based: Elkins, WV		
30. Daily Avg. Ambient Temperature (°F): 49.06	31. Annual Avg. Maximum Temperature (°F): 61.15	
32. Annual Avg. Minimum Temperature (°F): 36.97	33. Avg. Wind Speed (mph): 6.17	
34. Annual Avg. Solar Insulation Factor (BTU/ft^2-day): 1193.89	35. Atmospheric Pressure (psia): 13.73	
LIQUID INFORMATION		
36. Avg. daily temperature range of bulk liquid (°F): 49.08	36A. Minimum (°F): 39.97	36B. Maximum (°F): 61.15
37. Avg. operating pressure range of tank (psig): 0.88	37A. Minimum (psig): -0.03	37B. Maximum (psig): 0.88
38A. Minimum liquid surface temperature (°F): 44.89	38B. Corresponding vapor pressure (psia): 6.68	
39A. Avg. liquid surface temperature (°F): 50.67	39B. Corresponding vapor pressure (psia): 7.45	
40A. Maximum liquid surface temperature (°F): 56.45	40B. Corresponding vapor pressure (psia): 8.28	
41. Provide the following for each liquid or gas to be stored in the tank. Add additional pages if necessary. SEE PROMAX MODEL IN CALCULATIONS.		

41A. Material name and composition:			
41B. CAS number:			
41C. Liquid density (lb/gal):			
41D. Liquid molecular weight (lb/lb-mole):			
41E. Vapor molecular weight (lb/lb-mole):			
41F. Maximum true vapor pressure (psia):			
41G. Maximum Reid vapor pressure (psia):			
41H. Months Storage per year. From: To:			
42. Final maximum gauge pressure and temperature prior to transfer into tank used as inputs into flashing emission calculations.			

ATTACHMENT L – STORAGE VESSEL DATA SHEET

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

The following information is REQUIRED:

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

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

Additional information may be requested if necessary.

GENERAL INFORMATION (REQUIRED)

1. Bulk Storage Area Name: Greer Well Pad	2. Tank Name Produced Water Tank
2. Emission Unit ID number: T17-T20	3.Emission Point ID number: 10e
5. Date Installed , Modified or Relocated *(for existing tanks)* Was the tank manufactured after August 23, 2011 and on or before September 18, 2015? ☐ Yes ☒ No Was the tank manufactured after September 18, 2015? ☒ Yes ☐ No	6. Type of change: ☒ New construction ☐ New stored material ☐ Other ☐ Relocation
7A. Description of Tank Modification *(if applicable)*	
7B. Will more than one material be stored in this tank? *If so, a separate form must be completed for each material.* ☐ Yes ☒ No	
7C. Was USEPA Tanks simulation software utilized? ☐ Yes ☒ No ProMax Model Simulation Report Ran (See Calculations) ***If Yes, please provide the appropriate documentation and items 8-42 below are not required.***	

TANK INFORMATION

8. Design Capacity *(specify barrels or gallons).* Use the internal cross-sectional area multiplied by internal height.
500 bbl

9A. Tank Internal Diameter (ft.) 12	9B. Tank Internal Height (ft.) 25
10A. Maximum Liquid Height (ft.) 25	10B. Average Liquid Height (ft.) 12.5
11A. Maximum Vapor Space Height (ft.) 25	11B. Average Vapor Space Height (ft.) 12.5

12. Nominal Capacity *(specify barrels or gallons).* This is also known as "working volume".

13A. Maximum annual throughput (gal/yr) 9,449,412 per tank	13B. Maximum daily throughput (gal/day) 25,888.80 per tank
14. Number of tank turnovers per year 365 per tank	15. Maximum tank fill rate (gal/min) 17.98 per tank

16. Tank fill method ☒ Submerged ☐ Splash ☐ Bottom Loading

17. Is the tank system a variable vapor space system? ☐ Yes ☒ No
If yes, (A) What is the volume expansion capacity of the system (gal)?
(B) What are the number of transfers into the system per year?

18. Type of tank (check all that apply):
☒ Fixed Roof ☐ vertical ☐ horizontal ☐ flat roof ☒ cone roof ☐ dome roof ☐ other (describe)

☐ External Floating Roof ☐ pontoon roof ☐ double deck roof
☐ Domed External (or Covered) Floating Roof
☐ Internal Floating Roof ☐ vertical column support ☐ self-supporting
☐ Variable Vapor Space ☐ lifter roof ☐ diaphragm
☐ Pressurized ☐ spherical ☒ cylindrical
☐ Other (describe)

PRESSURE/VACUUM CONTROL DATA

19. Check as many as apply:
☐ Does Not Apply ☐ Rupture Disc (psig)
☐ Inert Gas Blanket of _____ ☐ Carbon Adsorption[1]
☒ Vent to Vapor Combustion Device[1] (vapor combustors, flares, thermal oxidizers, enclosed combustors)
☒ Conservation Vent (psig) ☐ Condenser[1]
-0.03 Vacuum Setting 0.88 Pressure Setting
☒ Emergency Relief Valve (psig)
-0.03 Vacuum Setting 0.88 Pressure Setting
☐ Thief Hatch Weighted ☐ Yes ☒ No
[1] Complete appropriate Air Pollution Control Device Sheet

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

Material Name	**Flashing Loss**		**Working/ Breathing Loss**		**Total Emissions Loss**		**Estimation Method[1]**
	lb/hr	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**	
VOC'(All tanks Uncontrolled)	3.59	15.72	<0.01	<0.01	3.59	15.72	O- ProMax

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

TANK CONSTRUCTION AND OPERATION INFORMATION

21. Tank Shell Construction:
☐ Riveted ☐ Gunite lined ☐ Epoxy-coated rivets ☒ Other (describe) Welded

21A. Shell Color: Green	21B. Roof Color: Green	21C. Year Last Painted: 2018

22. Shell Condition (if metal and unlined):
☒ No Rust ☐ Light Rust ☐ Dense Rust ☐ Not applicable

22A. Is the tank heated? ☐ Yes ☒ No	22B. If yes, operating temperature:	22C. If yes, how is heat provided to tank?

23. Operating Pressure Range (psig): 0.88

Must be listed for tanks using VRUs with closed vent system.		
24. Is the tank a **Vertical Fixed Roof Tank**? ☒ Yes ☐ No	24A. If yes, for dome roof provide radius (ft):	24B. If yes, for cone roof, provide slop (ft/ft): 0.17
25. Complete item 25 for **Floating Roof Tanks** ☐ Does not apply ☒		
25A. Year Internal Floaters Installed:		
25B. Primary Seal Type *(check one):* ☐ Metallic (mechanical) shoe seal ☐ Liquid mounted resilient seal ☐ Vapor mounted resilient seal ☐ Other (describe):		
25C. Is the Floating Roof equipped with a secondary seal? ☐ Yes ☐ No		
25D. If yes, how is the secondary seal mounted? *(check one)* ☐ Shoe ☐ Rim ☐ Other (describe):		
25E. Is the floating roof equipped with a weather shield? ☐ Yes ☐ No		
25F. Describe deck fittings:		
26. Complete the following section for **Internal Floating Roof Tanks** ☒ Does not apply		
26A. Deck Type: ☐ Bolted ☐ Welded	26B. For bolted decks, provide deck construction:	
26C. Deck seam. Continuous sheet construction: ☐ 5 ft. wide ☐ 6 ft. wide ☐ 7 ft. wide ☐ 5 x 7.5 ft. wide ☐ 5 x 12 ft. wide ☐ other (describe)		
26D. Deck seam length (ft.):	26E. Area of deck (ft^2):	26F. For column supported tanks, # of columns:	26G. For column supported tanks, diameter of column:
27. Closed Vent System with VRU? ☐ Yes ☐ No		
28. Closed Vent System with Enclosed Combustor? ☒ Yes ☐ No		
SITE INFORMATION		
29. Provide the city and state on which the data in this section are based: Elkins, WV		
30. Daily Avg. Ambient Temperature (°F): 49.06	31. Annual Avg. Maximum Temperature (°F): 61.15	
32. Annual Avg. Minimum Temperature (°F): 36.97	33. Avg. Wind Speed (mph): 6.17	
34. Annual Avg. Solar Insulation Factor (BTU/ft^2-day): 1193.89	35. Atmospheric Pressure (psia): 13.73	
LIQUID INFORMATION		
36. Avg. daily temperature range of bulk liquid (°F): 49.08	36A. Minimum (°F): 39.97	36B. Maximum (°F): 61.15
37. Avg. operating pressure range of tank (psig): 0.88	37A. Minimum (psig): -0.03	37B. Maximum (psig): 0.88
38A. Minimum liquid surface temperature (°F): 44.89	38B. Corresponding vapor pressure (psia): 0.16	
39A. Avg. liquid surface temperature (°F): 50.67	39B. Corresponding vapor pressure (psia): 0.20	
40A. Maximum liquid surface temperature (°F): 56.45	40B. Corresponding vapor pressure (psia): 0.24	
41. Provide the following for each liquid or gas to be stored in the tank. Add additional pages if necessary. SEE PROMAX MODEL IN CALCULATIONS.		
41A. Material name and composition:		
41B. CAS number:		
41C. Liquid density (lb/gal):		
41D. Liquid molecular weight (lb/lb-mole):		
41E. Vapor molecular weight (lb/lb-mole):		
41F. Maximum true vapor pressure (psia):		
41G. Maximum Reid vapor pressure (psia):		
41H. Months Storage per year. From: To:		
42. Final maximum gauge pressure and temperature prior to transfer into tank used as inputs into flashing emission calculations.		

ATTACHMENT M

NATURAL GAS FIRED FUEL BURNING UNIT(S) DATA SHEET(S)

General G70-D Permit Application

Greer Well Pad
Proctor, West Virginia

Tug Hill Operating, LLC
380 Southpointe Blvd., Suite 200
Canonsburg, PA 15317

July 2017

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]
GPU-1	1e	GPU Heater	2017	New	1 MMBtu/hr	1,253
GPU-2	2e	GPU Heater	2017	New	1 MMBtu/hr	1,253
GPU-3	3e	GPU Heater	2017	New	1 MMBtu/hr	1,253
GPU-4	4e	GPU Heater	2017	New	1 MMBtu/hr	1,253
GPU-5	5e	GPU Heater	2017	New	1 MMBtu/hr	1,253
GPU-6	6e	GPU Heater	2017	New	1 MMBtu/hr	1,253
GPU-7	7e	GPU Heater	2017	New	1 MMBtu/hr	1,253
GPU-8	8e	GPU Heater	2017	New	1 MMBtu/hr	1,253
GPU-9	9e	GPU Heater	2017	New	1 MMBtu/hr	1,253
GPU-10	10e	GPU Heater	2017	New	1 MMBtu/hr	1,253
SH-1	11e	Condensate Stabilizer Heater	2017	New	5 MMBtu/hr	1,253

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 SHEET(S)

General G70-D Permit Application

Greer Well Pad
Proctor, West Virginia

Tug Hill Operating, LLC
380 Southpointe Blvd., Suite 200
Canonsburg, PA 15317

July 2017

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]	G-1	CE-1	
Engine Manufacturer/Model	Power Solutions International Inc./ 8.1LNA	Caterpillar/ G3508BLE	
Manufacturers Rated bhp/rpm	118/ 1800	690/ 1400	
Source Status[2]	NS	NS	
Date Installed/ Modified/Removed/Relocated[3]	2017	2017	
Engine Manufactured /Reconstruction Date[4]	12/31/2016	1/27/2012	
Check all applicable Federal Rules for the engine (include EPA Certificate of Conformity if applicable)[5]	☒40CFR60 Subpart JJJJ ☒JJJJ Certified? ☐40CFR60 Subpart IIII ☐IIII Certified? ☒40CFR63 Subpart ZZZZ ☐ NESHAP ZZZZ/ NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources	☒40CFR60 Subpart JJJJ ☐JJJJ Certified? ☐40CFR60 Subpart IIII ☐IIII Certified? ☒40CFR63 Subpart ZZZZ ☐ NESHAP ZZZZ/ NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources	☐40CFR60 Subpart JJJJ ☐JJJJ Certified? ☐40CFR60 Subpart IIII ☐IIII Certified? ☐40CFR63 Subpart ZZZZ ☐ NESHAP ZZZZ/ NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources
Engine Type[6]	4SLB	4SLB	
APCD Type[7]	NA	OxCat/ A/F	
Fuel Type[8]	RG	RG	
H_2S (gr/100 scf)	0.25	0.25	
Operating bhp/rpm	118/ 1800	690/ 1400	
BSFC (BTU/bhp-hr)	9,645	8,203	
Hourly Fuel Throughput	894 ft^3/hr	4,517.20 ft^3/hr	ft^3/hr gal/hr
Annual Fuel Throughput (Must use 8,760 hrs/yr unless emergency generator)	7.83 $MMft^3/yr$	39.57 $MMft^3/yr$	$MMft^3/yr$ 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]
AP	NO_x	0.26	1.14	1.52	6.66		
AP	CO	0.52	2.28	3.04	13.33		
AP	VOC	0.18	0.80	1.06	4.66		
AP	SO_2	<0.01	<0.01	<0.01	0.01		
AP	PM_{10}	0.01	0.05	0.06	0.25		
AP	Formaldehyde	0.07	0.30	0.64	2.80		
AP	Total HAPs	0.09	0.40	0.76	3.88		
AP	GHG (CO_2e)	137.17	546.21	850.32	3385.98		

1 Enter the appropriate Source Identification Number for each natural gas-fueled reciprocating internal combustion engine/generator engine located at the well site. Multiple 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# CE-1, use extra pages as necessary)

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

☐ NSCR ☐ SCR ☒ Oxidation Catalyst

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

Manufacturer: Emit	Model #: ELX-3050Z
Design Operating Temperature: 931 °F	Design gas volume: 4455 acfm
Service life of catalyst: 8760 hr.	Provide manufacturer data? ☒Yes ☐ No
Volume of gas handled: 4455 acfm at 931°F	Operating temperature range for NSCR/Ox Cat: From 931 °F to
Reducing agent used, if any: NA	Ammonia slip (ppm): NA

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, EPA Certified Engine – See Certificate of Conformity Attached

USA COMPRESSION

Emissions Report

7/10/2017

USA Compression Unit 2311, G3508BLE/JGJ4

Engine Serial Number	RBK01117	**Engine Manufactured Date**	1/27/2012
Max HP	690	**Max RPM**	1400
Number of Engine Cylinders	8	**Total Displacement (in3)**	2105
Combustion Type & Setting	4 Stroke Lean Burn	**Fuel Delivery Method**	Carburetor
Compression Ratio	8:1	**Combustion Air Treatment**	Turbocharged and Aftercooled
Engine Modified/Reconstructed?	EMD after 7/1/10		
Compressor Frame Serial #	F37427	**Unit Packaged Date**	8/23/2012
Compressor Frame Max RPM	1800	**# of Compressor Throws**	4

AIR ENVIRONMENTAL REGULATIONS

County and State selected for Quote: Wetzel, WV

NSPS JJJJ	**NOx**	1 g/hp-hr	**CO**	2 g/hp-hr	**VOC**	0.7 g/hp-hr	
Ozone Non-Attainment/General Permit	**NOx**		**CO**		**VOC**		**CH20**

RAW ENGINE EMISSIONS

(based on assumption of burning 900-970 LHV BTU/SCF or 80-85 Fuel Methane # Fuel Gas with little to no H2S)

Fuel Consumption: 8203 HHV BTU/bhp-hr

	g/bhp-hr	lb/MMBTU	lb/hr	TPY
Nitrogren Oxides (NOx)	0.5		0.761	3.333
Carbon Monoxide (CO)	2.58		3.925	17.192
Volatile Organic Compounds (NMNEHC excluding CH2O)	0.55		0.837	3.666
Formaldehyde (CH2O)	0.42		0.639	2.799
Particulate Matter (PM) Filterable+Condensable		0.0100	0.0565	0.2476
Sulfur Dioxide (SO2)		0.0006	0.0033	0.0146

	g/bhp-hr	lb/MMBTU	lb/hr	Metric Tonne/yr
Carbon Dioxide (CO2)	477		725.5952	2882.637
Methane (CH4)	4.67		7.104	28.223

CONTROLLED EMISSIONS

Catalytic Converter Make/Model	ELX-3050Z-1010F-31CEE-241
Catalyst Element Type	Oxidation
# of Catalyst Elements Currently in Housing	1
Air/Fuel Ratio Control	Yes
Other Engine Emissions Control Equipment	None

	% Reduction Required to Comply with JJJJ & Non-Attainment / General Permit Limits	lb/hr	TPY
Nitrogen Oxides (NOx)	0	0.761	3.333
Carbon Monoxide (CO)	22	3.0423	13.325
Volatile Organic Compounds (NMNEHC excluding CH2O)	0	0.837	3.666
Formaldehyde (CH2O)	0	0.639	2.799
Particulate Matter (PM) Filterable+Condensable	0	0.0565	0.2476
Sulfur Dioxide (SO2)	0	0.0033	0.0146

	% Reduction Required to Comply with JJJJ & Non-Attainment / General Permit Limits	lb/hr	Metric Tonne/yr
Carbon Dioxide (CO2)	0	725.5952	2882.6370
Methane (CH4)	0	7.104	28.223

1. g/bhp-hr are based on Engine Manufacturer Specifications assuming a "Pipeline Quality" fuel gas composition, 1200 ft elevation, and 100- 110 F Max Air Inlet. Note that g/bhp-hr values are based on 100% engine load operation and some g/hp-hr values are Nominal and are not representative of Not- To-Exceed values. It is recommended to apply safety factor (i.e. increase the value by a nominal percentage) to the g/hp- hr values for Air Permitting to allow for operational flexibility and variations in fuel gas composition.
2. lb/MMBTU emission Factors are based on EPA's AP-42, Fifth Edition, Volume I, Chapter 3: Stationary Internal Combution Sources (Section 3.2 Natural Gas-Fired Reciprocating Engines).

6655 Corp. Parkway, Ste 160
Fort Worth, TX 76126
Office: 817.546.7456 | Direct: 307.675.5041
bosborn@emittechnologies.com

Prepared For:
Chris Magee
USA COMPRESSION

QUOTE: QUO-07887-Z8K9

INFORMATION PROVIDED BY CATERPILLAR

Engine:	G3508B
Horsepower:	690
RPM:	1400
Compression Ratio:	8.0:1
Exhaust Flow Rate:	4455 CFM
Exhaust Temperature:	931 °F
Reference:	DM8826-00
Fuel:	Natural Gas
Annual Operating Hours:	8760

Uncontrolled Emissions

	g/bhp-hr
NOx:	0.50
CO:	2.58
THC:	5.49
NMHC	0.82
NMNEHC:	0.55
HCHO:	0.42
O2:	9.30 %

POST CATALYST EMISSIONS

	% Reduction	g/bhp-hr
NOx:	Unaffected by Oxidation Catalyst	
CO:	—	<2.00
VOC:	—	<0.70

CONTROL EQUIPMENT

Catalytic Converter

Model:	**ELX-3050Z-1010F-31CEE-241**
Catalyst Type:	Oxidation, Precious group metals
Manufacturer:	EMIT Technologies, Inc.
Element Size:	Rectangle 24 x 15 x 3.5
Catalyst Elements:	1
Housing Type:	3 Element Capacity
Catalyst Installation:	Accessible Housing
Construction:	10 gauge Carbon Steel
Sample Ports:	6 (0.5" NPT)
Inlet Connections:	10" Flat Face Flange
Outlet Connections:	10" Flat Face Flange
Configuration:	End In / End Out
Silencer:	Integrated
Silencer Grade:	Hospital Enhanced
Insertion Loss:	35-50 dBA

PSI HEAVY-DUTY

8.1LNA

	Rev:	A				
	Units		8.1L NA			
	Std	Metric	1500		1800	
General Engine Data						
Type	N/A		In-Line cycle			
Number of cylinders	N/A		6			
Aspiration	N/A		Naturally Aspirated			
Bore	in	mm	4.37	111	4.37	111
Stroke	in	mm	5.47	139	5.47	139
Displacement	in^3	L	492	8.1	492	8.1
Compression Ratio	N/A		10.5			
Mean Piston Speed	ft/min	m/s	1368	6.95	1641	8.34
Gross Standby Power Rating[1,2,3] Per ISO 3046 at the Flywheel						
NG	Hp	kW	99	74	118	88
LP	Hp	kW	99	74	118	88
MEP (@ rated Load on NG)	psi	bar	106	7	105	7
MEP (@ rated Load on LP)	psi	bar	106	7	105	7
Gross Prime Power Rating[1,2,3] Per ISO 3046 at the Flywheel						
NG	Hp	kW	90	67	106	79
LP	Hp	kW	90	67	106	79
MEP (@ rated Load on NG)	psi	bar	97	7	95	7
MEP (@ rated Load on LP)	psi	bar	97	7	95	7
RPM Range (Min-Max)	RPM		1500-2000			
Rotation Viewed from Flywheel	N/A		Counter Clockwise			
Firing Order	N/A		1-5-3-6-2-4			
Dry Weight						
Fan to Flywheel	lb	kg	2200	998	2200	998
Rad to Flywheel	lb	kg	2660	1207	2660	1207
Wet Weight						
Fan to Flywheel	lb	kg	2288	1038	2288	1038
Rad to Flywheel	lb	kg	2900	1316	2900	1316
CG						
Distance from FW housing	in	mm	17	426	17	426
Distance above center of crankshaft	in	mm	7	184	7	184
Engine Mounting						
Maximum Allowable Bending Moment at Rear of Block	lb ft	N m	3540	4800	3540	4800
Moment of Inertia About Roll Axis	lb ft^2	kg m^2				
Flywheel housing	N/A		SAE No 2			
Flywheel	N/A		No 11 1/2			
Number of Flywheel Teeth	N/A		140			
Exhaust System						
Type			Air Cooled Manifold			
Maximum allowable Back pressure	in HG	kPa	3	10.146	3	10.146
Standard Catalyst Back pressure	in HG	kPa	1.5	5.073	1.5	5.073
Exhaust Outlet Pipe Size						
Maximum Turbine Inlet Temperature	F	C	1382	750	1382	750
Exhaust Flow at Rated Power	lb/hr	kg/hr	632	283	790	358
Exhaust Flow at Rated Power @1350F	cfm	m^3/min	478.5	13.5	605.7	17.2
Air Induction System						
Maximum allowable Intake Air Restriction with Air Cleaner						
Clean	inH2O	kPa	5	20	5	20
Dirty	inH2O	kPa	15	4	15	4
Combustion Air required (entire engine)	lb/hr	kg/hr	596	267	745	338
Combustion Air required (entire engine)	cfm	m^3/min	150	4	189	5

PSI HEAVY-DUTY

8.1LNA

	Rev:	A				
	Units		8.1L NA			
	Std	Metric	1500		1800	
Electrical System						
Minimum Recommended Battery Capacity	AH		150			
Cold Cranking Current						
Engine only	CCA		900			
Engine with Drive train	CCA		900			
Maximum Allowable Resistance of Starting Circuit	Ohms		0.002			
Starting Motor Power	HP	kW	6.0	4.5	6.0	4.5
Battery Charging Alternator						
Voltage	Volts		24			
Current	Amps		45			
Coil primary Resistance	Ohms		0.59Ω ± 10%			
Spark Plug p/n			IFR7F-4D			
Spark plug gap	inches	mm	.015" (-0/+.008") .38mm (-0/+.2mm)			
Cooling System						
Coolant Capacity						
Engine only	gal	L	5	19	5	19
Engine with Radiator	gal	L	22	83	22	83
Engine Coolant Flow	gal/min	L/min	53	201	63	238
Water Pump Speed	RPM		1950		2340	
Heat rejected to Cooling water at rated Load	btu/min	kcal/sec	3915	16	4990	21
Maximum Intake Air Temperature (IAT)	F	C	155	68	155	68
ECU IAT Warning	F	C	140	79.5	140	79.5
ECU IAT Shutdown	F	C	155	88	155	88
Maximum Coolant Friction Head External to the engine	psi	bar	5.8	0.4	5.8	0.4
Maximum Air Restriction Across a Radiator	inH2O	mmH2O	0.5	12.7	0.5	12.7
Standard Thermostat Range						
Cracking Temperature	F	C	160	71	160	71
Full Open Temperature	F	C	185	85	185	85
Maximum Allowable Pressure Cap	psi	bar	14.7	1	14.7	1
Ambient Clearance Open Genset (water) (Air-to-Boil)						
Specified	F	C	142	61	142	61
Acutal	F	C			160	71
Ambient Clearance (Oil)						
Specified	F	C	142	61	142	61
Acutal	F	C			148	64
CAC Rise over Ambient (Charge)						
Specified	F	C	N/A			
Acutal	F	C				
Maximum Allowable Top Tank Temperature	F	C	230	110	230	110
ECU Warning	F	C	220	104	220	104
ECU Shutdown	F	C	230	110	230	110
Fan Power	HP	kW	5	3.7	9	6.7
Fan Diameter, including blades	in	mm	28	711	28	711
Fan Speed	RPM		1950		2340	
Cooling Fan Air Flow @ 1" Static H2O Pressure and 125F @ radiator	CFM	m^3/min	8000	224	10000	280
Charge Air Cooler						
Compressor Outlet Temperature	F	C	N/A	N/A	N/A	N/A
Compressor Flow Rate per CAC	lb/hr	kg/hr	N/A	N/A	N/A	N/A
Heat Rejection per CAC	btu/min	kW	N/A	N/A	N/A	N/A

PSI HEAVY-DUTY

8.1LNA

	Rev:	A				
	Units		8.1L NA			
	Std	Metric	1500		1800	
Lubrication System						
Oil Specification			SAE 15W-40 Low Ash Gas engine oil (.25-.5% by wt), API CD/CF or higher			
Oil Pressure						
Idle						
Min	Psi	Bar	11	0.8	11	0.8
Max	Psi	Bar	20.3	1.4	20.3	1.4
Rated Speed						
Min	Psi	Bar	20.3	1.4	20.3	1.4
Max	Psi	Bar	70	4.8	70	4.8
Maximum Allowable Oil Temperature	F	C	250	121	250	121
Engine Oil Capacity						
Min	Qts	L	18	17	18	17
Max	Qts	L	25	24	25	24
Oil Filter Capacity	Qts	L	3.75	4	3.75	4
ECU Oil Pressure Warning[5]	psi		30			
ECU Oil Pressure Shut Down[5]	psi		25			
Fuel System						
Fuel Consumption[6]						
NG	Ft^3/hr	kg/hr	736	16.7	894	20.3
LP	Ft^3/hr	kg/hr	180	17	392	20.9
Maximum EPR Rated Pressure	psi	kPa	1.0	6.9	1.0	6.9
Maximum Running pressure to Electronic Pressure Regulator (EPR)	inH2O	kPa	11.0	2.7	11.0	2.7
Minimum Running pressure to EPR	inH2O	kPa	7.0	1.7	7.0	1.7
Minimum Gas Supply Pipe Size			1-1/4" NPT			
Maximum EPR Rated Pressure	psi	kPa	1.0	6.9	1.0	6.9
Maximum Running Pressure to EPR	inH2O	kPa	11.0	2.7	11.0	2.7
Minimum Running Pressure to EPR	inH2O	kPa	7.0	1.7	7.0	1.7
Minimum LPG Supply Pipe Size[4]			1-1/4" NPT			

[1] Standby and overload ratings based on ISO3046.

[2] All ratings are gross flywheel horsepower corrected to 77°F at an altitude of 328feet with no cooling fan or alternator losses using heating value for NG of 1015 BTU/SCF.

[3] Production tolerances in engines and installed components can account for power variations of +/- 5%. Altitude, temperature and excessive exhaust and intake restrictions should be applied to power calculations.

[4] The preceeding pipe sizes are only suggestions and piping sizes may vary with temperature, pressure, distance from supply and application of local codes. Gas must be available at adequate volume and pressure for engine at the EPR.

[5] >1400RPM

[6] See NGE Technical Spec. 56300002 - Fuel Specification

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
2016 MODEL YEAR
CERTIFICATE OF CONFORMITY
WITH THE CLEAN AIR ACT

OFFICE OF TRANSPORTATION AND AIR QUALITY
ANN ARBOR, MICHIGAN 48105

Certificate Issued To: **Power Solutions International, Inc.**
(U.S. Manufacturer or Importer)

Certificate Number: GPSIB8.10NGP-014

Effective Date: 12/03/2015

Expiration Date: 12/31/2016

Byron J. Bunker, Division Director
Compliance Division

Issue Date: 12/03/2015

Revision Date: N/A

Manufacturer: Power Solutions International, Inc.
Engine Family: GPSIB8.10NGP
Mobile/Stationary Certification Type: Mobile and Stationary
Fuel : Natural Gas (CNG/LNG)
LPG/Propane
Emission Standards :
Mobile Part 1048
NMHC + NOx (g/kW-hr) : 2.7
CO (g/kW-hr) : 4.4
HC + NOx (g/kW-hr) : 2.7
Part 60 Subpart JJJJ Table 1
VOC (g/Hp-hr) : 0.7
NOx (g/Hp-hr) : 1
CO (g/Hp-hr) : 2
Emergency Use Only : N

Pursuant to Section 213 of the Clean Air Act (42 U.S.C. section 7547) and 40 CFR Part 1048, 40 CFR Part 60, 1065, 1068, and 60 (stationary only and combined stationary and mobile) and subject to the terms and conditions prescribed in those provisions, this certificate of conformity is hereby issued with respect to the test engines which have been found to conform to applicable requirements and which represent the following nonroad engines, by engine family, more fully described in the documentation required by 40 CFR Part 1048, 40 CFR Part 60 and produced in the stated model year.

This certificate of conformity covers only those new nonroad spark-ignition engines which conform in all material respects to the design specifications that applied to those engines described in the documentation required by 40 CFR Part 1048, 40 CFR Part 60 and which are produced during the model year stated on this certificate of the said manufacturer, as defined in 40 CFR Part 1048, 40 CFR Part 60. This certificate of conformity does not cover nonroad engines imported prior to the effective date of the certificate.

It is a term of this certificate that the manufacturer shall consent to all inspections described in 40 CFR 1068.20 and authorized in a warrant or court order. Failure to comply with the requirements of such a warrant or court order may lead to revocation or suspension of this certificate for reasons specified in 40 CFR Part 1048, 40 CFR Part 60. It is also a term of this certificate that this certificate may be revoked or suspended or rendered void *ab initio* for other reasons specified in 40 CFR Part 1048, 40 CFR Part 60.

This certificate does not cover large nonroad engines sold, offered for sale, or introduced, or delivered for introduction, into commerce in the U.S. prior to the effective date of the certificate.

ATTACHMENT O

TANKER TRUCK/ RAIL CAR LOADING DATA SHEET(S)

General G70-D Permit Application

Greer Well Pad
Proctor, West Virginia

Tug Hill Operating, LLC
380 Southpointe Blvd., Suite 200
Canonsburg, PA 15317

July 2017

ATTACHMENT O – TANKER TRUCK/RAIL CAR 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/rail cars. Use extra pages if necessary.

Truck/Rail Car Loadout Collection Efficiencies

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

- For tanker trucks/rail cars passing the MACT level annual leak test – 99.2%
- For tanker trucks/rail cars passing the NSPS level annual leak test – 98.7%
- For tanker trucks/rail cars 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/rail car 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#: TL-1	Emission Point ID#: Fugitive	Year Installed/Modified:2017
Emission Unit Description: Tank Truck Loading (Water & Condensate)		
Loading Area Data		
Number of Pumps: 1	Number of Liquids Loaded: 2	Max number of trucks/rail cars loading at one (1) time: 1
Are tanker trucks/rail cars pressure tested for leaks at this or any other location? ☐ Yes ☐ No ☒ Not Required If Yes, Please describe:		
Provide description of closed vent system and any bypasses.		
Are any of the following truck/rail car loadout systems utilized? ☐ Closed System to tanker truck/rail car passing a MACT level annual leak test? ☐ Closed System to tanker truck/rail car passing a NSPS level annual leak test? ☐ Closed System to tanker truck/rail car 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	7	7	7	7

Bulk Liquid Data (use extra pages as necessary)

Liquid Name	Produced Water	Condensate	
Max. Daily Throughput (1000 gal/day)	103.55	157.79	
Max. Annual Throughput (1000 gal/yr)	37,795.35	57,594.81	
Loading Method[1]	SUB	SUB	
Max. Fill Rate (gal/min)	71.91	109.58	
Average Fill Time (min/loading)	60	60	
Max. Bulk Liquid Temperature (°F)	49.08	49.08	
True Vapor Pressure[2]	0.20	7.45	
Cargo Vessel Condition[3]	C	C	
Control Equipment or Method[4]	ECD (VRU-1)	ECD (VRU-1)	
Max. Collection Efficiency (%)	0	70	

Max. Control Efficiency (%)		0	98	
Max.VOC Emission Rate	Loading (lb/hr)	<0.01	9.88	
	Annual (ton/yr)	<0.01	43.26	
Max.HAP Emission Rate	Loading (lb/hr)	0	0	
	Annual (ton/yr)	0	0	
Estimation Method[5]		EPA	EPA	

1 BF Bottom Fill SP Splash Fill SUB Submerged Fill

2 At maximum bulk liquid temperature

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

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

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

ATTACHMENT P

GLYCOL DEHYDRATION UNIT DATA SHEET(S)

NOT APPLICABLE- No glycol dehydration unit in use at the facility.

General G70-D Permit Application

Greer Well Pad
Proctor, West Virginia

Tug Hill Operating, LLC
380 Southpointe Blvd., Suite 200
Canonsburg, PA 15317

July 2017

ATTACHMENT Q

PNEUMATIC CONTROLLERS DATA SHEET(S)

General G70-D Permit Application

Greer Well Pad
Proctor, West Virginia

Tug Hill Operating, LLC
380 Southpointe Blvd., Suite 200
Canonsburg, PA 15317

July 2017

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, and on or before September 18, 2015?

☐ Yes ☒ No

Please list approximate number.

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

☐ Yes ☒ No

Please list approximate number.

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

☐ Yes ☒ No

Please list approximate number.

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

☐ Yes ☒ No

Please list approximate number.

ATTACHMENT R

PNEUMATIC PUMP DATA SHEET(S)

General G70-D Permit Application

Greer Well Pad
Proctor, West Virginia

Tug Hill Operating, LLC
380 Southpointe Blvd., Suite 200
Canonsburg, PA 15317

July 2017

ATTACHMENT R – PNEUMATIC PUMP DATA SHEET

Are there any natural gas-driven diaphragm pumps located at a well site that commenced construction, modification or reconstruction after September 18, 2015?

☐ Yes ☒ No

Please list.

Source ID #	Date	Pump Make/Model	Pump Size

ATTACHMENT S

AIR POLLUTION CONTROL DEVICE/ EMISSION REDUCTION DEVICE SHEET(S)

General G70-D Permit Application

Greer Well Pad
Proctor, West Virginia

Tug Hill Operating, LLC
380 Southpointe Blvd., Suite 200
Canonsburg, PA 15317

July 2017

ATTACHMENT S – 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: T01-T20	Make/Model:
Primary Control Device ID: VDU-1	Make/Model: Zeeco/ EGF-4-30
Control Efficiency (%): 98	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#: VDU-1	Installation Date: ☒ New ☐ Modified ☐ Relocated	
Maximum Rated Total Flow Capacity 3,833.33 scfh 92,000 scfd	Maximum Design Heat Input (from mfg. spec sheet) 8.0 MMBTU/hr	Design Heat Content 2,085 BTU/scf

Control Device Information

Type of Vapor Combustion Control?

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

Manufacturer: Zeeco Model: EGF-4-30	Hours of operation per year? 8760

List the emission units whose emissions are controlled by this vapor control device (Emission Point ID# 10e)

Emission Unit ID#	Emission Source Description	Emission Unit ID#	Emission Source Description
T01-T16	Condensate Tanks		
T17-T20	Produced Water Tanks		

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	Multiple Burner Tip	☒ Yes ☐ No Provide determination.

Waste Gas Information

Maximum Waste Gas Flow Rate	Heat Value of Waste Gas Stream	Exit Velocity of the Emissions Stream
63.89 (scfm)	2,085 BTU/ft^3	0.09 (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	65 scfh	1,253 BTU/hr	☒ Yes ☐ No

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

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

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

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

KWI
Setting the New STANDARD

Change Order #1: Long Description

Design Information (Estimated):

	Continuous
Flare Type	Enclosed
Gas MW (lb/mol)	39.7
Gas LHV (Btu/Scf)	2085
Flow Rate (MScfd)	92
Available Pressure	8 oz/in2
Smokeless Capacity	0-100%

Scope of Supply:

Enclosed Flare (Continuous)

1. (1) 4’ Dia. x 30’ OAH Enclosed Flare Stack w/ Air Control Dampers
2. (1) Multi-Jet (MJ) Flare Tips
3. (1) EGF-Z-HEI Electric Ignition Pilot w/ Flame Scanner to Prove Pilot Ignition
4. Shutdown Monitoring Logic and Controls
    a. Stack Mounted Thermocouple for Monitoring and High Temperature Shutdown
    b. 3” Pneumatic Butterfly Valve for Flare Shutdown
5. (1) Nema 4, Skid Mounted Pilot Ignition and Monitoring Panel
6. (1) 3” Group D Flame Arrester

Required Utilities:

Pilot Fuel Gas: (Per Pilot) 65 Scfh Natural Gas at 15 Psig OR 30 Scfh Propane at 7 psig
Electricity: 120V / 1 Phase / 60 Hz

KWI
Setting the New STANDARD

Equipment Description:

Enclosed Flare (Continuous):

- Self-Supported Enclosed Flare Stack w/ Damper(s): The enclosure prevents flame from being seen by personnel while also increasing residence time to ensure high destruction efficiencies. Design wind speed for this type of installation is 90 mph.

- Multi-Jet Flare Tip: The flare tip uses multi-jet technology to break up the exiting gas to allow for more fuel air interaction ensuring smokeless flaring. The tip along with the enclosure will provide a VOC destruction efficiency of at least 98 wt%.

- EGF-Z-HEI Pilot: The high stability, electronic ignition pilot is proven to stay lit in extreme weather conditions. Components in the heat affected zone are made of temperature resistant investment castings. A flame scanner is used in conjunction to continuously monitor the pilot status.

- Shutdown Monitoring & Controls: The burner management and high temperature shutdown systems ensure that the flare will operate in a safe manner to protect both personnel and equipment. A signal from the high temperature thermocouple or should the flame scanner detect a pilot failure, all gas sources to the system will be shut down indefinitely until personnel can check the system to ensure that there is not a build-up of combustible vapors or damage to the equipment.

- Automatic Ignition/Monitoring Panel: The automatic pilot ignition and monitoring panel will continuously monitor the pilot and attempt to relight if a pilot failure signal is received. The control panel (Nema 4 enclosure) will be skid mounted.

- Flame Arrester: If the potential exists for having combustible levels of oxygen in the flare gases, the addition of a flame arrester is recommended. Installed at the inlet to the flare, the arrester ensures that any flashback from the flare tip is stopped before entering the site piping system. Group D gas rating is typical.

KWI
Setting the New STANDARD

Additional Equipment:

- Skid Mounted KO Drum - For areas where liquid carryover is possible in the flare headers, we can offer a separate skidded KO drum. The knock out drum will separate any liquids that condense as the flare gas moves through the header. The KO drum is a 3'OD x 10' TL-TL vessel that is also skid mounted. The KO drum comes complete with an automatic blowcase to automatically drain the drum should a high liquid level be reached. Rosemount level, pressure and temperature transmitters are also provided for remote monitoring of the drum.

ATTACHMENT T

EMISSION CALULATIONS

General G70-D Permit Application

Greer Well Pad
Proctor, West Virginia

Tug Hill Operating, LLC
380 Southpointe Blvd., Suite 200
Canonsburg, PA 15317

July 2017

Table 1. Annual Potential To Emit (PTE) Summary
Tug Hill Operating, LLC Greer Pad

Criteria PTE

Source	PM	PM10	PM2.5	SO2	NOx	CO	VOC *	CO2e
Line Heaters (tpy)	0.326	0.326	0.326	0.026	4.294	3.607	0.236	5125.034
Stabilizer Heater (tpy)	0.163	0.163	0.163	0.013	2.147	1.804	0.118	2562.517
Generator (tpy)	0.049	0.049	0.049	0.003	1.139	2.279	0.798	546.207
Compressor (tpy)	0.247	0.247	0.247	0.015	6.663	13.325	4.664	3385.977
Tanks (tpy)*	--	--	--	--	--	--	1.770	--
Vapor Combustor (tpy)	--	--	--	0.090	2.405	10.963	4.951	--
Truck Loading Fugitives (tpy)	--	--	--	--	--	--	43.260	--
Component Fugitives (tpy)	--	--	--	--	--	--	5.060	71.476
Total Emissions (tpy)	**0.786**	**0.786**	**0.786**	**0.146**	**16.648**	**31.978**	**59.087**	**11691.211**
Total Emissions (lb/hr)	0.179	0.179	0.179	0.033	3.801	7.301	13.490	2669.226

*VOC emissions from tanks accounted for within VOC emissions from VDU

HAP PTE

Source	Benzene	Toluene	Ethylbenzene	Xylene	n-Hexane	Formaldehyde	Total HAPs (tpy)
Line Heaters (tpy)	0.000	0.000	--	--	0.077	0.003	0.081
Stabilizer Heater (tpy)	0.000	0.000	--	--	0.039	0.002	0.041
Generator (tpy)	0.002	0.002	0.000	0.001	0.005	0.296	0.399
Compressor (tpy)	0.002	0.010	0.001	0.005	0.028	2.798	3.320
Vapor Combustor (tpy)	--	--	--	--	--	--	--
Fugitives (tpy)	0.000	0.000	0.000	0.000	0.065	--	0.066
Total Emissions (tpy)	**0.005**	**0.013**	**0.001**	**0.006**	**0.214**	**3.099**	**3.907**
Total Emissions (lb/hr)	0.001	0.003	0.000	0.001	0.049	0.708	0.892

Table 2 Generator Engine Emissions (G-1)
Power Solutions Int. Model: 8.1LNA
Tug Hill Operating, LLC Greer Pad

Pollutant	Emission Factor			PTE (lb/hr)		PTE (tons/yr)	
Criteria Pollutants							
PM/PM10/PM2.5**	9.98E-03	lb/MMBtu	(1)	0.01	(a)	0.05	(c)
SO_2	5.88E-04	lb/MMBtu	(1)	0.00	(a)	0.00	(c)
NOx	1.00E+00	g/hp-hr	(2)	0.26	(b)	1.14	(d)
CO	2.00E+00	g/hp-hr	(2)	0.52	(b)	2.28	(d)
VOC	7.00E-01	g/hp-hr	(2)	0.18	(b)	0.80	(d)
Hazardous Air Pollutants							
1,1,2,2-Tetrachloroethane	4.00E-05	lb/MMBtu	(1)	0.000	(a)	0.000	(c)
1,1,2-Trichloroethane	3.18E-05	lb/MMBtu	(1)	0.000	(a)	0.000	(c)
1,3-Butadiene	2.67E-04	lb/MMBtu	(1)	0.000	(a)	0.001	(c)
1,3-Dichloropropene	2.64E-05	lb/MMBtu	(1)	0.000	(a)	0.000	(c)
2-Methylnapthalene	3.32E-05	lb/MMBtu	(1)	0.000	(a)	0.000	(c)
2,2,4-Trimethylpentane	2.50E-05	lb/MMBtu	(1)	0.000	(a)	0.000	(c)
Acetaldehyde	8.36E-03	lb/MMBtu	(1)	0.009	(a)	0.041	(c)
Acrolein	5.14E-03	lb/MMBtu	(1)	0.006	(a)	0.025	(c)
Benzene	4.40E-04	lb/MMBtu	(1)	0.000	(a)	0.002	(c)
Biphenyl	2.12E-03	lb/MMBtu	(1)	0.002	(a)	0.010	(c)
Carbon Tetrachloride	3.67E-05	lb/MMBtu	(1)	0.000	(a)	0.000	(c)
Chlorobenzene	3.04E-05	lb/MMBtu	(1)	0.000	(a)	0.000	(c)
Chloroform	2.85E-05	lb/MMBtu	(1)	0.000	(a)	0.000	(c)
Ethylbenzene	3.97E-05	lb/MMBtu	(1)	0.000	(a)	0.000	(c)
Ethylene Dibromide	4.43E-05	lb/MMBtu	(1)	0.000	(a)	0.000	(c)
Formaldehyde	2.60E-01	g/hp-hr	(2)	0.068	(b)	0.296	(d)
Methanol	2.50E-03	lb/MMBtu	(1)	0.003	(a)	0.012	(c)
Methylene Chloride	2.00E-05	lb/MMBtu	(1)	0.000	(a)	0.000	(c)
n-Hexane	1.11E-03	lb/MMBtu	(1)	0.001	(a)	0.005	(c)
Naphthalene	7.44E-05	lb/MMBtu	(1)	0.000	(a)	0.000	(c)
PAH (POM)	2.69E-05	lb/MMBtu	(1)	0.000	(a)	0.000	(c)
Phenol	1.04E-05	lb/MMBtu	(1)	0.000	(a)	0.000	(c)
Styrene	2.36E-05	lb/MMBtu	(1)	0.000	(a)	0.000	(c)
Toluene	4.08E-04	lb/MMBtu	(1)	0.000	(a)	0.002	(c)
Vinyl Chloride	1.49E-05	lb/MMBtu	(1)	0.000	(a)	0.000	(c)
Xylenes	1.84E-04	lb/MMBtu	(1)	0.000	(a)	0.001	(c)
Total HAP				**0.091**		**0.399**	
Greenhouse Gas Emissions						Metric Tonne/yr	
CO_2	4.71E+02	g/hp-hr	(2)	122.53	(b)	487.88	(d)
CH_4	2.24E+00	g/hp-hr	(2)	0.58	(b)	2.32	(d)
N_2O	2.2E-04	lb/MMBtu	(3)	0.00	(a)	0.00	(c)
CO_2e[(e)]	-	-		137.17		546.21	

** includes condensible PM

Calculations:

Hourly Emissions - If emission factor note 1 is used, use calculation (a). If emission factor note 2 is used, use calculation (b).

(a) Hourly Emissions (lb/hr) = Emission factor (lb/MMBtu) * (1MMBtu/1000000 Btu) * Engine Power Output (hp) * BSFC (Btu/hp-hr)

(b) Hourly Emissions (lb/hr) = Emission factor (g/hp-hr) * Engine Power Output (hp) * (lb/453.6g)

Annual Emissions - If emission factor note 1 is used, use calculation (c). If emission factor note 2 is used, use calculation (d).

(c) Annual emissions (tons/yr) = Emission factor (lb/MMBtu) * (1MMBtu/1000000Btu) * Engine Power Output (hp) * BSFC (Btu/hp-hr) * Annual Hours of operation (hr/yr) * (1ton/2000lbs)

(d) Annual emissions (tons/yr) = Emission factor (g/hp-hr) * Engine Power Output (hp) * Annual Hours of operation (hr/yr) * (1ton/2000lbs) * (lb/453.6g)

MAXIMUM HOURLY EMISSION INPUTS

Engine Power Output (kW) =	88	
Engine Power Output (hp) =	118	
Number of Engines =	1	
BSFC (BTU/HP-hr) =	9,493	(4)
Heat Content Natural Gas(Btu/scf) =	1,253.0	(5)
Fuel Throughput (ft3/hr) =	894.0	(6)
PTE Hours of Operation =	8,760	

(e) CO_2 equivalent = [(CO_2 emissions)*(GWP_{CO2})]+[(CH_4 emissions)*(GWP_{CH4})]+[(N_2O emissions)*(GWP_{N2O})]

Global Warming Potential (GWP)

CO_2	1	(7)
CH_4	25	(7)
N_2O	298	(7)

Notes:

(1) AP-42, Chapter 3.2, Table 3.2-2. Natural Gas-fired Reciprocating Engines (7/00). *Uncontrolled Emission Factors for 4-Stroke Lean-Burn Engines.*

(2) Emission factors supplied from manufacturer's specification sheet

(3) Emission factors supplied from 40 CFR 98, Subpart C, Table C-1 and C-2.

(4) Fuel consumption from manufacturer's specification sheet.

(5) Value obtained from AP-42, Chapter 3.2, Table 3.2-1, footnote b

(6) Fuel throughput = BSFC (BTU/HP-hr) x Power (HP) / Heat Content (BTU/scf)

(7) Global Warming Potentials obtained from 40 CFR 98, Subpart A, Table A-1

Table 3 Compressor Engine Emissions (CE-1)
Caterpillar G3508BLE
Tug Hill Operating, LLC Greer Pad

Pollutant	Emission Factor		PTE (lb/hr)		PTE (tons/yr)	
Criteria Pollutants						
PM/PM10/PM2.5**	9.98E-03 lb/MMBtu	(1)	0.06	(a)	0.25	(c)
SO_2	5.88E-04 lb/MMBtu	(1)	0.00	(a)	0.01	(c)
NOx	1.00E+00 g/hp-hr	(2)	1.52	(b)	6.66	(d)
CO	2.00E+00 g/hp-hr	(2)	3.04	(b)	13.33	(d)
VOC	7.00E-01 g/hp-hr	(2)	1.06	(b)	4.66	(d)
Hazardous Air Pollutants						
1,1,2,2-Tetrachloroethane	4.00E-05 lb/MMBtu	(1)	0.000	(a)	0.001	(c)
1,1,2-Trichloroethane	3.18E-05 lb/MMBtu	(1)	0.000	(a)	0.001	(c)
1,3-Butadiene	2.67E-04 lb/MMBtu	(1)	0.002	(a)	0.007	(c)
1,3-Dichloropropene	2.64E-05 lb/MMBtu	(1)	0.000	(a)	0.001	(c)
2-Methylnapthalene	3.32E-05 lb/MMBtu	(1)	0.000	(a)	0.001	(c)
2,2,4-Trimethylpentane	2.50E-05 lb/MMBtu	(1)	0.000	(a)	0.001	(c)
Acetaldehyde	8.36E-03 lb/MMBtu	(1)	0.047	(a)	0.207	(c)
Acrolein	5.14E-03 lb/MMBtu	(1)	0.029	(a)	0.127	(c)
Benzene	4.40E-04 lb/MMBtu	(1)	0.002	(a)	0.011	(c)
Biphenyl	2.12E-03 lb/MMBtu	(1)	0.012	(a)	0.053	(c)
Carbon Tetrachloride	3.67E-05 lb/MMBtu	(1)	0.000	(a)	0.001	(c)
Chlorobenzene	3.04E-05 lb/MMBtu	(1)	0.000	(a)	0.001	(c)
Chloroform	2.85E-05 lb/MMBtu	(1)	0.000	(a)	0.001	(c)
Ethylbenzene	3.97E-05 lb/MMBtu	(1)	0.000	(a)	0.001	(c)
Ethylene Dibromide	4.43E-05 lb/MMBtu	(1)	0.000	(a)	0.001	(c)
Formaldehyde	4.20E-01 g/hp-hr	(2)	0.639	(b)	2.798	(d)
Methanol	2.50E-03 lb/MMBtu	(1)	0.014	(a)	0.062	(c)
Methylene Chloride	2.00E-05 lb/MMBtu	(1)	0.000	(a)	0.000	(c)
n-Hexane	1.11E-03 lb/MMBtu	(1)	0.006	(a)	0.028	(c)
Naphthalene	7.44E-05 lb/MMBtu	(1)	0.000	(a)	0.002	(c)
PAH (POM)	2.69E-05 lb/MMBtu	(1)	0.000	(a)	0.001	(c)
Phenol	1.04E-05 lb/MMBtu	(1)	0.000	(a)	0.000	(c)
Styrene	2.36E-05 lb/MMBtu	(1)	0.000	(a)	0.001	(c)
Toluene	4.08E-04 lb/MMBtu	(1)	0.002	(a)	0.010	(c)
Vinyl Chloride	1.49E-05 lb/MMBtu	(1)	0.000	(a)	0.000	(c)
Xylenes	1.84E-04 lb/MMBtu	(1)	0.001	(a)	0.005	(c)
Total HAP			**0.758**		**3.320**	
Greenhouse Gas Emissions					Metric Tonne/yr	
CO_2	5.00E+02 g/hp-hr	(2)	760.58	(b)	3028.50	(d)
CH_4	2.35E+00 g/hp-hr	(2)	3.57	(b)	14.23	(d)
N_2O	2.2E-04 lb/MMBtu	(3)	0.00	(a)	0.01	(c)
$CO_2e^{(e)}$	- -		850.32		3385.98	

** includes condensible PM

Calculations:

Hourly Emissions - If emission factor note 1 is used, use calculation (a). If emission factor note 2 is used, use calculation (b).

(a) Hourly Emissions (lb/hr) = Emission factor (lb/MMBtu) * (1MMBtu/1000000 Btu) * Engine Power Output (hp) * BSFC (Btu/hp-hr)

(b) Hourly Emissions (lb/hr) = Emission factor (g/hp-hr) * Engine Power Output (hp) * (lb/453.6g)

Annual Emissions - If emission factor note 1 is used, use calculation (c). If emission factor note 2 is used, use calculation (d).

(c) Annual emissions (tons/yr) = Emission factor (lb/MMBtu) * (1MMBtu/1000000Btu) * Engine Power Output (hp) * BSFC (Btu/hp-hr) * Annual Hours of operation (hr/yr) * (1ton/2000lbs)

(d) Annual emissions (tons/yr) = Emission factor (g/hp-hr) * Engine Power Output (hp) * Annual Hours of operation (hr/yr) * (1ton/2000lbs) * (lb/453.6g)

MAXIMUM HOURLY EMISSION INPUTS

Engine Power Output (kW) =	515	
Engine Power Output (hp) =	690	
Number of Engines =	1	
BSFC (BTU/HP-hr) =	8,203	(4)
Heat Content Natural Gas(Btu/scf) =	1,253.0	(5)
Fuel Throughput (ft3/hr) =	4,517.2	(6)
PTE Hours of Operation =	8,760	

(e) CO_2 equivalent = $[(CO_2 \text{ emissions})*(GWP_{CO2})]+[(CH_4 \text{ emissions})*(GWP_{CH4})]+[(N_2O \text{ emissions})*(GWP_{N2O})]$

Global Warming Potential (GWP)

CO_2	1	(7)
CH_4	25	(7)
N_2O	298	(7)

Notes:

(1) AP-42, Chapter 3.2, Table 3.2-2. Natural Gas-fired Reciprocating Engines (7/00). *Uncontrolled Emission Factors for 4-Stroke Lean-Burn Engines.*

(2) Emission factors supplied from manufacturer's specification sheet

(3) Emission factors supplied from 40 CFR 98, Subpart C, Table C-1 and C-2.

(4) Fuel consumption from manufacturer's specification sheet.

(5) Value obtained from AP-42, Chapter 3.2, Table 3.2-1, footnote b

(6) Fuel throughput = BSFC (BTU/HP-hr) x Power (HP) / Heat Content (BTU/scf)

(7) Global Warming Potentials obtained from 40 CFR 98, Subpart A, Table A-1

Table 4 Stabilizer Heater (SH-1) Rates and Emissions
Tug Hill Operating, LLC Greer Pad

Pollutant	Emission Factor			SH Emissions (lb/hr)	SH Emissions (ton/yr)
Criteria Pollutants					
PM/PM10/PM2.5	7.6	lb/MMcf	(1)	0.037	0.163
SO_2	0.6	lb/MMcf	(1)	0.003	0.013
NOx	100	lb/MMcf	(2)	0.490	2.147
CO	84	lb/MMcf	(2)	0.412	1.804
VOC	5.5	lb/MMcf	(1)	0.027	0.118
Hazardous Air Pollutants					
Arsenic	2.0E-04	lb/MMcf	(3)	0.000	0.000
Benzene	2.1E-03	lb/MMcf	(4)	0.000	0.000
Beryllium	1.2E-05	lb/MMcf	(3)	0.000	0.000
Cadmium	1.1E-03	lb/MMcf	(3)	0.000	0.000
Chromium	1.4E-03	lb/MMcf	(3)	0.000	0.000
Cobalt	8.4E-05	lb/MMcf	(3)	0.000	0.000
Dichlorobenzene	1.2E-03	lb/MMcf	(4)	0.000	0.000
Formaldehyde	7.5E-02	lb/MMcf	(4)	0.000	0.002
Hexane	1.8E+00	lb/MMcf	(4)	0.009	0.039
Lead	5.0E-04	lb/MMcf	(3)	0.000	0.000
Manganese	3.8E-04	lb/MMcf	(3)	0.000	0.000
Mercury	2.6E-04	lb/MMcf	(3)	0.000	0.000
Naphthalene	6.1E-04	lb/MMcf	(4)	0.000	0.000
Nickel	2.1E-03	lb/MMcf	(3)	0.000	0.000
PAH/POM	1.3E-03	lb/MMcf	(4)	0.000	0.000
Selenium	2.4E-05	lb/MMcf	(3)	0.000	0.000
Toluene	3.4E-03	lb/MMcf	(4)	0.000	0.000
Total HAP	**1.9E+00**	**lb/MMCF**		0.009	0.041
Greenhouse Gas Emissions					
CO_2	116.89	lb/MMBtu	(5)	584.445	2559.871
CH_4	2.2E-03	lb/MMBtu	(5)	0.011	0.048
N_2O	0.0	lb/MMBtu	(5)	0.001	0.005
$CO_2e^{(b)}$	-	-		585.050	2562.517

Calculations:

(a) Annual emissions (tons/yr) = [Annual Usage (MMBtu/yr or MMCF/yr)]x [Number of Identical Heaters]x [Emission Factor (lb/MMBtu or lb/MMCF)] / [2,000 lb/ton]

Number of Line Heaters= 1
Fuel Use (MMBtu/hr) = 5
Hours of Operation (hr/yr)= 8760
PTE Fuel Use (MMcf/yr) = 42.9

(b) CO_2 equivalent = [(CO_2 emissions)*(GWP_{CO2})]+[(CH_4 emissions)*(GWP_{CH4})]+[(N_2O emissions)*(GWP_{N2O})]
Global Warming Potential (GWP)

CO_2	1	(6)
CH_4	25	(6)
N_2O	298	(6)

Notes:

(1) AP-42, Chapter 1.4, Table 1.4-2. Emission Factors For Criteria Pollutants and Greenhouse Gases From Natural Gas Combustion, July 1998.
(2) AP-42, Chapter 1.4, Table 1.4-1. Emission Factors For Nitrogen Oxides (Nox) and Carbon Monoxide(CO) From Natural Gas Combustion, July 1998.
(3) AP-42, Chapter 1.4, Table 1.4-4. Emission Factors For Metals From Natural Gas Combustion, July 1998.
(4) AP-42, Chapter 1.4, Table 1.4-3. Emission Factors for Speciated Organic Compounds from Natural Gas Combustion, July 1998.
(5) Emission factors are from 40 CFR 98, Subpart C, Table C-1 and C-2.
(6) Global Warming Potentials obtained from 40 CFR 98, Subpart A, Table A-1
(7) MMBtu to MMcf conversion factor is 1020. AP-42, Chapter 1.4

Table 5 GPU Heater (GPU-1 through GPU-10) Rates and Emissions
Tug Hill Operating, LLC Greer Pad

Pollutant	Emission Factor			1.00 MBtu/hr GPU Emissions (lb/hr)	1.00 MMBtu/hr GPU Emissions (ton/yr)	1.00 MMBtu/hr GPU Emissions x 10 (lb/hr)	1.00 MMBtu/hr GPU Emissions x 10 (ton/yr)
Criteria Pollutants							
PM/PM10/PM2.5	7.6	lb/MMcf	(1)	0.007	0.033	0.075	0.326
SO_2	0.6	lb/MMcf	(1)	0.001	0.003	0.006	0.026
NOx	100	lb/MMcf	(2)	0.098	0.429	0.980	4.294
CO	84	lb/MMcf	(2)	0.082	0.361	0.824	3.607
VOC	5.5	lb/MMcf	(1)	0.005	0.024	0.054	0.236
Hazardous Air Pollutants							
Arsenic	2.0E-04	lb/MMcf	(3)	0.000	0.000	0.000	0.000
Benzene	2.1E-03	lb/MMcf	(4)	0.000	0.000	0.000	0.000
Beryllium	1.2E-05	lb/MMcf	(3)	0.000	0.000	0.000	0.000
Cadmium	1.1E-03	lb/MMcf	(3)	0.000	0.000	0.000	0.000
Chromium	1.4E-03	lb/MMcf	(3)	0.000	0.000	0.000	0.000
Cobalt	8.4E-05	lb/MMcf	(3)	0.000	0.000	0.000	0.000
Dichlorobenzene	1.2E-03	lb/MMcf	(4)	0.000	0.000	0.000	0.000
Formaldehyde	7.5E-02	lb/MMcf	(4)	0.000	0.000	0.001	0.003
Hexane	1.8E+00	lb/MMcf	(4)	0.002	0.008	0.018	0.077
Lead	5.0E-04	lb/MMcf	(3)	0.000	0.000	0.000	0.000
Manganese	3.8E-04	lb/MMcf	(3)	0.000	0.000	0.000	0.000
Mercury	2.6E-04	lb/MMcf	(3)	0.000	0.000	0.000	0.000
Naphthalene	6.1E-04	lb/MMcf	(4)	0.000	0.000	0.000	0.000
Nickel	2.1E-03	lb/MMcf	(3)	0.000	0.000	0.000	0.000
PAH/POM	1.3E-03	lb/MMcf	(4)	0.000	0.000	0.000	0.000
Selenium	2.4E-05	lb/MMcf	(3)	0.000	0.000	0.000	0.000
Toluene	3.4E-03	lb/MMcf	(4)	0.000	0.000	0.000	0.000
Total HAP	**1.9E+00**	**lb/MMCF**		0.002	0.008	0.019	0.081
Greenhouse Gas Emissions							
CO_2	116.89	lb/MMBtu	(5)	116.889	511.974	1168.891	5119.742
CH_4	2.2E-03	lb/MMBtu	(5)	0.002	0.010	0.022	0.097
N_2O	0.0	lb/MMBtu	(5)	0.000	0.001	0.002	0.010
CO_2e[(b)]	-	-		117.010	512.503	1170.099	5125.034

Calculations:

(a) Annual emissions (tons/yr) = [Annual Usage (MMBtu/yr or MMCF/yr)]x [Number of Identical Heaters]x [Emission Factor (lb/MMBtu or lb/MMCF)] / [2,000 lb/ton]

Number of Line Heaters= 10
Fuel Use (MMBtu/hr) = 1
Hours of Operation (hr/yr)= 8760
PTE Fuel Use (MMcf/yr) = 8.6

(b) CO_2 equivalent = [(CO_2 emissions)*(GWP_{CO2})]+[(CH_4 emissions)*(GWP_{CH4})]+[(N_2O emissions)*(GWP_{N2O})]
Global Warming Potential (GWP)

CO_2	1	(6)
CH_4	25	(6)
N_2O	298	(6)

Notes:

(1) AP-42, Chapter 1.4, Table 1.4-2. Emission Factors For Criteria Pollutants and Greenhouse Gases From Natural Gas Combustion, July 1998.
(2) AP-42, Chapter 1.4, Table 1.4-1. Emission Factors For Nitrogen Oxides (Nox) and Carbon Monoxide(CO) From Natural Gas Combustion, July 1998.
(3) AP-42, Chapter 1.4, Table 1.4-4. Emission Factors For Metals From Natural Gas Combustion, July 1998.
(4) AP-42, Chapter 1.4, Table 1.4-3. Emission Factors for Speciated Organic Compounds from Natural Gas Combustion, July 1998.
(5) Emission factors are from 40 CFR 98, Subpart C, Table C-1 and C-2.
(6) Global Warming Potentials obtained from 40 CFR 98, Subpart A, Table A-1
(7) MMBtu to MMcf conversion factor is 1020. AP-42, Chapter 1.4

Table 6. Combustor (VDU-1) Emissions
Tug Hill Operating, LLC Greer Pad

Pollutant	Emission Factor (lb/MMBtu)	Volume (scf/hr)	Gas Heat Value (Btu/scf)	(MMBtu/ 1000000Btu)	Emissions (lbs/hr)	Emissions (ton/yr)
CO	0.31	3,833	2,085	(1/1,000,000)	2.48	10.85
NOx	0.068	3,833	2,085	(1/1,000,000)	0.54	2.38
VOC[a]	0.14	3,833	2,085	(1/1,000,000)	1.12	4.90
CO2	116.89	3,833	2,085	(1/1,000,000)	934.24	4091.98

Example Formula:

$$emissions\left(\frac{ton}{yr}\right) = emission\,factor\left(\frac{lb}{MMBtu}\right) \times Volume\left(\frac{scf}{hr}\right) \times gas\,heat\,value\left(\frac{Btu}{scf}\right) \times \frac{MMBtu}{1{,}000{,}000\,Btu} \times \frac{659\,hrs}{1\,yr} \times \frac{1\,ton}{2{,}000\,lbs}$$

Emission Factor = AP-42 Tables 13.5-1 and 2 emission factor for specific pollutant
[a] - 98% DRE for VOCs from ProMax simulated unconrolled emissions was found to be less than AP-42 Factor.
Hours of operation calculated at 8760 hrs/yr for worst case
Volume from manufacturer spec. sheet.
Gas Heat Value = 1501 Btu/scf from low pressure separator ProMax Estimate

Pollutant	Volume (scf/hr)	grain H2S/ 100 scf	Mol Fraction	Mol weight (g/mol)	(lb-mol /scf)	Emissions (lbs/hr)	Emissions (ton/yr)
SO2	3,833	15.26	0.0002423	64.00	1/379.4	0.1567	0.0783

Example Formula:

$$emissions\left(\frac{ton}{yr}\right) = Volume\left(\frac{scf}{hr}\right) \times mol\,fraction\left(\frac{H2S}{100\,scf} \times 0.00001588\right) \times molecular\,weight \times \frac{lb\text{-}mol}{scf} \times \frac{659\,hrs}{1\,yr} \times \frac{1\,ton}{2{,}000\,lbs}$$

$$\frac{1\,grain\ H2S}{100\,scf} = 15.26\,ppm\ of\ H2S$$

Volume from manufacturer spec. sheet.
H2S conversion taken from supporting Sulfur Measurement Handbook
grain H2S/100 scf = 15.26
1 lb mol = 379.4 cubic feet

For Pilot Light

Pollutant	Emission Factor (lb/MMBtu)	Volume (scf/hr)	Gas Heat Value (Btu/scf)	(MMBtu/ 1000000Btu)	Emissions (lbs/hr)	Emissions (ton/yr)
CO	0.31	65.0	1,253	(1/1,000,000)	0.0252	0.1106
NOx	0.068	65.0	1,253	(1/1,000,000)	0.0055	0.0243
VOC[a]	0.14	65.0	1,253	(1/1,000,000)	0.0114	0.0499

[a] - Measured as methane equivalent, assumed worst case

Example Formula:

$$emissions\left(\frac{ton}{yr}\right) = emission\,factor\left(\frac{lb}{MMBtu}\right) \times Volume\left(\frac{scf}{hr}\right) \times gas\,heat\,value\left(\frac{Btu}{scf}\right) \times \frac{MMBtu}{1{,}000{,}000\,Btu} \times \frac{8760\,hrs}{1\,yr} \times \frac{1\,ton}{2{,}000\,lbs}$$

Volume from manufacturer spec. sheet.
Emission Factor = AP-42 Tables 13.5-1 and 2 emission factor for specific pollutant
Gas Heat Value = 1197 Btu/scf average of two sales gas samples taken 6-10-16

Pollutant	Volume (scf/hr)	grain H2S/ 100 scf	Mol Fraction	Mol weight (g/mol)	(lb-mol /scf)	Emissions (lbs/hr)	Emissions (ton/yr)
SO2	65.0	15.26	0.0002423	64.00	1/379.4	0.0027	0.0116

Example Formula:

$$emissions\left(\frac{ton}{yr}\right) = Volume\left(\frac{scf}{hr}\right) \times mol\,fraction\left(\frac{H2S}{100\,scf} \times 0.00001588\right) \times molecular\,weight \times \frac{lb\text{-}mol}{scf} \times \frac{8760\,hrs}{1\,yr} \times \frac{1\,ton}{2{,}000\,lbs}$$

$$\frac{1\,grain\ H2S}{100\,scf} = 15.26\,ppm\ of\ H2S$$

Volume from manufacturer spec. sheet.
H2S conversion taken from supporting Sulfur Measurement Handbook
grain H2S/100 scf = 15.26
1 lb mol = 379.4 cubic feet

Note: Controlled emissions from 2% of captured emissions predicted by ProMax = 3.79 tpy VOCs. Therefore, VOC emissions were taken from higher estimates of VOCs using AP-42's THC emission factor.

Flare and Pilot Combined		
Pollutant	**lb/hr**	**ton/yr**
CO	**2.50**	**10.96**
Nox	**0.55**	**2.40**
VOC	**1.13**	**4.95**
SO2	**0.16**	**0.09**

Table 7 Tank Emissions
Tug Hill Operating, LLC Greer Pad

Emission Unit	Tank Contents	Control Devices	Tank Throughput (bbls/day)	Flashing EF (lbs/bbls)		Flashing Emissions (lbs/day) (a)	Working and Breathing Emissions (lbs/day) (b)	VOC Emissions (lb/hr)	VOC Emissions (tons/yr)	VOC Emissions Controlled (lb/hr)(c)	VOC Emissions Controlled (tons/yr)(c)
T01	Condensate	VDU-1	234.8	0.000	(1)	0.00	2.49E+01	1.038	4.548	0.021	0.091
T02	Condensate	VDU-1	234.8	0.000	(1)	0.00	2.49E+01	1.038	4.548	0.021	0.091
T03	Condensate	VDU-1	234.8	0.000	(1)	0.00	2.49E+01	1.038	4.548	0.021	0.091
T04	Condensate	VDU-1	234.8	0.000	(1)	0.00	2.49E+01	1.038	4.548	0.021	0.091
T05	Condensate	VDU-1	234.8	0.000	(1)	0.00	2.49E+01	1.038	4.548	0.021	0.091
T06	Condensate	VDU-1	234.8	0.000	(1)	0.00	2.49E+01	1.038	4.548	0.021	0.091
T07	Condensate	VDU-1	234.8	0.000	(1)	0.00	2.49E+01	1.038	4.548	0.021	0.091
T08	Condensate	VDU-1	234.8	0.000	(1)	0.00	2.49E+01	1.038	4.548	0.021	0.091
T09	Condensate	VDU-1	234.8	0.000	(1)	0.00	2.49E+01	1.038	4.548	0.021	0.091
T10	Condensate	VDU-1	234.8	0.000	(1)	0.00	2.49E+01	1.038	4.548	0.021	0.091
T11	Condensate	VDU-1	234.8	0.000	(1)	0.00	2.49E+01	1.038	4.548	0.021	0.091
T12	Condensate	VDU-1	234.8	0.000	(1)	0.00	2.49E+01	1.038	4.548	0.021	0.091
T13	Condensate	VDU-1	234.8	0.000	(1)	0.00	2.49E+01	1.038	4.548	0.021	0.091
T14	Condensate	VDU-1	234.8	0.000	(1)	0.00	2.49E+01	1.038	4.548	0.021	0.091
T15	Condensate	VDU-1	234.8	0.000	(1)	0.00	2.49E+01	1.038	4.548	0.021	0.091
T16	Condensate	VDU-1	234.8	0.000	(1)	0.00	2.49E+01	1.038	4.548	0.021	0.091
T17	Produced Water	VDU-1	616.4	0.035	(1)	21.53	1.95E-04	0.897	3.930	0.018	0.079
T18	Produced Water	VDU-1	616.4	0.035	(1)	21.53	1.95E-04	0.897	3.930	0.018	0.079
T19	Produced Water	VDU-1	616.4	0.035	(1)	21.53	1.95E-04	0.897	3.930	0.018	0.079
T20	Produced Water	VDU-1	616.4	0.035	(1)	21.53	1.95E-04	0.897	3.930	0.018	0.079
Total			6222.2	0.14		86.14	398.74	**20.203**	**88.490**	**0.404**	**1.770**

Calculations:

(a) Flashing Emissions

PTE emissions (lbs/day) from ProMax.

(b) Working and Breathing Emissions

PTE emissions (lbs/day) from ProMax.

(c) Emissions routed to combustion device with conservative 98% destruction efficiency

Notes:

(1) ProMax Simulation based on representative inputs and worst case operating parameters

Table 8 Truck Loading (TL-1) VOC Emissions
Tug Hill Operating, LLC Greer Pad

Contents	Volume Transferred		PTE VOC Emissions (lb/hr)	PTE VOC Emissions[(a)] (tons/yr)	Controlled VOC Emissions[(b)(c)] (tons/yr)
Produced Water	37,795,349	gal/yr	0.000	0.000	--
Condensate	57,594,810	gal/yr	32.922	144.200	--
Total	95,390,159	gal/yr	32.922	144.200	--
Total Captured (70%)				100.940	2.019
Total Fugitive (30%)				43.260	43.260

Notes:

(a) Annual Emissions(tons/yr) from ProMax loading losses

(b) 70% Capture efficiency for tanker trucks/rail cars not passing a MACT or NSPS level annual leak test.

(c) 2.02 tpy of VOC Point Source Emissions are added to VDU-1's potential to emit.

Table 9 Fugitive Leaks
Tug Hill Operating, LLC Greer Pad

Pollutant	Emission Factor	PTE[(a) Gas Service (tons/yr)	PTE VOC emissions (ton/yr)	PTE CO_2e emissions (ton/yr)	PTE Total HAPs emissions (ton/yr)
Valves	9.9E-03 lb/hr/source	16.32	3.47	49.00	0.04
Pressure Relief Valves	1.9E-02 lb/hr/source	0.85	0.18	2.55	0.00
Connectors (2)	8.6E-04 lb/hr/source	6.25	1.33	18.77	0.02
Open Ended Lines	4.4E-03 lb/hr/source	0.39	0.08	1.16	0.00
Compressors	1.9E-02 lb/hr/source	0.08	0.00	0.00	0.00
Total	- -	23.90	5.06	71.48	0.07

Pollutant	PTE Benzene emissions (ton/yr)	PTE Toluene emissions (ton/yr)	PTE Ethylbenzene emissions (ton/yr)	PTE Xylenes emissions (ton/yr)	PTE n-Hexane emissions (ton/yr)
Valves	1.63E-04	1.63E-04	1.63E-04	1.63E-04	4.43E-02
Pressure Relief Valves	8.49E-06	8.49E-06	8.49E-06	8.49E-06	2.30E-03
Connectors (2)	6.25E-05	6.25E-05	6.25E-05	6.25E-05	1.70E-02
Open Ended Lines	3.86E-06	3.86E-06	3.86E-06	3.86E-06	1.05E-03
Compressors	8.49E-07	8.49E-07	8.49E-07	8.49E-07	2.30E-04
Total	0.00	0.00	0.00	0.00	0.06

Calculations:

(a) Annual emissions (tons/yr) = [Emission Factor (lb/hr/source)] x [Number of Sources] x [Hours of Operation per Year] x [ton/2000lb]

WET GAS INPUTS TABLE	
Gas Stream Components	**Wt Percent**
Methane	56.50%
Ethane	22.25%
VOC	21.25%
Benzene	0.00%
Toluene	0.00%
Ethylbenzene	0.00%
Xylenes	0.00%
n-Hexane	0.27%

Number of Components in Gas Service

Valves =	376
Pressure Relief Valves =	10
Connectors =	1,662
Open Ended Lines =	20
Compressors =	1.000
Maximum Hour of Operation =	8,760

Global Warming Potential (GWP)

CO_2	1
CH_4	25
N_2O	298

(1) Emission factors from 1995 EPA Protocol for Equipment Leak Emission Estimates, Table 2-4 Oil and Gas Production

(2) Connectors is assumed to include flange connections in the total count

(3) Worst case VOC wt % assumption for station based on gas sample analysis from facility

(4) *Default Average Component Counts for Major Onshore Natural Gas Production Equipment* from 40 CFR 98, Subpart W, Table W-1B

(5) Global Warming Potentials obtained from 40 CFR 98, Subpart A, Table A-1

Bryan Research & Engineering, Inc.

ProMax® 4.0

Simulation Report

Project: Tug-hill Stabilizer Simulation - 8 wells - June 1st w tank emissions.pmx

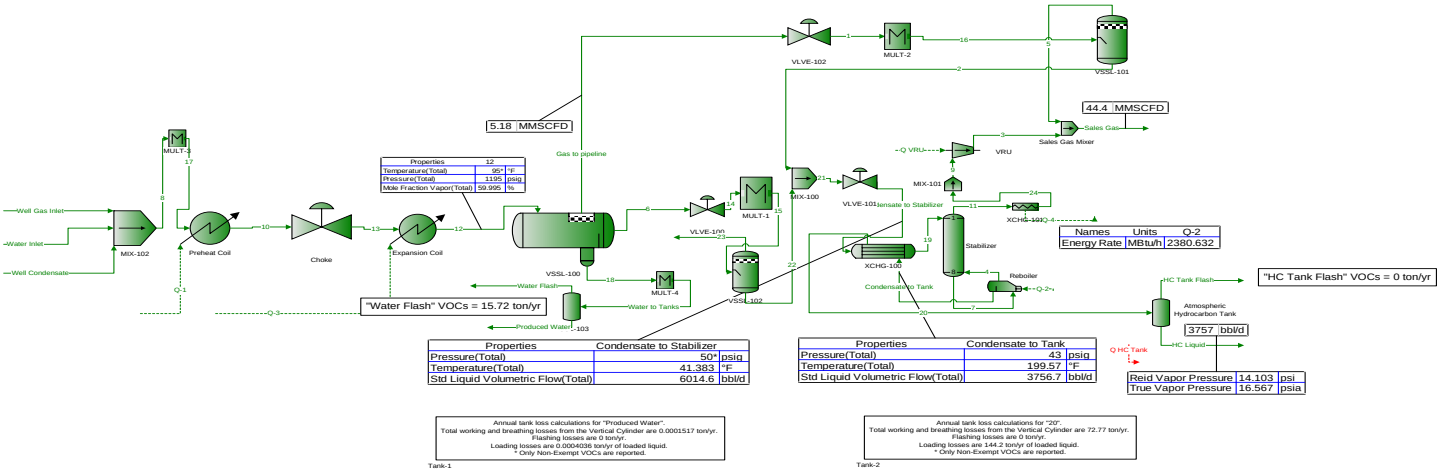
Licensed to SLR International Corporation and Affiliates

Client Name: Tug-Hill
Location: Greer Facility
Job: Marcellus Wells

ProMax Filename:
ProMax Version: 4.0.16071.0
Simulation Initiated: 7/19/2017 12:04:13 PM

Bryan Research & Engineering, Inc.
Chemical Engineering Consultants
P.O. Box 4747 Bryan, Texas 77805
Office: (979) 776-5220
FAX: (979) 776-4818
mailto:sales@bre.com
http://www.bre.com/

Report Navigator can be activated via the ProMax Navigator Toolbar.
An asterisk (*), throughout the report, denotes a user specified value.
A question mark (?) after a value, throughout the report, denotes an extrapolated or approximate value.


VLVE-102
MULT-2
VSSL-101
5.18 MMSCFD
44.4 MMSCFD
Sales Gas
Sales Gas Mixer
Q VRU
VRU
Gas to pipeline
MULT-3
Properties 12
Temperature(Total) 95° °F
Pressure(Total) 1195 psig
Mole Fraction Vapor(Total) 59.995 %
MIX-100
VLVE-101
Sensate to Stabilizer
MIX-101
XCHG-101
Names Units Q-2
Energy Rate MBtu/h 2380.632
Well Gas Inlet
Water Inlet
Well Condensate
MIX-102
Preheat Coil
Choke
Expansion Coil
MULT-1
VLVE-100
Stabilizer
XCHG-100
Reboiler
Condensate to Tank
Q-2
HC Tank Flash
"HC Tank Flash" VOCs = 0 ton/yr
Atmospheric Hydrocarbon Tank
3757 bbl/d
HC Liquid
Q HC Tank
Reid Vapor Pressure 14.103 psi
True Vapor Pressure 16.567 psia
Q-1
Q-3
"Water Flash" VOCs = 15.72 ton/yr
Water Flash
Water to Tanks
Produced Water
VSSL-100
MULT-4
VSSL-102
Properties Condensate to Stabilizer
Pressure(Total) 50* psig
Temperature(Total) 41.383 °F
Std Liquid Volumetric Flow(Total) 6014.6 bbl/d
Properties Condensate to Tank
Pressure(Total) 43 psig
Temperature(Total) 199.57 °F
Std Liquid Volumetric Flow(Total) 3756.7 bbl/d
Annual tank loss calculations for "Produced Water".
Total working and breathing losses from the Vertical Cylinder are 0.0001517 ton/yr.
Flashing losses are 0 ton/yr.
Loading losses are 0.0004036 ton/yr of loaded liquid.
* Only Non-Exempt VOCs are reported.
Tank-1
Annual tank loss calculations for "20".
Total working and breathing losses from the Vertical Cylinder are 72.77 ton/yr.
Flashing losses are 0 ton/yr.
Loading losses are 144.2 ton/yr of loaded liquid.
* Only Non-Exempt VOCs are reported.
Tank-2

Process Streams		Condensate to Stabilizer	Condensate to Tank	Gas to pipeline	HC Liquid	HC Tank Flash	Produced Water	Sales Gas	Water Flash	Water Inlet	Water to Tanks	Well Condensate	Well Gas Inlet
Composition	Status:	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Phase: Total	From Block:	VLVE-101	Reboiler	VSSL-100	Atmospheric Hydrocarbon Tank	Atmospheric Hydrocarbon Tank	VSSL-103	Sales Gas Mixer	VSSL-103	--	MultiplierMixer-O-4	--	--
	To Block:	XCHG-100	XCHG-100	VLVE-102	--	--	--	--	--	MIX-102	VSSL-103	MIX-102	MIX-102
Mole Fraction		%	%	%	%	%	%	%	%	%	%	%	%
Nitrogen		0.0181793	0	0.616439	0		4.21170E-06	0.577551	0.400606	0*	0.000571907	0.027*	0.594*
Carbon Dioxide		0.0871058	1.40130E-08	0.205410	1.40130E-08		0.000898340	0.203834	2.45024	0*	0.00436930	0.039*	0.218*
Methane		9.73876	1.70206E-09	75.6298	1.70206E-09		0.00157619	71.8959	75.7862	0*	0.108971	10.838*	74.97*
Ethane		14.7545	0.000987685	14.9927	0.000987685		0.000355156	16.0557	12.5356	0*	0.0181189	13.005*	15.749*
Propane		16.6020	3.12118	5.42902	3.12118		3.92397E-05	7.14974	2.05450	0*	0.00295062	15.319*	5.76*
Isobutane		3.16700	2.37209	0.523769	2.37209		1.17293E-06	0.750463	0.0950350	0*	0.000135846	3.066*	0.535*
n-Butane		11.5531	11.1803	1.45919	11.1803		7.49530E-06	2.11875	0.377408	0*	0.000542311	11.345*	1.446*
2,2-Dimethylpropane		0.0929878	0.105841	0.00994976	0.105841		6.74237E-09	0.0142155	0.000869534	0*	1.23895E-06	0.154*	0.001*
Isopentane		3.79669	5.48183	0.265597	5.48183		3.58011E-07	0.360113	0.0300545	0*	4.29479E-05	3.985*	0.213*
n-Pentane		6.35758	9.88312	0.373844	9.88312		1.19484E-07	0.484250	0.0197495	0*	2.81064E-05	6.673*	0.283*
2,2-Dimethylbutane		0.0929872	0.160911	0.00394730	0.160911		5.40092E-10	0.00451204	0.000124885	0*	1.77514E-07	0.095*	0.003*
Cyclopentane		0	0	0	0		0	0	0	0*	0	0*	0*
2,3-Dimethylbutane		0.263342	0.476571	0.00924782	0.476571		5.45007E-09	0.00963934	0.000587347	0*	8.37774E-07	0.26*	0.008*
2-Methylpentane		1.79782	3.28458	0.0607435	3.28458		1.53268E-08	0.0614507	0.00244387	0*	3.47852E-06	1.849*	0.042*
3-Methylpentane		1.10251	2.04499	0.0341257	2.04499		5.56614E-08	0.0330644	0.00347366	0*	4.97812E-06	1.128*	0.024*
n-Hexane		3.67689	6.97328	0.100965	6.97328		1.36861E-08	0.0892521	0.00284207	0*	4.04118E-06	3.778*	0.067*
Methylcyclopentane		0.537224	1.01844	0.0141287	1.01844		8.55780E-08	0.0130504	0.00290566	0*	4.20308E-06	0.572*	0.007*
Benzene		0.0568604	0.107187	0.00149812	0.107187		2.26094E-05	0.00145060	0.0107144	0*	3.77608E-05	0.059*	0.001*
Cyclohexane		0.591979	1.13856	0.0140856	1.13856		3.38619E-07	0.0121354	0.00564173	0*	8.33305E-06	0.62*	0.008*
2-Methylhexane		1.17453	2.34771	0.0215963	2.34771		1.57105E-09	0.0134747	0.000386159	0*	5.48795E-07	1.246*	0.009*
3-Methylhexane		1.05831	2.12448	0.0182099	2.12448		1.73500E-09	0.0109340	0.000373733	0*	5.31351E-07	1.112*	0.009*
2,2,4-Trimethylpentane		0	0	0	0		0	0	0	0*	0	0*	0*
n-Heptane		2.97991	6.04331	0.0451471	6.04331		1.73397E-09	0.0239190	0.000554870	0*	7.88040E-07	3.114*	0.025*
Methylcyclohexane		1.28561	2.60782	0.0179091	2.60782		5.55465E-08	0.00997071	0.00216689	0*	3.12617E-06	1.354*	0.009*
Toluene		0.224061	0.454950	0.00296846	0.454950		2.15131E-05	0.00168333	0.0125845	0*	3.93162E-05	0.24*	0.001*
n-Octane		4.62419	9.61616	0.0364197	9.61616		1.38750E-10	0.0113895	0.000115797	0*	1.64235E-07	4.94*	0.014*
Ethylbenzene		0.208317	0.433314	0.00142502	0.433314		5.22115E-06	0.000492537	0.00388844	0*	1.07241E-05	0.227*	0*
1,3-Dimethylbenzene		0.259976	0.541376	0.00168207	0.541376		4.11464E-06	0.000558360	0.00385834	0*	9.57648E-06	0.276*	0.001*
1,4-Dimethylbenzene		0.00933444	0.0194289	6.22624E-05	0.0194289		1.65107E-07	2.09667E-05	0.000147392	0*	3.73742E-07	0.003*	0.001*
1,2-Dimethylbenzene		0.399550	0.833179	0.00234800	0.833179		1.63212E-05	0.000749104	0.00763929	0*	2.71238E-05	0.435*	0*
n-Nonane		2.69391	5.65184	0.0105419	5.65184		1.62707E-11	0.00206577	1.75090E-05	0*	2.48283E-08	2.913*	0.002*
n-Decane		2.38201	5.01208	0.00519525	5.01208		5.30280E-13	0.000653141	1.79382E-06	0*	2.54257E-09	2.587*	0*
Undecane		1.80131	3.79445	0.00204974	3.79445		9.41184E-14	0.000167695	3.91567E-07	0*	5.54985E-10	1.956*	0*
Dodecane		1.33355	2.81016	0.000804172	2.81016		1.64743E-13	4.56274E-05	2.62436E-07	0*	3.72063E-10	1.448*	0*
Tridecane		1.03701	2.18558	0.000355128	2.18558		2.55421E-13	1.31176E-05	1.76763E-07	0*	2.50746E-10	1.126*	0*
Tetradecane		0.827958	1.74507	0.000160360	1.74507		4.16926E-13	4.01314E-06	1.22690E-07	0*	1.74281E-10	0.899*	0*
Pentadecane		0.664947	1.40152	6.11505E-05	1.40152		1.09971E-12	1.00910E-06	1.00956E-07	0*	1.44164E-10	0.722*	0*
Hexadecane		0.455885	0.960885	2.43842E-05	0.960885		7.74373E-13	2.73466E-07	4.26935E-08	0*	6.12744E-11	0.495*	0*
Heptadecane		0.383128	0.807534	1.27283E-05	0.807534		1.30927E-12	9.62519E-08	3.14291E-08	0*	4.58457E-11	0.416*	0*
Octadecane		0.338921	0.714357	6.76828E-06	0.714357		5.12408E-12	3.70263E-08	3.74249E-08	0*	5.81518E-11	0.368*	0*
Nonadecane		0.280899	0.592063	3.22773E-06	0.592063		6.12157E-12	1.20619E-08	2.18765E-08	0*	3.71141E-11	0.305*	0*
Eicosane		0.206299	0.434827	1.36025E-06	0.434827		1.12410E-11	3.48820E-09	1.37418E-08	0*	3.06987E-11	0.224*	0*
Heneicosane		0.151962	0.320296	5.36213E-07	0.320296		1.57867E-11	9.11816E-10	6.15072E-09	0*	2.44805E-11	0.165*	0*
Docosane		0.139989	0.295061	3.22291E-07	0.295061		2.22031E-11	3.89315E-10	3.19742E-09	0*	2.67027E-11	0.152*	0*
Tricosane		0.0911770	0.192178	1.06223E-07	0.192178		1.43965E-11	8.32799E-11	7.43151E-10	0*	1.54293E-11	0.099*	0*
Tetracosane		0.0699945	0.147530	4.61474E-08	0.147530		1.32652E-11	2.43887E-11	2.18882E-10	0*	1.35565E-11	0.076*	0*
Pentacosane		0.0478909	0.100942	1.91344E-08	0.100942		1.03555E-11	7.15337E-12	6.30241E-11	0*	1.04301E-11	0.052*	0*
Hexacosane		0.0460490	0.0970595	1.02459E-08	0.0970595		1.09937E-11	2.51752E-12	2.10035E-11	0*	1.10079E-11	0.05*	0*
Heptacosane		0.0524958	0.110648	5.55341E-09	0.110648		1.41821E-11	8.72296E-13	7.16832E-12	0*	1.41722E-11	0.057*	0*
Octacosane		0.0432860	0.0912359	3.34404E-09	0.0912359		1.23430E-11	3.88228E-13	2.92096E-12	0*	1.23296E-11	0.047*	0*
Nonacosane		0.0101308	0.0213531	5.29670E-10	0.0213531		2.38819E-12	4.53444E-14	3.18385E-13	0*	2.38525E-12	0.011*	0*
Triacontane		0.0101308	0.0213531	3.10185E-10	0.0213531		2.67812E-12	1.81557E-14	1.20591E-13	0*	2.67450E-12	0.011*	0*
Hentriacontane		0.0571007	0.120354	3.05811E-08	0.120354		0	9.66246E-13	0	0*	0	0.062*	0*
Water		0.362777	1.87775E-07	0.0885253	1.87775E-07		99.9970	0.0888709	6.18931	100*	99.8641	0*	0*
Molar Flow		lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h
Nitrogen		0.135233	0	3.50887	0	0	8.37198E-05	28.1863	0.0113007	0*	0.0113844	0.0210203*	3.31552*
Carbon Dioxide		0.647969	4.94563E-08	1.16923	4.94563E-08	0	0.0178571	9.94774	0.0691187	0*	0.0869758	0.0303626*	1.21681*
Methane		72.4454	6.00710E-09	430.497	6.00710E-09	0	0.0313313	3508.75	2.13785	0*	2.16918	8.43769*	418.459*
Ethane		109.757	0.00348584	85.3410	0.00348584	0	0.00705975	783.567	0.353617	0*	0.360677	10.1248*	87.9059*
Propane		123.500	11.0156	30.9029	11.0156	0	0.000780002	348.930	0.0579554	0*	0.0587354	11.9263*	32.1505*
Isobutane		23.5589	8.37183	2.98138	8.37183	0	2.33154E-05	36.6250	0.00268084	0*	0.00270416	2.38697*	2.98620*
n-Butane		85.9417	39.4587	8.30594	39.4587	0	0.000148991	103.402	0.0106463	0*	0.0107953	8.83241*	8.07111*
2,2-Dimethylpropane		0.691724	0.373544	0.0566356	0.373544	0	1.34024E-07	0.693762	2.45287E-05	0*	2.46627E-05	0.119893*	0.00558168*
Isopentane		28.2431	19.3471	1.51182	19.3471	0	7.11650E-06	17.5746	0.000847808	0*	0.000854925	3.10244*	1.18890*
n-Pentane		47.2933	34.8806	2.12798	34.8806	0	2.37509E-06	23.6329	0.000557114	0*	0.000559489	5.19512*	1.57962*
2,2-Dimethylbutane		0.691720	0.567904	0.0224687	0.567904	0	1.07359E-08	0.220202	3.52288E-06	0*	3.53362E-06	0.0739602*	0.0167450*
Cyclopentane		0	0	0	0	0	0	0	0	0*	0	0*	0*
2,3-Dimethylbutane		1.95897	1.68196	0.0526401	1.68196	0	1.08336E-07	0.470430	1.65685E-05	0*	1.66768E-05	0.202417*	0.0446535*
2-Methylpentane		13.3738	11.5923	0.345762	11.5923	0	3.04664E-07	2.99899	6.89391E-05	0*	6.92437E-05	1.43950*	0.234431*
3-Methylpentane		8.20143	7.21740	0.194249	7.21740	0	1.10643E-06	1.61365	9.79884E-05	0*	9.90948E-05	0.878180*	0.133960*
n-Hexane		27.3519	24.6108	0.574712	24.6108	0	2.72050E-07	4.35579	8.01720E-05	0*	8.04440E-05	2.94128*	0.373973*
Methylcyclopentane		3.99634	3.59440	0.0804228	3.59440	0	1.70111E-06	0.636902	8.19657E-05	0*	8.36668E-05	0.445318*	0.0390718*
Benzene		0.422977	0.378294	0.00852753	0.378294	0	0.000449427	0.0707937	0.000302243	0*	0.000751670	0.0459332*	0.00558168*
Cyclohexane		4.40366	4.01831	0.0801773	4.01831	0	6.73102E-06	0.592247	0.000159147	0*	0.000165878	0.482688*	0.0446535*
2-Methylhexane		8.73715	8.28578	0.122930	8.28578	0	3.12291E-08	0.657607	1.08931E-05	0*	1.09244E-05	0.970047*	0.0502351*
3-Methylhexane		7.87266	7.49793	0.103654	7.49793	0	3.44882E-08	0.533616	1.05426E-05	0*	1.05771E-05	0.865724*	0.0502351*
2,2,4-Trimethylpentane		0	0	0	0	0	0	0	0	0*	0	0*	0*
n-Heptane		22.1671	21.3287	0.256985	21.3287	0	3.44676E-08	1.16733	1.56523E-05	0*	1.56868E-05	2.42434*	0.139542*
Methylcyclohexane		9.56351	9.20380	0.101942	9.20380	0	1.10415E-06	0.486602	6.11258E-05	0*	6.22299E-05	1.05413*	0.0502351*
Toluene		1.66676	1.60566	0.0168970	1.60566	0	0.000427634	0.0821519	0.000354997	0*	0.000782631	0.186847*	0.00558168*
n-Octane		34.3988	33.9384	0.207307	33.9384	0	2.75806E-09	0.555842	3.26652E-06	0*	3.26928E-06	3.84593*	0.0781436*
Ethylbenzene		1.54964	1.52930	0.00811143	1.52930	0	0.000103785	0.0240374	0.000109689	0*	0.000213474	0.176726*	0*
1,3-Dimethylbenzene		1.93393	1.91068	0.00957462	1.91068	0	8.17903E-05	0.0272497	0.000108840	0*	0.000190630	0.214874*	0.00558168*
1,4-Dimethylbenzene		0.0694377	0.0685706	0.000354408	0.0685706	0	3.28197E-06	0.00102324	4.15778E-06	0*	7.43975E-06	0.00233559*	0.00558168*
1,2-Dimethylbenzene		2.97220	2.94054	0.0133652	2.94054	0	0.000324432	0.0365586	0.000215497	0*	0.000539928	0.338660*	0*
n-Nonane		20.0397	19.9471	0.0600065	19.9471	0	3.23428E-10	0.100816	4.93911E-07	0*	4.94234E-07	2.26785*	0.0111634*
n-Decane		17.7195	17.6892	0.0295722	17.6892	0	1.05408E-11	0.0318753	5.06020E-08	0*	5.06125E-08	2.01405*	0*
Undecane		13.3997	13.3918	0.0116675	13.3918	0	1.87087E-12	0.00818406	1.10457E-08	0*	1.10476E-08	1.52280*	0*
Dodecane		9.92010	9.91790	0.00457748	9.91790	0	3.27473E-12	0.00222676	7.40304E-09	0*	7.40632E-09	1.12731*	0*
Tridecane		7.71422	7.71358	0.00202145	7.71358	0	5.07723E-12	0.000640181	4.98630E-09	0*	4.99138E-09	0.876623*	0*
Tetradecane		6.15907	6.15888	0.000912793	6.15888	0	8.28760E-12	0.000195854	3.46097E-09	0*	3.46925E-09	0.699897*	0*
Pentadecane		4.94645	4.94640	0.000348079	4.94640	0	2.18599E-11	4.92474E-05	2.84787E-09	0*	2.86973E-09	0.562098*	0*
Hexadecane		3.39127	3.39126	0.000138799	3.39126	0	1.53929E-11	1.33460E-05	1.20434E-09	0*	1.21973E-09	0.385372*	0*
Heptadecane		2.85004	2.85003	7.24516E-05	2.85003	0	2.60255E-11	4.69740E-06	8.86582E-10	0*	9.12608E-10	0.323868*	0*
Octadecane		2.52119	2.52118	3.85261E-05	2.52118	0	1.01856E-10	1.80700E-06	1.05572E-09	0*	1.15758E-09	0.286499*	0*
Nonadecane		2.08957	2.08957	1.83728E-05	2.08957	0	1.21684E-10	5.88659E-07	6.17113E-10	0*	7.38797E-10	0.237451*	0*
Eicosane		1.53464	1.53464	7.74274E-06	1.53464	0	2.23448E-10	1.70235E-07	3.87643E-10	0*	6.11091E-10	0.174390*	0*
Heneicosane		1.13042	1.13042	3.05221E-06	1.13042	0	3.13805E-10	4.44995E-08	1.73506E-10	0*	4.87311E-10	0.128457*	0*
Docosane		1.04136	1.04136	1.83453E-06	1.04136	0	4.41351E-10	1.89998E-08	9.01959E-11	0*	5.31547E-10	0.118336*	0*
Tricosane		0.678254	0.678254	6.04638E-07	0.678254	0	2.86173E-10	4.06432E-09	2.09635E-11	0*	3.07136E-10	0.0770743*	0*
Tetracosane		0.520680	0.520680	2.62679E-07	0.520680	0	2.63683E-10	1.19024E-09	6.17444E-12	0*	2.69858E-10	0.0591682*	0*
Pentacosane		0.356255	0.356255	1.08916E-07	0.356255	0	2.05845E-10	3.49107E-10	1.77785E-12	0*	2.07622E-10	0.0404835*	0*
Hexacosane		0.342553	0.342553	5.83216E-08	0.342553	0	2.18532E-10	1.22863E-10	5.92486E-13	0*	2.19124E-10	0.0389264*	0*
Heptacosane		0.390510	0.390510	3.16109E-08	0.390510	0	2.81911E-10	4.25708E-11	2.02211E-13	0*	2.82113E-10	0.0443761*	0*
Octacosane		0.321999	0.321999	1.90348E-08	0.321999	0	2.45352E-10	1.89468E-11	8.23973E-14	0*	2.45434E-10	0.0365908*	0*
Nonacosane		0.0753616	0.0753616	3.01497E-09	0.0753616	0	4.74721E-11	2.21295E-12	9.98133E-15	0*	4.74811E-11	0.00856381*	0*
Triacontane		0.0753616	0.0753616	1.76562E-09	0.0753616	0	5.32354E-11	8.86055E-13	3.40176E-15	0*	5.32388E-11	0.00856381*	0*
Hentriacontane		0.424765	0.424765	1.74073E-07	0.424765	0	0	4.71559E-11	0	0*	0	0.0482688*	0*
Water		2.69865	6.62716E-07	0.503900	6.62716E-07	0	1987.73	4.33718	0.174594	226.438*	1987.90	0*	0*

Process Streams		Condensate to Stabilizer	Condensate to Tank	Gas to pipeline	HC Liquid	HC Tank Flash	Produced Water	Sales Gas	Water Flash	Water Inlet	Water to Tanks	Well Condensate	Well Gas Inlet
Properties	**Status:**	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Phase: Total	**From Block:**	VLVE-101	Reboiler	VSSL-100	Atmospheric Hydrocarbon Tank	Atmospheric Hydrocarbon Tank	VSSL-103	Sales Gas Mixer	VSSL-103	--	MultiplierMixer-O-4	--	--
	To Block:	XCHG-100	XCHG-100	VLVE-102	--	--	--	--	--	MIX-102	VSSL-103	MIX-102	MIX-102
Property	**Units**												
Temperature	°F	41.3825	199.573	94.9720	61.6803		98.3846	83.1047	98.3846	62.5*	94.9720	62.5*	62.5*
Pressure	psig	50*	43	1194	0	0*	0	373	0*	2300*	1194	2300*	2300*
Molecular Weight	lb/lbmol	72.7647	109.414	21.3198	109.414		18.0156	22.3405	19.5054	18.0153	18.0177	74.9728	21.2859
Mass Density	lb/ft^3	3.26145	39.8346	5.60950	44.1847		61.9696	1.64332	0.0479765	62.4714	61.9792	41.5472	13.3824
Molar Flow	lbmol/h	743.887	352.930	569.216	352.930	0	1987.79	4880.32	2.82090	226.438	1990.61	77.8529	558.168
Mass Flow	lb/h	54128.7	38615.4	12135.6	38615.4	0	35811.2	109029	55.0228	4079.35	35866.2	5836.84	11881.1
Std Vapor Volumetric Flow	MMSCFD	6.77504	3.21435	5.18420	3.21435	0	18.1040	44.4480	0.0256917	2.06231	18.1297	0.709054	5.08358*
Std Liquid Volumetric Flow	sgpm	175.425	109.569	69.9459	109.569	0	71.5927	612.908	0.316273	8.15491*	71.9090	18.7101*	68.7360
Specific Gravity			0.638692	0.736114	0.708441		0.993597	0.771358	0.673468	1.00164	0.993749	0.666151	0.734943
API Gravity			67.9093		68.0073		10.0016			9.72236	10.0802	80.4962	
Mass Fraction		%	%	%	%	%	%	%	%	%	%	%	%
Nitrogen		0.00699877	0	0.809979	0		6.54900E-06	0.724207	0.575346	0*	0.000889184	0.0100885*	0.781738*
Carbon Dioxide		0.0526833	5.63647E-09	0.424019	5.63647E-09		0.00219451	0.401541	5.52840	0*	0.0106723	0.0228933*	0.450725*
Methane		2.14711	2.49560E-10	56.9091	2.49560E-10		0.00140356	51.6275	62.3313	0*	0.0970245	2.31908*	56.5025*
Ethane		6.09708	0.000271435	21.1455	0.000271435		0.000592776	21.6100	19.3246	0*	0.0302379	5.21587*	22.2475*
Propane		10.0608	1.25789	11.2288	1.25789		9.60445E-05	14.1121	4.64458	0*	0.00722121	9.00995*	11.932*
Isobutane		2.52970	1.26009	1.42791	1.26009		3.78414E-06	1.95244	0.283185	0*	0.000438216	2.37690*	1.46085*
n-Butane		9.22823	5.93916	3.97806	5.93916		2.41815E-05	5.51224	1.12460	0*	0.00174941	8.79515*	3.94838*
2,2-Dimethylpropane		0.0922007	0.0697928	0.0336712	0.0697928		2.70018E-08	0.0459090	0.00321633	0*	4.96117E-06	0.148199*	0.00338952*
Isopentane		3.76455	3.61479	0.898813	3.61479		1.43376E-06	1.16299	0.111169	0*	0.000171977	3.83490*	0.721967*
n-Pentane		6.30377	6.51706	1.26513	6.51706		4.78509E-07	1.56389	0.0730517	0*	0.000112547	6.42165*	0.959233*
2,2-Dimethylbutane		0.110125	0.126735	0.0159551	0.126735		2.58346E-09	0.0174045	0.000551745	0*	8.49018E-07	0.109195*	0.0121454*
Cyclopentane		0	0	0	0		0	0	0	0*	0	0*	0*
2,3-Dimethylbutane		0.311877	0.375353	0.0373801	0.375353		2.60697E-08	0.0371824	0.00259492	0*	4.00692E-06	0.298850*	0.0323878*
2-Methylpentane		2.12916	2.58697	0.245528	2.58697		7.33137E-08	0.237037	0.0107971	0*	1.66371E-05	2.12528*	0.170036*
3-Methylpentane		1.30570	1.61066	0.137937	1.61066		2.66249E-07	0.127541	0.0153467	0*	2.38094E-05	1.29655*	0.0971635*
n-Hexane		4.35454	5.49224	0.408107	5.49224		6.54657E-08	0.344277	0.0125564	0*	1.93282E-05	4.34252*	0.271248*
Methylcyclopentane		0.621353	0.783374	0.0557728	0.783374		3.99776E-07	0.0491625	0.0125370	0*	1.96323E-05	0.642090*	0.0276764*
Benzene		0.0610389	0.0765220	0.00548884	0.0765220		9.80296E-05	0.00507189	0.0429073	0*	0.000163704	0.0614703*	0.00366966*
Cyclohexane		0.684682	0.875762	0.0556026	0.875762		1.58185E-06	0.0457156	0.0243422	0*	3.89231E-05	0.695971*	0.0316302*
2-Methylhexane		1.61740	2.15005	0.101502	2.15005		8.73810E-09	0.0604367	0.00198375	0*	3.05202E-06	1.66529*	0.0423670*
3-Methylhexane		1.45737	1.94562	0.0855858	1.94562		9.65002E-09	0.0490414	0.00191992	0*	2.95500E-06	1.48620*	0.0423670*
2,2,4-Trimethylpentane		0	0	0	0		0	0	0	0*	0	0*	0*
n-Heptane		4.10353	5.53452	0.212189	5.53452		9.64425E-09	0.107282	0.00285045	0*	4.38253E-06	4.16190*	0.117686*
Methylcyclohexane		1.73476	2.34022	0.0824786	2.34022		3.02732E-07	0.0438210	0.0109077	0*	1.70358E-05	1.77323*	0.0415146*
Toluene		0.283717	0.383119	0.0128289	0.383119		0.000110026	0.00694252	0.0594460	0*	0.000201054	0.294950*	0.00432862*
n-Octane		7.25922	10.0393	0.195132	10.0393		8.79750E-10	0.0582351	0.000678138	0*	1.04122E-06	7.52659*	0.0751297*
Ethylbenzene		0.303938	0.420449	0.00709609	0.420449		3.07680E-05	0.00234060	0.0211642	0*	6.31890E-05	0.321443*	0*
1,3-Dimethylbenzene		0.379310	0.525303	0.00837613	0.525303		2.42474E-05	0.00265340	0.0210004	0*	5.64271E-05	0.390829*	0.00498758*
1,4-Dimethylbenzene		0.0136191	0.0188521	0.000310045	0.0188521		9.72965E-07	9.96366E-05	0.000802233	0*	2.20219E-06	0.00424814*	0.00498758*
1,2-Dimethylbenzene		0.582950	0.808441	0.0116922	0.808441		9.61802E-05	0.00355983	0.0415796	0*	0.000159820	0.615981*	0*
n-Nonane		4.74829	6.62511	0.0634181	6.62511		1.15833E-10	0.0118594	0.000115128	0*	1.76735E-07	4.98324*	0.0120507*
n-Decane		4.65771	6.51772	0.0346715	6.51772		4.18799E-12	0.00415970	1.30850E-05	0*	2.00781E-08	4.90955*	0*
Undecane		3.86946	5.42075	0.0150279	5.42075		8.16597E-13	0.00117330	3.13786E-06	0*	4.81464E-09	4.07800*	0*
Dodecane		3.12170	4.37484	0.00642496	4.37484		1.55762E-12	0.000347885	2.29177E-06	0*	3.51739E-09	3.28979*	0*
Tridecane		2.62745	3.68270	0.00307095	3.68270		2.61383E-12	0.000108251	1.67073E-06	0*	2.56570E-09	2.76889*	0*
Tetradecane		2.25737	3.16415	0.00149220	3.16415		4.59119E-12	3.56374E-05	1.24787E-06	0*	1.91896E-09	2.37887*	0*
Pentadecane		1.94111	2.72091	0.000609259	2.72091		1.29662E-11	9.59458E-06	1.09942E-06	0*	1.69957E-09	2.04559*	0*
Hexadecane		1.41870	1.98864	0.000258990	1.98864		9.73323E-12	2.77182E-06	4.95635E-07	0*	7.70078E-10	1.49505*	0*
Heptadecane		1.26613	1.77479	0.000143564	1.77479		1.74758E-11	1.03603E-06	3.87466E-07	0*	6.11865E-10	1.33428*	0*
Octadecane		1.18537	1.66158	8.07930E-05	1.66158		7.23845E-11	4.21789E-07	4.88297E-07	0*	8.21376E-10	1.24917*	0*
Nonadecane		1.03659	1.45303	4.06530E-05	1.45303		9.12415E-11	1.44978E-07	3.01162E-07	0*	5.53118E-10	1.09238*	0*
Eicosane		0.801067	1.12289	1.80271E-05	1.12289		1.76299E-10	4.41163E-08	1.99059E-07	0*	4.81407E-10	0.844182*	0*
Heneicosane		0.619365	0.868188	7.45913E-06	0.868188		2.59881E-10	1.21045E-08	9.35199E-08	0*	4.02952E-10	0.652700*	0*
Docosane		0.597552	0.837612	4.69535E-06	0.837612		3.82796E-10	5.41265E-09	5.09151E-08	0*	4.60319E-10	0.629713*	0*
Tricosane		0.406771	0.570187	1.61741E-06	0.570187		2.59415E-10	1.21013E-09	1.23682E-08	0*	2.77991E-10	0.428664*	0*
Tetracosane		0.325761	0.456632	7.33029E-07	0.456632		2.49356E-10	3.69701E-10	3.80024E-09	0*	2.54803E-10	0.343294*	0*
Pentacosane		0.232121	0.325373	3.16528E-07	0.325373		2.02723E-10	1.12927E-10	1.13955E-09	0*	2.04160E-10	0.244614*	0*
Hexacosane		0.232070	0.325301	1.76234E-07	0.325301		2.23777E-10	4.13236E-11	3.94871E-10	0*	2.24039E-10	0.244560*	0*
Heptacosane		0.274679	0.385028	9.91742E-08	0.385028		2.99719E-10	1.48659E-11	1.39921E-10	0*	2.99474E-10	0.289463*	0*
Octacosane		0.234834	0.329176	6.19189E-08	0.329176		2.70460E-10	6.86004E-12	5.91159E-11	0*	2.70136E-10	0.247473*	0*
Nonacosane		0.0569140	0.0797786	1.01559E-08	0.0797786		5.41897E-11	8.29710E-13	6.67280E-12	0*	5.41168E-11	0.0599772*	0*
Triacontane		0.0588669	0.0825160	6.15158E-09	0.0825160		6.28536E-11	3.43612E-13	2.61402E-12	0*	6.27612E-11	0.0620351*	0*
Hentriacontane		0.342802	0.480519	6.26604E-07	0.480519		0	1.88937E-11	0	0*	0	0.361252*	0*
Water		0.0898173	3.09178E-08	0.0748042	3.09178E-08		99.9953	0.0716650	5.71648	100*	99.8507	0*	0*
Mass Flow		lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h
Nitrogen		3.78834	0	98.2954	0	0	0.00234528	789.594	0.316571	0*	0.318916	0.588849*	92.8790*
Carbon Dioxide		28.5168	2.17655E-06	51.4571	2.17655E-06	0	0.785882	437.795	3.04188	0*	3.82776	1.33624*	53.5511*
Methane		1162.20	9.63687E-08	6906.23	9.63687E-08	0	0.502631	56288.9	34.2964	0*	34.7990	135.361*	6713.11*
Ethane		3300.27	0.104816	2566.12	0.104816	0	0.212280	23561.1	10.6329	0*	10.8452	304.442*	2643.25*
Propane		5445.81	485.739	1362.68	485.739	0	0.0343947	15386.3	2.55558	0*	2.58997	525.897*	1417.70*
Isobutane		1369.30	486.589	173.284	486.589	0	0.00135514	2128.73	0.155816	0*	0.157172	138.736*	173.565*
n-Butane		4995.12	2293.43	482.759	2293.43	0	0.00865967	6009.93	0.618786	0*	0.627446	513.359*	469.111*
2,2-Dimethylpropane		49.9071	26.9508	4.08619	26.9508	0	9.66966E-06	50.0541	0.00176971	0*	0.00177938	8.65016*	0.402712*
Isopentane		2037.70	1395.87	109.076	1395.87	0	0.000513447	1267.99	0.0611683	0*	0.0616818	223.837*	85.7776*
n-Pentane		3412.15	2516.59	153.531	2516.59	0	0.000171360	1705.09	0.0401951	0*	0.0403664	374.822*	113.967*
2,2-Dimethylbutane		59.6092	48.9393	1.93625	48.9393	0	9.25168E-07	18.9760	0.000303585	0*	0.000304511	6.37355*	1.44301*
Cyclopentane		0	0	0	0	0	0	0	0	0*	0	0*	0*
2,3-Dimethylbutane		168.815	144.944	4.53628	144.944	0	9.33587E-06	40.5395	0.00142779	0*	0.00143713	17.4434*	3.84803*
2-Methylpentane		1152.49	998.970	29.7962	998.970	0	2.62545E-05	258.439	0.00594085	0*	0.00596710	124.049*	20.2021*
3-Methylpentane		706.761	621.962	16.7395	621.962	0	9.53470E-05	139.056	0.00844419	0*	0.00853953	75.6775*	11.5441*
n-Hexane		2357.06	2120.85	49.5260	2120.85	0	2.34440E-05	375.361	0.00690885	0*	0.00693229	253.466*	32.2272*
Methylcyclopentane		336.330	302.503	6.76834	302.503	0	0.000143165	53.6013	0.00689819	0*	0.00704135	37.4778*	3.28826*
Benzene		33.0395	29.5493	0.666101	29.5493	0	0.0351056	5.52983	0.0236088	0*	0.0587143	3.58793*	0.435996*
Cyclohexane		370.610	338.179	6.74768	338.179	0	0.000566480	49.8432	0.0133938	0*	0.0139602	40.6227*	3.75801*
2-Methylhexane		875.479	830.251	12.3178	830.251	0	3.12922E-06	65.8934	0.00109151	0*	0.00109464	97.2006*	5.03366*
3-Methylhexane		788.856	751.307	10.3863	751.307	0	3.45579E-06	53.4693	0.00105639	0*	0.00105985	86.7472*	5.03366*
2,2,4-Trimethylpentane		0	0	0	0	0	0	0	0	0*	0	0*	0*
n-Heptane		2221.19	2137.18	25.7504	2137.18	0	3.45372E-06	116.968	0.00156839	0*	0.00157185	242.923*	13.9824*
Methylcyclohexane		939.004	903.685	10.0092	903.685	0	0.000108412	47.7775	0.00600170	0*	0.00611011	103.501*	4.93239*
Toluene		153.573	147.943	1.55686	147.943	0	0.0394015	7.56935	0.0327089	0*	0.0721104	17.2158*	0.514287*
n-Octane		3929.32	3876.73	23.6804	3876.73	0	3.15049E-07	63.4930	0.000373130	0*	0.000373445	439.315*	8.92622*
Ethylbenzene		164.518	162.358	0.861150	162.358	0	0.0110184	2.55193	0.0116451	0*	0.0226635	18.7621*	0*
1,3-Dimethylbenzene		205.315	202.848	1.01649	202.848	0	0.00868327	2.89297	0.0115550	0*	0.0202383	22.8121*	0.592579*
1,4-Dimethylbenzene		7.37185	7.27979	0.0376257	7.27979	0	0.000348430	0.108633	0.000441411	0*	0.000789841	0.247957*	0.592579*
1,2-Dimethylbenzene		315.544	312.183	1.41892	312.183	0	0.0344433	3.88125	0.0228782	0*	0.0573215	35.9538*	0*
n-Nonane		2570.19	2558.31	7.69613	2558.31	0	4.14813E-08	12.9302	6.33466E-05	0*	6.33881E-05	290.864*	1.43176*
n-Decane		2521.16	2516.84	4.20758	2516.84	0	1.49977E-09	4.53528	7.19974E-06	0*	7.20123E-06	286.563*	0*
Undecane		2094.49	2093.24	1.82372	2093.24	0	2.92433E-10	1.27924	1.72653E-06	0*	1.72683E-06	238.027*	0*
Dodecane		1689.74	1689.36	0.779704	1689.36	0	5.57801E-10	0.379295	1.26100E-06	0*	1.26155E-06	192.020*	0*
Tridecane		1422.20	1422.09	0.372677	1422.09	0	9.36044E-10	0.118025	9.19285E-07	0*	9.20218E-07	161.615*	0*
Tetradecane		1221.89	1221.85	0.181087	1221.85	0	1.64416E-09	0.0388550	6.86614E-07	0*	6.88258E-07	138.851*	0*
Pentadecane		1050.70	1050.69	0.0739370	1050.69	0	4.64336E-09	0.0104609	6.04929E-07	0*	6.09573E-07	119.398*	0*
Hexadecane		767.923	767.920	0.0314298	767.920	0	3.48558E-09	0.00302208	2.72712E-07	0*	2.76198E-07	87.2640*	0*
Heptadecane		685.342	685.341	0.0174223	685.341	0	6.25830E-09	0.00112957	2.13194E-07	0*	2.19453E-07	77.8798*	0*
Octadecane		641.628	641.627	0.00980468	641.627	0	2.59217E-08	0.000459872	2.68675E-07	0*	2.94596E-07	72.9122*	0*
Nonadecane		561.093	561.093	0.00493347	561.093	0	3.26746E-08	0.000158067	1.65708E-07	0*	1.98382E-07	63.7606*	0*
Eicosane		433.607	433.607	0.00218769	433.607	0	6.31347E-08	4.80995E-05	1.09528E-07	0*	1.72662E-07	49.2736*	0*
Heneicosane		335.254	335.254	0.000905207	335.254	0	9.30665E-08	1.31974E-05	5.14572E-08	0*	1.44524E-07	38.0971*	0*
Docosane		323.447	323.447	0.000569807	323.447	0	1.37084E-07	5.90135E-06	2.80149E-08	0*	1.65099E-07	36.7553*	0*
Tricosane		220.180	220.180	0.000196282	220.180	0	9.28995E-08	1.31939E-06	6.80533E-09	0*	9.97048E-08	25.0204*	0*
Tetracosane		176.330	176.330	8.89572E-05	176.330	0	8.92973E-08	4.03081E-07	2.09100E-09	0*	9.13883E-08	20.0375*	0*
Pentacosane		125.644	125.644	3.84125E-05	125.644	0	7.25973E-08	1.23123E-07	6.27012E-10	0*	7.32243E-08	14.2777*	0*
Hexacosane		125.616	125.616	2.13869E-05	125.616	0	8.01372E-08	4.50546E-08	2.17269E-10	0*	8.03544E-08	14.2746*	0*
Heptacosane		148.680	148.680	1.20353E-05	148.680	0	1.07333E-07	1.62081E-08	7.69885E-11	0*	1.07410E-07	16.8955*	0*
Octacosane		127.113	127.113	7.51420E-06	127.113	0	9.68551E-08	7.47943E-09	3.25272E-11	0*	9.68876E-08	14.4446*	0*
Nonacosane		30.8068	30.8068	1.23248E-06	30.8068	0	1.94060E-08	9.04624E-10	3.67145E-12	0*	1.94096E-08	3.50077*	0*
Triacontane		31.8639	31.8639	7.46528E-07	31.8639	0	2.25086E-08	3.74636E-10	1.43831E-12	0*	2.25101E-08	3.62089*	0*
Hentriacontane		185.554	185.554	7.60419E-05	185.554	0	0	2.05996E-08	0	0*	0	21.0857*	0*
Water		48.6170	1.19390E-05	9.07791	1.19390E-05	0	35809.5	78.1355	3.14536	4079.35*	35812.6	0*	0*

Environments Report

Client Name:	Marcellus Wells	**Job:**	0
Location:	0		
Flowsheet:	Exercise 7		

Project-Wide Constants

Atmospheric Pressure	14.6959 psia	Ideal Gas Reference Volume	379.484 ft^3/lbmol
Ideal Gas Reference Pressure	14.6959 psia	Liquid Reference Temperature	60 °F
Ideal Gas Reference Temperature	60 °F		

Environment1

Environment Settings

Number of Poynting Intervals	0	Phase Tolerance	1 %
Gibbs Excess Model Evaluation Temperature	77 °F	Emulsion Enabled	FALSE
Freeze Out Temperature Threshold Difference	10 °F		

Components

Component	Henry's Law Comp.	Phase Initiator	Component	Henry's Law Comp.	Phase Initiator
Nitrogen	FALSE	FALSE	Carbon Dioxide	FALSE	FALSE
Methane	FALSE	FALSE	Ethane	FALSE	FALSE
Propane	FALSE	FALSE	Isobutane	FALSE	FALSE
n-Butane	FALSE	FALSE	2,2-Dimethylpropane	FALSE	FALSE
Isopentane	FALSE	FALSE	n-Pentane	FALSE	FALSE
2,2-Dimethylbutane	FALSE	FALSE	Cyclopentane	FALSE	FALSE
2,3-Dimethylbutane	FALSE	FALSE	2-Methylpentane	FALSE	FALSE
3-Methylpentane	FALSE	FALSE	n-Hexane	FALSE	FALSE
Methylcyclopentane	FALSE	FALSE	Benzene	FALSE	FALSE
Cyclohexane	FALSE	FALSE	2-Methylhexane	FALSE	FALSE
3-Methylhexane	FALSE	FALSE	2,2,4-Trimethylpentane	FALSE	FALSE
n-Heptane	FALSE	FALSE	Methylcyclohexane	FALSE	FALSE
Toluene	FALSE	FALSE	n-Octane	FALSE	FALSE
Ethylbenzene	FALSE	FALSE	1,3-Dimethylbenzene	FALSE	FALSE
1,4-Dimethylbenzene	FALSE	FALSE	1,2-Dimethylbenzene	FALSE	FALSE
n-Nonane	FALSE	FALSE	n-Decane	FALSE	FALSE
Undecane	FALSE	FALSE	Dodecane	FALSE	FALSE
Tridecane	FALSE	FALSE	Tetradecane	FALSE	FALSE
Pentadecane	FALSE	FALSE	Hexadecane	FALSE	FALSE
Heptadecane	FALSE	FALSE	Octadecane	FALSE	FALSE
Nonadecane	FALSE	FALSE	Eicosane	FALSE	FALSE
Heneicosane	FALSE	FALSE	Docosane	FALSE	FALSE
Tricosane	FALSE	FALSE	Tetracosane	FALSE	FALSE
Pentacosane	FALSE	FALSE	Hexacosane	FALSE	FALSE
Heptacosane	FALSE	FALSE	Octacosane	FALSE	FALSE
Nonacosane	FALSE	FALSE	Triacontane	FALSE	FALSE
Hentriacontane	FALSE	FALSE	Water	FALSE	TRUE

Physical Property Method Sets

Liquid Molar Volume	COSTALD	Vapor Package	SRK
Overall Package	SRK	Light Liquid Package	SRK
Stability Calculation	SRK	Heavy Liquid Package	SRK

Notes:

Well Site Environment

Environment Settings

Number of Poynting Intervals	0	Phase Tolerance	1 %
Gibbs Excess Model Evaluation Temperature	77 °F	Emulsion Enabled	FALSE
Freeze Out Temperature Threshold Difference	10 °F		

Components

Component	Henry's Law Comp.	Phase Initiator	Component	Henry's Law Comp.	Phase Initiator
Methane	FALSE	FALSE	Ethane	FALSE	FALSE
Propane	FALSE	FALSE	Isobutane	FALSE	FALSE
n-Butane	FALSE	FALSE	Isopentane	FALSE	FALSE
n-Pentane	FALSE	FALSE	n-Hexane	FALSE	FALSE
n-Heptane	FALSE	FALSE	n-Octane	FALSE	FALSE
n-Nonane	FALSE	FALSE	Benzene	FALSE	FALSE
Toluene	FALSE	FALSE	Ethylbenzene	FALSE	FALSE
1,3-Dimethylbenzene	FALSE	FALSE	Water	FALSE	TRUE

Physical Property Method Sets

Liquid Molar Volume	COSTALD	Vapor Package	Peng-Robinson
Overall Package	Peng-Robinson	Light Liquid Package	Peng-Robinson
Stability Calculation	Peng-Robinson	Heavy Liquid Package	Peng-Robinson

Notes:

Calculators Report

Client Name:	Marcellus Wells	**Job:**	0
Location:	0		
Flowsheet:	Exercise 7		

Minimum End Approach Temperature Solver

Source Code

Residual Error (for CV1) = MEAT/20-1

Calculated Variable [CV1]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!19!Phases!Total!Properties!Temperature
Value	107.356
Units	°F

Measured Variable [MEAT]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!Blocks!XCHG-100!QManager!Properties!Minimum End Approach Temperature
Value	19.9998
Units	°F

Solver Properties

Status: **Solved**

Error	-1.24507E-05	Iterations	1
Calculated Value	107.356 °F	Max Iterations	50*
Lower Bound	°F	Weighting	1*
Upper Bound	°F	Priority	0
Step Size	°F	Solver Active	Active
Is Minimizer	FALSE	Group	
Algorithm	Default	Skip Dependency Check	FALSE

Notes:

Mult{A20136B5-E985-4EF1-B0C8-00B83634AD77}-Flow

Source Code

```
CV1 = // Deletion and/or renaming of related constants and shapes can prevent this calculator from functioning.
// Additional measured variables may be required to establish the correct dependencies for this calculator.
GetObject("ProMax:ProMax").VisioApp.Documents("ProMax Property Stencil.vss").ExecuteLine('ForceUpdate("{A20136B5-E985-4EF1-B0C8-00B83634AD77}")');
GetObject("ProMax:ProMax").Project.VisioDocument.Pages.ItemFromID(0).Shapes("{A20136B5-E985-4EF1-B0C8-00B83634AD77}").CellsU("User.Var_OutletMolarFlow_V").ResultIU
// This script was programmatically generated.  GUID={A20136B5-E985-4EF1-B0C8-00B83634AD77}
```

Calculated Variable [CV1]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!MultiplierOutlet-4!Phases!Total!Properties!Molar Flow
Value	250.812
Units	mol/s

Measured Variable [MV1]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!MultiplierBypass-4!Phases!Total!Properties!Gibbs Free Energy
Value	0
Units	Btu/h

Measured Variable [MV2]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!MultiplierInlet-4!Phases!Total!Properties!Gibbs Free Energy
Value	-3.28377E+07
Units	Btu/h

Measured Variable [MV3]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!MultiplierInlet-4!Phases!Total!Properties!Molar Flow
Value	248.826
Units	lbmol/h

Measured Variable [MV4]

SourceMoniker	ProMax:ProMax!Project!User Value Sets!Inline Flow Multiplier.57!BlockReady!Properties!Parameter
Value	1
Units	

Notes:

Mult{A20136B5-E985-4EF1-B0C8-00B83634AD77}-H

Source Code

```
CV1 = Hin
// This script was programmatically generated.  GUID={A20136B5-E985-4EF1-B0C8-00B83634AD77}
```

Calculated Variable [CV1]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!MultiplierOutlet-4!Phases!Total!Properties!Mass Enthalpy
Value	-1.57958E+07
Units	J/kg

Measured Variable [MV1]

SourceMoniker	ProMax:ProMax!Project!User Value Sets!Inline Flow Multiplier.57!BlockReady!Properties!Parameter
Value	1
Units	

Measured Variable [Hin]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!MultiplierInlet-4!Phases!Total!Properties!Mass Enthalpy
Value	-1.57958E+07
Units	J/kg

Notes:

Mult{A20136B5-E985-4EF1-B0C8-00B83634AD77}-P

Source Code

```
CV1 = Pin
// This script was programmatically generated.  GUID={A20136B5-E985-4EF1-B0C8-00B83634AD77}
```

Calculated Variable [CV1]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!MultiplierOutlet-4!Phases!Total!Properties!Pressure
Value	8.33367E+06
Units	Pa

Measured Variable [Pin]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!MultiplierInlet-4!Phases!Total!Properties!Pressure
Value	8.33367E+06
Units	Pa

Measured Variable [MV1]

SourceMoniker	ProMax:ProMax!Project!User Value Sets!Inline Flow Multiplier.57!BlockReady!Properties!Parameter
Value	1
Units	

Notes:

Mult{EF10D7E6-042B-478B-8AF2-EB3FA56F5746}-Flow

Source Code

```
CV1 = // Deletion and/or renaming of related constants and shapes can prevent this calculator from functioning.
// Additional measured variables may be required to establish the correct dependencies for this calculator.
GetObject("ProMax:ProMax").VisioApp.Documents("ProMax Property Stencil.vss").ExecuteLine('ForceUpdate("{EF10D7E6-042B-478B-8AF2-EB3FA56F5746}")');
GetObject("ProMax:ProMax").Project.VisioDocument.Pages.ItemFromID(0).Shapes("{EF10D7E6-042B-478B-8AF2-EB3FA56F5746}").CellsU("User.Var_OutletMolarFlow_V").ResultIU
// This script was programmatically generated.  GUID={EF10D7E6-042B-478B-8AF2-EB3FA56F5746}
```

Calculated Variable [CV1]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!MultiplierOutlet-3!Phases!Total!Properties!Molar Flow
Value	119.535
Units	mol/s

Measured Variable [MV1]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!MultiplierInlet-3!Phases!Total!Properties!Gibbs Free Energy
Value	-6.95958E+07
Units	Btu/h

Measured Variable [MV2]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!MultiplierBypass-3!Phases!Total!Properties!Gibbs Free Energy
Value	0
Units	Btu/h

Measured Variable [MV3]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!MultiplierInlet-3!Phases!Total!Properties!Molar Flow
Value	862.459
Units	lbmol/h

Notes:

Mult{EF10D7E6-042B-478B-8AF2-EB3FA56F5746}-H

Source Code

```
CV1 = Hin
// This script was programmatically generated.  GUID={EF10D7E6-042B-478B-8AF2-EB3FA56F5746}
```

Calculated Variable [CV1]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!MultiplierOutlet-3!Phases!Total!Properties!Mass Enthalpy
Value	-5.77589E+06
Units	J/kg

Measured Variable [Hin]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!MultiplierInlet-3!Phases!Total!Properties!Mass Enthalpy
Value	-5.77589E+06
Units	J/kg

Notes:

Mult{EF10D7E6-042B-478B-8AF2-EB3FA56F5746}-P

Source Code

```
CV1 = Pin
// This script was programmatically generated.  GUID={EF10D7E6-042B-478B-8AF2-EB3FA56F5746}
```

Calculated Variable [CV1]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!MultiplierOutlet-3!Phases!Total!Properties!Pressure
Value	1.59593E+07
Units	Pa

Measured Variable [Pin]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!MultiplierInlet-3!Phases!Total!Properties!Pressure
Value	1.59593E+07
Units	Pa

Notes:

Mult{2D476221-4F9C-4925-9E51-4D5375038608}-Flow

Source Code

```
CV1 = // Deletion and/or renaming of related constants and shapes can prevent this calculator from functioning.
// Additional measured variables may be required to establish the correct dependencies for this calculator.
GetObject("ProMax:ProMax").VisioApp.Documents("ProMax Property Stencil.vss").ExecuteLine('ForceUpdate("{2D476221-4F9C-4925-9E51-4D5375038608}")');
GetObject("ProMax:ProMax").Project.VisioDocument.Pages.ItemFromID(0).Shapes("{2D476221-4F9C-4925-9E51-4D5375038608}").CellsU("User.Var_OutletMolarFlow_V").ResultIU
// This script was programmatically generated.  GUID={2D476221-4F9C-4925-9E51-4D5375038608}
```

Calculated Variable [CV1]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!MultiplierOutlet-1!Phases!Total!Properties!Molar Flow
Value	131.706
Units	mol/s

Measured Variable [MV1]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!MultiplierInlet-1!Phases!Total!Properties!Gibbs Free Energy
Value	-1.21886E+07
Units	Btu/h

Measured Variable [MV2]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!MultiplierBypass-1!Phases!Total!Properties!Gibbs Free Energy
Value	0
Units	Btu/h

Measured Variable [MV3]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!MultiplierInlet-1!Phases!Total!Properties!Molar Flow
Value	130.663
Units	lbmol/h

Notes:

Mult{2D476221-4F9C-4925-9E51-4D5375038608}-H

Source Code

```
CV1 = Hin
// This script was programmatically generated.  GUID={2D476221-4F9C-4925-9E51-4D5375038608}
```

Calculated Variable [CV1]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!MultiplierOutlet-1!Phases!Total!Properties!Mass Enthalpy
Value	-2.53477E+06
Units	J/kg

Measured Variable [Hin]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!MultiplierInlet-1!Phases!Total!Properties!Mass Enthalpy
Value	-2.53477E+06
Units	J/kg

Notes:

Mult{2D476221-4F9C-4925-9E51-4D5375038608}-P

Source Code

```
CV1 = Pin
// This script was programmatically generated.  GUID={2D476221-4F9C-4925-9E51-4D5375038608}
```

Calculated Variable [CV1]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!MultiplierOutlet-1!Phases!Total!Properties!Pressure
Value	2.67307E+06
Units	Pa

Measured Variable [Pin]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!MultiplierInlet-1!Phases!Total!Properties!Pressure
Value	2.67307E+06
Units	Pa

Notes:

Mult{2216A14C-4661-4738-AEFA-53A7EB9C6107}-Flow

Source Code

```
CV1 = // Deletion and/or renaming of related constants and shapes can prevent this calculator from functioning.
// Additional measured variables may be required to establish the correct dependencies for this calculator.
GetObject("ProMax:ProMax").VisioApp.Documents("ProMax Property Stencil.vss").ExecuteLine('ForceUpdate("{2216A14C-4661-4738-AEFA-53A7EB9C6107}")');
GetObject("ProMax:ProMax").Project.VisioDocument.Pages.ItemFromID(0).Shapes("{2216A14C-4661-4738-AEFA-53A7EB9C6107}").CellsU("User.Var_OutletMolarFlow_V").ResultIU
// This script was programmatically generated.  GUID={2216A14C-4661-4738-AEFA-53A7EB9C6107}
```

Calculated Variable [CV1]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!MultiplierOutlet-2!Phases!Total!Properties!Molar Flow
Value	573.760
Units	mol/s

Measured Variable [MV1]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!MultiplierInlet-2!Phases!Total!Properties!Gibbs Free Energy
Value	-3.19949E+07
Units	Btu/h

Measured Variable [MV2]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!MultiplierBypass-2!Phases!Total!Properties!Gibbs Free Energy
Value	0
Units	Btu/h

Measured Variable [MV3]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!MultiplierInlet-2!Phases!Total!Properties!Molar Flow
Value	569.216
Units	lbmol/h

Notes:

Mult{2216A14C-4661-4738-AEFA-53A7EB9C6107}-H

Source Code

CV1 = Hin
// This script was programmatically generated. GUID={2216A14C-4661-4738-AEFA-53A7EB9C6107}

Calculated Variable [CV1]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!MultiplierOutlet-2!Phases!Total!Properties!Mass Enthalpy
Value	-3.84205E+06
Units	J/kg

Measured Variable [Hin]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!MultiplierInlet-2!Phases!Total!Properties!Mass Enthalpy
Value	-3.84205E+06
Units	J/kg

Notes:

Mult{2216A14C-4661-4738-AEFA-53A7EB9C6107}-P

Source Code

CV1 = Pin
// This script was programmatically generated. GUID={2216A14C-4661-4738-AEFA-53A7EB9C6107}

Calculated Variable [CV1]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!MultiplierOutlet-2!Phases!Total!Properties!Pressure
Value	2.68686E+06
Units	Pa

Measured Variable [Pin]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!MultiplierInlet-2!Phases!Total!Properties!Pressure
Value	2.68686E+06
Units	Pa

Notes:

Simple Solver 1

Source Code

Residual Error (for CV1) = Solidformation/10-1

Calculated Variable [CV1]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!10!Phases!Total!Properties!Temperature
Value	99.3745
Units	°F

Measured Variable [Solidformation]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!13!Analyses!Freeze 1!Properties!Degrees above Solids Formation
Value	9.99984
Units	°F

Solver Properties

Status: **Solved**

Error	-1.64286E-05		Iterations	1
Calculated Value	99.3745	°F	Max Iterations	20
Lower Bound		°F	Weighting	1
Upper Bound		°F	Priority	0
Step Size		°F	Solver Active	Active
Is Minimizer	FALSE		Group	
Algorithm	Default		Skip Dependency Check	FALSE

Notes:

Simple Specifier 1

Source Code

CV1 = P2

Calculated Variable [CV1]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!3!Phases!Total!Properties!Pressure
Value	373
Units	psig

Measured Variable [P2]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!5!Phases!Total!Properties!Pressure
Value	373
Units	psig

Notes:

Simple Specifier 2

Source Code

CV1 = P

Calculated Variable [CV1]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!14!Phases!Total!Properties!Pressure
Value	373
Units	psig

Measured Variable [P]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!2!Phases!Total!Properties!Pressure
Value	373
Units	psig

Notes:

Simple Specifier 6

Source Code

```
CV1 = if(P10 > 1199)
1200
else
P10
```

Calculated Variable [CV1]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!13!Phases!Total!Properties!Pressure
Value	1200
Units	psig

Measured Variable [Pwell]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!8!Phases!Total!Properties!Pressure
Value	2300
Units	psig

Measured Variable [P10]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Exercise 7!PStreams!10!Phases!Total!Properties!Pressure
Value	2295
Units	psig

Notes:

User Value Sets Report

Client Name:	Marcellus Wells	**Job:**	0
Location:	0		
Flowsheet:	Exercise 7		

User Value Set 1

User Value [Sales Gas Flow]

Parameter	61*	MMSCFD	Upper Bour		MMSCFD
Lower Bound		MMSCFD	Enforce Bo	FALSE	

User Value [Condensate flow]

Parameter	145.833*	sgpm	Upper Bour		sgpm
Lower Bound		sgpm	Enforce Bo	FALSE	

Notes:

MULT-1

User Value [FlowMultiplier]

Parameter	8*		Upper Bour	
Lower Bound	0*		Enforce Bo	FALSE

User Value [OutletMolarFlow]

Parameter	131.706*	mol/s	Upper Bour		mol/s
Lower Bound		mol/s	Enforce Bo	FALSE	

User Value [BlockReady]

Parameter	1*		Upper Bour	
Lower Bound			Enforce Bo	FALSE

Notes:
This User Value Set was programmatically generated. GUID={2D476221-4F9C-4925-9E51-4D5375038608}

Inline Flow Multiplier

User Value [BlockReady]

Parameter	1*		Upper Bour	
Lower Bound			Enforce Bo	FALSE

Notes:
This User Value Set was programmatically generated. GUID={2D476221-4F9C-4925-9E51-4D5375038608}

MULT-2

User Value [FlowMultiplier]

Parameter	8*		Upper Bour	
Lower Bound	0*		Enforce Bo	FALSE

User Value [OutletMolarFlow]

Parameter	573.760*	mol/s	Upper Bour		mol/s
Lower Bound		mol/s	Enforce Bo	FALSE	

User Value [BlockReady]

Parameter	1*		Upper Bour	
Lower Bound			Enforce Bo	FALSE

Notes:
This User Value Set was programmatically generated. GUID={2216A14C-4661-4738-AEFA-53A7EB9C6107}

User Value Set 2

User Value [BlockReady]

Parameter	1*	Upper Bour	
Lower Bound		Enforce Bo	FALSE

Notes:
This User Value Set was programmatically generated. GUID={2216A14C-4661-4738-AEFA-53A7EB9C6107}

MULT-3

User Value [FlowMultiplier]

Parameter	1.1*	Upper Bour	
Lower Bound	0*	Enforce Bo	FALSE

User Value [OutletMolarFlow]

Parameter	119.535*	mol/s	Upper Bour		mol/s
Lower Bound		mol/s	Enforce Bo	FALSE	

User Value [BlockReady]

Parameter	1*	Upper Bour	
Lower Bound		Enforce Bo	FALSE

Notes:
This User Value Set was programmatically generated. GUID={EF10D7E6-042B-478B-8AF2-EB3FA56F5746}

User Value Set 3

User Value [BlockReady]

Parameter	1*	Upper Bour	
Lower Bound		Enforce Bo	FALSE

Notes:
This User Value Set was programmatically generated. GUID={EF10D7E6-042B-478B-8AF2-EB3FA56F5746}

MULT-4

User Value [FlowMultiplier]

Parameter	8*	Upper Bour	
Lower Bound	0*	Enforce Bo	FALSE

User Value [OutletMolarFlow]

Parameter	250.812*	mol/s	Upper Bour		mol/s
Lower Bound		mol/s	Enforce Bo	FALSE	

User Value [BlockReady]

Parameter	1*	Upper Bour	
Lower Bound		Enforce Bo	FALSE

Notes:
This User Value Set was programmatically generated. GUID={A20136B5-E985-4EF1-B0C8-00B83634AD77}

Inline Flow Multiplier.57

User Value [BlockReady]

Parameter	1*	Upper Bour	
Lower Bound		Enforce Bo	FALSE

Notes:
This User Value Set was programmatically generated. GUID={A20136B5-E985-4EF1-B0C8-00B83634AD77}

Sum Component Flow/Frac.60

User Value [CompSum]

Parameter	15.7226*	ton/yr	Upper Bour		ton/yr
Lower Bound		ton/yr	Enforce Bo	FALSE	

Notes:
This User Value Set was programmatically generated. GUID={0C154D43-FFCF-46F5-A6D1-C13963CE8BCE}

Tank-1

User Value [BlockReady]

Parameter	1*		Upper Bour		
Lower Bound			Enforce Bo	FALSE	

User Value [ShellLength]

Parameter	25*	ft	Upper Bour		ft
Lower Bound	0*	ft	Enforce Bo	FALSE	

User Value [ShellDiam]

Parameter	12*	ft	Upper Bour		ft
Lower Bound	0*	ft	Enforce Bo	FALSE	

User Value [BreatherVP]

Parameter	0.0300000*	psig	Upper Bour		psig
Lower Bound		psig	Enforce Bo	FALSE	

User Value [BreatherVacP]

Parameter	-0.0300000*	psig	Upper Bour		psig
Lower Bound		psig	Enforce Bo	FALSE	

User Value [DomeRadius]

Parameter	6*	ft	Upper Bour		ft
Lower Bound		ft	Enforce Bo	FALSE	

User Value [OpPress]

Parameter	0*	psig	Upper Bour		psig
Lower Bound		psig	Enforce Bo	FALSE	

User Value [AvgPercentLiq]

Parameter	50*	%	Upper Bour		%
Lower Bound		%	Enforce Bo	FALSE	

User Value [MaxPercentLiq]

Parameter	90*	%	Upper Bour		%
Lower Bound		%	Enforce Bo	FALSE	

User Value [AnnNetTP]

Parameter	2451.60*	bbl/day	Upper Bour		bbl/day
Lower Bound	0*	bbl/day	Enforce Bo	FALSE	

User Value [OREff]

Parameter	0*	%	Upper Bour		%
Lower Bound		%	Enforce Bo	FALSE	

User Value [MaxAvgT]

Parameter	61.15*	°F	Upper Bour		°F
Lower Bound		°F	Enforce Bo	FALSE	

User Value [MinAvgT]

Parameter	36.9667*	°F	Upper Bour		°F
Lower Bound		°F	Enforce Bo	FALSE	

User Value [BulkLiqT]				
Parameter	49.0783*	°F	Upper Bour	°F
Lower Bound		°F	Enforce Bo	FALSE

User Value [AvgP]				
Parameter	13.7315*	psia	Upper Bour	psia
Lower Bound		psia	Enforce Bo	FALSE

User Value [ThermI]				
Parameter	1193.89*	Btu/ft^2/day	Upper Bour	Btu/ft^2/day
Lower Bound		Btu/ft^2/day	Enforce Bo	FALSE

User Value [AvgWindSpeed]				
Parameter	6.16667*	mi/h	Upper Bour	mi/h
Lower Bound		mi/h	Enforce Bo	FALSE

User Value [MaxHourlyLoadingRate]				
Parameter	102.150*	bbl/hr	Upper Bour	bbl/hr
Lower Bound	0*	bbl/hr	Enforce Bo	FALSE

User Value [EntrainedOilFrac]				
Parameter	1*	%	Upper Bour	%
Lower Bound		%	Enforce Bo	FALSE

User Value [TurnoverRate]				
Parameter	493.538*		Upper Bour	
Lower Bound			Enforce Bo	FALSE

User Value [LLossSatFactor]				
Parameter	0.5*		Upper Bour	
Lower Bound			Enforce Bo	FALSE

User Value [AtmPressure]				
Parameter	13.7315*	psia	Upper Bour	psia
Lower Bound		psia	Enforce Bo	FALSE

User Value [TVP]				
Parameter	0.200593*	psia	Upper Bour	psia
Lower Bound		psia	Enforce Bo	FALSE

User Value [MaxVP]				
Parameter	0.244266*	psia	Upper Bour	psia
Lower Bound		psia	Enforce Bo	FALSE

User Value [MinVP]				
Parameter	0.164361*	psia	Upper Bour	psia
Lower Bound		psia	Enforce Bo	FALSE

User Value [AvgLiqSurfaceT]				
Parameter	50.6729*	°F	Upper Bour	°F
Lower Bound		°F	Enforce Bo	FALSE

User Value [MaxLiqSurfaceT]				
Parameter	56.4466*	°F	Upper Bour	°F
Lower Bound		°F	Enforce Bo	FALSE

User Value [TotalLosses]				
Parameter	0.000151671*	ton/yr	Upper Bour	ton/yr
Lower Bound		ton/yr	Enforce Bo	FALSE

User Value [WorkingLosses]

Parameter	3.35690E-05*	ton/yr	Upper Bour		ton/yr
Lower Bound		ton/yr	Enforce Bo	FALSE	

User Value [StandingLosses]

Parameter	4.34873E-06*	ton/yr	Upper Bour		ton/yr
Lower Bound		ton/yr	Enforce Bo	FALSE	

User Value [RimSealLosses]

Parameter	0*	ton/yr	Upper Bour		ton/yr
Lower Bound		ton/yr	Enforce Bo	FALSE	

User Value [WithdrawalLoss]

Parameter	0*	ton/yr	Upper Bour		ton/yr
Lower Bound		ton/yr	Enforce Bo	FALSE	

User Value [LoadingLosses]

Parameter	0.000403573*	ton/yr	Upper Bour		ton/yr
Lower Bound		ton/yr	Enforce Bo	FALSE	

User Value [MaxHourlyLoadingLoss]

Parameter	9.21400E-05*	lb/hr	Upper Bour		lb/hr
Lower Bound		lb/hr	Enforce Bo	FALSE	

User Value [PStar]

Parameter			Upper Bour		
Lower Bound			Enforce Bo	FALSE	

User Value [AllCTotalLosses]

Parameter	0.324765*	ton/yr	Upper Bour		ton/yr
Lower Bound		ton/yr	Enforce Bo	FALSE	

User Value [AllCLoadingLosses]

Parameter	0.864149*	ton/yr	Upper Bour		ton/yr
Lower Bound		ton/yr	Enforce Bo	FALSE	

User Value [AllCMaxHLoadingLoss]

Parameter	0.197294*	lb/hr	Upper Bour		lb/hr
Lower Bound		lb/hr	Enforce Bo	FALSE	

User Value [AllCFlashingLosses]

Parameter	0*	ton/yr	Upper Bour		ton/yr
Lower Bound		ton/yr	Enforce Bo	FALSE	

User Value [DeckFittingLosses]

Parameter	0*	ton/yr	Upper Bour		ton/yr
Lower Bound		ton/yr	Enforce Bo	FALSE	

User Value [DeckSeamLosses]

Parameter	0*	ton/yr	Upper Bour		ton/yr
Lower Bound		ton/yr	Enforce Bo	FALSE	

User Value [FlashingLosses]

Parameter	0*	ton/yr	Upper Bour		ton/yr
Lower Bound		ton/yr	Enforce Bo	FALSE	

User Value [TotalResidual]

Parameter	156853*	ton/yr	Upper Bour		ton/yr
Lower Bound		ton/yr	Enforce Bo	FALSE	

User Value [GasMoleWeight]

Parameter	0.0187796*	kg/mol	Upper Bour		kg/mol
Lower Bound		kg/mol	Enforce Bo	FALSE	

User Value [VapReportableFrac]				
Parameter	0.0467018*	%	Upper Bour	%
Lower Bound		%	Enforce Bo	FALSE

User Value [LiqReportableFrac]				
Parameter	0.000488923*	%	Upper Bour	%
Lower Bound		%	Enforce Bo	FALSE

User Value [FlashReportableFrac]				
Parameter	0*	%	Upper Bour	%
Lower Bound		%	Enforce Bo	FALSE

Notes:
This User Value Set was programmatically generated. GUID={744688F4-185F-42D0-AD26-A863FCC873B5}

Tank-2

User Value [BlockReady]				
Parameter	1*		Upper Bour	
Lower Bound			Enforce Bo	FALSE

User Value [ShellLength]				
Parameter	20*	ft	Upper Bour	ft
Lower Bound	0*	ft	Enforce Bo	FALSE

User Value [ShellDiam]				
Parameter	12*	ft	Upper Bour	ft
Lower Bound	0*	ft	Enforce Bo	FALSE

User Value [BreatherVP]				
Parameter	0.0300000*	psig	Upper Bour	psig
Lower Bound		psig	Enforce Bo	FALSE

User Value [BreatherVacP]				
Parameter	-0.0300000*	psig	Upper Bour	psig
Lower Bound		psig	Enforce Bo	FALSE

User Value [DomeRadius]				
Parameter	6*	ft	Upper Bour	ft
Lower Bound		ft	Enforce Bo	FALSE

User Value [OpPress]				
Parameter	0*	psig	Upper Bour	psig
Lower Bound		psig	Enforce Bo	FALSE

User Value [AvgPercentLiq]				
Parameter	50*	%	Upper Bour	%
Lower Bound		%	Enforce Bo	FALSE

User Value [MaxPercentLiq]				
Parameter	90*	%	Upper Bour	%
Lower Bound		%	Enforce Bo	FALSE

User Value [AnnNetTP]				
Parameter	3708.26*	bbl/day	Upper Bour	bbl/day
Lower Bound	0*	bbl/day	Enforce Bo	FALSE

User Value [OREff]				
Parameter	0*	%	Upper Bour	%
Lower Bound		%	Enforce Bo	FALSE

User Value [MaxAvgT]					
Parameter	61.15*	°F	Upper Bour		°F
Lower Bound		°F	Enforce Bo	FALSE	
User Value [MinAvgT]					
Parameter	36.9667*	°F	Upper Bour		°F
Lower Bound		°F	Enforce Bo	FALSE	
User Value [BulkLiqT]					
Parameter	49.0783*	°F	Upper Bour		°F
Lower Bound		°F	Enforce Bo	FALSE	
User Value [AvgP]					
Parameter	13.7315*	psia	Upper Bour		psia
Lower Bound		psia	Enforce Bo	FALSE	
User Value [Therml]					
Parameter	1193.89*	Btu/ft^2/day	Upper Bour		Btu/ft^2/day
Lower Bound		Btu/ft^2/day	Enforce Bo	FALSE	
User Value [AvgWindSpeed]					
Parameter	6.16667*	mi/h	Upper Bour		mi/h
Lower Bound		mi/h	Enforce Bo	FALSE	
User Value [MaxHourlyLoadingRate]					
Parameter	154.511*	bbl/hr	Upper Bour		bbl/hr
Lower Bound	0*	bbl/hr	Enforce Bo	FALSE	
User Value [EntrainedOilFrac]					
Parameter	1*	%	Upper Bour		%
Lower Bound		%	Enforce Bo	FALSE	
User Value [TurnoverRate]					
Parameter	466.574*		Upper Bour		
Lower Bound			Enforce Bo	FALSE	
User Value [LLossSatFactor]					
Parameter	0.5*		Upper Bour		
Lower Bound			Enforce Bo	FALSE	
User Value [AtmPressure]					
Parameter	13.7315*	psia	Upper Bour		psia
Lower Bound		psia	Enforce Bo	FALSE	
User Value [TVP]					
Parameter	7.44658*	psia	Upper Bour		psia
Lower Bound		psia	Enforce Bo	FALSE	
User Value [MaxVP]					
Parameter	8.27964*	psia	Upper Bour		psia
Lower Bound		psia	Enforce Bo	FALSE	
User Value [MinVP]					
Parameter	6.68148*	psia	Upper Bour		psia
Lower Bound		psia	Enforce Bo	FALSE	
User Value [AvgLiqSurfaceT]					
Parameter	50.6729*	°F	Upper Bour		°F
Lower Bound		°F	Enforce Bo	FALSE	
User Value [MaxLiqSurfaceT]					

Parameter	56.4466*	°F	Upper Bour		°F
Lower Bound		°F	Enforce Bo	FALSE	

User Value [TotalLosses]

Parameter	72.7729*	ton/yr	Upper Bour		ton/yr
Lower Bound		ton/yr	Enforce Bo	FALSE	

User Value [WorkingLosses]

Parameter	8.12192*	ton/yr	Upper Bour		ton/yr
Lower Bound		ton/yr	Enforce Bo	FALSE	

User Value [StandingLosses]

Parameter	0.974694*	ton/yr	Upper Bour		ton/yr
Lower Bound		ton/yr	Enforce Bo	FALSE	

User Value [RimSealLosses]

Parameter	0*	ton/yr	Upper Bour		ton/yr
Lower Bound		ton/yr	Enforce Bo	FALSE	

User Value [WithdrawalLoss]

Parameter	0*	ton/yr	Upper Bour		ton/yr
Lower Bound		ton/yr	Enforce Bo	FALSE	

User Value [LoadingLosses]

Parameter	144.237*	ton/yr	Upper Bour		ton/yr
Lower Bound		ton/yr	Enforce Bo	FALSE	

User Value [MaxHourlyLoadingLoss]

Parameter	32.9309*	lb/hr	Upper Bour		lb/hr
Lower Bound		lb/hr	Enforce Bo	FALSE	

User Value [PStar]

Parameter			Upper Bour		
Lower Bound			Enforce Bo	FALSE	

User Value [AllCTotalLosses]

Parameter	72.7959*	ton/yr	Upper Bour		ton/yr
Lower Bound		ton/yr	Enforce Bo	FALSE	

User Value [AllCLoadingLosses]

Parameter	144.283*	ton/yr	Upper Bour		ton/yr
Lower Bound		ton/yr	Enforce Bo	FALSE	

User Value [AllCMaxHLoadingLoss]

Parameter	32.9413*	lb/hr	Upper Bour		lb/hr
Lower Bound		lb/hr	Enforce Bo	FALSE	

User Value [AllCFlashingLosses]

Parameter	0*	ton/yr	Upper Bour		ton/yr
Lower Bound		ton/yr	Enforce Bo	FALSE	

User Value [DeckFittingLosses]

Parameter	0*	ton/yr	Upper Bour		ton/yr
Lower Bound		ton/yr	Enforce Bo	FALSE	

User Value [DeckSeamLosses]

Parameter	0*	ton/yr	Upper Bour		ton/yr
Lower Bound		ton/yr	Enforce Bo	FALSE	

User Value [FlashingLosses]

Parameter	0*	ton/yr	Upper Bour		ton/yr
Lower Bound		ton/yr	Enforce Bo	FALSE	

User Value [TotalResidual]

Parameter	169063*	ton/yr	Upper Bour	ton/yr
Lower Bound		ton/yr	Enforce Bo	FALSE

User Value [GasMoleWeight]

Parameter	0.0558405*	kg/mol	Upper Bour	kg/mol
Lower Bound		kg/mol	Enforce Bo	FALSE

User Value [VapReportableFrac]

Parameter	99.9685*	%	Upper Bour	%
Lower Bound		%	Enforce Bo	FALSE

User Value [LiqReportableFrac]

Parameter	99.9997*	%	Upper Bour	%
Lower Bound		%	Enforce Bo	FALSE

User Value [FlashReportableFrac]

Parameter	0*	%	Upper Bour	%
Lower Bound		%	Enforce Bo	FALSE

Notes:
This User Value Set was programmatically generated. GUID={55301CB3-975B-4CD7-ADC8-ABC7D5A70A17}

Sum Component Flow/Frac.276

User Value [CompSum]

Parameter	0*	ton/yr	Upper Bour	ton/yr
Lower Bound		ton/yr	Enforce Bo	FALSE

Notes:
This User Value Set was programmatically generated. GUID={4C20067A-03B3-47FB-B04B-6788E737C4C5}

ATTACHMENT U

FACILITY-WIDE EMISSION SUMMARY SHEET(S)

General G70-D Permit Application

Greer Well Pad
Proctor, West Virginia

Tug Hill Operating, LLC
380 Southpointe Blvd., Suite 200
Canonsburg, PA 15317

July 2017

ATTACHMENT U - 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
1e	0.10	0.43	0.08	0.36	0.01	0.02	0.00	0.00	0.01	0.03	0.01	0.03	117.01	512.50
2e	0.10	0.43	0.08	0.36	0.01	0.02	0.00	0.00	0.01	0.03	0.01	0.03	117.01	512.50
3e	0.10	0.43	0.08	0.36	0.01	0.02	0.00	0.00	0.01	0.03	0.01	0.03	117.01	512.50
4e	0.10	0.43	0.08	0.36	0.01	0.02	0.00	0.00	0.01	0.03	0.01	0.03	117.01	512.50
5e	0.10	0.43	0.08	0.36	0.01	0.02	0.00	0.00	0.01	0.03	0.01	0.03	117.01	512.50
6e	0.10	0.43	0.08	0.36	0.01	0.02	0.00	0.00	0.01	0.03	0.01	0.03	117.01	512.50
7e	0.10	0.43	0.08	0.36	0.01	0.02	0.00	0.00	0.01	0.03	0.01	0.03	117.01	512.50
8e	0.10	0.43	0.08	0.36	0.01	0.02	0.00	0.00	0.01	0.03	0.01	0.03	117.01	512.50
9e	0.10	0.43	0.08	0.36	0.01	0.02	0.00	0.00	0.01	0.03	0.01	0.03	117.01	512.50
10e	0.10	0.43	0.08	0.36	0.01	0.02	0.00	0.00	0.01	0.03	0.01	0.03	117.01	512.50
11e	0.49	2.15	0.41	1.80	0.03	0.12	0.00	0.01	0.04	0.16	0.04	0.16	585.05	2562.52
12e	0.55	2.40	2.50	10.96	1.13	4.95	0.16	0.09	--	--	--	--	934.24	4091.98
13e	1.52	6.66	3.04	13.33	1.06	4.66	0.00	0.01	0.06	0.25	0.06	0.25	850.32	3385.98
14e	0.26	1.14	0.52	2.28	0.18	0.80	0.00	0.00	0.01	0.05	0.01	0.05	137.17	546.21
TOTAL	3.80	16.65	7.30	31.98	2.46	10.77	0.17	0.15	0.18	0.79	0.18	0.79	3676.88	15711.72

Annual emissions shall be based on 8,760 hours per year of operation for all emission units except for 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 catergories in Table 1. Therefore fugitive emissions shall not be included in the PTE above.

ATTACHMENT U - 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
1e	0.00	0.00	0.00	0.00	0.00	0.00	--	--	--	--	0.00	0.01	0.00	0.01
2e	0.00	0.00	0.00	0.00	0.00	0.00	--	--	--	--	0.00	0.01	0.00	0.01
3e	0.00	0.00	0.00	0.00	0.00	0.00	--	--	--	--	0.00	0.01	0.00	0.01
4e	0.00	0.00	0.00	0.00	0.00	0.00	--	--	--	--	0.00	0.01	0.00	0.01
5e	0.00	0.00	0.00	0.00	0.00	0.00	--	--	--	--	0.00	0.01	0.00	0.01
6e	0.00	0.00	0.00	0.00	0.00	0.00	--	--	--	--	0.00	0.01	0.00	0.01
7e	0.00	0.00	0.00	0.00	0.00	0.00	--	--	--	--	0.00	0.01	0.00	0.01
8e	0.00	0.00	0.00	0.00	0.00	0.00	--	--	--	--	0.00	0.01	0.00	0.01
9e	0.00	0.00	0.00	0.00	0.00	0.00	--	--	--	--	0.00	0.01	0.00	0.01
10e	0.00	0.00	0.00	0.00	0.00	0.00	--	--	--	--	0.00	0.01	0.00	0.01
11e	0.00	0.00	0.00	0.00	0.00	0.00	--	--	--	--	0.01	0.04	0.01	0.04
12e	--	--	--	--	--	--	--	--	--	--	--	--	--	--
13e	0.64	2.80	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.03	0.76	3.32
14e	0.07	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.09	0.40
TOTAL	0.71	3.10	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.01	0.03	0.15	0.88	3.84

Annual emissions shall be based on 8,760 hours per year of operation for all emission units except for 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 catergories in Table 1. Therefore fugitive emissions shall not be included in the PTE above.

ATTACHMENT V

CLASS I LEGAL ADVERTISEMENT

General G70-D Permit Modification Application

Greer Well Pad
Proctor, West Virginia

Tug Hill Operating, LLC
380 Southpointe Blvd., Suite 200
Canonsburg, PA 15317

July 2017

AIR QUALITY PERMIT NOTICE
Notice of Application

Notice is given that Tug Hill Operating, LLC has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a G70-D General Permit Registration, for a natural gas well pad located off Waynes Ridge, North of Proctor, in Marshall County, West Virginia. The latitude and longitude coordinates are 39.75716 and -80.83611.

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

Pollutant	Tons/yr
PM/PM_{10}/$PM_{2.5}$	0.79
NO_X	16.65
CO	31.98
VOCs	59.09
Benzene	0.01
Toluene	0.02
Xylenes	0.01
n-Hexane	0.22
Formaldehyde	3.10
Total HAPs	3.91

Startup of operation is planned to begin in the 4th quarter of 2017. 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 28th day of August, 2017.

By: Tug Hill Operating, LLC
Sean Willis
Vice President
380 Southpointe Blvd., Suite 200
Canonsburg, PA 15317