

Tug Hill Operating, LLC

Wayne Well Pad

New Martinsville, West Virginia

**Permit Determination** 

SLR Ref: 116.01631.00010





# **Wayne Well Pad Permit Determination**

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.

Chi Ban

Chris Boggess Associate Engineer

Jesse Hanshaw, P.E. Principal Engineer





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# SECTION 1.0 TECHNICAL SUPPORT DOCUMENT

# PERMIT DETERMINATION

Wayne Well Pad New Martinsville, West Virginia

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

# 1.1 INTRODUCTION

The Wayne Well Site previously owned and operated by Gastar Exploration LLC has been purchased by Tug Hill Operating, LLC (Tug Hill). The site was purchased as a non-permitted pad as a result of being below permitting thresholds based on (4) 1.5 MMBtu/hr heaters and (2) produced water tanks. As a result, no DAQ ownership transfer documents have to be completed and this should be the first determination submitted for the site.

Tug has prepared this permit determination in order to evaluate the existing equipment as well as a 1.5 MM gallon produced water tank proposed to be added to the site.

The details of this evaluation are provided in section 2.0 with supporting calculations and ProMax Simulations conducted for worst case operating scenarios.

# 1.2 SITE HISTORY

The following is a brief summary of the history related to this site:

- The four wells onsite were put into production in 2014
- The tanks were installed in 2014.

# 1.3 DESCRIPTION OF FACILITY

Tug Hill Operating, LLC is submitting a permit determination to evaluate the installation of a 1.5 MM gallon produced water accumulation/recycle tank at their existing Wayne well pad site. The newly proposed water tank will be used to consolidate and store produced water from Tug Hill's operating area. The accumulated water will be recycled and re-used to offset the amount of freshwater needed for subsequent well development and minimize volumes that would otherwise be sent to disposal.

The existing facility as purchased from Gastar was a non-permitted site operating 4 wells and associated separation equipment. The existing site utilized 2-400 bbl produced water tanks, which were installed between August 23, 2011 and September 18, 2015. The current plan is to remove one of these tanks since the two tank capacity is not necessary at a produced water rate of 7 barrels per day (bbl/d). Additionally, the site was designed to flow condensate into a dedicated pipeline for transport offsite and, therefore, no condensate is stored on-site.

# DESCRIPTION OF PROCESS

Natural gas, condensate and produced water will be generated from four (4) horizontal wells located onsite producing from the Marcellus formation. Each well stream will pass through a

Gas Processing Unit (GPU), which consists of a combination 1.5 MMBtu/hr line heaters and 3-phase separator.

In the separator, the multiphase stream is divided into sales gas and its associated liquids (produced water and condensate). The gas and condensate will leave the separators and go directly into a their individual respective sales lines. The separated water phase will be routed to a single 400 (bbl) tank (T01) and the second 400 bbl tank will be removed. Because the organic liquid phase flows into its respective sales pipeline, the need for on-site condensate storage is eliminated.

The produced water is hauled to the newly proposed water tank on-site using 140 bbl pump trucks. This water will be accumulated in the 1.5 MM gallon produced water tank (T02). Since this large accumulation tank is intended for produced water storage only VOC emissions are expected to be nonexistent. Additionally, any emissions displaced from truck loading are expected to be minimal as a result of being 99.4% water. Due to these emissions being fugitive in nature they are not controlled, but released to the atmosphere via the pump truck's vacuum system.

## **Description of Emission Calculations**

The existing process water tank (T01) was estimated to collect no more than 15 (bbl) of condensate per year as a worst case historical estimate. The balance throughput is made up of 7 bbl/d of produced water. The tank emissions were estimated using ProMax with representative samples of gas and condensate measured from the Shields Pad in 2016. The Shields gas analysis was found to be virtually identical to the Wayne pad, therefore these inputs were viewed to be representative and reflect the most recent data available from the area. This estimate predicts approximately 1 tpy of VOCs originating from this tank as flash gas emissions. Working, breathing and loading losses are all predicted by ProMax to be very small as a result of tank contents being mostly water. The water is drained off the bottom of this atmospheric storage vessel and transferred via truck to the produced water storage tank (T02).

The 1.5 MM gallon produced water tank (T02) was intended for produced water storage only, but to account for any entrained oil a worst case analysis was conducted using US EPA's Tanks 4.09 software to assess working and breathing losses assuming #2 fuel oil as the tank's contents. This is truly a hypothetical case, but was run to show that at an average throughput of 300 bbl/d the tank remains below any permitting thresholds. Additionally, since the water trucked to this storage vessel originates from area storage tanks there will be little chance of oil entrainment due to extended settling times at the well pads and additionally no potential for flashing.

The combustion emissions were evaluated on 4 - 1.5 MMBtu/hr GPU burners and also found to result emissions below permitting thresholds.

# 1.4 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 the line heaters are subject to the visible emission standard of §45-2-3 as follows:

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

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.

### 45 CSR 10 - Emission of Sulfur Oxides

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

10.1 Any fuel burning units having a design heat input less than 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 OOOO - Storage Vessel NSPS Requirements

The existing storage vessel (T01) was constructed after August 23, 2011 but before, September 18, 2015 and has been demonstrated to have a PTE VOCs < 6 tpy using ProMax Equation of State estimation techniques with representative inputs. Therefore, the existing storage vessel is not considered an affected source under this regulation.

### 40 CFR 60 Subpart OOOOa - Storage Vessel NSPS Requirements

The newly proposed produced water storage vessel (T02) will be constructed after September 18, 2015 and has been demonstrated to have a PTE VOCs < 6 tpy using US EPA Tanks 4.09 software. Therefore, the existing storage vessel is not considered an affected source under this regulation

**40 CFR 61** - This facility is subject to the asbestos inspection and notification requirements. However, no asbestos is affected by the proposed construction activities.

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

The company is apply for this permit determination to assure all permitting thresholds are evaluated and the proper minor source permits are identified if applicable.

### 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

The site shall minimize fugitive PM so that emissions do not travel offsite.

## 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 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.

### 40 CFR 60 Subpart KKK - Natural Gas Processing Plant NSPS

This subpart is not applicable because this site is not a processing plant 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 single 400 bbl [16,800 gal] produced water tank (T01) is below the size capacity threshold of 75 meters cubed (m^3) [19,813 gallons] defined within the applicability section 60.110b(a) of this Federal standards.

The 1.5 MM gallon produced water storage vessel (T02) is not intended to store volatile organic liquids (VOL) as defined by this regulation. Additionally the tank will be inspected regularly and, if entrained oil were found to have been introduced to the tank causing organic phase liquids to be observed, it would be promptly removed and the cause of the malfunction investigated and corrected. Nevertheless, with respect to the well pad produced water storage vessels, any entrained oil that remains after settling in these source tanks would fall under the vapor pressure exemption of 3.5 kPa (0.508 psi) for tanks greater than 151 cubic meters (39,890 gal) as listed under the exempt criteria in 60.110b(b).

## 40 CFR 60 Subpart OOOOa – Fugitive Component Leak Monitoring

The site is classified as a well pad facility, which will not be subject to the monitoring requirement of this section since the proposed produced water tank will not constitute a modification as defined under this Federal regulation.

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

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

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

This subpart is not applicable because the process heaters at this facility are not classified as boilers 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 nor any substitutes.

# Aggregation Discussion (Facility Determination)

The Wayne site 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, of 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.

Tug Hill operates other well pads in the area, the closest being the Greer Pad, which has a straight line distance greater than 0.25 miles away. Therefore, no other facilities operated by Tug Hill are within a quarter-mile radius and as a result this pad should be considered a single facility as defined within this determination application.

# SECTION 2. APPLICATION FOR PERMIT

# **Permit Determination**

Wayne Well Pad New Martinsville, West Virginia

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

WEST VIRG DEPARTMENT OF ENVIRONM DIVISION OF AIR	INIA IENTAL PROTECTION QUALITY	PERMIT DETERMINATION FORM (PDF)		
601 57 <sup>th</sup> Stree Charleston, WV	25304	FOR AGENCY USE O	NLY: PLANT I.D. #	
Phone: (304) 92 www.dep.wv.g	26-0475 ov/daq	PDF # PERMIT WRITER:		
1. NAME OF APPLICANT (AS REGISTERE	D WITH THE WV SECR	ETARY OF STATE'S O	FFICE):	
Tug Hill Operating, LLC				
2. NAME OF FACILITY (IF DIFFERENT FRO	OM ABOVE):		3. NORTH AMERICAN INDUSTRY	
Wayne Well Pad				
4A. MAILING ADDRESS:		4B. PHYSICAL ADDR	RESS:	
380 Southpointe Blvd, Suite 200		Access Road locate	d off County Route 78 (Waynes Ridge Rd)	
Cannonsburg, PA 15317		Near New Martinsvil	le, WV	
5A. DIRECTIONS TO FACILITY (PLEASE PR	OVIDE MAP AS ATTA	L CHMENT A):		
Travelling North on State Route 2 from New Martinsville, turn Right onto County Route 2/2 (Wells Hill Road). Travel County Route 2/2 for approximately 2.5 miles to the junction of County Route 78 (Waynes Ridge Road). Turn left on County Route 78 and travel approximately 0.25 miles to well pad access road located on the left.				
5B. NEAREST ROAD: County Route 78 (Wayne's Ridge Rd)	5C. NEAREST CITY ( New Martinsville	STY OR TOWN: 5D. COUNTY: Marshall		
5E. UTM NORTHING (KM): 4,399.557	(KM): 5F. UTM EASTING (KM): 5G. UTM ZON 515.845 17		5G. UTM ZONE: 17	
6A. INDIVIDUAL TO CONTACT IF MORE INF Jerry V. DeRosa	FORMATION IS REQUIF	UIRED: 6B. TITLE: Director, EH&S Affairs		
6C. TELEPHONE:	6D. FAX:		6E. E-MAIL:	
(412) 736-5767			jderosa@tug-hillop.com	
7A. DAQ PLANT I.D. NO. (FOR AN EXISTIN	G FACILITY ONLY):	7B. PLEASE LIST ALL CURRENT 45CSR13, 45CSR14, 45CSR AND/OR TITLE V (45CSR30) PERMIT NUMBERS ASSOCIAT WITH THIS PROCESS (FOR AN EXISTING FACILITY ONL) N/A		
7C. IS THIS PDF BEING SUBMITTED AS TH	E RESULT OF AN ENF	ORCEMENT ACTION?	IF YES, PLEASE LIST: <b>No</b>	
8A. TYPE OF EMISSION SOURCE (CHECK	ONE):	8B. IF ADMINISTRAT APPLICANT'S CO	IVE UPDATE, DOES DAQ HAVE THE DNSENT TO UPDATE THE EXISTING	
NEW SOURCE ADMINISTRA		PERMIT WITH TH	HE INFORMATION CONTAINED HEREIN?	
	ASE EXPLAIN IN 11B)			
9. IS DEMOLITION OR PHYSICAL RENOV	ATION AT AN EXISTING	G FACILITY INVOLVED		
10A. DATE OF ANTICIPATED INSTALLATION	OR CHANGE:	10B. DATE OF ANTICI	PATED START-UP:	
<u>7/20/2017</u> <u>August /1/2017</u> .			August /1/2017 .	
11A. PLEASE PROVIDE A <b>DETAILED PROCE</b> POINT AS <b>ATTACHMENT B</b> .	SS FLOW DIAGRAM S	HOWING EACH PROP	OSED OR MODIFIED PROCESS EMISSION	

11B. PLEASE PROVIDE A DETAILED PROCESS DESCRIPTION AS ATTACHMENT C.

12. PLEASE PROVIDE **MATERIAL SAFETY DATA SHEETS (MSDS)** FOR ALL MATERIALS PROCESSED, USED OR PRODUCED AS **ATTACHMENT D**. FOR CHEMICAL PROCESSE, PLEASE PROVIDE A MSDS FOR EACH COMPOUND EMITTED TO AIR.

#### 13A. REGULATED AIR POLLUTANT EMISSIONS:

⇒ FOR A NEW FACILITY, PLEASE PROVIDE PLANT WIDE EMISSIONS BASED ON THE POTENTIAL TO EMIT (PTE) FOR THE FOLLOWING AIR POLLUTANTS INCLUDING ALL PROCESSES.

⇒ FOR AN EXISTING FACILITY, PLEASE PROVIDE THE PROPOSED CHANGE IN EMISSIONS BASED ON THE PTE OF ALL PROCESS CHANGES FOR THE FOLLOWING AIR POLLUTANTS.

PTE FOR A GIVEN POLLUTANT IS TYPICALLY <u>BEFORE AIR POLLUTION CONTROL DEVICES</u> AND IS COLLECTED BASED ON THE MAXIMUM DESIGN CAPACITY OF PROCESS EQUIPMENT.

POLLUTANT	HOURLY PTE (LB/HR)	YEARLY PTE (TON/YR) (HOURLY PTE MULTIPLIED BY 8760 HR/YR) DIVIDED BY 2000 LB/TON
РМ	0.05	0.20
PM <sub>10</sub>	0.05	0.20
VOCs	0.54	2.35
со	0.49	2.16
NO <sub>x</sub>	0.59	2.58
SO <sub>2</sub>	<0.01	0.02
Pb	0.00	0.00
HAPs (AGGREGATE AMOUNT)	0.01	0.03
TAPs (INDIVIDUALLY)*		
Benzene	< 0.01	<0.01
Formaldehyde	< 0.01	<0.01
OTHER (INDIVIDUALLY)*		

\* ATTACH ADDITIONAL PAGES AS NEEDED

#### 13B. PLEASE PROVIDE ALL SUPPORTING CALCULATIONS AS ATTACHMENT E.

CALCULATE AN HOURLY AND YEARLY PTE OF EACH PROCESS EMISSION POINT (SHOWN IN YOUR DETAILED PROCESS FLOW DIAGRAM) FOR ALL AIR POLLUTANTS LISTED ABOVE INCLUDING INDIVIDUAL HAP'S (LISTED IN SECTION 112[b] OF THE 1990 CAAA), TAP'S (LISTED IN 45CSR27), AND OTHER AIR POLLUTANTS (E.G. POLLUTANTS LISTED IN TABLE 45-13A OF 45CSR13. MINERAL ACIDS PER 45CSR7. ETC.).

#### 14. CERTIFICATION OF DATA

I, <u>SEAN WILLIS</u> (TYPE NAME) ATTEST THAT ALL THE REPRESENTATIONS CONTAINED IN THIS APPLICATION, OR APPENDED HERETO, ARE TRUE, ACCURATE, AND COMPLETE TO THE BEST OF MY KNOWLEDGE BASED ON INFORMATION AND BELIEF AFTER REASONABLE INQUIRY, AND THAT I AM A **RESPONSIBLE OFFICIAL\*\*** (PRESIDENT, VICE PRESIDENT, SECRETARY OR TREASURER, GENERAL PARTNER OR SOLE PROPRIETOR) OF THE APPLICANT.

SIGNATURE OF RESPONSIBLE OFFICIAL:

TITLE: VICE PRESIDENT – ENGINEERING & DEVELOPMENT MANAGER – APPALACHIA REGION DATE: 07/17/2017.

\*\* THE DEFINITION OF THE PHRASE 'RESPONSIBLE OFFICIAL' CAN BE FOUND AT 45CSR13, SECTION 2.23

 NOTE: PLEASE CHECK ENCLOSED ATTACHMENTS:

 Image: Construction of the second structure

 Image: Construction of the second structure

 Constructure

 Constructure

# ATTACHMENT A

# **AREA MAP**

# **Permit Determination**

Wayne Well Pad New Martinsville, West Virginia

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

# Attachment A - Area Map

Tug Hill Operating, LLC - Wayne Well Pad

GPS Coordinates of Site: Lat: 39.74577, Long: -80.81506

UTM Coordinates of Site: Northing: 4,399.557 km, Easting: 515.845 km, Zone: 17 Legend

🍰 300' Barrier

Fug Hill - Wayne Well Pad

N

900 ft

Tug Hill - Wayne Well Pad

Google earth

© 2017 Google



# ATTACHMENT B

# **PROCESS FLOW DIAGRAM**

# **Permit Determination**

Wayne Well Pad New Martinsville, West Virginia

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



# ATTACHMENT C

# **PROCESS DESCRIPTION**

# **Permit Determination**

Wayne Well Pad New Martinsville, West Virginia

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

Tug Hill Operating, LLC is submitting a permit determination to evaluate the installation of a 1.5 MM gallon produced water accumulation/recycle tank at their existing Wayne well pad site. The newly proposed water tank will be used to consolidate and store produced water from Tug Hill's sites in the area. The accumulated water will be recycled and used to offset the amount of freshwater needed for subsequent well development in the area and minimize volumes sent for disposal.

The existing facility was purchased from Gastar as a non-permitted site operating 4 wells and associated separation equipment. The existing site utilized 2-400 bbl produced water tanks, which were installed between August 23, 2011 and September 18, 2015. The current plan is to remove one of these tanks since the two tank capacity is not necessary at a produced water rate of 7 barrels per day (bbl/d). Additionally, the site was designed to flow condensate into the gas pipeline for transport off-site so, no condensate is stored on-site.

# **DESCRIPTION OF PROCESS**

Natural gas, condensate and produced water will be collected from four (4) horizontal wells located on-site producing from the Marcellus formation. Each well stream will pass through a Gas Processing Unit (GPU), which consist of a combination 1.5 MMBtu/hr line heater and 3-phase separator.

The well stream will require heating due to reductions in pressure. In the separator, the multiphase stream is divided into sales gas and its associated liquids (produced water and condensate). The gas will leave the separators and go directly into the sales line. The separated water phase will be routed to a single 400 barrel (bbl) tank (T01) and the second 400 bbl tank will be removed. The organic liquid phase is piped to a midstream condensate sales line, which eliminates the need for on-site storage.

The produced water is hauled to the newly proposed produced water tank by 140 bbl pump trucks. This water will be accumulated in the 1.5 MM gallon produced water tank (T02). Since this large accumulation tank is intended for produced water storage only VOC emissions are expected to be nonexistent. Additionally, any emissions displaced from truck loading are expected to be minimal as a result of being over 99% by volume water. Due to the truck loading emissions being minimal and fugitive in nature they are not controlled, but released to the atmosphere via the pump truck's vacuum system.

# ATTACHMENT D

# SAFETY DATA SHEETS

# **Permit Determination**

Wayne Well Pad New Martinsville, West Virginia

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

# SAFETY DATA SHEET

Date Issued : SDS No : Date Revised : Revision No : 1

# Non-Sour Natural Gas

(West Virginia)

# \*\*\*IMPORTANT\*\*\*

This SDS has been prepared for Non-Sour Natural Gas. Refer to the following sections for important safety and response information. **Section 4-** First Aid Measures (for accidental exposure).

Section 5- Fire Fighting Measures.

Section 6- Accidental Release Measures.

## 1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: Non-Sour Natural Gas GENERAL USE: Refinery Feedstock. Common Name and Synonyms:

#### 2. HAZARDS IDENTIFICATION

This product has not been tested to determine its specific health hazards. Therefore, the information provided in

this section includes health hazard information based on the product components.

#### GHS CLASSIFICATIONS

Health	Physical
Carcinogenicity, Category 1	Gases Under Pressure, Liquefied gas
Hazard Not Otherwise Classified, Simple Asphyxiant	Flammable Gases, Category 1
GHS LABEL	
WARNING	DANGER
H000: May displace oxygen and cause rapid suffocation.	H220: Extremely flammable gas.
WARNING	DANGER
H280: Contains gas under pressure; may explode if heated.	H350: May cause cancer.

# PRECAUTIONARY

#### **STATEMENT(S)** Prevention:

P210: Keep away from heat/sparks/open flames/hot surfaces - no smoking.

# Sweet Natural Gas

P201: Obtain special instructions before use. P202: Do not handle until all safety precautions have been read and understood. P281: Use personal protective equipment as required.

#### Response:

P377: Leaking gas fire: Do not extinguish unless leak can be stopped safely. P381: Eliminate all ignition sources if safe to do so. P308+P313: IF exposed or concerned: Get medical advice/attention.

#### Storage:

P403: Store in a well-ventilated place.

P410+P403: Protect from sunlight. Store in a well-ventilated place

#### Disposal:

P501: Dispose of contents/container in accordance with local/regional/national regulations.

# EMERGENCY OVERVIEW

### PHYSICAL APPERANCE:

**IMMEDIATE CONCERNS: HAZARD DESCRIPTION / WARNING INFORMATION SUMMARY -** This material is a flammable gas. This product is toxic; inhalation of this material may cause severe injury or death. Please read entire contents of Section

2 of this Safety Data Sheet (SDS) for details.

#### POTENTIAL HEALTH EFFECTS

EYES: This product is unlikely to cause eye irritation.

SKIN: This product is unlikely to cause skin irritation or injury.

**INGESTION:** This product is a compressed gas; hence oral exposure and resulting acute toxicity are unlikely.

**INHALATION:** This product is a simple asphyxiant. Excessive exposure may cause central nervous system effects such as dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure and death.

#### SIGNS AND SYMPTOMS OF OVER EXPOSURE

**CARCINOGENICITY:** No component of this product present at levels greater than or equal to 0.1% is identified as a probable, possible, or confirmed carcinogen by IARC, NTP, OSHA or ACGIH.

MUTAGENICITY: Not Established.

#### REPRODUCTIVE TOXICITY

REPRODUCTIVE EFFECTS: Not Established.

TERATOGENIC EFFECTS: Not Established.

**MEDICAL CONDITIONS AGGRAVATED:** Persons with pre-existing central nervous system disorders should refrain from contact with this material.

ROUTES OF ENTRY: Inhalation, skin contact, eye contact.

TARGET ORGAN STATEMENT: May cause damage to lungs and central nervous system.

SENSITIZATION: Not Established.

COMMENTS: OTHER HAZARDS - Not Established.

#### 3. COMPOSITION / INFORMATIO N ON INGREDIENTS

Chemical Name	Vol. %	CAS
Methane	70 - 94	74-82-8
Ethane	5 - 10	74-84-0
Propane	1 - 4	74-98-6
i-Butane	0.5 - 3	75-28-5
n-Butane	0.5 - 2	106-97-8
Carbon Dioxide	0.5 - 10	124-38-9
Nitrogen	0.5 - 10	7727-37-9

# Sweet Natural Gas

Benzene	may contain	71-43-2
Hydrogen Sulfide	may contain	7783-06-4

COMMENTS: This may not be a complete list of components. Compositions given are typical values, not

specifications.

#### 4. FIRST AID MEASURES

EYES: Immediately flush eyes with plenty of water. Get medical attention, if irritation persists.

SKIN: Wash with soap and water. Get medical attention if irritation develops or

persists. **INGESTION:** This is not considered a major potential route of exposure.

**INHALATION:** Move victim to fresh air. Call 911, emergency medical service, or Emergency Phone Numbers(s) provided in Section 1 of this SDS. Give artificial respiration if victim is not breathing. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Administer oxygen if breathing is difficult.

ANTIDOTES: Not Established.

**NOTES TO PHYSICIAN: CLINICAL TESTING & MEDICAL MONITORING FOR DELAYED EFFECTS -** Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed. Provide general supportive measures and treat symptomatically.

#### 5. FIRE FIGHTING MEASURES

FLASH POINT: -188 °C (-306.4 °F) Notes: Based on methane. .

AUTOIGNITION TEMPERATURE: 482℃ (900°F) to 649℃ (1200°F)

GENERAL HAZARD: DECOMPOSITION TEMPERATURE - Not Established.

#### EXTINGUISHING MEDIA:

**SMALL FIRE -** Class B fire extinguisher, carbon dioxide, multipurpose dry chemical, water fog or alcohol-resistant foam. **LARGE FIRE -** Water fog or alcohol-resistant foam.

**HAZARDOUS COMBUSTION PRODUCTS:** Any combustion, including incomplete combustion, may form carbon monoxide and carbon dioxide. Burning produces noxious and toxic fumes. Downwind personnel must be evacuated.

OTHER CONSIDERATIONS: INAPPROPRIATE EXTINGUISHING MEDIA - Do not use water jet.

**FIRE EXPLOSION:** HIGHLY FLAMMABLE. Will be easily ignited by heat, sparks or flames. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks). Vapor explosion hazard indoors, outdoors or in sewers. Runoff to sewer may create fire or explosion hazard. Containers may explode when heated.

COMMENTS:

**SPECIFIC HAZARDS THAT MAY ARISE FROM THE PRODUCT -** Vapors are flammable and heavier than air. Vapors may travel across the ground and reach remote ignition sources causing a flashback fire danger.

### 6. ACCIDENTAL RELEASE MEASURES

**SMALL SPILL:** For emergency information and procedures to follow in the case of an accidental release, call the Emergency Telephone Number(s) listed in Section 1 of this SDS. Remove any ignition sources and protect from ignition. Water spray may reduce vapor but may not prevent ignition in closed spaces. A vapor suppressing foam may be used to reduce vapors. Provide sufficient ventilation in the affected area(s) and wear appropriate personal protective equipment as indicated in Section 8 of this SDS when handling spill material. Isolate the area until gas has dispersed. Never discharge releases directly into sewers or surface waters.

LARGE SPILL: Use similar response procedures as indicated under Small Spill.

#### 7. HANDLING AND STORAGE

**GENERAL PROCEDURES:** Handle in accordance with good industrial hygiene and safety practices. These practices include but are not limited to avoiding unnecessary exposure and prompt removal of material from eyes, skin and clothing. If needed, take first aid actions as indicated in Section 4 of this SDS.

- **HANDLING**: Use only with adequate ventilation. Wear appropriate personal protective equipment and use exposure controls as indicated in Section 8 of this SDS. Vent slowly to the atmosphere when opening. Avoid all contact with skin and eyes. Avoid breathing product dust or vapors. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Do not reuse container. Remove contaminated clothing immediately. Wash with soap and water after working with this product.
- **STORAGE:** Keep in airtight container away from all heat sources. Store in a segregated and approved area. Store in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Keep container in a well-ventilated area. Ground all containers during transfer. Store away from incompatible materials. Cylinders should be separated from oxygen cylinders or other oxidizers by a minimum distance of 20 feet, or by a barrier of non-combustible material at least 5 feet high having a fire resistance rating of at least 1/2 hour. Store in the original container or an approved alternative made from compatible material. Do not store in unlabeled containers. Treat empty containers in a similar fashion as residual product may exist. Use appropriate containment to avoid environmental contamination.

**STORAGE TEMPERATURE:** Store containers in a room with ambient temperature.

STORAGE PRESSURE: Containers should be stored in room with ambient pressure.

#### SHELF LIFE:

HOW TO MAINTAIN THE INTEGRITY OF THE SUBSTANCE BY USE OF STABILIZERS OR ANTIOXIDANTS - Not Established.

**ELECTROSTATIC ACCUMULATION HAZARD:** To minimize the hazard of static electricity during transfer operations, bonding and grounding may be necessary, but may not by themselves be sufficient. For more information, refer to OSHA Standard 29 CFR 1910.106; National Fire Protection Standard (NFPA) 77 - "Recommended Practice on Static Electricity"; and/or the American Petroleum Institute (API) Recommended Practice 2003 - "Protection Against Ignitions Arising Out of Static, Lighting and Stray Currents."

#### 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

#### EXPOSURE GUIDELINES

OSHA HAZARDOUS COMPONENTS (29 CFR1910.1200)					
		EXPOSURE LIMITS			
		OSHA	OSHA PEL ACGIH TLV		
Chemical Name		ppm mg/m³ ppm mg			mg/m³
Ethono	TWA	N/E	N/E	1000	N/E
Ethane S	STEL	N/E	N/E	N/E	N/E
Dranana	TWA	1000	1800	1000	N/E
Propane TWA STEL	N/E	N/E	N/E	N/E	
: Duter -	TWA	N/E	N/E	1000	N/E
	STEL	N/E	N/E	N/E	N/E
	TWA	N/E	N/E	1000	N/E

### **Sweet Natural Gas**

	n-Butane	STEL	N/E	N/E	N/E	N/E
Carban Diavida	Carbon Diovide	TWA	5000	9000	5000	9000
	Carbon Dioxide	STEL	N/E	N/E	30000	54000

**ENGINEERING CONTROLS:** Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

#### PERSONAL PROTECTIVE EQUIPMENT

**EYES AND FACE:** Employees should be provided with and required to use splash-proof safety goggles and splash shields where there is any possibility of product coming in contact with eyes. Ensure that eye wash station is operable and nearby.

SKIN: GLOVES AND BOOTS - Any impervious gloves and boots including butyl rubber, nitrile rubber or neoprene rubber.

**RESPIRATORY:** Depending on airborne concentration a full-face supplied air respirator is recommended, because air purifying respirators cannot provide adequate protection.

**PROTECTIVE CLOTHING:** Depending on the conditions of use, protective gloves, apron, boots, head and face protection should be worn. Cotton clothing is recommended.

**WORK HYGIENIC PRACTICES:** Consider the potential hazards of this material, applicable exposure limits, job activities, environmental working conditions, and other substances in the workplace when designing engineering controls and selecting personal protective equipment (PPE). The user should read and understand all manufacturer instructions and limitations supplied with the personal protection equipment before use.

#### 9. PHYSICAL AND CHEMICAL PROPERTIES

**ODOR:** Generally odorless (if no H<sub>2</sub>S is present and no mercaptan added for odor).

APPEARANCE: Colorless gas. pH: Not Applicable. **PERCENT VOLATILE: 100%** VAPOR PRESSURE: Not Established. **VAPOR DENSITY:** 0.6 to 0.8 (Air = 1) **BOILING POINT:** -161 ℃ (-258 °F) Notes: Based on methane. FREEZING POINT: Not Applicable. MELTING POINT: Not Applicable. FLASH POINT: -188 ℃ (-306.4 °F) Notes: Based on methane. AUTO IGNITION TEMP: Not Established. **DECOMPOSITION TEMP:** Not Established. EVAPORATION RATE: Not Established. **DENSITY:** Not Established. SPECIFIC GRAVITY: Not Established. VISCOSITY: Not Applicable. SOLUBILITY: Not Established. COEFF. OIL/WATER: Not Established. **ODOR THRESHOLD:** Not Established. COMMENTS: FLAMMABILITY - Refer to Section 2 and Section 5 of this SDS for classification and flammability characteristics.

#### 10. STABILITY AND REACTIVITY

#### STABLE: Yes

#### HAZARDOUS POLYMERIZATIO N: No

**STABILITY:** This product is anticipated to be stable under normal ambient storage and handling conditions of temperature and pressure.

**POLYMERIZATION:** This product is not anticipated to cause hazardous reactions or polymerizations under normal ambient storage and handling conditions of temperature and pressure.

**CONDITIONS TO AVOID:** Avoid contact with incompatible materials. Avoid exposure to excess heat, sparks, open flame, or other potential ignition sources. Prevent vapor accumulation.

**HAZARDOUS DECOMPOSITION PRODUCTS:** Products of thermal decomposition include carbon oxides and nitrogen oxides. **INCOMPATIBLE MATERIALS:** Strong oxidizing agents, liquid oxygen, mineral acids and metal catalysts.

#### 11. TOXICOLOGICAL INFORMATION

ACUTE				
Chemical Name	ORAL LD <sub>50</sub> (rat)	DERMAL LD <sub>50</sub> (rabbit)	INHALATION LC <sub>50</sub> (rat)	
Ethane	Ethane Not Established.			
Propane	Not Established.	Not Established.	658 mg/L (4 hours)	
i-Butane	Not Established.		658 mg/L (4 hours)	
n-Butane	Not Established.	Not Established.	658 g/m <sup>3</sup>	
Carbon Dioxide	Not Established.	Not Established.	30000 to 50000 ppm (30 min)	
Benzene	930 mg/kg	> 9400 ug/kg	10000 ppm (7 hours)	
Hydrogen Sulfide	Not Established.	Not Established.	444 ppm	

**NOTES: ACUTE TOXICITY & HEALTH EFFECTS -** This product is a simple asphyxiant; higher concentrations may cause dizziness. Refer to Section 2 of this SDS for additional hazards identification.

EYE EFFECTS: Not expected to cause prolonged or significant eye irritation.

SKIN EFFECTS: Not expected to cause prolonged or significant skin irritation.

**CHRONIC: TOXICITY & HEALTH EFFECTS -** This product is not expected to be toxic. Refer to Section 2 of this SDS for additional hazards identification.

#### CARCINOGENICITY

Chemical Name	NTP	IARC	OSHA
	Status	Status	Status
Benzene	1	1	Carcinogen.

**Notes:** No component of this product at levels greater than 0.1% is identified as a carcinogen by ACGIH, the International Agency for Research on Cancer (ARC), the U.S. National Toxicology Program (NTP) or the U.S. Occupational Safety and Health Act (OSHA).

SENSITIZATION: Not Established.

**NEUROTOXICITY:** Not Established.

**GENETIC EFFECTS:** Not Established.

**REPRODUCTIVE EFFECTS:** Not Established.

# Sweet Natural Gas

 TARGET ORGANS: Contact may cause damage to the lungs and central nervous system.

 TERATOG ENIC EFFECTS: Not Established.

 MUTAGENICITY: Not Established.

 SYNERGISTIC MATERIALS: Not Established.

#### 12. ECOLOGICAL INFORMATION

ENVIRONMENTAL DATA: MOBILITY IN SOIL POTENTIAL - Not Established.

ECOTOXICOLOGICAL INFORMATION: TERRESTRIAL/MICROORGANISM TOXICITY -

**ACUTE:** Ecological data does not exist for this mixture.

CHRONIC: Ecological data does not exist for this mixture.

BIOACCUMULATION/ACCUMULATION: Ecological data does not exist for this mixture.

AQUATIC TOXICITY (ACUTE): Ecological data does not exist for this mixture.

Notes: (CHRONIC) - Ecological data does not exist for this mixture.

CHEMICAL FATE INFORMATION: PERSISTENCE & DEGRADABILITY - Not Established.

**GENERAL COMMENTS:** Any other adverse environmental effects, such as environmental fate (exposure), ozone depletion potential, photochemical ozone creation potential, endocrine disrupting potential, and global warming potential are indicated in this section if data exists. Otherwise, this data has not been established.

**COMMENTS:** Data from laboratory studies and from scientific literature is noted in this section if available. Otherwise, data has not been established.

#### 13. DISPOSAL CONSIDERATIONS

**DISPOSAL METHOD:** It is recommended that this product, in any form, be incinerated in a suitable combustion chamber for disposal. Empty containers should be disposed of in a similar fashion due to presence of product residue. Follow applicable Federal, state, and local regulations.

**PRODUCT DISPOSAL:** Persons conducting disposal of this product and its containers/packaging should refer to Section 8 of this SDS for the proper selection of exposure controls and personal protective equipment.

**EMPTY CONTAINER:** Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition. They may explode and cause injury or death.

GENERAL COMMENTS: PHYSICAL & CHEMICAL PROPERTIES THAT MAY AFFECT DISPOSAL OPTIONS - Not Established. COMMENTS: Dispose of material in accordance with national, state, regional, and local regulations. Never discharge directly into sewers or surface waters. Consult with environmental regulatory agencies for guidance on acceptable disposal practices for the product, in any form, and its containers/packaging.

#### 14. TRANSPORT INFORMATION

DOT (DEPARTMENT OF TRANSPORTATIO N) PROPER SHIPPING NAME: Compressed gas, flammable, n.o.s. PRIMARY HAZARD CLASS/DIVISION: 2.1 UN/NA NUMBER: 1954 NAERG: 115 LABEL: 2.1: Flammable Gas MARINE POLLUTANT #1: Not Listed.

### 15. REGULATORY INFORMATION

## UNITED STATES

#### SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT)

311/312 HAZARD CATEGORIES: Fire Hazard. Immediate (Acute) Health Hazard.

FIRE: Yes PRESSURE GENERATING: No REACTIVITY: No ACUTE: Yes CHRONIC: Yes

CERCLA (COMPREHENSIVE RESPONSE, COMPENSATION, AND LIABILITY ACT)

Chemical Name	Wt.%	CERCLA RQ
Benzene	may contain	10
Hydrogen Sulfide	may contain	100

### TSCA (TOXIC SUBSTANCE CONTROL ACT)

Chemical Name	CAS
Methane	74-82-8
Ethane	74-84-0
Propane	74-98-6
i-Butane	75-28-5
n-Butane	106-97-8
Carbon Dioxide	124-38-9
Nitrogen	7727-37-9

# CLEAN AIR ACT

Chemical Name	Vol. %	CAS
Ethane	5 - 10	74-84-0
Propane	1 - 4	74-98-6
i-Butane	0.5 - 3	75-28-5
n-Butane	0.5 - 2	106-97-8

#### 16. OTHER INFORMATIO N

RELEVANT R-PHRASES:R61: May cause harm to the unborn child.

R26: Very toxic by inhalation.

R48/23: Toxic : danger of serious damage to health by prolonged exposure through inhalation.

R50/53: Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

R12: Extremely flammable.

R45: May cause cancer.

R46: May cause heritable genetic damage.

R11: Highly flammable.

R36/38: Irritating to eyes and skin.

R65: Harmful: may cause lung damage if swallowed.

#### PREPARED BY:

#### **REVISION SUMMARY:**

#### NATIONAL FIRE PROTECTION ASSOCIATION®HAZARD RATING

FIRE: 4-Severe Flammability

REACTIVITY: 0- Stable

#### HAZARDOUS MATERIAL IDENTIFICATION SYSTEM®HAZARD RATING

HEALTH: 2- Slight Hazard

- FIRE: 4- Severe Flammable Gas
- PHYSICAL: 0- Minimal Hazard



**HMIS RATINGS NOTES:** Please refer to Section 8 of this SDS for recommended personal protective equipment. **DATA SOURCES:** 

#### REFERENCES

ACGIH. 2012 Guide to Occupational Exposure Values. Cincinnati, OH. Signature Publications, 2012.

Forsberg, K.; Mansdorf, S.Z. Quick Selection Guide to Chemical Protective Clothing. Fifth Edition. Hoboken, NJ. John Wiley & Sons, 2007.

Lide, D.R. CRC Handbook of Chemistry and Physics. 88th Edition. Boca Raton, FL. CRC Press, 2008.

UNECE. Globally Harmonized System of Classification and labelling of Chemicals (GHS). Third Revised Edition. New York and Geneva. United Nations, 2009.

US DOT; Pipeline and Hazardous Materials Safety Administration. 2008 Emergency Response Guidebook. Neenah, WI. J.J. Keller & Associates, Inc. 2008.

US EPA. Consolidated List of Chemicals Subject to the Emergency Planning and Community Right-To-Know Act (EPCRA) and Section 112(r) of the Clean Air Act. [Available] Online: <u>http://www.epa.go v/ceppo/pubs/title3.pdf</u>. Retrieved 02/02/2011.

#### ADDITIONAL MSDS INFORMATION:

#### KEY / LEGEND

ACGIH - American Conference of Governmental Industrial Hygienists

- ADR Agreement on Dangerous Goods by Road
- CAA Clean Air Act
- CAS Chemical Abstracts Service Registry Number

CDG - Carriage of Dangerous Goods By Road and Rail Manual

CERCLA - Comprehensive Environmental Response, Conmensation, and Liability Act

CFR - Code of Federal Regulations

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EINECS - European Inventory of Existing Chemical Substances Registry Number ERG - Emergency Response Guidebook EPCRA - Emergency Planning and Community Right-to-Know Act GHS - Globally Harmonized System of Classification and Labelling of Chemicals IARC - International Agency for Research on Cancer IATA - International Air Transport Association ICAO - International Civil Aviation Organization IMDG - International Maritime Dangerous Goods Code IMO - International Maritime Organization N/E - Not Established NTP - National Toxicology Program OSHA - Occupational Safety and Health Administration PEL - Permissible Exposure Limit PPE - Personal Protective Equipment RCRA - Resource Conversation and Recovery Act RID - Regulations Concerning the International Transport of Dangerous Goods by Rail **RQ** - Reportable Quantities SARA - Superfund Amendments and Reauthorization Act of 1986 SDS - Safety Data Sheet TCC - Tag Closed Cup TDG - Transportation of Dangerous Goods TLV - Threshold Limit Value TSCA - Toxic Substance Control Act UN/NA - United Nations / North American Number UNECE - United Nations Economic Commission for Europe US DOT - United States Department of Transportation US EPA - United States Environmental Protection Agency Vol. - Volume WHMIS - Workplace Hazardous Materials Information System

**GENERAL STATEMENTS:** Other information not included anywhere else in this SDS is included in this section if, in fact, such data exists.

MANUFACTURER DISCLAIMER: This information relates to the specific material designated and may not be valid for such material used in combination with any other materials or in any process. Such information is to the best of our knowledge and belief, accurate and reliable as of the date compiled. However, no representation, warranty or guarantee is made as to its accuracy, reliability or completeness. NO WARRANTY OF MERCANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY, EXPRESSED OR IMPLIED, IS MADE CONCERNING THE INFORMATION HEREIN PROVIDED. It is the user's responsibility to satisfy himself as to the suitabliity and completeness of such information for his own particular use. We do not accept liability for any loss or damage that may occur from the use of this information nor do we offer warranty against patent infringemen

**Sweet Natural Gas** 

# SAFETY DATA SHEET

Date Issued: SDS NO: Date Revised: Revision No:

Non-Sour Natural Gas Condensate (Atmospheric Liquid) (West Virginia)

### \*\*\*IMPORTANT\*\*\*

This SDS has been prepared for Non-Sour Natural Gas Condensate at atmospheric pressure (i.e., atmospheric liquid). Refer to the following sections for important safety and response information.
Section 4- First Aid Measures (for accidental exposure).
Section 5- Fire Fighting Measures.
Section 6- Accidental Release Measures.

#### 1. PRODUCT AND COMPANY IDENTIFICATION

**PRODUCT NAME:** Non-Sour Natural Gas Condensate (Atmospheric Liquid) **GENERAL USE:** Condensate extracted from natural gas well production. **Common Name and Synonyms:** Gas Liquid, Condensate Liquids, Drip Gas, Natural Gas Condensate

#### 2. HAZARDS IDENTIFICATION

This product has not been tested to determine its specific health hazards. Therefore, the information provided in

this section includes health hazard information based on the product components.

### **GHS CLASSIFICATIONS**

Health	Physical
H319 Eye damage/irritation Category 2	
H315 Skin corrosion/irritation Category 2	H224 – Extremely flammable liquid and vapor – Category 1
H304 Aspiration Hazard Category 1	
H331 Acute toxicity, Inhalation Category 3	
H336 Specific target organ toxicity (single exposure) Category 3	
H350 Carcinogenicity Category 1B	
H412 – Harmful to aquatic life, chronic toxicity Category 3	

GHS LABEL

WARNING	DANGER
H320: Causes eye irritation.	H350: May cause cancer.
H315: Causes skin irritation.	

# Non-Sour Natural Gas Condensate (Atmospheric Liquid)



H224 Extremely flammable liquid and vapor



### PRECAUTIONARY STATEMENT(S)

#### Prevention:

P201: Obtain special instructions before use.

P202: Do not handle until all safety precautions have been read and understood.

- P210: Keep away from heat/sparks/open flames/hot surfaces. No smoking.
- P233: Keep container tightly closed.
- P235: Keep cool.
- P240: Ground/bond container and receiving equipment.
- P241: Use with explosion-proof equipment.
- P242: Use only non-sparking tools.
- P243: Take precautionary measures against static discharge.
- P261: Avoid breathing dust/fume/gas/mist/vapours/spray.
- P264: Wash thoroughly after handling.
- P271: Use only outdoors or in a well-ventilated area.
- P273: Avoid release to the environment.
- P280: Wear protective gloves / protective clothing / eye protection / face protection.

#### Response:

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. (P304+P340) If experiencing respiratory symptoms: Immediately call a POISON CENTER or doctor/physician. (P342+310)

IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. (P302+P310) Call a POISON CENTER or doctor/physician. (P311) Do NOT induce vomiting. (P331)

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. (P305+P351+338) : If eye irritation persists: Get medical advice/attention. (P337+P313)

IF ON SKIN: Remove/Take off immediately all contaminated clothing. (P302+P361) Wash with plenty of soap and water. (P352) If skin irritation or a rash occurs: Get medical advice/attention. (P333+P313)

IF ON CLOTHING: Take off contaminated clothing and wash before reuse. (P306+P362)

IF exposed or concerned: Call a POISON CENTER or doctor/physician if you feel unwell. (P308+P312)

In case of fire: Use dry chemical, carbon dioxide, or foam for extinction. (P370+P378) Collect spillage. (P391)\*

Store in a well-ventilated place. Keep container tightly closed. Keep cool. (P403+P233+235)

Store locked up. (P405)

IF exposed or concerned: Call a POISON CENTER or doctor/physician if you feel unwell. (P308+3312)

#### Disposal:

Dispose of contents/container in accordance with local/regional/national regulations. (P501)

#### EMERGENCY OVERVIEW

#### PHYSICAL APPEARANCE: Clear liquid.

**IMMEDIATE CONCERNS: HAZARD DESCRIPTION / WARNING INFORMATION SUMMARY** – This product is a highly flammable liquid which may be harmful if ingested, inhaled, comes in contact with skin or eyes, or is released into the environment. Please read entire contents of Section 2 of this Safety Data Sheet (SDS) for details.

#### POTENTIAL HEALTH EFFECTS

**EYES:** Eye contact with vapors may cause eye irritation, watering of eyes and reddening. Eye contact with liquid may cause irritation and pain. Prolonged contact may result in tissue damage.

SKIN: Skin contact may cause skin irritation and redness. Repeated or prolonged skin contact may cause dermatitis.

**INGESTION:** Ingestion may cause irritation to the gastrointestinal tract with nausea and diarrhea. May be harmful if swallowed in large quantities.

INHALATION: Breathing the mist and vapors may be irritating to the respiratory tract.

#### SIGNS AND SYMPTOMS OF OVEREXPOSURE

**CHRONIC EFFECTS:** Skin, eye, and respiratory tract irritation. Gastrointestinal and vascular effects and death may occur at high concentrations. May cause nervous system effects, such as headache, nausea and drowsiness.

CARCINOGENICITY: Condensate contains Catergory 2 constituents (Benezene).

MUTAGENICITY: Not Established.

#### REPRODUCTIVE TOXICITY

**REPRODUCTIVE EFFECTS:** Not Established.

TERATOGENIC EFFECTS: Not Established.

**MEDICAL CONDITIONS AGGRAVATED: Benzene** – Pre-existing blood system disorders, respiratory conditions, central nervous, liver, kidney, and cardio-vascular conditions may be aggravated by severe or chronic overexposure to benzene. Skin disorders may also be aggravated by exposures to benzene.

ROUTES OF ENTRY: Inhalation, skin contact, eye contact, ingestion.

TARGET ORGAN STATEMENT: May cause damage to eyes, skin and respiratory system.

CANCER STATEMENT: This product may cause cancer. Refer to Section 11 of this SDS for details.

SENSITIZATION: Not Established.

**COMMENTS:** ADDITIONAL MEDICAL AND TOXICOLOGICAL INFORMATION: Natural gas condensate and some of its fractions have been shown to cause skin irritation, damage and even cancers when applied directly and repeatedly to skin. When laboratory animals inhale oil vapors at high concentration or ingest in repeated doses, various tumors have developed.

This product contains benzene, which can cause degeneration in blood forming bone marrow leading to anemia which may further degrade to leukemia, a type of cancer (see 29 CFR 1910.1028 of standard). Benzene is recognized as a human carcinogen by OSHA, NTP, ACGIH, and IARC.

## 3. COMPOSITION / INFORMATIO N ON INGREDIENTS

Compositions given are typical values, not specifications. Compositions provided may vary with geographic location, geologic formation, temperature and pressure and actual values could be higher or lower than the ranges provided.

	Non-Sour Atmospheric Condensate Liquid	
Chemical Name	WT % (All Vary)	CAS
Water	<1.0 - 5.0	7732-18-5
Nitrogen	0.0 – 0.015	7727-37-9
Carbon Dioxide	0.0 - 0.04	124-38-9
Benzene	<0.10 - 0.70	71-43-2
Ethyl benzene	<1.0 - 3.0	100-41-4
Toluene	<1.0 - 5.0	108-88-3
Xylenes	<1.0 - 5.0	1330-20-7
Methane	<1.0 - 5.0	74-82-8
Ethane	<1.0 - 8.0	74-84-0
Propane	1.0 - 10.0	74-98-6
Isobutane	1.0 - 3.0	75-28-5
n-Butane	2.0 - 9.0	106-97-8
2,2-Dimethylpropane	0.0 - 0.20	463-82-1
Isopentane	2.0 - 5.0	78-78-4
n-Pentane	2.0 - 7.0	109-66-0
2,2-Dimethylbutane	0.10 - 0.40	75-83-2
Cyclopentane	0.000	287-92-3
2,3-Dimethylbutane	0.30 – 0.70	79-29-8
2-Methylpentane	1.0 - 4.0	107-83-5
3-Methylpentane	1.0 - 3.0	96-14-0
n-Hexane	2.0 - 5.0	110-54-3
Heptanes Plus	45.0 - 80.0	Mixture
Hydrogen Sulfide	<1.0	7783-06-4

**COMMENTS:** Some components of this material such as benzene, toluene and xylene have been shown to produce fetal toxicity and/or reduce female or male reproductive capacity in laboratory animals.

#### 4. FIRST AID MEASURES

**EYES:** Immediately flush with large amounts of water, holding eyelids open, for at least 20 minutes. Repeat if necessary. Remove contact lenses, if present and easy to do. If pain or redness persists, seek medical attention. If eye is exposed to hot liquid, cover eyes with cloth and seek medical attention immediately.

**SKIN:** In case of hot liquid exposure, do not remove clothing or treat, wash only unburned area and seek medical attention immediately.

**INGESTION:** Do not induce vomiting. If vomiting occurs spontaneously, keep head below hips to prevent aspiration of liquid into the lungs. Have exposed individual rinse mouth thoroughly with water. Never give anything by mouth to an unconscious person. Obtain medical assistance immediately and treat as directed by a medical professional.

**INHALATION:** Move victim to fresh air. Call 911, emergency medical service, or Emergency Phone Numbers(s) provided in Section 1 of this SDS. Give artificial respiration if victim is not breathing. Do not use mouth-to-mouth methods if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Administer oxygen if breathing is difficult.

ANTIDOTES: Not Established.

**NOTES TO PHYSICIAN:** No specific treatment. Treat symptomatically. General supportive measures with continual monitoring of gas exchange, acid-base balance, electrolytes, and fluid intake are also required. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled. **CLINICAL TESTING & MEDICAL MONITORING FOR DELAYED EFFECTS** – Not Established.

COMMENTS: CONTRAINDICATIONS - Not Established.

#### 5. FIRE FIGHTING MEASURES

#### FLASH POINT: This material is capable of flashing at temperatures of 22°C (72°F) or lower.

\*\*\*\*\*IMPORTANT: This material is highly flammable. When separator condensate liquid under pressure encounters normal atmospheric pressures, each 42-gallon barrel equivalent of condensate is capable of flashing over 92 pounds of volatile vapors to the atmosphere in a relatively short amount of time\*\*\*\*\*

AUTOIGNITION TEMPERATURE: Not Established.

#### EXTINGUISHING MEDIA:

**SMALL FIRE** – Class B fire extinguisher, carbon dioxide, multipurpose dry chemical, water fog or alcoholresistant foam.

**LARGE FIRE** – Water fog or alcohol-resistant foam.

#### COMMENTS:

**SPECIFIC HAZARDS THAT MAY ARISE FROM THE PRODUCT** - Vapors are flammable and some constituents may be heavier than air. Vapors may travel through the air as well as across the ground and reach remote ignition sources causing a flashback fire danger. Sudden reaction and fire may result if product is mixed with an oxidizing agent.

**FIRE EXPLOSION:** This product is extremely flammable. Hydrocarbon vapors that are released are a potential fire hazard. The condensate as well as its related vapors can easily be ignited by heat, sparks or flames. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Some vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks). Vapor explosion hazard indoors, outdoors or in sewers. Many liquids are lighter than water. Runoff to sewer may create fire or explosion hazard. Containers may explode when heated.

SENSITIVE TO STATIC DISCHARGE: Not Established.

SENSITIVITY TO IMPACT: Not Established.
# 6. ACCIDENTAL RELEASE MEASURES

**SMALL SPILL:** For emergency information and procedures to follow in the case of an accidental release, call the Emergency Telephone Number(s) listed in Section 1 of this SDS. Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). As an immediate precautionary measure, isolate spill or leak area 50 meters (160 feet) in all directions. Evacuate building and all affected areas. Keep unauthorized personnel away. Do not touch or walk through spilled material. Stay upwind. Keep out of low areas. Stop leak if you can do it without risk. Prevent entry into waterways, sewers, basements or confined areas. Dike far ahead of liquid for later disposal. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean non-sparking tools to collect absorbed material. Water spray may reduce vapor; but may not prevent ignition in closed spaces. A vapor suppressing foam may be used to reduce vapors. Provide sufficient ventilation in the affected area(s) and wear appropriate personal protective equipment as indicated in Section 8 when handling spill material. This material has been reported to behave when spilled in water in a manner that it partitions and the lighter ends volatize off and the heaver ends can sink.

**LARGE SPILL:** Use similar response procedures as indicated under Small Spill. Consider initial downwind evacuation for at least 100 meters (330 feet). Large releases may require the notification of local emergency response agencies. Wear self-contained breathing apparatus if conditions or air monitoring warrants.

#### 7. HANDLING AND STORAGE

**GENERAL PROCEDURES:** Handle in accordance with good industrial hygiene and safety practices. These practices include but are not limited to avoiding unnecessary exposure and prompt removal of material from eyes, skin and clothing. Wash exposed skin and clothing frequently. If needed, take first aid actions as indicated in Section 4 of this SDS.

**HANDLING:** Wear appropriate personal protective equipment and use exposure controls as indicated in Section 8. Vent slowly to the atmosphere when opening. Avoid all contact with skin and eyes. Avoid breathing product dust or vapors. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Remove contaminated clothing immediately. Wash with soap and water after working with this product.

**STORAGE:** Keep in airtight container away from all heat sources. Store the container in a segregated and approved area. Store in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Keep container in a well-ventilated area. Ground all containers during transfer. Store containers away from incompatible materials. Store in the original container or an approved alternative made from compatible material. Do not store in unlabeled containers. Treat empty containers in a similar fashion as residual product may exist. Use appropriate containment to avoid environmental containing.

STORAGE TEMPERATURE: Store containers of product in a cool (between 50°F or below), well ventilated location.

**STORAGE PRESSURE:** Store in a room with ambient atmospheric pressure.

ELECTROSTATIC ACCUMULATION HAZARD: Not Established.

#### 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

OSHA HAZARDOUS COMPONENTS (29 CFR1910.1200)				
		EXPOSURE LIMI	тѕ	
		OSHA PEL	ACGIH TLV	
Chemical Name ppm ppm				
Denzene	TWA	1	0.5	
Benzene	STEL	5	2.5	
Taluana	TWA	200	20	
roluene	STEL	300	N/E	
Ethyl benzene	TWA	100	20	

# Non-Sour Natural Gas Condensate (Atmospheric Liquid)

	STEL	125	N/E
	TWA	100	100
m-p Xylene	STEL	150	150
	TWA	100	100
o- Xylene	STEL	150	150
	TWA	50	50
nexalle	STEL	N/E	N/E
Hydrogen Sulfide	TWA	N/E	1
	STEL	20	5
Propano	TWA	1000	N/E
Propane	STEL	N/E	N/E
n Pontono	TWA	1000	1000
	STEL	N/E	N/E

**Note:** OSHA has also assigned  $H_2S$  a STEL value of 50 ppm for a 10-minute peak that may be reached only once per 8-hour shift. In the event no Federal OSHA PEL exists for a constituent, California/OSHA PELs have been substituted, as appropriate.

#### **EXPOSURE GUIDELINES**

**ENGINEERING CONTROLS:** Provide adequate general and local ventilation to maintain airborne chemical concentrations below applicable exposure limits, to prevent accumulation of flammable vapors and formation of explosive atmospheres, and to prevent formation of oxygen deficient atmospheres, especially in confined spaces. This product may release gases or vapors that can displace oxygen in enclosed areas.

#### PERSONAL PROTECTIVE EQUIPMENT

**EYES AND FACE:** Employees should be provided with and required to use splash-proof safety goggles and full face splash shields where there is any possibility of product coming in contact with eyes. Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of contact lenses. Ensure that eye wash station is operable and nearby.

**SKIN:** Consider wearing long-sleeve, FRC, otherwise normal working clothes should be worn. Wash contaminated clothing prior to reuse. If gloves are required for job operations involving this product, wear nitrile rubber or polyvinylalcohol (PVAL) gloves.

**RESPIRATORY:** Respiratory protection is normally not required except in emergencies or when conditions cause excessive airborne levels of mists or vapors. Select NIOSH-approved organic vapor air-purifying respirator, SCBA or air-supplied respirator where there may be potential for overexposure.

**PROTECTIVE CLOTHING:** Long sleeve shirt and long pants or coveralls; Consider wearing long-sleeve, FRC, . Consider wearing butyl rubber apron or outerwear where splashing may occur. Fully encapsulating, vapor protective clothing should be worn for spills and leaks with no fire.

**WORK HYGIENIC PRACTICES:** Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Promptly remove contaminated clothing and launder before reuse. Shower after work using plenty of soap and water.

**OTHER USE PRECAUTIONS: FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR DEATH CONDITIONS** - A self-contained breathing apparatus with full face piece operated in a pressure-demand or other positive pressure mode is recommended for firefighting or other immediately dangerous to life and death conditions. Supplied-air respirator with full face piece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode may also be used.

**COMMENTS: EXPOSURE LIMITS & SOURCES -** Refer to Section 16 Table 1 for additional exposure limits and sources for this product or its components, whichever applies.

#### 9. PHYSICAL AND CHEMICAL PROPERTIES

**ODOR:** Hydrocarbon.

APPEARANCE: Brown to Clear Liquid pH: 5.5 to 8.0

VAPOR PRESSURE: Not Established.

**VAPOR DENSITY: >** 3-4 (natural gasoline) (Air = 1)

BOILING POINT: Varies depending on hydrocarbon content.

FREEZING POINT: Not Available

POUR POINT: Not Established.

FLASH POINT: 22°C (72°F) May flash at lower temperatures..

SOLUBILITY IN WATER: Not Established.

EVAPORATION RATE: Not Established.

SPECIFIC GRAVITY: < 1.0 at 0℃ (32 ℉) VISCOSITY: Not Established. COEFF. OIL/WATER: Not Established. ODOR THRESHOLD: Not Established. RELATIVE DENSITY: Not Established. DECOMPOSTION TEMP: Not Established. AUTO-IGNITION TEMP: Not Established.

#### **10. STABILITY AND REACTIVITY**

#### STABLE: Yes

HAZARDOUS POLYMERIZATIO N: No

**STABILITY: CHEMICAL STABILITY -** This product is anticipated to be stable under normal ambient storage and handling conditions of temperature and pressure.

**POLYMERIZATION:** This product is not anticipated to cause hazardous reactions or polymerizations under normal ambient storage and handling conditions of temperature and pressure.

**CONDITIONS TO AVOID:** Avoid contact with incompatible materials such as heat, open flame, other sources of ignition, and oxidizing materials such as chlorine and concentrated nitric acid.

**HAZARDOUS DECOMPOSITION PRODUCTS:** This product may produce carbon monoxide and carbon dioxide during decomposition.

# 11. TOXICOLOGICAL

#### **INFORMATION ACUTE**

Chemical Name	ORAL LD <sub>50</sub> (rat)	DERMAL LD <sub>50</sub> (rabbit)	INHALATIO N LC₅₀ (rat)
Xylene	5000 mg/kg	12400 mg/kg	4550 ppm (4 hours)
Hexane	25 g/kg	Not Established.	48000 ppm (4 hours)
Crude Oil	< 5000 mg/kg	> 2000 mg/kg	Not Established
Toluene	636 mg/kg	14100 ug/kg	49 g/m <sup>3</sup> (4 hours)

# Non-Sour Natural Gas Condensate (Atmospheric Liquid)

Benzene	930 mg/kg	< 9400 ug/kg	10000 ppm (7 hours)
Ethyl benzene	<= 3500 mg/kg	<= 3500 mg/kg	<= 55000 mg/m <sup>3</sup>
Hydrogen Sulfide	Not Established	Not Established.	700 mg/m3 (4 hours)

**EYE EFFECTS:** May cause moderate to severe eye irritation.

**SKIN EFFECTS:** May cause mild skin irritation. Prolonged or repeated contact may result in mild irritation. May be absorbed through skin with toxic effects.

**CHRONIC:** This product contains benzene, which can cause degeneration in blood forming bone marrow leading to anemia, which may further degrade to leukemia, a type of cancer. Chronic exposure affects the hematopoietic system causing blood disorders including anemia and pancytopenia.

#### CARCINOGENICITY

Chemical Name	NTP Status	IAR C Status	OSHA Status
Crude Oil		3	
Benzene	1	1	Carcinogen.

**SENSITIZATION:** This product is not expected to be a skin sensitizer.

**NEUROTOXICITY:** Not Established.

GENETIC EFFECTS: Not Established.

**REPRODUCTIVE EFFECTS:** Not Established.

TERATOG ENIC EFFECTS: Not Established.

MUTAGENICITY: Not Established.

#### 12. ECOLOGICAL INFORMATION

#### ENVIRONMENTAL DATA: MOBILITY IN SOIL POTENTIAL - Not Established.

BIOACCUMULATION/ACCUMULATION: Not Established.

**DISTRIBUTION:** Do not discharge into or allow runoff to flow into sewers and natural waterways. Contain spill material and dike for proper disposal.

AQUATIC TOXICITY (ACUTE): This product is not expected to be acutely harmful to aquatic life.

CHEMICAL FATE INFORMATION: PERSISTENCE & DEGRADABILITY - Not Established.

**GENERAL COMMENTS:** Any other adverse environmental effects, such as environmental fate (exposure), ozone depletion potential, photochemical ozone creation potential, endocrine disrupting potential, and global warming potential are indicated in this section if data exists. Otherwise, this data has not been established.

#### **13. DISPOSAL CONSIDERATIONS**

**DISPOSAL METHOD:** Properly characterize the material and to manage it in accordance with applicable Federal, state and local regulations.

#### 14. TRANSPORT INFORMATION

DOT (DEPARTMENT OF TRANSPORTATIO N) PROPER SHIPPING NAME: Flammable liquid, n.o.s. PRIMARY HAZARD CLASS/DIVISION: 3 UN/NA NUMBER: 1993 PACKING GROUP: II NAERG: 128

# 15. REGULATORY

#### **INFORMATION UNITED**

#### STATES

#### SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT)

311/312 HAZARD CATEGORIES: Fire hazard. Immediate (acute) health hazard. Delayed (chronic) health hazard.

FIRE: Yes PRESSURE GENERATING: No REACTIVITY: No ACUTE: Yes CHRONIC: Yes

#### EPCRA SECTION 313 SUPPLIER NOTIFICATION

Chemical Name	Vol. %	CAS
Benzene	<0-1.0	71-43-2

# CERCLA (COMPREHENSIVE RESPONSE, COMPENSATION, AND LIABILITY ACT)

Chemical Name	Vol. %	CERCLA RQ
Benzene	<0-1.0	10
Hydrogen Sulfide	<0-1.0	100

#### **TSCA (TOXIC SUBSTANCE CONTROL ACT)**

Chemical Name	CAS
Crude Oil	8002-05-9
Benzene	71-43-2
Hydrogen Sulfide	7783-06-4

#### CLEAN AIR ACT

Chemical Name	Vol. %	CAS
Hydrogen Sulfide	<0-1.0	7783-06-4

#### 16. OTHER INFORMATIO N

#### **RELEVANT R-PHRASES:**

R36/37/38: Irritating to eyes, respiratory system and skin.

R45: May cause cancer.

R46: May cause heritable genetic damage.

R11: Highly flammable.

R36/38: Irritating to eyes and skin.

R65: Harmful: may cause lung damage if swallowed.

R12: Extremely flammable.

R26: Very toxic by inhalation.

R50: Very toxic to aquatic organisms.

#### PREPARED BY:

**REVISION SUMMARY:** 

#### NATIONAL FIRE PROTECTION ASSOCIATION®HAZARD RATING

HEALTH: 1-Slightly Hazardous

FIRE: 4- Severely Flammable

REACTIVITY: 0- Stable

#### HAZARDOUS MATERIAL IDENTIFICATION SYSTEM®HAZARD RATING

HEALTH: 1- Slight Hazard (\*Chronic)

FIRE: 4- Severely Flammable Liquid

# Non-Sour Natural Gas Condensate (Atmospheric Liquid)



# DATA SOURCES: REFERENCES

ACGIH. 2012 Guide to Occupational Exposure Values. Cincinnati, OH. Signature Publications, 2012.

Forsberg, K.; Mansdorf, S.Z. Quick Selection Guide to Chemical Protective Clothing. Fifth Edition. Hoboken, NJ. John Wiley & Sons, 2007.

Lide, D.R. CRC Handbook of Chemistry and Physics. 88th Edition. Boca Raton, FL. CRC Press, 2008.

UNECE. Globally Harmonized System of Classification and labeling of Chemicals (GHS). Third Revised Edition. New York and Geneva. United Nations, 2009.

US DOT; Pipeline and Hazardous Materials Safety Administration. 2008 Emergency Response Guidebook. Neenah, WI. J.J. Keller & Associates, Inc. 2008.

US EPA. Consolidated List of Chemicals Subject to the Emergency Planning and Community Right-To-Know Act (EPCRA) and Section 112(r) of the Clean Air Act. [Available] Online: <u>http://www.epa.go v/ceppo/pubs/title3.pdf</u>. Retrieved 02/02/2011.

# ADDITIONAL MSDS

## INFORMATION: <u>KEY / LEGEND</u>

ACGIH - American Conference of Governmental Industrial Hygienists

- ADR Agreement on Dangerous Goods by Road
- CAA Clean Air Act

CAS - Chemical Abstracts Service Registry Number

CDG - Carriage of Dangerous Goods By Road and Rail Manual

CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act

CFR - Code of Federal Regulations

EINECS - European Inventory of Existing Chemical Substances Registry Number

ERG - Emergency Response Guidebook

EPCRA - Emergency Planning and Community Right-to-Know Act

GHS - Globally Harmonized System of Classification and Labeling of Chemicals

IARC - International Agency for Research on Cancer

IATA - International Air Transport Association

ICAO - International Civil Aviation Organization

IMDG - International Maritime Dangerous Goods Code

IMO - International Maritime Organization

N/E - Not Established

NTP - National Toxicology Program

OSHA - Occupational Safety and Health Administration

PEL - Permissible Exposure Limit

PPE - Personal Protective Equipment

RCRA - Resource Conversation and Recovery Act

RID - Regulations Concerning the International Transport of Dangerous Goods by Rail

RQ - Reportable Quantities

SARA - Superfund Amendments and Reauthorization Act of 1986

SDS - Safety Data Sheet

TCC - Tag Closed Cup

TDG - Transportation of Dangerous Goods

TLV - Threshold Limit Value

TSCA - Toxic Substance Control Act

UN/NA - United Nations / North American Number

UNECE - United Nations Economic Commission for Europe

# **Sweet Produced Water**

US DOT - United States Department of Transportation US EPA - United States Environmental Protection Agency Vol. - Volume WHMIS - Workplace Hazardous Materials Information System

**GENERAL STATEMENTS:** Other information not included anywhere else in this SDS is included in this section if, in fact, such data exists.

**MANUFACTURER DISCLAIMER:** This information relates to the specific material designated and may not be valid for such material used in combination with any other materials or in any process. Such information is to the best of our knowledge and belief, accurate and reliable as of the date compiled. However, no representation, warranty or guarantee is made as to its accuracy, reliability or completeness. NO WARRANTY OF MERCANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY, EXPRESSED OR IMPLIED, IS MADE CONCERNING THE INFORMATION HEREIN PROVIDED. It is the user's responsibility to satisfy himself as to the suitability and completeness of such information for his own particular use. We do not accept liability for any loss or damage that may occur from the use of this information nor do we offer warranty against patent infringement.

# SAFETY DATA SHEET

Date Issued : SDS No: Date Revised : **Revision No:** 

# **Non-Sour Produced** Water (West Virginia)

#### \*\*\*IMPORTANT\*\*\*

This SDS has been prepared for Non-Sour Produced Water. Refer to the following sections for important safety and response information. Section 4- First Aid Measures (for accidental exposure).

Section 5- Fire Fighting Measures.

Section 6- Accidental Release Measures.

# 1. PRODUCT AND COMPANY IDENTIFICATION

**PRODUCT NAME:** Non-Sour Produced Water (West Virginia) GENERAL USE: Water extracted from natural gas well production.

# 2. HAZARDS IDENTIFICATION

This material is not considered hazardous according to OSHA criteria.

# 3. COMPOSITION / INFORMATIO N ON INGREDIENTS

Chemical Name	Vol. %	CAS
Water	>90	7732-18-5
Sodium Chloride	<10	7647-14-5

COMMENTS: Compositions given are typical values, not specifications. Composition may vary with geographic location, geologic formation, temperature and pressure.

#### 4. FIRST AID MEASURES

EYES: Immediately flush with large amounts of water, holding eyelids open, for at least 20 minutes. Repeat if necessary. Remove contact lenses, if present and easy to do. If pain or redness persists, seek medical attention. If eye is exposed to hot liquid, cover eyes with cloth and seek medical attention immediately.

SKIN: In case of hot liquid exposure, do not remove clothing or treat, wash only unburned area and seek medical attention immediately.

**INGESTION:** Do not induce vomiting. If vomiting occurs spontaneously, keep head below hips to prevent aspiration of liquid into the lungs. Have exposed individual rinse mouth thoroughly with water. Never give anything by mouth to an unconscious person. Obtain medical assistance immediately and treat as directed by a medical professional.

**INHALATION:** Move victim to fresh air. Call 911, emergency medical service,

NOTES: Contact poison treatment center immediately if large quantities have been ingested or inhaled.

#### 5. FIRE FIGHTING MEASURES

## FLASH POINT: N/A

**EXTINGUISHING MEDIA:** Material is not flammable.

FIRE FIGHTING PROCEDURES: PROTECTIVE ACTIONS TO TAKE DURING FIRE FIGHTING - Move containers from fire area if you can do it without risk. Dike fire-control water for later disposal; do not scatter the material. Do not get water inside containers.

**FIRE FIGHTING EQUIPMENT: PRECAUTIO NS FOR FIRE INVOLVING TANKS OR CAR/TRAILER LOADS -** Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.

# 6. ACCIDENTAL RELEASE MEASURES

**SMALL SPILL:** For emergency information and procedures to follow in the case of an accidental release, call the Emergency Telephone Number(s) listed in Section 1 of this SDS. As an immediate precautionary measure, isolate spill or leak area 50 meters (160 feet) in all directions. Keep unauthorized personnel away. Do not touch or walk through spilled material. 7Stop leak if you can do it without risk. Prevent entry into waterways, sewers. Dike far ahead of liquid for later disposal. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.

**LARGE SPILL:** Use similar response procedures as indicated under Small Spill. Large releases may require the notification of local emergency response agencies.

**COMMENT:** CAUTION This material is capable of off gassing volatiles.

#### 7. HANDLING AND STORAGE

**GENERAL PROCEDURES:** Handle in accordance with good industrial hygiene and safety practices. These practices include but are not limited to avoiding unnecessary exposure and prompt removal of material from eyes, skin and clothing. Wash exposed skin and clothing frequently. If needed, take first aid actions as indicated in Section 4 of this SDS.

**HANDLING:** Wear appropriate personal protective equipment and use exposure controls as indicated in Section 8. Avoid all contact with skin and eyes. Avoid breathing product dust or vapors. Wash with soap and water after working with this product.

**STORAGE:** Keep in airtight container away from all heat sources. Store in a segregated and approved area. Store in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Keep container in a well-ventilated area. Ground all containers during transfer. Store in the original container or an approved alternative made from compatible material. Do not store in unlabeled containers. Treat empty containers in a similar fashion as residual product may exist. Use appropriate containment to avoid environmental contamination.

**STORAGE TEMPERATURE:** Store containers of product in cool well ventilated location.

STORAGE PRESSURE: Store in a room with ambient pressure.

ELECTROSTATIC ACCUMULATION HAZARD: Not Established.

#### 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

#### EXPOSURE GUIDELINES

OSHA HAZARDOUS COMPONENTS (29 CFR1910.1200)			
	EXPOSURE LIMITS		
		OSHA PEL	ACGIH TLV
Chemical Name		ppm	ppm
Sedium Chlorida	TWA	N/E	N/E
Sodium Chionde	STEL	N/E	N/E

**ENGINEERING CONTROLS:** Provide adequate general and local ventilation to maintain airborne chemical concentrations below applicable exposure limits.

# PERSONAL PROTECTIVE EQUIPMENT

# **Produced Water**

**EYES AND FACE:** Employees should be provided with and required to use splash-proof safety goggles and full face splash shields where there is any possibility of product coming in contact with eyes. Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of contact lenses. Ensure that eye wash station is operable and nearby.

**SKIN:** Consider wearing long-sleeve, FRC, otherwise normal working clothes should be worn. Wash contaminated clothing prior to reuse. If gloves are required for job operations involving this product, wear nitrile rubber or butyl rubber gloves.

**RESPIRATORY:** Respiratory protection is normally not required except in emergencies or when conditions cause excessive airborne levels of mists or vapors. Select NIOSH-approved organic vapor air-purifying respirator, SCBA or air-supplied respirator where there may be potential for overexposure.

**PROTECTIVE CLOTHING:** Long sleeve shirt and long pants or coveralls. Consider wearing butyl rubber apron or outerwear where splashing may occur. Fully encapsulating, vapor protective clothing should be worn for spills and leaks with no fire.

**WORK HYGIENIC PRACTICES:** Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Promptly remove contaminated clothing and launder before reuse. Shower after work using plenty of soap and water.

**COMMENTS: EXPOSURE LIMITS & SOURCES -** Refer to Section 16 Table 1 for additional exposure limits and sources for this product or its components, whichever applies.

#### 9. PHYSICAL AND CHEMICAL PROPERTIES

ODOR: Salty. APPEARANCE: Clear or opaque liquid. **pH:** 6-8 PERCENT VOLATILE: Negligible. VAPOR PRESSURE: Not Established. VAPOR **DENSITY:** >1.0 (Air = 1) BOILING POINT: 212° F / 100° C **FREEZING POINT:** < 0℃ (<32°F) POUR POINT: Not Established. FLASH POINT: Not Applicable LOWER EXPLOSIVE LIMITS: Not Applicable SOLUBILITY IN WATER: Not Established. EVAPORATION RATE: Not Established. SPECIFIC **GRAVITY:** > 1.000 at 0°C (32°F) VISCOSITY: Not Established. COEFF. OIL/WATER: Not Established. **ODOR THRESHOLD:** Not Established.

#### **10. STABILITY AND REACTIVITY**

#### STABLE: Yes

#### HAZARDOUS POLYMERIZATIO N: No

**STABILITY: CHEMICAL STABILITY -** This product is anticipated to be stable under normal ambient storage and handling conditions of temperature and pressure.

**POLYMERIZATION:** This product is not anticipated to cause hazardous reactions or polymerizations under normal ambient storage and handling conditions of temperature and pressure.

CONDITIONS TO AVOID: Avoid contact with incompatible materials such as heat.

#### 11. TOXICOLOGICAL INFORMATION ACUTE

# Produced Water

Chemical Name	ORAL LD <sub>50</sub> (rat)	DERMAL LD <sub>50</sub> (rabbit)	INHALATION $LC_{50}$ (rat)
Sodium Chloride	3000 mg/kg	N/E	N/E

**EYE EFFECTS:** May cause moderate to severe eye irritation.

**SKIN EFFECTS:** May cause mild skin irritation. Prolonged or repeated contact may result in mild irritation. **CHRONIC:** Not Established.

**CARCINOGENICITY:** Not expected to cause cancer. This substance is not listed as a carcinogen by IARC, NTP, or OSHA. **SENSITIZATION:** This product is not expected to be a skin sensitizer.

**NEUROTOXICITY:** Not Established.

GENETIC EFFECTS: Not Established.

REPRODUCTIVE EFFECTS: Not Established.

TERATOG ENIC EFFECTS: Not Established.

MUTAGENICITY: Not Established.

#### 12. ECOLOGICAL INFORMATION

ENVIRONMENTAL DATA: MOBILITY IN SOIL POTENTIAL - Not Established.

BIOACCUMULATION/ACCUMULATION: Not Established.

**DISTRIBUTIO N:** Do not discharge into or allow runoff to flow into sewers and natural waterways. Contain spill material and dike for proper disposal.

AQUATIC TOXICITY (ACUTE): This product is not expected to be harmful to aquatic life.

96-HOUR LC<sub>50</sub>: 3930 - 5360 mg/L Pimephales promelas for calcium chloride.

48-HOUR EC<sub>50</sub>: 52 mg/L for Daphnia magna for calcium chloride.

CHEMICAL FATE INFORMATION: PERSISTENCE & DEGRADABILITY - Not Established.

#### 13. DISPOSAL CONSIDERATIONS

**DISPOSAL METHOD:** The generator of a waste is responsible to determine if the material disposed of meets federal, state, or local criteria to be defined as a hazardous waste and dispose of accordance with applicable Federal, state and local regulations.

#### 14. TRANSPORT INFORMATION

#### DOT (DEPARTMENT OF TRANSPORTATIO N)

Not Regulated

#### **15. REGULATORY INFORMATION UNITED STATES**

#### SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT)

311/312 HAZARD CATEGORIES: Fire hazard. Immediate (acute) health hazard. Delayed (chronic) health hazard. FIRE: No PRESSURE GENERATING: No REACTIVITY: No ACUTE: No CHRONIC: No

#### **EPCRA SECTION 313 SUPPLIER NOTIFICATION**

This material does not contain any chemicals subject to the reporting requirements of SARA 313 and 40 CFR 372.

#### CERCLA (COMPREHENSIVE RESPONSE, COMPENSATION, AND LIABILITY ACT)

This material does not contain any chemicals with CERCLA Reportable Quantities.

#### TSCA (TOXIC SUBSTANCE CONTROL ACT)

All components are either listed on the TSCA Inventory, or are not regulated under TSCA.

## 16. OTHER INFORMATIO N

# RELEVANT R-PHRASES: R36/37/38: Irritating to eyes, respiratory system and skin. R36/38: Irritating to eyes and skin. R65: Harmful: may cause lung damage if swallowed. PREPARED BY:

# REVISION SUMMARY:NATIONAL FIRE PROTECTION ASSOCIATION®HAZARD RATINGHEALTH:0-Hazard No greater than Ordinary MaterialFIRE:0-Will Not BurnREACTIVITY:0- Stable

# HAZARDOUS MATERIAL IDENTIFICATION SYSTEM® HAZARD RATING

HEALTH:	0- Minimal Hazard
FIRE:	0- Minimal Hazard
PHYSICAL:	0- Minimal Hazard

# HMIS RATING

HEALTH	0
FLAMMABILITY	0
PHYSICAL HAZARD	0
PERSONAL PROTECTION	В



# Sweet Produced Water

#### ADDITIONAL MSDS INFORMATION: KEY / LEGEND

ACGIH - American Conference of Governmental Industrial Hygienists ADR - Agreement on Dangerous Goods by Road CAA - Clean Air Act CAS - Chemical Abstracts Service Registry Number CDG - Carriage of Dangerous Goods by Road and Rail Manual CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act CFR - Code of Federal Regulations EINECS - European Inventory of Existing Chemical Substances Registry Number NAERG - Emergency Response Guidebook EPCRA - Emergency Planning and Community Right-to-Know Act GHS - Globally Harmonized System of Classification and Labeling of Chemicals IARC - International Agency for Research on Cancer IATA - International Air Transport Association ICAO - International Civil Aviation Organization IMDG - International Maritime Dangerous Goods Code IMO - International Maritime Organization MSDS - Material Safety Data Sheet N/E - Not Established NOV - National Oil well Varco NTP - National Toxicology Program OSHA - Occupational Safety and Health Administration PEL - Permissible Exposure Limit PPE - Personal Protective Equipment RCRA - Resource Conversation and Recovery Act RID - Regulations Concerning the International Transport of Dangerous Goods by Rail **RQ** - Reportable Quantities SARA - Superfund Amendments and Reauthorization Act of 1986 SDS - Safety Data Sheet TCC - Tag Closed Cup

TDG - Transportation of Dangerous Goods

TLV - Threshold Limit Value

TSCA - Toxic Substance Control Act

UN/NA - United Nations / North American Number

- UNECE United Nations Economic Commission for Europe
- US DOT United States Department of Transportation

US EPA - United States Environmental Protection Agency

Vol. - Volume

WHMIS - Workplace Hazardous Materials Information System

**GENERAL STATEMENTS:** Other information not included anywhere else in this SDS is included in this section if, in fact, such data exists.

MANUFACTURER DISCLAIMER: This information relates to the specific material designated and may not be valid for such material used in combination with any other materials or in any process. Such information is to the best of our knowledge and belief, accurate and reliable as of the date compiled. However, no representation, warranty or guarantee is made as to its accuracy, reliability or completeness. NO WARRANTY OF MERCANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY, EXPRESSED OR IMPLIED, IS MADE CONCERNING THE INFORMATION HEREIN PROVIDED. It is the user's responsibility to satisfy himself as to the suitability and completeness of such information for his own particular use. We do not accept liability for any loss or damage that may occur from the use of this information nor do we offer warranty against patent infringement.

# ATTACHMENT E

# **EMISSION CALCULATIONS**

# **Permit Determination**

Wayne Well Pad New Martinsville, 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 Wayne Well Pad

#### Criteria Pollutants

Proposed Facility Wide PTE - Criteria	Proposed Facility Wide PTE - Criteria Pollutants							
Source	РМ	PM10	PM2.5	SO2	NOx	со	VOC	CO2e
Line Heaters (ton/yr)	0.196	0.196	0.196	0.015	2.576	2.164	0.142	3075.020
Tanks (ton/yr)	-	-	-	-	-	-	1.325	-
Truck Loading (ton/yr)	-	-	-	-	-	-	0.000	-
Fugitives (ton/yr)	-	-	-	-	-	-	0.885	16.588
Total Emissions (ton/yr)	0.196	0.196	0.196	0.015	2.576	2.164	2.351	3091.608
Total Emissions (lb/hr)	0.045	0.045	0.045	0.004	0.588	0.494	0.537	705.847

#### Proposed Facility Wide PTE - HAPs

#### Hazardous Air Pollutants (HAPs)

Source	Benzene	Toluene	Ethylbenzene	Xylene	n-Hexane	Formaldehyde	Total HAPs
Line Heaters (ton/yr)	0.0000	0.0000			0.0116	0.000	0.012
Tanks (ton/yr)	-	-	-	-	-	-	-
Truck Loading (ton/yr)	-	-	-	-	-	-	-
Fugitives (ton/yr)	0.0002	0.0000	0.0000	0.0000	0.0133		0.014
Total Emissions (ton/yr)	0.000	0.000	0.000	0.000	0.025	0.000	0.026
Total Emissions (lb/hr)	0.000	0.000	0.000	0.000	0.006	0.000	0.006

Pollutant	Emission Factor	1.50 MBtu/hr GPU Emissions (lb/hr)	1.50 MMBtu/hr GPU Emissions (ton/yr)	1.50 MBtu/hr GPU Emissions (lb/hr) x4	1.50 MMBtu/hr GPU Emissions (ton/yr) x4
Oritaria Dallatarta					
		0.011	0.040	0.470	0.400
PM/PM10/PM2.5		0.011	0.049	0.179	0.196
SO <sub>2</sub>	0.6 lb/MMct (1	0.001	0.004	0.014	0.015
NOx	100 lb/MMcf (2	0.147	0.644	2.353	2.576
СО	84 lb/MMcf (2	0.124	0.541	1.976	2.164
VOC	5.5 lb/MMcf (1	0.008	0.035	0.129	0.142
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	0.002	0.002
Hexane	1.8E+00 lb/MMcf (4	0.003	0.012	0.042	0.046
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 Ib/MMCF	0.003	0.012	0.044	0.049
Greenhouse Gas Emissions					
CO <sub>2</sub>	116.89 lb/MMBtu (5	175.334	767.961	701.335	3071.845
CH <sub>4</sub>	2.2E-03 lb/MMBtu (5	0.003	0.014	0.013	0.058
N <sub>2</sub> O	0.0 lb/MMBtu (5	0.000	0.001	0.001	0.006
CO <sub>2</sub> e <sup>(b)</sup>		175.515	768.755	702.059	3075.020

#### Table 2 GPU Heater (LH-1 through LH-4) Rates and Emissions Tug Hill Operating, LLC Wayne Well Pad

#### Calculations:

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

Number of Heaters=	4
Fuel Use (MMBtu/hr) =	1.5
Hours of Operation (hr/yr)=	8760
PTE Fuel Use (MMcf/yr) =	12.9

(b) CO<sub>2</sub> equivalent = [(CO<sub>2</sub> emissions)\*(GWP<sub>CO2</sub>)]+[(CH<sub>4</sub> emissions)\*(GWP<sub>CH4</sub>)]+[(N<sub>2</sub>O emissions)\*(GWP<sub>N2O</sub>)] 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 3. Tank Emissions Tug Hill Operating, LLC Wayne Well Pad

Emission Unit ID	Tank Capacity (bbl)	Tank Contents	Control Devices	Tank Throughput (bbls/day)	VOC Emis Factor (lbs/	sion bbls)	VOC Emissions (lbs/yr) <sup>(a)</sup>	VOC Emissions (lb/hr) <sup>(b)</sup>	VOC Emissions (tons/yr) <sup>(c)</sup>
T01	400	Pipeline Liquids	None	7.04	8.26E-01	(1)	2121.74	0.242	1.061
T02	35714	Pipeline Liquids	None	300.07	4.82E-03	(1)	528.20	0.060	0.264
Totals							2649.94	0.30	1.32

#### Calculations:

(a) VOC Emissions (lb/yr) = Tank Throughput (bbls/day) \* VOC Emission Factor (lbs/bbls) \* (365days/yr)

(b) VOC Emissions (lb/hr) = VOC Emissions (lbs/yr) \* (yr/8760hr) (c) VOC Emissions (ton/yr) = VOC Emissions (lbs/yr) \* (1ton/2000lbs)

Notes:

(1) VOC emission factor includes Flashing/Working/Breathing losses as calculated from the Promax Model Simulation report

Contents	Volume Transferred	PTE VOC Emissions (lb/hr)	PTE VOC Emission (ton/yr) <sup>(a)</sup>	
Pipeline Liquids	107,923 gal/yr	3.38E-05	1.48E-04	
Total 3.38F-05 1.48F-04				
Calculations: (a) PTE VOC Emissions (to	n/yr) given as calculated in ti	ne Promax Model simu	lation report	

#### Table 5 Fugitive Leaks Tug Hill Operating, LLC Wayne Well Pad

1		0			
Pollutant	Emission Factor	PTE <sup>(a) Gas Service</sup> (tons/yr)	PTE VOC emissions (ton/yr)	PTE CO <sub>2</sub> e emissions (ton/yr)	PTE Total HAPs emissions (ton/yr)
Valves	9.9E-03 lb/hr/source	6.25	0.60	11.28	0.01
Pressure Relief Valves	1.9E-02 lb/hr/source	0.34	0.03	0.61	0.00
Connectors (2)	8.6E-04 lb/hr/source	2.41	0.23	4.35	0.00
Open Ended Lines	4.4E-03 lb/hr/source	0.19	0.02	0.35	0.00
Total		9.19	0.88	16.59	0.01

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	1.25E-04	1.25E-04	6.25E-06	6.25E-06	9.06E-03
Pressure Relief Valves	6.79E-06	6.79E-06	3.40E-07	3.40E-07	4.92E-04
Connectors (2)	4.82E-05	4.82E-05	2.41E-06	2.41E-06	3.49E-03
Open Ended Lines	3.86E-06	3.86E-06	1.93E-07	1.93E-07	2.80E-04
Total	0.00	0.00	0.00	0.00	0.01

#### 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	75.00%
Ethane	15.38%
VOC	9.62%
Benzene	0.00%
Toluene	0.00%
Ethylbenzene	0.00%
Xylenes	0.00%
n-Hexane	0.15%

Number of Components in Gas Service

Valves =	144
Pressure Relief Valves =	4
Connectors =	640
Open Ended Lines =	10
Maximum Hour of Operation =	8,760

#### Global Warming Potential (GWP)

CO <sub>2</sub>	1
$CH_4$	25
N <sub>2</sub> O	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

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Simulation Report
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ProMax Filename: N:\West Virginia\Tug Hill\Projects\Determination\Wayne\ProMax\Tug Hill_Wayne_WellPad.pmx ProMax Version: 4.0.16071.0 Simulation Initiated: 7/17/2017 9:51:16 AM
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Tug Hill- Wayne



Process Streams		Condensate	Condensate To Pipeline	Flash	Gas	Gas To Pipeline	Produced Liquid	ProducedWater	Water	Well Stream	2
Composition	Status: From Block:	Solved	Solved	Solved Storage Vessel	Solved	Solved	Solved Storage Vessel	Solved	Solved	Solved	Solved
	To Block:	MIX-100			MIX-100	V33E-100		VLVE-100	MIX-100	VSSL-100	Storage Vessel
Mole Fraction C1		% 8.99139*	%	36,8069	% 75.001*	% 75.0668	% 0.00105579	0.0626619	% 0*	73.6013	% 0.0626619
C2		10.9960*	11.0369	18.0692	15.375*	15.3685	0.00113325	0.0313758	0*	15.1397	0.0313758
C3 iC4		13.0047*	12.4271 2.81557	13.6969	5.545* 0.552*	5.52636 0.546410	0.00159808	0.0245215	0*	5.51106 0.557470	0.0245215
nC4		10.8482*	11.0293	9.77886	1.518*	1.49313	0.00360679	0.0199687	0*	1.54978	0.0199687
iC5 nC5		4.71444* 8.28622*	4.34143 7.86777	3.01603 4.87974	0.275*	0.267358 0.371528	0.00265511 0.00571159	0.00769894 0.0138698	0* 0*	0.296252 0.426217	0.00769894 0.0138698
N2		0.0199764*	0.0307051	0.161026	0.682*	0.682736	2.14297E-06	0.000271667	0*	0.668924	0.000271667
CO2 Benzene		0.0819034*	0.0637718	0.0279196	0.188*	0.00160461	0.000220700	0.000229681	0*	0.00242293	0.00229681
Ethylbenzene		0.261691*	0.151163	0.00557049	0*	0.000282909	0.000264023	0.000272905	0*	0.00147488	0.000272905
o-Xylene		0.478435*	0.287587	0.00820199	0.002	0.000426392	0.000508481	0.000521358	0*	0.00269644	0.000521358
C6 C7		6.02789*	7.89681	2.33545	0.145*	0.115988	0.0100009	0.0138933	0*	0.176169	0.0138933
C8		1.75393*	1.60862	0.0600116	0.006*	0.00308705	0.00273298	0.00282885	0*	0.0157691	0.00282885
C9 C10		0.937893*	0.733393	0.00848029	0.001*	0.000465288 8.10939E-05	0.00127765	0.00128970	0* 0*	0.00626659	0.00128970
C11		1.46527*	1.03130	0.00116400	0*	8.87480E-05	0.00181467	0.00181358	0*	0.00825821	0.00181358
C12 C13		0.897940*	0.636195 0.419937	0.000237849 5.16608E-05	0*	2.04232E-05 5.38155E-06	0.00112025 0.000739626	0.00111877 0.000738474	0*	0.00506076	0.00111877 0.000738474
2,2-Dimethylpropane		0.137837*	0.133769	0.111576	0.015*	0.0147301	5.11379E-05	0.000237809	0*	0.0154868	0.000237809
2,2-Dimetnyibutane Cyclopentane		0.1/1/9/-	0.263286	0.128514	0.009*	0.00787015	0.000248956	0.000463649	0*	0.00979420	0.000463649
2,3-Dimethylbutane		0.402525*	0.662577	0.270213	0.018*	0.0149791	0.000716872	0.00116796	0*	0.0199205	0.00116796
3-Methylpentane		1.89476*	2.39802	0.849738	0.094	0.0800592	0.00281254	0.00423014	0*	0.0626539	0.00686411
Methylcyclopentane Cyclobexane		0.821031*	0.724710	0.224048	0.012*	0.0108770	0.000906506	0.00128000	0*	0.0163952	0.00128000
2-Methylhexane		2.00164*	1.82938	0.233134	0.014*	0.013733	0.00129224	0.00321806	0*	0.0279524	0.00321806
3-Methylhexane 2.2.4-Trimethylpentane		1.89476*	1.87527	0.271194	0.017*	0.0127544	0.00284971	0.00329887	0*	0.0273501	0.00329887
Methylcyclohexane		1.87479*	1.86368	0.212557	0.014*	0.00972931	0.00293087	0.00328174	0*	0.0242955	0.00328174
m-Xylene p-Xylene		0.262690*	0.154125	0.00523582	0*	0.000264730	0.000266822	0.000275139	0*	0.00148051	0.000275139
Water		0*	0.0417072	2.52415	0*	0.106172	99.9242	99.7611	100*	1.37021	99.7611
C14 C15		0.395533* 0.249705*	0.281170	1.18870E-05 2.58990E-06	0* 0*	1.45171E-06 3.67909E-07	0.000495255	0.000494446	0* 0*	0.00222921 0.00140733	0.000494446 0.000312270
C16		0.132843*	0.0944831	5.03512E-07	0*	8.39804E-08	0.000166429	0.000166152	0*	0.000748699	0.000166152
C17 C18		0.0759104* 0.0639246*	0.0539935 0.0454695	1.14766E-07 3.81525E-08	0* 0*	2.25156E-08 8.64370E-09	9.51084E-05 8.00936E-05	9.49494E-05 7.99596E-05	0* 0*	0.000427828 0.000360276	9.49494E-05 7.99596E-05
C19		0.0389540*	0.0277083	8.25431E-09	0*	2.21591E-09	4.88077E-05	4.87261E-05	0*	0.000219543	4.87261E-05
C20 C21		0.0179788* 0.00998821*	0.0127886 0.00710476	9.45323E-10 2.30803E-10	0*	3.12557E-10 8.89746E-11	2.25268E-05 1.25149E-05	2.24891E-05 1.24940E-05	0*	0.000101328 5.62932E-05	2.24891E-05 1.24940E-05
C22		0.00599293*	0.00426286	6.16951E-11	0*	2.74051E-11	7.50895E-06	7.49638E-06	0*	3.37759E-05	7.49638E-06
C23 C24		0.00299646* 0.00199764*	0.00213143	8.80462E-12 2.01532E-12	0*	4.74218E-12 1.29247E-12	3.75448E-06 2.50299E-06	3.74819E-06 2.49880E-06	0*	1.68880E-05 1.12586E-05	3.74819E-06 2.49880E-06
C25		0.000998821*	0.000710477	3.95209E-13	0*	2.95797E-13	1.25149E-06	1.24940E-06	0*	5.62932E-06	1.24940E-06
C26 C27		0.000998821*	0.00213143	3.28925E-14	0*	3.62753E-14	1.25149E-06	1.24940E-06	0*	5.62932E-06	1.24940E-06
C28		0.000998821*	0.000710477	1.72005E-14	0* 0*	2.16397E-14	1.25149E-06	1.24940E-06	0*	5.62932E-06	1.24940E-06
C30		0*	0	0	0*	0	0 0	0	0*	0	0
Other C10s Other C7s		1.84482*	1.26192	0.00640877	0*	0.000407177	0.00221226	0.00221928	0* 0*	0.0103974	0.00221928
Other C8s		4.16808*	3.55849	0.168516	0.013*	0.00821387	0.00598813	0.00626017	0*	0.0362398	0.00626017
Molar Flow		2.10951* Ibmol/h	1.46907 Ibmol/h	0.0228783	lbmol/h	0.00125578 Ibmol/h	0.00254985 Ibmol/h	0.00258388 Ibmol/h	lbmol/h	0.0128698 lbmol/h	0.00258388 Ibmol/h
C1		0.226950*	0.355356	0.00350113	329.399*	329.267	5.98993E-05	0.00356103	0*	329.626	0.00356103
C2 C3		0.328249*	0.390540	0.00171877	67.5259° 24.3532*	67.4111 24.2404	6.42938E-05 9.06655E-05	0.00178306	0*	24.6815	0.00178306
iC4		0.0723055*	0.0996284	0.000253087	2.42434*	2.39673	3.78985E-05	0.000290985	0*	2.49665	0.000290985
iC5		0.118996*	0.153621	0.000286890	1.20778*	1.17272	0.000150636	0.000437526	0*	1.32678	0.000437526
nC5 N2		0.209151*	0.278399	0.000464168 1.53171E-05	1.69968*	1.62964	0.000324042 1.21580E-07	0.000788211 1.54387E-05	0*	1.90883	0.000788211 1.54387E-05
CO2		0.00138661*	0.00225655	9.93021E-05	0.825683*	0.824682	3.12242E-05	0.000130526	0*	0.827069	0.000130526
Benzene Ethylbenzene		0.00206731* 0.00660531*	0.00379766 0.00534887	2.65576E-06 5.29874E-07	0.00878386*	0.00703833 0.00124093	1.25213E-05 1.49792E-05	1.51770E-05 1.55090E-05	0* 0*	0.0108512 0.00660531	1.51770E-05 1.55090E-05
Toluene		0.00756333*	0.0100342	2.71471E-06	0.00878386*	0.0000000	2 82299E-05	0.001105.05			3.09446E-05
o-Xylene C6		0.0120761* 0.152149*	0.0101762			0.00628208	LIGEROUP OF	3.09446E-05	0*	0.0163472	
C7		0.0005070*	0.279427	7.80186E-07 0.000222151	0* 0.636830*	0.00628208 0.00187029 0.508762	2.88482E-05 0.000567393	3.09446E-05 2.96284E-05 0.000789544	0* 0*	0.0163472 0.0120761 0.788979	2.96284E-05 0.000789544
C9		0.0303073	0.279427 0.127555	7.80186E-07 0.000222151 3.88682E-05	0* 0.636830* 0.122974*	0.00628208 0.00187029 0.508762 0.0855661	2.88482E-05 0.000567393 0.000321423	3.09446E-05 2.96284E-05 0.000789544 0.000360292	0* 0* 0*	0.0163472 0.0120761 0.788979 0.213482	2.96284E-05 0.000789544 0.000360292
C10		0.0442707* 0.0236732*	0.279427 0.127555 0.0569207 0.0259510	7.80186E-07 0.000222151 3.88682E-05 5.70840E-06 8.06659E-07	0* 0.636830* 0.122974* 0.0263516* 0.00439193*	0.00628208 0.00187029 0.508762 0.0855661 0.0135408 0.00204090	2.88482E-05 0.000567393 0.000321423 0.000155053 7.24862E-05	3.09446E-05 2.96284E-05 0.000789544 0.000360292 0.000160762 7.32929E-05	0* 0* 0* 0* 0*	0.0163472 0.0120761 0.788979 0.213482 0.0706223 0.0280652	2.96284E-05 0.000789544 0.000360292 0.000160762 7.32929E-05
011		0.0236732* 0.0120257* 0.0260947*	0.279427 0.127555 0.0569207 0.0259510 0.0116371	7.80186E-07 0.000222151 3.88682E-05 5.70840E-06 8.06659E-07 1.16697E-07	0* 0.636830* 0.122974* 0.0263516* 0.00439193* 0*	0.00028208 0.00187029 0.508762 0.0855661 0.0135408 0.00204090 0.000355704	2.88482E-05 0.000567393 0.000321423 0.000155053 7.24862E-05 3.27497E-05	3.09446E-05 2.96284E-05 0.000789544 0.000360292 0.000160762 7.32929E-05 3.28664E-05 0.000402024	0* 0* 0* 0* 0*	0.0163472 0.0120761 0.788979 0.213482 0.0706223 0.0280652 0.0120257	2.96284E-05 0.000789544 0.000360292 0.000160762 7.32929E-05 3.28664E-05
C12		0.0442707* 0.0236732* 0.0120257* 0.0369847* 0.0226648*	0.279427 0.127555 0.0569207 0.0259510 0.0116371 0.0364924 0.0225116	7.80186E-07 0.000222151 3.88682E-05 5.70840E-06 8.06659E-07 1.16697E-07 1.10721E-07 2.26246E-08	0* 0.636830* 0.122974* 0.0263516* 0.00439193* 0* 0* 0*	0.00626208 0.00187029 0.0855661 0.0135408 0.00204090 0.000355704 0.000389277 8.95827E-05	2.88482E-05 0.000567393 0.000155053 7.24862E-05 3.27497E-05 0.000102954 6.35563E-05	3.09446E-05 2.96284E-05 0.000789544 0.000360292 0.000160762 7.32929E-05 3.28664E-05 0.000103064 6.35789E-05	0* 0* 0* 0* 0* 0* 0* 0*	0.0163472 0.0120761 0.788979 0.213482 0.0706223 0.0280652 0.0120257 0.0369847 0.0226648	2.96284E-05 0.000789544 0.000360292 0.000160762 7.32929E-05 3.28664E-05 0.000103064 6.35789E-05
C12 C13 2.2-Dimethyloropane		0.0442707* 0.0236732* 0.0120257* 0.0369847* 0.0226648* 0.0149250*	0.279427 0.127555 0.0569207 0.0259510 0.0116371 0.0364924 0.0225116 0.0148594 0.0148594	7.80186E-07 0.000222151 3.88682E-05 5.70840E-06 8.06659E-07 1.16697E-07 1.10721E-07 2.26246E-08 4.91406E-09 1.06130E-05	0* 0.636830* 0.122974* 0.0263516* 0.00439193* 0* 0* 0* 0* 0* 0*	0.00628208 0.0187029 0.508762 0.0855661 0.0135408 0.000204090 0.000389277 8.95827E-05 2.36052E-05 0.0646412	2.88482E-05 0.000567393 0.000321423 0.000155053 7.24862E-05 3.27497E-05 0.000102954 6.35563E-05 4.19621E-05 2.0117E-06	3.09446E-05 2.96284E-05 0.000789544 0.000360292 0.000160762 7.32929E-05 3.28664E-05 0.000103064 6.35789E-05 4.19670E-05 1.35146E-05	0* 0* 0* 0* 0* 0* 0*	0.0163472 0.0120761 0.788979 0.213482 0.0706223 0.02806252 0.0120257 0.0369847 0.0226648 0.0149250 0.0149250	2.96284E-05 0.000789544 0.000360292 0.000160762 7.32929E-05 3.28664E-05 0.000103064 6.35789E-05 4.19670E-05 1.35145E-05
C12 C13 2,2-Dimethylpropane 2,2-Dimethylbutane		0.0442707* 0.0236732* 0.0120257* 0.0369847* 0.0226648* 0.0149250* 0.00347913* 0.00433631*	0.279427 0.127555 0.0569207 0.0259510 0.0116371 0.0364924 0.0225116 0.0148594 0.0047340 0.00931634	7.80186E-07 0.000222151 3.88682E-05 5.70840E-06 8.06659E-07 1.16697E-07 1.10721E-07 2.26246E-08 4.91406E-09 1.06132E-05 1.22245E-05	0* 0.636830* 0.122974* 0.0263516* 0* 0* 0* 0* 0* 0* 0* 0* 0.0658789* 0.0395274*	0.00626208 0.00187029 0.508762 0.0855661 0.0135408 0.000204090 0.000389277 8.95827E-05 2.36052E-05 0.0646112 0.0345210	2.88482E-05 0.000567393 0.000321423 7.24862E-05 3.27497E-05 0.000102954 6.35563E-05 4.19621E-05 2.90127E-06 1.41243E-05	3.09446E-05 2.96244E-05 0.000789544 0.000360292 0.000160762 7.32929E-05 3.28664E-05 0.000103064 6.35789E-05 4.19670E-05 1.35145E-05 2.63488E-05	0* 0* 0* 0* 0* 0* 0* 0* 0* 0*	0.0163472 0.0120761 0.788979 0.213482 0.0706223 0.0280652 0.0120257 0.0369847 0.0226648 0.0149250 0.063581 0.0438637	2.96284E-05 0.000789544 0.000360292 0.000160762 7.32929E-05 3.28664E-05 0.000103064 6.35789E-05 4.19670E-05 1.35145E-05 2.63488E-05
C12 C13 2,2-Dimethylpropane 2,2-Dimethylbutane Cyclopentane 2,3-Dimethylbutane		0.0442707* 0.0236732* 0.0120257* 0.026648* 0.0149250* 0.00347913* 0.00433631* 0.00433631*	0.279427 0.127555 0.0569207 0.021659510 0.0364924 0.0364924 0.00473340 0.00931634 0.00931634 0.00931634	7.80186E-07 0.000222151 3.88682E-05 5.70840E-06 8.06659E-07 1.16697E-07 1.10721E-07 2.26246E-08 4.91406E-09 1.06132E-05 1.22245E-05 0 0.2,57031E-05	0* 0.636830* 0.122974* 0.0263516* 0.00439193* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0*	0.006250 0.00187029 0.508762 0.0855661 0.0135408 0.00204090 0.000355704 0.000355704 0.000389277-05 2.38052E-05 0.0646112 0.0345210 0.0645712	2.88482E-05 0.000567393 0.000321423 0.000155053 7.24862E-05 3.27497E-05 0.000102954 4.35563E-05 4.19621E-05 2.90127E-06 1.41243E-05 0 4.06711E-05	3.09446E-05 2.9624E-05 0.000789544 0.00060292 0.000160762 7.32924E-05 3.28664E-05 0.000103064 4.35789E-05 1.35145E-05 2.6348E-05 0 6.63429E-05		0.0163472 0.0120761 0.788979 0.213482 0.0706223 0.0280652 0.0120257 0.0369847 0.0226648 0.0149250 0.0693581 0.0438637 0 0.0893148	2.96284E-05 0.000789544 0.000360292 0.000160762 7.32929E-05 3.28664E-05 0.000103064 6.35789E-05 1.35145E-05 2.63488E-05 0 0.6,63742E-05
C12 C13 2,2-Dimethylpropane 2,2-Dimethylbutane Cyclopentane 2,3-Dimethylbutane 2-Methylpentane		0.0442707* 0.0236732* 0.0120257* 0.0369847* 0.0226648* 0.0149250* 0.00347913* 0.00433631* 0* 0.0101601* 0.0101601*	0.279427 0.127555 0.0666207 0.0259510 0.0384924 0.0228116 0.0148594 0.0047340 0.0043164 0.0093163 0.0093163 0.0234452	7.80186E-07 0.000222151 3.88682E-05 5.70840E-06 8.06659E-07 1.16697E-07 1.16697E-07 2.26246E-08 4.91406E-09 1.06132E-05 1.22245E-05 0.257031E-05 0.000141186	0* 0.636830* 0.122974* 0.0263516* 0.00439193* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0*	0.00628/06 0.00187/029 0.508762 0.0855661 0.0135408 0.00204990 0.000355704 0.000389277-05 2.36052E-05 0.0646112 0.0345210 0.0646113 0.0351165	2 88482E-05 0.000567393 0.000321423 0.000155053 7.24862E-05 3.27497E-05 4.9563E-05 2.90122FE-06 2.90127E-06 1.41243E-05 0.000248996	3.09446E-05 2.9624E-05 0.000789544 0.00060292 0.000160762 7.32929E-05 3.28664E-05 0.000103064 4.35798E-05 1.35145E-05 2.63488E-05 0.6.63742E-05 0.6.63742E-06	0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0	0.0163472 0.0120761 0.788979 0.213482 0.0706223 0.0280652 0.0120257 0.0368947 0.0226648 0.0149250 0.0693581 0.0438637 0 0.08982148 0.489483	2.96284E-05 0.000789544 0.00360292 0.000160762 7.32929E-05 3.28664E-05 0.000103064 6.35789E-05 1.35145E-05 2.63488E-05 0.6.63742E-05 0.6.63742E-05
C12 C13 2,2-Dimethylpropane 2,2-Dimethylbutane Cyclopentane 2,3-Dimethylbutane 2-Methylpentane 3-Methylpentane Methylcopentane		0.0442707* 0.0236732* 0.0120257* 0.0369847* 0.0226648* 0.00439250* 0.00347913* 0.00433631* 0.0043631* 0.0101601* 0.0766418* 0.0478255* 0.027235*	0.279427 0.127555 0.0666207 0.0216510 0.0116371 0.0384924 0.0228116 0.0148594 0.00473340 0.00473340 0.00473340 0.00371634 0.0234452 0.039263	7.80186E-07 0.000222151 3.88682E-05 5.70840E-06 8.06659E-07 1.10627E-07 1.10721E-07 2.26246E-08 4.91406E-09 1.06132E-05 0.2.57031E-05 0.000141186 8.08284E-05 2.13118E-05	0* 0.636830* 0.122974* 0.0263516* 0.00439193* 0* 0* 0* 0* 0.0658789* 0.0395274* 0.0395274* 0.0790547* 0.412841* 0.232772* 0.527032*	0.006230 0.00187029 0.508762 0.0855661 0.0135408 0.0024090 0.00355704 0.00355704 0.068512 0.0646112 0.0345210 0 0.06657033 0.351165 0.195504 0.0477102	2 88482E-05 0.000567393 0.00035423 0.000155053 7.24862E-05 3.27497E-05 4.19621E-05 2.90127E-06 1.41243E-05 0.000159567 0.00024896 0.000159567 5.1429E-05	3.09446E-05 2.96244E-05 0.000789544 0.000380292 0.000160762 7.3229E-05 3.28664E-05 0.000103064 6.35789E-05 1.35145E-05 2.63488E-05 0.6.63742E-05 0.00039082 0.000240396 7.27417E-05	0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0	0.0163472 0.0120761 0.788979 0.213462 0.0706223 0.0280652 0.0120257 0.0369847 0.0438647 0.0438637 0 0.0693581 0.0438637 0 0 0.0693581 0.0438637 0 0 0.0692148 0.0734267	2.96284E-05 0.000789544 0.000380292 0.000160762 7.32929E-05 3.28664E-05 0.000103064 4.19670E-05 1.35145E-05 2.63488E-05 0 0.663742E-05 0.000390082 0.000240396 7.27417F-05
C12 C13 2.2-Dimethylpropane 2.2-Dimethylbutane Cyclopentane 2.3-Dimethylbutane 2.4-Methylpentane 3-Methylpentane Methylcyclopentane Cyclohexane		0.0442707* 0.0236732* 0.0120257* 0.0369847* 0.0226648* 0.0149250* 0.00347913* 0.0043631* 0.0043631* 0.010601* 0.0766418* 0.0076255* 0.0220345*	0.279427 0.127552 0.0668207 0.0116371 0.0285610 0.01445544 0.00445544 0.00445544 0.00445544 0.00345454 0.0234452 0.03345457 0.03345457	7.80186E-07 0.000222151 3.88682E-05 5.708406-06 8.06659E-07 1.10697E-07 1.10721E-07 2.26246E-08 1.06132E-05 1.22245E-05 1.22245E-05 0.000141186 8.06284E-05 2.13114E-05 2.13114E-05	0+ 0.636830+ 0.122974* 0.0263516* 0.00439193* 0* 0* 0.0658789* 0* 0.0395274* 0.0395274* 0.0395274* 0.0390547* 0.412841* 0.4228712* 0.0527032* 0.06514870*	0.006230 0.00187029 0.508762 0.085661 0.0135408 0.0024090 0.000355704 0.00355704 0.38527E-05 0.0646112 0.0345210 0 0.0657033 0.351165 0.195504 0.0477102 0.04787102 0.04787102	2.88442E-05 0.00057393 0.000321423 0.000155053 7.24862E-05 3.27497E-05 0.000102954 6.35663E-05 2.90127E-06 1.4124E-05 0.000248896 0.000149567 5.14299E-05 7.33140E-05	3.09446E-05 2.96248E-05 0.000789544 0.000360292 0.000160762 3.28664E-05 3.28664E-05 3.28664E-05 1.35145E-05 2.63742E-05 0.000390682 0.000240396 7.27417E-05 3.5494E-05	0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0	0.0163472 0.0120761 0.788879 0.213482 0.0706223 0.0280652 0.0120257 0.0389847 0.0226548 0.0149250 0.0693581 0.0438637 0 0.0893248 0.0893248 0.0893248 0.0894283 0.280588 0.0734267 0.08832415	2.96294E-05 0.000799544 0.000360292 0.000160782 7.32292F-05 3.28664E-05 4.19670E-05 4.19670E-05 1.35145E-05 2.6348E-05 0.000390082 0.000240396 7.27417E-05 9.59901E-05
C12 C13 2.2-Dimethylpropane 2.2-Dimethylbutane Cyclopentane 3.3-Methylpentane 3.4-Methylpentane Methylycyclopentane Cyclohexane 2.4-Methylhexane 3.4-Methylhexane		0.0442707 0.0236732 0.0120257 0.0369847 0.0226648 0.0149250 0.0043631 0.0043631 0.0766418 0.0766418 0.0766418 0.027235 0.0220345 0.0220345 0.0220345	0.279427 0.127555 0.0666207 0.0256510 0.0384324 0.0225116 0.0445544 0.0047340 0.00331637 0.0234452 0.037928 0.0234452 0.037928 0.024453 0.0265437 0.03456437 0.0484534	7.80186E-07 0.000222151 3.88682E-05 5.708406E-06 8.06659E-07 1.16697E-07 1.0697E-07 1.0721E-07 2.26246E-08 4.91406E-09 1.06132E-05 0.000141186 8.08284E-05 2.37031E-05 2.21761E-05 2.21761E-05 2.57594E-05	0+ 0.636830* 0.122974* 0.0263516* 0.00439193* 0* 0* 0.0395274* 0.0395274* 0.0395274* 0.0395274* 0.039547* 0.412841* 0.412841* 0.0527032* 0.0527032* 0.0527032* 0.0527032* 0.0527032*	0.0062300 0.00187029 0.0508762 0.085561 0.0135408 0.00204090 0.000355704 0.000355704 0.000355704 0.3522F-05 0.0646112 0.03645110 0.0657033 0.351165 0.195504 0.0492706 0.0652706 0.0652708	2 88442E-05 0 000321423 0 000321423 0 000321423 0 000155053 7 24862E-05 3 27497E-05 4 1962E-05 2 40122FE-05 2 40122FE-05 0 406711E-05 0 000248896 0 000159567 5 14299E-05 7 33140E-05 0 000155290 0 0001155290 0 000115576 0 000115576 0 000115576 0 000115576 0 000115576 0 000115576 0 000115577 0 000115776 0 0001157777 0 00011577777777777777777777777777777777	3.09446E-05 2.96248E-05 0.000789544 0.000360292 0.000160762 3.28664E-05 0.000103064 6.35789E-05 2.63488E-05 0.63742E-05 0.00030082 2.63488E-05 0.00032082 0.663742E-05 0.00032082 0.000240386 7.27417E-05 0.00032082 0.000240386 7.27417E-05 0.00031842 0.000240386 7.27417E-05 0.00031842 0.000240386 7.27417E-05 0.00031842 0.00018288 0.0001828 0.00018 0.0000000000	0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0	0.0163472 0.0120761 0.788379 0.213482 0.0706223 0.0280652 0.0120257 0.0369847 0.0369847 0.0369847 0.043863 0.043863 0.043863 0.043863 0.0489458 0.05892148 0.0892148 0.280598 0.0734267 0.0835215 0.125186 0.125186 0.125186	2 96294E-05 0.000799544 0.000360292 0.000160762 3.28664E-05 3.28664E-05 4.19670E-05 1.35145E-05 2.63498E-05 0.0001309082 0.0002403906 9.54901E-05 0.000182880 0.000182880 0.000182471
C12 C13 2.2-Dimethylpotane Cyclopentane 2.3-Dimethylpotane 2.4-fethylpentane 3-Methylpentane Methylpentane Cyclohexane 2.4-fethylhexane 3-Methylpexane 2.2.4-ftrimethylpentane 2.2.4-Trimethylpentane		0.0442707 0.0236732 0.0120257 0.0369847 0.0226647 0.0226647 0.0043631 0 0.0043631 0 0.0766418 0.0766418 0.0766418 0.0766418 0.07255 0.0207235 0.0207235 0.0207235 0.02725 0.02757 0.02757 0.02757 0.02757 0.02757 0.02757 0.02757 0.02757 0.02757 0.02757 0.027577 0.027577 0.027577 0.0275777 0.02757777777777777777777777777777777777	0.279427 0.12755 0.0668207 0.0258510 0.0116371 0.036424 0.02282116 0.0448544 0.00437340 0.00331634 0.03345437 0.0254437 0.0254437 0.0254437 0.0254437 0.0254437 0.0254437 0.0254437 0.0254437 0.0254437 0.0254437 0.0254437 0.0254437 0.0254437 0.0256457 0.02564577 0.02564577 0.025645770000	7.80186E-07 0.000222151 3.88682E-05 5.70840E-06 8.06659E-07 1.16697E-07 1.16697E-07 1.226246E-08 1.22245E-05 0.257031E-05 0.257031E-05 2.277964E-05 2.277964E-05 2.57964E-05	0.636830 0.122974* 0.0263516* 0.00439133* 0* 0* 0* 0* 0* 0.0658789* 0.0395274* 0.0790547* 0.412841* 0.232772* 0.0527032* 0.0614870* 0.064870* 0.0746628* 0.0746628*	0.00662300 0.00187029 0.0508762 0.0855661 0.0135408 0.00204090 0.000355704 0.000355704 0.00355704 0.00466112 0.0345210 0.0646112 0.0345210 0.0657033 0.351165 0.195504 0.0477102 0.0489869 0.0562946 0.05529448	2 88482E-05 0.000567393 0.000321423 0.000155053 7.24862E-05 3.27497E-05 4.1962E-05 2.90127E-06 1.41248E-05 0.00012854 0.0001248986 0.000158587 5.14298E-05 7.33140E-05 0.000155529 0.000155290	3.09446E-05 2.96244E-05 0.000789544 0.000360292 0.000160762 3.28664E-05 0.000103064 6.35798E-05 2.63488E-05 0.663742E-05 0.00039062 2.63488E-05 0.663742E-05 0.00039062 2.00039062 2.00039062 3.24747E-05 0.000390742 0.000397473 0.000187473 0.000187473	0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0	0.0163472 0.0120761 0.788879 0.213482 0.020652 0.0120257 0.0369847 0.0326648 0.0149250 0.0693581 0.0438637 0.0438637 0.0488637 0.0693581 0.0489483 0.200598 0.0734267 0.035215 0.122188 0.122188	2 9624E-05 0.000798544 0.001360292 0.0001360292 0.000130292 0.000103064 6.35789E-05 1.35145E-05 0.63748E-05 0.63742E-05 0.000390082 0.63742E-05 0.000390082 0.000240396 7.27417E-05 0.000390082 0.000240396 7.27417E-05 0.000187473 0.000187473
C12 C13 2.2-Dimethylpropane Cyclopentane 2.3-Dimethylputane 2.4-Methylpentane 3-Methylpentane Cyclohexane 2-Methylhexane 3-Methylhexane 3-Methylhexane 3-Methylhexane Methylcyclohexane Methylcyclohexane		0.0442707 0.0236732 0.0120257 0.0369847 0.0226548 0.0149250 0.0043631 0.0043631 0.0043631 0.00766418 0.0766418 0.0476255 0.0207235 0.0207235 0.0207235 0.0207235 0.02072312 0.0476255 0.0207235 0.02072312 0.00663052 0.0066352 0.0066352 0.0066352 0.0066352 0.0066352 0.0066352 0.0066352 0.0066352 0.0066352 0.0066352 0.0066352 0.0066352 0.0066352 0.0066352 0.0066352 0.0066352 0.0066352 0.0066352 0.0066352 0.0066552 0.00655555 0.006555555 0.0065555555555555555555555555555555555	0.279427 0.127555 0.0666207 0.0259510 0.0116371 0.02525116 0.0146554 0.00447340 0.00437340 0.00331634 0.00331634 0.00331634 0.00331634 0.00331634 0.00331634 0.00333631 0.0256457 0.00353639 0.006455369 0.00654599 0.0055459 0.0055459	7.80186E-00 0.000222151 3.88682E-05 5.70840E-06 8.06859E-07 1.16697E-07 1.10721E-07 2.26246E-08 4.91406E-09 1.06132E-05 1.22245E-05 0.000141186 8.08284E-05 2.13118E-05 2.13118E-05 2.2179E-05 2.27594E-05 2.27594E-05 2.27594E-05 2.42187E-05 0 0.202187E-05 0	0- 0.636830* 0.12297* 0.0043915* 0.0043915* 0.0058778* 0.0568778* 0.0790547* 0.0790547* 0.0790547* 0.0790547* 0.05277032* 0.05277032* 0.05414870* 0.06414870* 0.06164870* 0.06164870* 0.0616870*	0.0062300 0.00187029 0.508762 0.0855661 0.0135408 0.00204990 0.000355704 0.00355704 0.00355704 0.0046112 0.0345210 0.0646112 0.0485165 0.1955044 0.0477102 0.0489869 0.06559448 0.05559448 0.0426759 0.00116119	2 88442E-05 0 000567393 0 000321423 0 000155053 7 24862E-05 0 000102954 4 19621E-05 2 290127E-06 1 41243E-05 0 000248896 0 000159567 5 14298E-05 7 .33140E-05 7 .33140E-05 0 0.000165290 0 0.000165291 0 0.000165291 0 0.000165291	3.09446E-05 2.96248E-05 0.000789544 0.000360292 0.000160762 3.28664E-05 0.000103064 6.35798E-05 2.63488E-05 0.663742E-05 0.663742E-05 0.000390482 0.000240396 7.27417E-05 9.54901E-05 0.00018280 0.000180 0.00018280 0.00018000000000000000000000000000000	0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0	0.0163472 0.0120761 0.788379 0.213482 0.0706223 0.0280652 0.0120257 0.0368847 0.0226648 0.0149250 0.0693581 0.0438637 0.0835215 0.1225186 0.1725186 0.1725186 0.1225186 0.1225186 0.1225186 0.1225186 0.1225186 0.1225186 0.1225186 0.1225186 0.1225186 0.1225186 0.1225186 0.1225186 0.1225186 0.1225186 0.1225186 0.1225186 0.125518	2 98248-05 0 000798544 0 000360292 0 000160782 7 32929E-05 3 28664E-05 0 000103064 4 19670E-05 1 35145E-05 2 63488E-05 0 000330082 0 000240396 0 000240396 0 000240396 0 000186489 0 00018649 0 000018649 0 00018649 0 00000000000000000000000000000000000
C12 C13 2-Dimethylpropane Cyclopentane 2:3-Omethylbutane Cyclopentane 3-Methylpentane Methylcyclopentane Cyclohexane 3-Methylhexane 3-Methylhexane 3-Methylhexane Methylcycloh		0.0442707 0.0236732* 0.0120257* 0.0369847* 0.0226648 0.0149250* 0.00347913* 0.00439631* 0.0043631* 0.0766418* 0.0478255* 0.0207235* 0.0207235* 0.0207235* 0.0207235* 0.0207235* 0.0478252* 0.0478252* 0.0478252*	0.279427 0.127552 0.0668207 0.0116371 0.0258510 0.0258510 0.02582116 0.0248544 0.00483544 0.022416 0.0234452 0.0333641 0.0684650 0.0684650 0.0685469 0.0665469 0.0665469	7.80186E-07 0.000222151 3.88682E-05 5.70840E-06 8.06859E-07 1.16697E-07 1.10721E-07 2.26246E-08 4.91406E-09 1.06132E-05 1.22245E-05 0.000141186 8.06284E-05 2.13118E-05 2.13118E-05 2.21761E-05 2.2176	0 0.636830 0.122974* 0.0283516* 0.00439193* 0* 0* 0.00439193* 0* 0.00439193* 0.00439193* 0.00439193* 0.00439194* 0.0395274* 0.0395274* 0.0395274* 0.0395274* 0.0395274* 0.0395274* 0.0412870* 0.0746628* 0.076654* 0.076555* 0.07655* 0.0755* 0.07655* 0.07655* 0.0755*	0.0062302 0.00187029 0.0508762 0.0135408 0.00234990 0.000355704 0.000355704 0.000355704 0.000355704 0.0085703 0.0646112 0.0465703 0.0657033 0.055504 0.0467504 0.0467902 0.048569 0.0482699 0.0659448 0.0559448 0.0559448	2.88482E-05 0.00057393 0.000321423 0.000155053 7.24862E-05 3.27497E-05 0.000112284 4.95621E-05 2.90127E-06 2.90127E-06 0.002127E-06 0.002127E-06 0.002127E-06 0.0001595897 5.1429E-05 7.33140E-05 0.000155280 0.0001155280 0.0001155280 0.0001155280 0.0001155280 0.0001155280 0.0001155280 0.0001155280 0.0001155280 0.0001155280	3.09446E-05 2.96248E-05 0.00078954L 0.000360252 0.000160762 3.28664E-05 3.28664E-05 3.28664E-05 3.28664E-05 1.35145E-05 2.853488E-05 0.00039082 2.853488E-05 0.00039082 3.54901E-05 0.00039082 3.54901E-05 0.000182809 0.0001824039 0.000182403 0.000182403 0.000187470 0.000188499 1.56300E-05 2.65308E-05 0.000187470 0.000188499	0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0	0.0163472 0.0120761 0.788379 0.213482 0.0706223 0.0280652 0.0120257 0.0369847 0.0328644 0.0149250 0.0693581 0.0489438637 0.0882148 0.0489438637 0.0882148 0.0489428 0.0734267 0.0385215 0.125188 0.125188 0.125188 0.125188 0.0125489 0.0125489 0.0125489 0.0125489 0.0125489 0.0125489 0.0125489 0.0125489 0.0125489 0.0125489 0.0125489 0.0125489 0.0125489 0.0125489 0.0125489 0.0125489 0.0125489 0.012549 0.012549 0.012549 0.012549 0.012549 0.0053952 0.00563552 0.00563552 0.00563552 0.00563552 0.00563552 0.00563552 0.00563552 0.00563552 0.00563552 0.00563552 0.00563552 0.005652 0.005652 0.005652 0.005652 0.005652 0.005652 0.005652 0.005652 0.005652 0.005652 0.005652 0.005652 0.0056555 0.00565555 0.00565555 0.00565555 0.00565555 0.005555555 0.005555555555	2 9624E-05 0.00798544 0.000360392 0.000160782 7.32929E-05 3.28664E-05 0.000103064 4.53798E-05 4.19570E-05 4.19570E-05 4.135145E-05 2.63488E-05 0.000390082 0.000240396 0.000240396 0.000240396 0.000240396 0.000240396 0.000240396 0.000240396 0.00018747E-05 9.54901E-05 0.000182880 0.000182880 0.000182880 0.000182880 0.000185495 1.5666495
C12 C13 2.2-Dimethylpropane Cyclopentane 2.3-Dimethylputane Cyclopentane 3-Methylpentane Methylcyclopentane Cyclohexane 2.4-Methylhexane 3-Methylhexane 3.4-Methylhexane m-Xylene p-Xylene P-Xylene Vater C14		0.0442707 0.0236732 0.0120257 0.0369847 0.022654 0.0149250 0.00347913 0.00433631 0 0.00478255 0.002735 0.020245 0.020245 0.020245 0.0478255 0.0598360 0.0478255 0.047855 0.047855 0.047855 0.0478555 0.0478555 0.0478555 0.0478555 0.0478555 0.0478555 0.0478555 0.0478555 0.004785555 0.00478555 0.0047855555 0.0047855555 0.004785555555 0.0047855555555555555555555555555555555555	0.279427 0.127552 0.0666207 0.0256510 0.0146371 0.0364924 0.0225116 0.0446594 0.00437340 0.00331631 0.023452 0.0335637 0.04245437 0.0256437 0.03456437 0.03456437 0.03456437 0.04645439 0.00654569 0.0065569 0.005569 0.005569 0.005569 0.005569 0.005569 0.005569 0.005569 0.005569 0.005569 0.005569 0.005569 0.005569 0.005569 0.005569 0.005569 0.005569 0.005569 0.00569569 0.0055	7.80186E-07 0.000222151 3.88682E-05 5.70840E-06 8.06659E-07 1.16697E-07 1.16697E-07 1.26244E-08 4.9140E-09 1.22445E-05 1.22245E-05 0.227031E-05 2.375904E-05 2.57594E-05 2.57594E-05 0.000240101 1.3077E-09 0.000240101 1.3077E-09	0 0.536830 0.122974 0.02233516 0.004393516 0.00439574 0.00527032 0.412841 0.33952774 0.0527032 0.0614870 0.0746628 0.074	0.0062300 0.00187029 0.0508762 0.085661 0.0135408 0.00204990 0.000355704 0.000355704 0.000355704 0.00646112 0.0364510 0.06657033 0.351165 0.0559448 0.0602706 0.0562706 0.0559448 0 0.0426759 0.0116119 0 0.465768-06 6.36768E-06	2 88442E-05 0 000321423 0 000321423 0 000155053 7 24862E-05 3 .27497E-05 3 .27497E-05 3 .27497E-05 4 .19621E-05 2 .80127E-06 0 .4127E-06 0 .406711E-05 0 .000248896 0 .000156290 0 .000156290 0 .00016676 0 .000166281 1.51379E-05 0 .5.66912 2 .8097E-05	3.09446E-105 2.96248E-05 0.000789544 0.000360292 0.000160782 3.28664E-05 3.28664E-05 0.000103064 4.196706-05 1.35145E-05 0.663742E-05 0.000390082 0.663742E-05 0.000390082 0.000240396 7.27417E-05 0.0003187473 0.000182489 1.56330E-05 0.56330E 0.56330E 2.869890E-05	0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0* 0	0.0163472 0.0120761 0.788379 0.213482 0.0706223 0.0280652 0.0120257 0.0368847 0.0328647 0.0368847 0.0389847 0.0483837 0.08892148 0.048925 0.0683382 0.0734267 0.0835215 0.125186 0.125186 0.125186 0.125488 0.0128488 0.0128488 0.0128488 0.0128488 0.0128488 0.0128488 0.0128488 0.0128488 0.0128488 0.0128488 0.0128488 0.006633052 0.0128488 0.006633052 0.0128488 0.0098360 0.00863052 0.00863052 0.012848 0.0098360 0.00863052 0.00863052 0.00863052 0.00863052 0.00863052 0.00863052 0.00863052 0.00863052 0.00863052 0.00863052 0.00863052 0.00863052 0.00863052 0.00863052 0.00863052 0.00863052 0.00863052 0.008652 0.008652 0.008652 0.008652 0.008652 0.00852 0.008652 0.008652 0.008652 0.008652 0.008652 0.008652 0.008652 0.008652 0.008652 0.008652 0.008652 0.008652 0.008652 0.008652 0.008652 0.008652 0.008652 0.00852 0.00	2 9628E-05 0.00798544 0.000360292 1.23292F-05 3.22664E-05 0.000103064E 4.19670E-05 1.35145E-05 0.00039082 2.63488E-05 0.00039082 7.27417E-05 0.00039082 7.27417E-05 0.0003182489 0.000182489 0.000182499 1.5530E-05 0.000182473 0.000186499 1.55630E-05 0.568396 0.568396 0.000186499 1.568396 0.00018649 0.000186499 1.568396 0.000186499 0.00018649900000000000000000000000000000000000
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Process Streams		Condensate Cor	ndensate To Pipeline	Flash	Gas	Gas To Pipeline	Produced Liquid P	roducedWater	Water	Well Stream	2
Properties	Status:	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Phase: I otal	From Block: To Block:	 MIX-100	VSSL-100	Storage Vessel	 MIX-100	VSSL-100	Storage Vessel	VSSL-100 VLVE-100	 MIX-100	MIX-100 VSSL-100	VLVE-100 Storage Vessel
Property	Units										
Temperature Pressure	°F psig	71* 366*	70.1616 364	70.5763	71* 366*	70.1616 364	70.5763 0	70.1616 364	71* 366*	70.3277 366	70.5763
Molecular Weight	lb/lbmol	72.0128	69.4502	37.8585	21.4819	21.3809	18.0750	18.1081	18.0153	21.7192	18.1081
Mass Flow	lb/h	181.766	245.748	0.360116	439.193 9434.70	438.632 9378.36	102.547	102.907	110.551	9727.02	102.907
Specific Gravity		0.639009	0.630726	1.30715		0.738226	0.996763	0.994253	0.998771		
API Gravity Mass Density	lb/ft^3	39.8544	90.6876 39.3377	0.0989721	1.60297	1.58737	10.2440 62.1671	10.6061	9.95452 62.2924	1.65313	19.4601
Std Liquid Volumetric Flow	sgpm	0.583333*	0.798435	0.00150504	54.1971	53.9961	0.205366	0.206871	0.221000*	55.0014	0.206871
Std Vapor Volumetric Flow	MMSCFD	0.0229884	0.0322271	8.66331E-05	4* %	3.99489	0.0516713	0.0517580	0.0558892	4.07888	0.0517580
C1		2.00303*	2.31977	15.5969	56.0100*	56.3238	0.000937066	0.0555140	0*	54.3642	0.0555140
C2		4.59141*	4.77853	14.3514	21.5210*	21.6135	0.00188524	0.0521005	0*	20.9600	0.0521005
iC4		2.31206*	2.35632	4.08478	1.49351*	1.48537	0.00214804	0.0164349	0*	1.49183	0.0164349
nC4		8.75568*	9.23032	15.0130	4.10715*	4.05895	0.0115981	0.0640944	0*	4.14734	0.0640944
nC5		8.30187*	4.51012 8.17348	9.29956	1.29977*	1.25370	0.0227986	0.0552620	0*	1.41585	0.0552620
N2		0.00777095*	0.0123852	0.119152	0.889360*	0.894524	3.32127E-06	0.000420272	0*	0.862778	0.000420272
CO2 Benzene		0.0335728* 0.0888401*	0.0404112 0.120710	1.21356	0.385151*	0.386996	0.00134003 0.000953767	0.00558213	0*	0.374204 0.00871392	0.00558213
Ethylbenzene		0.385799*	0.231075	0.0156211	0*	0.00140476	0.00155077	0.00160000	0*	0.00720933	0.00160000
Toluene o-Xvlene		0.383390* 0.705334*	0.376211 0.439619	0.0694580	0.00857824*	0.00617187 0.00211721	0.00253646	0.00277065	0*	0.0154847 0.0131804	0.00277065
C6		7.21338*	9.79854	5.31606	0.581672*	0.467488	0.0476809	0.0661173	0*	0.698986	0.0661173
C7 C8		4.98941* 2.78213*	5.20098 2.64579	1.08151 0.181070	0.130605* 0.0319046*	0.0914220 0.0164927	0.0314074 0.0172716	0.0350821 0.0178448	0* 0*	0.219916 0.0829347	0.0350821 0.0178448
C9		1.67039*	1.35437	0.0287291	0.00597038*	0.00279106	0.00906584	0.00913465	0*	0.0370052	0.00913465
C10		0.941338*	0.673759	0.00461071	0*	0.000539648	0.00454396	0.00454419	0*	0.0175906	0.00454419
C12		2.12394*	1.56034	0.00107014	0*	0.000162705	0.0105570	0.0105238	0*	0.0396895	0.0105238
C13 2.2 Dimethyloropopo		1.51381*	1.11476	0.000251575	0*	4.64035E-05	0.00754405	0.00751853	0*	0.0282881	0.00751853
2,2-Dimethylbutane		0.205584*	0.326692	0.292531	0.0361038*	0.0317204	0.00118694	0.00220648	0*	0.0388605	0.00220648
Cyclopentane		0 491690*	0	0 615072	0*	0 0603730	0 00241780	0.00555825	0*	0 0700399	0 00555925
2-Methylpentane		3.63358*	4.83665	3.37857	0.377084*	0.322677	0.0209160	0.0326659	0*	0.433652	0.0326659
3-Methylpentane		2.26740*	2.97552	1.93422	0.212611*	0.179643	0.0134093	0.0201310	0*	0.248592	0.0201310
Methylcyclopentane Cyclohexane		0.959518" 1.02022*	0.878201 1.14859	0.498060 0.518258	0.0470123* 0.0548477*	0.0428142 0.0447675	0.00422082 0.00601683	0.00594897 0.00780938	0* 0*	0.0635298	0.00594897 0.00780938
2-Methylhexane		2.78517*	2.63942	0.767700	0.0792962*	0.0643953	0.0151739	0.0178073	0*	0.128959	0.0178073
3-Methylhexane 2.2.4-Trimethylpentane		2.63646*	2.70562	0.717784	0.0792962*	0.0597735	0.0157979	0.0182545	0*	0.126180	0.0182545
Methylcyclohexane		2.55619*	2.63480	0.551267	0.0639890*	0.0446792	0.0159210	0.0177944	0*	0.109833	0.0177944
m-Xylene p-Xylene		0.387271*	0.235604	0.0146826	0*	0.00131449	0.00156721	0.00161310	0* 0*	0.00723685	0.00161310
Water		0*	0.0108188	1.20114	0*	0.0894594	99.5942	99.2499	100*	1.13654	99.2499
C14 C15		1.08965* 0.736551*	0.803175 0.543113	6.22911E-05 1.45313E-05	0*	1.34701E-05 3.65509E-06	0.00543585	0.00541704	0*	0.0203621	0.00541704
C16		0.417720*	0.308061	3.01163E-06	0*	8.89420E-07	0.00208501	0.00207772	0*	0.00780583	0.00207772
C17 C18		0.253483*	0.186950	7.28964E-07 2.56471E-07	0*	2.53229E-07 1.02885E-07	0.00126531	0.00126089	0*	0.00473677	0.00126089
C19		0.145252*	0.107131	5.85458E-08	0*	2.78293E-08	0.000725086	0.000722549	0*	0.00271428	0.000722549
C20 C21		0.0705411*	0.0520283	7.05519E-09 1.80805E-09	0*	4.13042E-09 1.23416E-09	0.000352139	0.000350906	0*	0.00131818	0.000350906
C22		0.0258483*	0.0190647	5.06163E-10	0*	3.98114E-10	0.000129034	0.000128583	0*	0.000483021	0.000128583
C23		0.0135078*	0.00996284	7.54975E-11 1.80275E-11	0*	7.20007E-11 2.04715E-11	6.74306E-05 4.68961E-05	6.71947E-05 4.67320E-05	0* 0*	0.000252417	6.71947E-05 4.67320E-05
C25		0.00489170*	0.00360793	3.68167E-12	0*	4.87920E-12	2.44193E-05	2.43338E-05	0*	9.14099E-05	2.43338E-05
C26 C27		0.0152587*	0.0112543	3.75387E-12 3.30792E-13	0*	5.98832E-12 6.45960E-13	7.61714E-05 2.63616E-05	7.59048E-05 2.62694E-05	0* 0*	0.000285136 9.86809E-05	7.59048E-05 2.62694E-05
C28		0.00547534*	0.00403841	1.79354E-13	0*	3.99537E-13	2.73328E-05	2.72372E-05	0*	0.000102316	2.72372E-05
C29 C30		0*	0	0	0*	0	0	0	0* 0*	0	0
Other C10s		3.64032*	2.58198	0.0240550	0*	0.00270614	0.0173921	0.0174154	0*	0.0680257	0.0174154
Other C7s Other C8s		1.20338*	2.10528	0.525342	0.0745334*	0.0429824	0.0124142	0.0142091	0*	0.0947807	0.0142091
Other C9s		3.75221*	2.70947	0.0774063	0.00596269*	0.00752320	0.0180698	0.0182774	0*	0.0759002	0.0182774
Mass Flow		lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h
C1 C2		8.34563*	11.7432	0.0516817	2030.44*	2026.99	0.00193325	0.0536150	0*	2038.78	0.0536150
C3		14.4743*	19.3901	0.0574509	1073.87*	1068.89	0.00399795	0.0614489	0*	1088.35	0.0614489
nC4		4.20255	22.6833	0.0540641	387.498*	380.663	0.0118934	0.0659576	0*	403.413	0.0659576
iC5		8.58545*	11.0835	0.0206988	87.1399*	84.6102	0.0108682	0.0315669	0*	95.7253	0.0315669
N2		0.0141250*	0.0304364	0.000429084	83.9084*	83.8917	3.40586E-06	0.000432489	0*	83.9225	0.000432489
CO2		0.0610240*	0.0993097	0.00437024	36.3379*	36.2939	0.00137416	0.00574440	0*	36.3989	0.00574440
Ethylbenzene		0.701253*	0.296642	5.62541E-05	0.000123	0.131743	0.00159026	0.00164652	0*	0.701253	0.00118550
Toluene		0.696873*	0.924532	0.000250129	0.809331*	0.578821	0.00260106	0.00285119	0*	1.50620	0.00285119
C6		13.1115*	24.0797	0.0191440	54.8790*	43.8428	0.0488953	0.0680392	0*	67.9905	0.0680392
C7		9.06906*	12.7813	0.00389467	12.3222*	8.57389	0.0322073	0.0361019	0*	21.3913	0.0361019
C8 C9		3.03621*	3.32834	0.000103458	0.563287*	0.261756	0.00929673	0.00940018	0*	3.59950	0.00940018
C10		1.71104*	1.65575	1.66039E-05	0*	0.0506102	0.00465968	0.00467629	0*	1.71104	0.00467629
C12		3.86060*	3.83451	3.85376E-06	0*	0.0008473	0.0108259	0.0108297	0*	3.86060	0.0101098
C13 2.2 Dimethyloropopo		2.75159*	2.73950	9.05962E-07	4 75200*	0.00435189	0.00773619	0.00773709	0*	2.75159	0.00773709
2,2-Dimethylbutane		0.373683*	0.802839	0.00105345	3.40628*	2.97486	0.00121717	0.00227062	0*	3.77997	0.00227062
Cyclopentane		0*	0	0	0*	0	0	0	0*	0	0
2,3-Dimethylbutane 2-Methylpentane		6.60463*	11.8860	0.00221498	35.5768*	30.2618	0.0214487	0.00371982	0*	42.1814	0.00571982
3-Methylpentane		4.12138*	7.31228	0.00696541	20.0592*	16.8476	0.0137508	0.0207162	0*	24.1806	0.0207162
Cyclohexane		1.85441*	2.15816	0.00179359	4.43547	4.01527	0.00617006	0.00803639	0*	7.02913	0.00803639
2-Methylhexane		5.06251*	6.48631	0.00276461	7.48136*	6.03923	0.0155603	0.0183249	0*	12.5439	0.0183249
2,2,4-Trimethylpentane		4.79220	0.04900	0.00258485	7.48136	5.00578	0.0162003	0.0187851	0*	12.2736	0.0187851
Methylcyclohexane		4.64629*	6.47497	0.00198520	6.03717*	4.19018	0.0163264	0.0183116	0*	10.6835	0.0183116
m-Xylene p-Xylene		0.703929*	0.578992	5.28743E-05 0	0*	0.123278	0.00160712	0.00165999	0* 0*	0.703929	0.00165999
Water		0*	0.0265870	0.00432549	0*	8.38983	102.131	102.135	110.551*	110.551	102.135
C14 C15		1.98063* 1.33880*	1.97379	2.24320E-07 5.23294E-08	0* 0*	0.00126327 0.000342788	0.00557429 0.00376947	0.00557451 0.00376952	0* 0*	1.98063 1.33880	0.00557451 0.00376952
C16		0.759275*	0.757053	1.08454E-08	0*	8.34130E-05	0.00213811	0.00213812	0*	0.759275	0.00213812
C17 C18		0.460747* 0.410629*	0.459425 0.409463	2.62511E-09 9.23593E-10	0* 0*	2.37487E-05 9.64891E-06	0.00129754 0.00115643	0.00129754 0.00115644	0* 0*	0.460747	0.00129754 0.00115644
C19		0.264019*	0.263272	2.10833E-10	0*	2.60994E-06	0.000743553	0.000743553	0*	0.264019	0.000743553
C20 C21		0.128220*	0.127859	2.54068E-11 6.51108E-12	0*	3.87366E-07 1.15744E-07	0.000361107	0.000361107	0* 0*	0.128220	0.000361107
C22		0.0469835*	0.0468512	1.82277E-12	0*	3.73365E-08	0.000132320	0.000132320	0*	0.0469835	0.000132320
C23		0.0245526*	0.0244835	2.71878E-13 6.49200E-14	0*	6.75248E-09	6.91480E-05	6.91480E-05	0*	0.0245526	6.91480E-05
C25		0.00889146*	0.00886642	1.32583E-14	0*	4.57589E-10	2.50412E-05	2.50412E-05	0*	0.00889146	2.50412E-05
C26 C27		0.0277353*	0.0276572	1.35183E-14 1.19123E-15	0*	5.61607E-10 6.05805E-11	7.81113E-05 2 70330E-05	7.81113E-05	0*	0.0277353	7.81113E-05
C28		0.00995234*	0.00992431	6.45882E-16	0*	3.74700E-11	2.80289E-05	2.80289E-05	0*	0.00995234	2.80289E-05
C29 C30		0*	0	0	0*	0	0	0	0*	0	0
Other C10s		6.61687*	6.34516	8.66259E-05	0*	0.253792	0.0178350	0.0179217	0*	6.61687	0.0179217
Other C7s Other C8s		2.18733*	5.17367	0.00189184	7.03201*	4.03104	0.0127303	0.0146222	0*	9.21934	0.0146222
Other C9s		6.82026*	6.65846	0.000278752	0.562562*	0.705553	0.0185300	0.0405853	0*	7.38282	0.0405853

			Environme	nts Report	
Client Name:	Determination			Job:	N:\West Virginia\Tug Hill/Projects\Determination\Wavne\ProMax\Tug Hill Wavne WellPad.pmx
Location:	0				
Flowsheet:	Flowsheet1				
				<b>.</b>	
			Project-Wide	e Constants	
Atmospheric Pressure	14.6959	psia	Ideal Gas Reference Volume	379.48	84 ft^3/lbmol
Ideal Gas Reference Temperature	14.0959	∘⊧	Liquid Reference Temperature	c c	DU F
	00				
			Enviror	ment1	
			Environme	nt Settings	
Number of Poynting Intervals	0		Phase Tolerance		1 %
Gibbs Excess Model Evaluation Temperature	77	°F	Emulsion Enabled	FALS	SE
Freeze Out Temperature Threshold Difference	10	°F			
			C	nonto	
Component	Henry's Law Comp	Phase Initiator	Component	Henry's Law Comr	Phase Initiator
C1	FALSE	FALSE	C2	FALSE	FAI SE
C3	FALSE	FALSE	iC4	FALSE	FALSE
nC4	FALSE	FALSE	iC5	FALSE	FALSE
nC5	FALSE	FALSE	N2	FALSE	FALSE
CO2	FALSE	FALSE	Benzene	FALSE	FALSE
Ethylbenzene	FALSE	FALSE	Toluene	FALSE	FALSE
o-Xylene	FALSE	FALSE	C6	FALSE	FALSE
C7	FALSE	FALSE	C8	FALSE	FALSE
C9	FALSE	FALSE	C10	FALSE	FALSE
C11	FALSE	FALSE	C12	FALSE	FALSE
2.2 Dimethylbutane	FALSE	FALSE	2,2-Dimetrypropane	FALSE	FALSE
2.3-Dimethylbutane	FALSE	FALSE	2-Methylpentane	FALSE	FALSE
3-Methylpentane	FALSE	FALSE	Methylcyclopentane	FALSE	FALSE
Cvclohexane	FALSE	FALSE	2-Methylhexane	FALSE	FALSE
3-Methylhexane	FALSE	FALSE	2,2,4-Trimethylpentane	FALSE	FALSE
Methylcyclohexane	FALSE	FALSE	m-Xylene	FALSE	FALSE
p-Xylene	FALSE	FALSE	Water	FALSE	TRUE
C14	FALSE	FALSE	C15	FALSE	FALSE
C16	FALSE	FALSE	C17	FALSE	FALSE
C18	FALSE	FALSE	C19	FALSE	FALSE
C20	FALSE	FALSE	C21	FALSE	FALSE
C22	FALSE	FALSE	C23	FALSE	FALSE
C24	FALSE	FALSE	C27	FALSE	FALSE
C28	FALSE	FALSE	C29	FALSE	FALSE
C30	FALSE	FALSE	Other C10s	FALSE	FALSE
Other C7s	FALSE	FALSE	Other C8s	FALSE	FALSE
Other C9s	FALSE	FALSE			
	000500		Physical Proper	ty method Sets	
Liquid Molar Volume	COSTALD		Vapor Package	Peng-Robinson	
Overall Fackage Stability Calculation	Peng-Robinson		Ligni Liquid Package	Peng-Robinson	
	r ong roomson		TIORVY LIQUIU FACKAGE	r engercobilisori	
Notes:					

Single Oil Report Other C7s							
Client Name:	Determination		Job:	N:\West Virgini	nia\Tug Hill\Projects\Determination\Wayne\ProMax\Tug Hill_Wayne_WellPad.pm		
Location:	0						
Flowsheet:	Flowsheet1						
			Proper	ties			
Volume Average Boiling Point	203.724 °F	Low Temperature Viscosity	0.346990	cP			
Molecular Weight	100.07* lb/lbmol	Temperature of High T Viscosity	210	°F			
Specific Gravity	0.7016*	High Temperature Viscosity	0.210907	cP			
API Gravity	70.1819	Watson K	12.4309				
Critical Temperature	512.577 °F	ASTM D86 10-90% Slope	0	°F/%			
Critical Pressure	396.762 psig	ASTM D93 Flash Point	22.3697	°F			
Critical Volume	6.60925 ft^3/lbmol	Pour Point	-5.74868?	°F			
Acentric Factor	0.327670	Paraffinic Fraction	72.7939	%			
Carbon to Hydrogen Ratio	5.34782	Naphthenic Fraction	21.4640	%			
Refractive Index	1.39188	Aromatic Fraction	5.74203	%			
Temperature of Low T Viscosity	100 °F	Ideal Gas Heat Capacity	37.1038	Btu/(lbmol*°F)			
Notoci							

Single Oil Report Other C8s							
Client Name:	Determina	tion		Job:	N:\West Virginia\Tug Hill\Projects\Determination\Wayne\ProMax\Tug Hill_Wayne_WellPad.pmx		
Location:	0						
Flowsheet:	Flowsheet	1					
				Proper	erties		
Volume Average Boiling Point	251.782	°F	Low Temperature Viscosity	0.447017	17 cP		
Molecular Weight	114.08*	lb/lbmol	Temperature of High T Viscosity	210	10 °F		
Specific Gravity	0.724*		High Temperature Viscosity	0.258671	71 cP		
API Gravity	63.9420		Watson K	12.3304	04		
Critical Temperature	565.249	°F	ASTM D86 10-90% Slope	0	0 °F/%		
Critical Pressure	367.106	psig	ASTM D93 Flash Point	55.5298	98 °F		
Critical Volume	7.44256	ft^3/lbmol	Pour Point	-9.53663?	3? °F		
Acentric Factor	0.374355		Paraffinic Fraction	66.6400	00 %		
Carbon to Hydrogen Ratio	5.49489		Naphthenic Fraction	23.6733	33 %		
Refractive Index	1.40407		Aromatic Fraction	9.68675	75 %		
Temperature of Low T Viscosity	100	°F	Ideal Gas Heat Capacity	41.8448	48 Btu/(lbmol*°F)		

Single Oil Report Other C9s							
Client Name:	Determination		Job:	N:\West Virginia\Tug Hill\Projects\Determination\Wayne\ProMax\Tug Hill_Wayne_WellPad.pmx			
Location:	0						
Flowsheet:	Flowsheet1						
			Proper	ties			
Volume Average Boiling Point	296.856 °F	Low Temperature Viscosity	0.570492	cP			
Molecular Weight	128.09* lb/lbmol	Temperature of High T Viscosity	210	°F			
Specific Gravity	0.7424*	High Temperature Viscosity	0.314212	cP			
API Gravity	59.0981	Watson K	12.2735				
Critical Temperature	612.701 °F	ASTM D86 10-90% Slope	0	°F/%			
Critical Pressure	339.690 psig	ASTM D93 Flash Point	86.6305	°F			
Critical Volume	8.29059 ft^3/lbmol	Pour Point	-10.9710?	°F			
Acentric Factor	0.420726	Paraffinic Fraction	62.4329	%			
Carbon to Hydrogen Ratio	5.61990	Naphthenic Fraction	24.7431	%			
Refractive Index	1.41425	Aromatic Fraction	12.8241	%			
Temperature of Low T Viscosity	100 °F	Ideal Gas Heat Capacity	46.6869	Btu/(lbmol*°F)			

Notes:

Single Oil Report								
Other C10s								
				•				
Client Name:	Determina	tion		Job:	N:\West Virginia\Tug Hill\Projects\Determination\Wayne\ProMax\Tug Hill_Wayne_WellPad.pmx			
Location:	0							
Flowsheet:	Flowsheet	1						
				Proper	ties			
Volume Average Boiling Point	338.806	°F	Low Temperature Viscosity	0.715950	cP			
Molecular Weight	142.1*	lb/lbmol	Temperature of High T Viscosity	210	°F			
Specific Gravity	0.756*		High Temperature Viscosity	0.376056	cP			
API Gravity	55.6693		Watson K	12.2715				
Critical Temperature	654.485	°F	ASTM D86 10-90% Slope	0	°F/%			
Critical Pressure	313.037	psig	ASTM D93 Flash Point	115.576	°F			
Critical Volume	9.16628	ft^3/lbmol	Pour Point	-9.65966?	°F			
Acentric Factor	0.467467		Paraffinic Fraction	60.2425	%			
Carbon to Hydrogen Ratio	5.70210		Naphthenic Fraction	24.8511	%			
Refractive Index	1.42187		Aromatic Fraction	14.9065	%			
Temperature of Low T Viscosity	100	°F	Ideal Gas Heat Capacity	51.7717	Btu/(lbmol*°F)			
Notes:								

Calculators Report								
Oliver News	Determination	- Ou						
Client Name:	Determination		[]0	D: IN:\V				
Elowsheet:	0 Flowsheet1							
Flowsheet.	Flowsheet							
			Simple Solver 1					
			Source Code					
Residual Error (to	or CV1) = ProducedWater-7							
		Calci	ulated Variable [CV1]					
SourceMoniker	ProMax:ProMax!Project!Flowshee	ts!Flowsheet1!	PStreams!Water!Phases!Total!Properties!Std Liquid Volumetric Flow	'				
Value	7.57716							
Units	bbl/d							
			· · · · · · · · · · · · · · · · · · ·					
0	Decker Decker Decker (F)	Measure	a variable [ProducedWater]	The state of the s				
SourceMoniker Value Units	ProMax:ProMax!Project!Flowshee 7.00000 bbl/d	ts!Flowsheet1!I	PStreams!Produced Liquid!Phases!Total!Composition!Std Liquid Vo	lumetric Flow!Water				
			Solver Properties					
Status: Solved								
Error	8.52873E-07		Iterations	5				
Calculated Value	0.221000	sgpm	Max Iterations	40*				
Lower Bound		sgpm	Weighting	1*				
Upper Bound		sgpm	Priority	0*				
Step Size		sgpm	Solver Active	Active				
Is Minimizer	FALSE		Group					
Algorithm	Default		Skip Dependency Check	FALSE				
Notes:			Simple Oslare 2					
			Simple Solver 3					
			Source Code					
Residual Error (fo	or CV1) = ProducedLiquid-7.041							
		Calcu	ulated Variable [CV1]					
SourceMoniker	ProMax:ProMax!Project!Flowshee	ts!Flowsheet1!	Blocks!VSSL-100!Entrainments!Entrainment 1!Properties!Numerator	r Value				
Value	27.4562							
Units	bbl							
		Measure	d Variable [ProducedLiquid]					
SourceMoniker	ProMax:ProMax!Project!Flowshee	ts!Flowsheet1!	PStreams!Produced Liquid!Phases!Total!Properties!Std Liquid Volur	netric Flow				
Value	7.04113							
Units	bbl/d							
Status: Salved			Solver Properties					
Gradus, Solved	0.000100717		Herationa	F				
Coloulated Value	0.000132747	aal	Max Iterations	5				
Lower Bound	1153.16	yai	Weighting	20				
Upper Bound		gal	Priority	0				
Step Size		gal	Solver Active	Active				
Is Minimizer	FALSE		Group					
Algorithm	Default		Skip Dependency Check	FALSE				
Notes:								

	User Value Sets Report								
Client Name:	Determination	Job:	N:\West Virginia						
Location:	0								
Flowsneet:	Flowsheet1								
	Та	nk-1							
	User Value	[BlockReady]							
Parameter	1*	Upper Bour							
Lower Bound		Enforce Boi	FALSE						
	User Value		4						
Parameter	20^ tt 0* ft	Upper Bour	tt FALSE						
	U II		FALSE						
	User Value	[ShellDiam]							
Parameter	12* ft	Upper Bour	ft						
Lower Bound	0* ft	Enforce Boi	FALSE						
	User Value	[BreatherVP]							
Parameter	0.0300000* psig	Upper Bour	psig						
	psig		FALSE						
	User Value [	BreatherVacP]							
Parameter	-0.0300000* psig	Upper Bour	psig						
Lower Bound	psig	Enforce Boi	FALSE						
	User Value ]	DomeRadius]							
Parameter	0.17* ft	Upper Bour	ft						
Lower Bound	n		FALSE						
	User Valu	e [OpPress]							
Parameter	0* psig	Upper Bour	psig						
Lower Bound	psig	Enforce Boi	FALSE						
	User Value [A	vgPercentLiq]							
Parameter	50* %	Upper Bour	%						
Lower Bound	%	Enforce Boi	FALSE						
	User Value []	MaxPercentLig1							
Parameter	90* %	Upper Bour	%						
Lower Bound	%	Enforce Boi	FALSE						
	User Value	[AnnNetTP]							
Parameter	7.03781* bbl/day	Upper Bour	bbl/day						
Lower Bound	U^ bbl/day	Enforce Boi	FALSE						
	User Val	ue [ORFff]							
Parameter	0* %	Upper Bour	%						
Lower Bound	%	Enforce Boi	FALSE						
	User Value	e [MaxAvgT]							
Parameter	61.15* °F	Upper Bour	°F						
Lower Bound	°F	Enforce Boi	FALSE						
	Liser Valu								
Darameter	26 9667* °F		°F						
Lower Bound	°F	Enforce Bo	FALSE						

	User Value [E	BulkLiqT]	
Parameter	52.1383* °F	Upper Bour	°F
Lower Bound	°F	Enforce Boi	FALSE
	User Value	[AvgP]	
Parameter	13.7315* psia	Upper Bour	psia
Lower Bound	psia	Enforce Boi	FALSE
	User Value	Therml]	
Parameter	1193.89* Btu/ft^2/day	Upper Bour	Btu/ft^2/day
Lower Bound	Btu/ft^2/day	Enforce Boi	FALSE
		Wind Speed 1	
		windSpeed	÷ 0.
Parameter	6.16667° mi/h	Upper Bour	mi/n
	111/11	Eniorce Boi	FALSE
	User Value (MaxHou	rlvl oadingRate	
Parameter	0.293242* bbl/br		bbl/br
Lower Bound	0* bbl/hr	Enforce Boi	FALSE
	User Value [Entra	ainedOilFrac]	
Parameter	1* %	Upper Bour	%
Lower Bound	%	Enforce Bou	FALSE
	User Value [Tur	noverRate]	
Parameter	6.42400*	Upper Bour	
Lower Bound		Enforce Boi	FALSE
	User Value [LLos	ssSatFactor]	
Parameter	0.5*	Upper Bour	
Lower Bound		Enforce Boi	FALSE
		mDrocourol	
		nPressurej	· · · · · · · · · · · · · · · · · · ·
Parameter	13.7315" psia	Upper Bour	psia EALSE
	ρsia	Efficice Boi	FALSE
	User Value		
Parameter	0.251/38* psia	Lipper Bour	
l ower Bound	nsia	Enforce Boi	FALSE
Lonor Boana	poid	Eniored Ben	THEOL
	User Value [	MaxVP]	
Parameter	0.352008* psia	Upper Bour	psia
Lower Bound	psia	Enforce Boi	FALSE
	User Value	[MinVP]	
Parameter	0.177917* psia	Upper Bour	psia
Lower Bound	psia	Enforce Boi	FALSE
	User Value [Avgl	_iqSurfaceT]	
Parameter	57.1967* °F	Upper Bour	°F
Lower Bound	°F	Enforce Boi	FALSE
		Tl	
Parameter	67.2326* °F	Upper Bour	۲ <u>۲</u>
Lower Bound	۲ <b>۲</b>	Enlorce Bol	FALSE
	Lleer Value ITe	tall osses]	
Doromotor			tonkr
Farameter	0.000070434 [ON/yr top/yr	Enforce Bou	ION/yr EAI SE
	1017 yi	LINOICE DOI	IALVE

	User Value [WorkingLosses]			
Parameter	0.000219365* ton/yr	Upper Bour	ton/yr	
Lower Bound	ton/yr	Enforce Boi	FALSE	
	User Value [	Standinglosses]		
Parameter	0.000651069* top/yr	Upper Bour	ton/vr	
Lower Bound	ton/yr	Enforce Boi	FALSE	
	ř.	÷		
	User Value [	RimSealLosses]		
Parameter	0* ton/yr	Upper Bour	ton/yr	
Lower Bound	ton/yr	Enforce Bol	FALSE	
	User Value [	WithdrawalLoss]		
Parameter	0* ton/yr	Upper Bour	ton/yr	
Lower Bound	ton/yr	Enforce Boi	FALSE	
	User Value [	LoadingLosses		
Parameter	0.000148069* ton/yr	Upper Bour	ton/yr	
	tonyy	Ellioice Boi	FALSE	
	User Value [Max	HourlyLoadingLoss]		
Parameter	3.38058E-05* lb/hr	Upper Bour	lb/hr	
Lower Bound	lb/hr	Enforce Boi	FALSE	
Denementen	User Va	alue [PStar]		
Parameter Lower Bound		Upper Bour	FALSE	
			TALOL	
	User Value [/	AllCTotalLosses]		
Parameter	0.0184960* ton/yr	Upper Bour	ton/yr	
Lower Bound	ton/yr	Enforce Bo	FALSE	
	Licor Value [Al			
Parameter			ton/vr	
Lower Bound	ton/yr	Enforce Bou	FALSE	
	User Value [AllC	MaxHLoadingLoss]		
Parameter	0.000718345* lb/hr	Upper Bour	lb/hr	
Lower Bound	lb/hr	Enforce Boi	FALSE	
	User Value [Al	ICElashingl osses		
Parameter	1.57194* ton/vr	Upper Bour	ton/vr	
Lower Bound	ton/yr	Enforce Boi	FALSE	
	·			
	User Value [D	eckFittingLosses]		
Parameter	0* ton/yr	Upper Bour	ton/yr	
Lower Bound	ton/yr	Enforce Boi	FALSE	
	User Value [[	eckSeaml osses		
Parameter	0* ton/vr	Upper Bour	ton/vr	
Lower Bound	ton/yr	Enforce Boi	FALSE	
		•		
	User Value [	FlashingLosses]		
Parameter	1.05996* ton/yr	Upper Bour	ton/yr	
Lower Bound	ton/yr	Enforce Boi	FALSE	
	User Value	[TotalResidual]		
Parameter	449.142* ton/vr	Upper Bour	ton/vr	
Lower Bound	ton/yr	Enforce Boi	FALSE	
	User Value [	GasMoleWeight]		

Parameter	0.0192450* kg/mol	Upper Bour	kg/mol
Lower Bound	kg/mol	Enforce Boi	FALSE
	User Value [Vap	ReportableFrac]	
Parameter	4.70606* %	Upper Bour	%
Lower Bound	%	Enforce Boi	FALSE
	User Value [Liq	ReportableFrac]	
Parameter	0.402713* %	Upper Bour	%
Lower Bound	%	Enforce Boi	FALSE
	User Value [Flas	hReportableFrac]	
Parameter	67.4305* %	Upper Bour	%
Lower Bound	%	Enforce Boi	FALSE
<b>Notes:</b> This User Value Set w	as programmatically generated. GU	D={1EDE36BA-2D5D-4876-9	0370-5B5F79CCFF0E}
	Sum Compon	ent Flow/Frac	
	User Value	[CompSum]	
Parameter	1.06496* ton/yr	Upper Bour	ton/yr
Lower Bound	ton/yr	Enforce Boi	FALSE
Notes:			
This User Value Set w	as programmatically generated. GU	D={06B303CE-D6A3-4C69-A	BCE-29F0C05F34E0}

#### FESCO, Ltd. 1100 Fesco Ave. - Alice, Texas 78332

For: SLR International Corporation 8 Capitol Street, Suite 300 Charleston, West Virginia 25301

Sample: Tug Hill - Shields No. 9 & No. 10 GPU Sales Line Spot Gas Sample @ 366 psig & 71 °F

Date Sampled: 11/01/16

Job Number: 63606.021

#### CHROMATOGRAPH EXTENDED ANALYSIS - GPA 2286

COMPONENT	MOL%		GPM	
Nitrogen	0.682			
Carbon Dioxide	0.188			
Methane	75.001			
Ethane	15.375		4.104	
Propane	5.545		1.525	
Isobutane	0.552		0.180	
n-Butane	1.518		0.478	
2-2 Dimethylpropane	0.015		0.006	
Isopentane	0.275		0.100	
n-Pentane	0.387		0.140	
Hexanes	0.319		0.131	
Heptanes Plus	<u>0.143</u>		0.061	
Totals	100.000		6.725	
Computed Real Charac	teristics Of Hept	anes Plu	JS:	
Specific Gravity		3.411	(Air=1)	
Molecular Weight		98.43		
Gross Heating Value		5207	BTU/CF	
Computed Real Charac	Computed Real Characteristics Of Total Sample:			
Specific Gravity $$				

0.744	(Air=1)
0.9962	
21.48	
1287	BTU/CF
1266	BTU/CF
	0.744 0.9962 21.48 1287 1266

Base Conditions: 14.650 PSI & 60 Deg F

Sampled By: (SLR) N. Lanham Analyst: MR Processor: OA Cylinder ID: T-4675 Certified: FESCO, Ltd. - Alice, Texas

David Dannhaus 361-661-7015

#### CHROMATOGRAPH EXTENDED ANALYSIS - GPA 2286 TOTAL REPORT

COMPONENT	MOL %	GPM		WT %
Nitrogen	0.682			0.889
Carbon Dioxide	0.188			0.385
Methane	75.001			56.011
Ethane	15.375	4.104		21.522
Propane	5.545	1.525		11.382
Isobutane	0.552	0.180		1.494
n-Butane	1.518	0.478		4.107
2,2 Dimethylpropane	0.015	0.006		0.050
Isopentane	0.275	0.100		0.924
n-Pentane	0.387	0.140		1.300
2,2 Dimethylbutane	0.009	0.004		0.036
Cyclopentane	0.000	0.000		0.000
2,3 Dimethylbutane	0.018	0.007		0.072
2 Methylpentane	0.094	0.039		0.377
3 Methylpentane	0.053	0.022		0.213
n-Hexane	0.145	0.060		0.582
Methylcyclopentane	0.012	0.004		0.047
Benzene	0.002	0.001		0.007
Cyclohexane	0.014	0.005		0.055
2-Methylhexane	0.017	0.008		0.079
3-Methylhexane	0.017	0.008		0.079
2,2,4 Trimethylpentane	0.000	0.000		0.000
Other C7's	0.016	0.007		0.074
n-Heptane	0.028	0.013		0.131
Methylcyclohexane	0.014	0.006		0.064
Toluene	0.002	0.001		0.009
Other C8's	0.013	0.006		0.067
n-Octane	0.006	0.003		0.032
Ethylbenzene	0.000	0.000		0.000
M & P Xylenes	0.000	0.000		0.000
O-Xylene	0.000	0.000		0.000
Other C9's	0.001	0.001		0.006
n-Nonane	0.001	0.001		0.006
Other C10's	0.000	0.000		0.000
n-Decane	0.000	0.000		0.000
Undecanes (11)	<u>0.000</u>	<u>0.000</u>		0.000
Totals	100.000	6.725		100.000
Computed Real Charact	eristics of Total	Sample		
Specific Gravity		0.744	(Air=1)	
Compressibility (Z)		0.9962		
Molecular Weight		21.48		
Gross Heating Value				
Dry Basis		1287	BTU/CF	
Saturated Basis		1266	BTU/CF	

Page 2 of 3

#### FESCO, Ltd. 1100 Fesco Ave. - Alice, Texas 78332

Sample: Tug Hill - Shields No. 9 & No. 10 GPU Sales Line Spot Gas Sample @ 366 psig & 71 °F

Date Sampled: 11/01/16

Job Number: 63606.021

**GLYCALC FORMAT** 

COMPONENT	MOL%	GPM	Wt %
Carbon Dioxide	0.188		0.385
Hydrogen Sulfide			
Nitrogen	0.682		0.889
Methane	75.001		56.011
Ethane	15.375	4.104	21.522
Propane	5.545	1.525	11.382
Isobutane	0.552	0.180	1.494
n-Butane	1.533	0.483	4.157
Isopentane	0.275	0.100	0.924
n-Pentane	0.387	0.140	1.300
Cyclopentane	0.000	0.000	0.000
n-Hexane	0.145	0.060	0.582
Cyclohexane	0.014	0.005	0.055
Other C6's	0.174	0.072	0.698
Heptanes	0.090	0.040	0.410
Methylcyclohexane	0.014	0.006	0.064
2,2,4 Trimethylpentane	0.000	0.000	0.000
Benzene	0.002	0.001	0.007
Toluene	0.002	0.001	0.009
Ethylbenzene	0.000	0.000	0.000
Xylenes	0.000	0.000	0.000
Octanes Plus	<u>0.021</u>	<u>0.010</u>	<u>0.111</u>
Totals	100.000	6.725	100.000

#### **Real Characteristics Of Octanes Plus:**

Specific Gravity	3.916	(Air=1)
Molecular Weight	112.99	
Gross Heating Value	5791	BTU/CF

#### **Real Characteristics Of Total Sample:**

Specific Gravity	0.744	(Air=1)
Compressibility (Z)	0.9962	
Molecular Weight	21.48	
Gross Heating Value		
Dry Basis	1287	BTU/CF
Saturated Basis	1266	BTU/CF

#### FESCO, Ltd. 1100 FESCO Avenue - Alice, Texas 78332

For: SLR International Corporation 8 Capitol Street, Suite 300 Charleston, West Virginia 25301

#### Sample: Tug Hill - Shields No. 9 & No. 10 Condensate Separator Hydrocarbon Liquid Sampled @ 366 psig & 71 °F

Date Sampled: 11/01/16

Job Number: 63606.002

#### CHROMATOGRAPH EXTENDED ANALYSIS - GPA 2186-M

COMPONENT	MOL %	LIQ VOL %	WT %
Nitrogen	0.020	0.006	0.008
Carbon Dioxide	0.055	0.026	0.034
Methane	9.002	4.177	2.022
Ethane	11.009	8.062	4.635
Propane	13.020	9.822	8.038
Isobutane	2.868	2.570	2.334
n-Butane	10.861	9.376	8.839
2,2 Dimethylpropane	0.138	0.145	0.140
Isopentane	4.720	4.727	4.768
n-Pentane	8.296	8.235	8.381
2,2 Dimethylbutane	0.172	0.197	0.208
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.403	0.452	0.486
2 Methylpentane	3.040	3.455	3.668
3 Methylpentane	1.897	2.121	2.289
n-Hexane	6.035	6.795	7.281
Heptanes Plus	<u>28.464</u>	<u>39.833</u>	<u>46.869</u>
Totals:	100.000	100.000	100.000

#### Characteristics of Heptanes Plus:

Specific Gravity	0.7292	(Water=1)
°API Gravity	62.54	@ 60°F
Molecular Weight	117.6	
Vapor Volume	19.68	CF/Gal
Weight	6.08	Lbs/Gal

#### Characteristics of Total Sample:

Specific Gravity	0.6197	(Water=1)
°API Gravity	96.82	@ 60°F
Molecular Weight	71.4	
Vapor Volume	27.54	CF/Gal
Weight	5.16	Lbs/Gal

Base Conditions: 14.850 PSI & 60 °F

Sampled By: SLR Analyst: XG Processor: XGdjv Cylinder ID: PW-35024 Certified: FESCO, Ltd. - Alice, Texas

David Dannhaus 361-661-7015

FESCO, Ltd.

COMPONENT	Mol %	LiqVol %	Wt %
Nitrogen	0.020	0.006	0.008
Carbon Dioxide	0.055	0.026	0.034
Methane	9.002	4.177	2.022
Ethane	11.009	8.062	4.635
Propane	13.020	9.822	8.038
Isobutane	2.868	2.570	2.334
n-Butane	10.861	9.376	8.839
2.2 Dimethylpropane	0.138	0.145	0.140
Isopentane	4,720	4,727	4,768
n-Pentane	8 296	8 235	8.381
2.2 Dimethylbutane	0.172	0.197	0.208
	0.000	0.000	0.000
2.3 Dimethylbutane	0.403	0.452	0.486
2 Methylpentane	3 040	3 455	3 668
3 Methylpentane	1 897	2 121	2 289
n-Hevane	6.035	6 795	7 281
Methylcyclopentane	0.000	0.797	0.969
Benzene	0.022	0.063	0.009
Cyclohexane	0.002 0.874	0.005	1 030
2-Methylbevane	2 004	2 551	2 812
3-Methylhexane	1 777	2.001	2.012
2 2 4 Trimethylpentane	0.000	0.000	0.000
Other C-7's	0.000	1 093	1 204
n-Hentane	3 590	4 535	5.036
Methylcyclobexane	1 877	2.066	2 581
Toluene	0.300	0.275	0.387
Other C-8's	4 173	5 664	6 440
n-Octane	1,756	2.463	2.808
F-Benzene	0.262	0.277	0.390
M & P Xvlenes	0.263	0.280	0.392
O-Xvlene	0.479	0.499	0.712
Other C-9's	2.112	3.202	3.733
n-Nonane	0.939	1.447	1.687
Other C-10's	1.847	3.076	3.653
n-decane	0.477	0.802	0.950
Undecanes(11)	1.467	2.507	3.019
Dodecanes(12)	0.899	1.660	2.027
Tridecanes(13)	0.592	1.171	1.450
Tetradecanes(14)	0.396	0.840	1.055
Pentadecanes(15)	0.250	0.567	0.720
Hexadecanes(16)	0.133	0.323	0.413
Heptadecanes(17)	0.076	0.196	0.253
Octadecanes(18)	0.064	0.173	0.226
Nonadecanes(19)	0.039	0.111	0.145
Eicosanes(20)	0.018	0.054	0.071
Heneicosanes(21)	0.010	0.031	0.041
Docosanes(22)	0.006	0.019	0.025
Tricosanes(23)	0.003	0.009	0.013
Tetracosanes(24)	0.002	0.007	0.009
Pentacosanes(25)	0.001	0.005	0.007
Hexacosanes(26)	0.003	0.013	0.017
Heptacosanes(27)	0.001	0.003	0.004
Octacosanes(28)	0.001	0.002	0.003
Nonacosanes(29)	0.000	0.001	0.002
Triacontanes(30)	0.000	0.001	0.001
Hentriacontanes Plus(31+)	0.000	0.002	<u>0.003</u>
Total	100.000	100.000	100.000

Page 2 of 2

#### FESCO, Ltd. 1100 Fesco Avenue - Alice, Texas 78332

For: SLR International Corporation 8 Capitol Street, Suite 300 Charleston, West Virginia 25301 Date Sampled: 11/01/16

Date Analyzed: 11/11/16

Job Number: J63606

Sample: Tug Hill - Shields No. 9 & No. 10

FLASH LIBERATION OF SEPARATOR WATER			
	Separator	Stock Tank	
Pressure, psig	366	0	
Temperature, °F	71	70	
Gas Water Ratio (1)		1.45	
Gas Specific Gravity (2)		0.742	

(1) - Scf of water saturated vapor per barrel of stock tank water
(2) - Air = 1.000
(3) - Separator volume / Stock tank volume
Analyst: T.G.

Piston No. : PW-31464

Base Conditions: 14.65 PSI & 60 °F

Certified: FESCO, Ltd. - Alice, Texas

David Dannhaus 361-661-7015
#### FESCO, Ltd. 1100 Fesco Ave. - Alice, Texas 78332

For: SLR International Corporation 8 Capitol Street, Suite 300 Charleston, West Virginia 25301

Sample: Tug Hill - Shields No. 9 & No. 10 Gas Liberated From Separator Water From 366 psig & 71 °F to 0 psig & 70 °F

Date Sampled: 11/01/16

Job Number: 63606.011

#### CHROMATOGRAPH EXTENDED ANALYSIS - GPA 2286

COMPONENT	MOL%	GPM
Hydrogen Sulfide*	< 0.001	
Nitrogen	0.874	
Carbon Dioxide	2.675	
Methane	75.496	
Ethane	15.043	4.015
Propane	3.544	0.974
Isobutane	0.215	0.070
n-Butane	0.756	0.238
2-2 Dimethylpropane	0.000	0.000
Isopentane	0.190	0.069
n-Pentane	0.234	0.085
Hexanes	0.396	0.163
Heptanes Plus	0.577	<u>0.242</u>
Totals	100.000	5.856
Computed Real Charac	cteristics Of Heptar	nes Plus:
Specific Gravity		3.447 (Air=1)
Molecular Weight		99 47

Molecular weight	99.47	
Gross Heating Value	5174	BTU/CF

Computed Real Characteristics Of Total Sample:

•			
Specific Gravity	0.742	(Air=1)	
Compressibility (Z)	0.9964		
Molecular Weight	21.41		
Gross Heating Value			
Dry Basis	1216	BTU/CF	
Saturated Basis	1196	BTU/CF	

\*Hydrogen Sulfide tested in laboratory by: Stain Tube Method (GPA 2377) Results: <0.013 Gr/100 CF, <0.2 PPMV or <0.001 Mol %

Base Conditions: 14.650 PSI & 60 Deg F

Sampled By: (16)T. Gonzalez Analyst: MR Processor: OA Cylinder ID: WF# 1S Certified: FESCO, Ltd. - Alice, Texas

David Dannhaus 361-661-7015

CHROMATOGRAPH EXTENDED ANALYSIS - GPA 2286
TOTAL REPORT

COMPONENT	MOL %	GPM	WT %
Hydrogen Sulfide*	< 0.001		< 0.001
Nitrogen	0.874		1.144
Carbon Dioxide	2.675		5.500
Methane	75.496		56.581
Ethane	15.043	4.015	21.132
Propane	3.544	0.974	7.301
Isobutane	0.215	0.070	0.584
n-Butane	0.756	0.238	2.053
2,2 Dimethylpropane	0.000	0.000	0.000
sopentane	0.190	0.069	0.640
n-Pentane	0.234	0.085	0.789
2,2 Dimethylbutane	0.009	0.004	0.036
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.031	0.013	0.125
2 Methylpentane	0.104	0.043	0.419
3 Methylpentane	0.068	0.028	0.274
n-Hexane	0.184	0.076	0.741
Methylcyclopentane	0.032	0.011	0.126
Benzene	0.047	0.013	0.172
Cyclohexane	0.047	0.016	0.185
2-Methylhexane	0.038	0.018	0.178
3-Methylhexane	0.041	0.019	0.192
2,2,4 Trimethylpentane	0.000	0.000	0.000
Other C7's	0.043	0.019	0.199
n-Heptane	0.081	0.037	0.379
Methylcyclohexane	0.058	0.023	0.266
Toluene	0.041	0.014	0.176
Other C8's	0.062	0.029	0.319
n-Octane	0.034	0.017	0.181
Ethylbenzene	0.000	0.000	0.000
M & P Xylenes	0.011	0.004	0.055
O-Xylene	0.000	0.000	0.000
Other C9's	0.026	0.013	0.153
n-Nonane	0.010	0.006	0.060
Other C10's	0.000	0.000	0.000
n-Decane	0.006	0.004	0.040
Undecanes (11)	0.000	<u>0.000</u>	<u>0</u> .000
Totals	100.000	5.856	100.000
Computed Real Charac	cteristics Of T	otal Sample:	
Specific Gravity		0.742	(Air=1)

	0.7 42	(7 - 1)
Compressibility (Z)	0.9964	
Molecular Weight	21.41	
Gross Heating Value		
Dry Basis	1216	BTU/CF
Saturated Basis	1196	BTU/CF

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

Identification User Identification: City: State: Company: Type of Tank: Description:	T002 New Martinsville WV Tug Hill Vertical Fixed Roof Tank 1.5 MMgal Frackwater AST
Tank Dimensions Shell Height (ft): Diameter (ft): Liquid Height (ft) : Avg. Liquid Height (ft): Volume (gallons): Turnovers: Net Throughput(gal/yr): Is Tank Heated (y/n):	12.00 142.25 11.00 6.00 1,307,736.70 3.52 4,600,000.00 N
Paint Characteristics Shell Color/Shade: Shell Condition Roof Color/Shade: Roof Condition:	Gray/Medium Good Gray/Medium Good
Roof Characteristics Type: Height (ft) Slope (ft/ft) (Cone Roof)	Cone 0.00 0.06
Breather Vent Settings Vacuum Settings (psig): Pressure Settings (psig)	-0.03 0.03

Meterological Data used in Emissions Calculations: Elkins, West Virginia (Avg Atmospheric Pressure = 13.73 psia)

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

T002 - Vertical Fixed Roof Tank New Martinsville, WV

		Dai Temp	ly Liquid Su erature (de	rf. g F)	Liquid Bulk Temp	Vapo	Pressure (	psia)	Vapor Mol.	Liquid Mass	Vapor Mass	Mol.	Basis for Vapor Pressure
Mixture/Component	Month	Avg.	Min.	Max.	(deg F)	Avg.	Min.	Max.	Weight.	Fract.	Fract.	Weight	Calculations
Distillate fuel oil no. 2	All	57.20	47.16	67.23	52.14	0.0059	0.0041	0.0083	130.0000			188.00	Option 1: VP50 = .0045 VP60 = .0065

## TANKS 4.0.9d Emissions Report - Detail Format Detail Calculations (AP-42)

#### T002 - Vertical Fixed Roof Tank New Martinsville, WV

Annual Emission Calcaulations	
Standing Losses (lb):	443.6330
Vapor Space Volume (cu ft):	118,904.6483
Vapor Density (lb/cu ft):	0.0001
Vapor Space Expansion Factor:	0.0736
venieu vapor Saturation Factor.	0.9977
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	118,904.6483
Tank Diameter (ft):	142.2500
Vapor Space Outage (ft):	7.4818
Average Liquid Height (ft):	6.0000
Roof Outage (ft):	1.4818
Roof Outage (Cone Roof)	
Roof Outage (ft):	1.4818
Roof Height (ft):	0.0000
Roof Slope (ft/ft):	0.0625
Shell Radius (ft):	71.1250
Vapor Density	
Vapor Density (lb/cu ft):	0.0001
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid	
Surface Temperature (psia):	0.0059
Daily Avg. Liquid Surrace Temp. (deg. R):	510.800/
Ideal Gas Constant R	49.0000
(psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	511.8083
Tank Paint Solar Absorptance (Shell):	0.6800
Tank Paint Solar Absorptance (Roof):	0.6800
Daily Total Solar Insulation	
Factor (Btu/sqtt day):	1,193.8870
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0736
Daily Vapor Temperature Range (deg. R):	40.1436
Daily vapor Pressure Range (psia): Proother Vent Proce, Setting Pange(psia):	0.0042
Vanor Pressure at Daily Average Liquid	0.0000
Surface Temperature (psia):	0.0059
Vapor Pressure at Daily Minimum Liquid	
Surface Temperature (psia):	0.0041
Vapor Pressure at Daily Maximum Liquid	
Surface Temperature (psia):	0.0083
Daily Avg. Liquid Surface Temp. (deg R):	516.8667
Daily Min. Liquid Surface Temp. (deg R).	500.0300
Daily Ambient Temp. Range (deg. R):	24.1833
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor	0.9977
Vapor Pressure at Daily Average Liquid:	0.0011
Surface Temperature (psia):	0.0059
Vapor Space Outage (ft):	7.4818
Working Losses (Ib):	84.5649
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid	
Surface Temperature (psia):	0.0059
Annual Net Throughput (gal/yr.):	4,600,000.0000
Annual Lumovers:	3.51/5
Maximum Liquid Volume (gal):	1 307 736 7022
Maximum Liquid Height (ft):	11,000,7000
Tank Diameter (ft):	142,2500
Working Loss Product Factor:	1.0000
Total Losses (lb):	528.1979

## TANKS 4.0.9d Emissions Report - Detail Format Individual Tank Emission Totals

## **Emissions Report for: Annual**

T002 - Vertical Fixed Roof Tank New Martinsville, WV

	Losses(lbs)					
Components	Working Loss Breathing Loss Total Emiss					
Distillate fuel oil no. 2	84.56	443.63	528.20			



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		REVISIONS		
REV.	DESCRIPTION		DATE	APPROVED
А	NEW RELEASE		7/13/2017	НIИ
В	Change out pond panel to ma Strapping charts	TCH CUSTOMER	7/13/2017	НГИ

С

а ТМР-01272 В

LDPE LINER ANK)	TOLERANCES UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES: ERACTIONAL: + 1/16"			PC	MFG. SOLUTION	NS, LLC	_
	BEND: ± 1/16"		NAME	DATE			
	ANGULAR: $(BEND) \pm 0.5^{\circ}$	DRAWN	N.HILL	10/20/2016	32K TANK INSIDE	36K	
	ONE PLACE DECIMAL: ± 0.1"	ENG APPR.					
	TWO PLACE DECIMAL: ± 0.01" THREE PLACE DECIMAL: ± 0.003"	MFG APPR.				1001	
		Q.A.					
DIER COFT	EST. WEIGHT	PROPRIETA THE INFORMAT	RY AND CONFIE	D IN THIS	SIZE DWG. NO.	REV	-
<b>13/2017</b> 4219/		<ul> <li>DRAWING IS THE SOLE PROPERTY OF</li> <li>PCI MFG SOLUTIONS, LLC. ANY</li> <li>REPRODUCTION IN PART OR AS A WHOLE</li> </ul>		IY S A WHOLE	<b>D</b>   TMP-01272	B	
	DO NOT SCALE DRAWING	PCI MANUFAC	TURING, LLC IS	SION OF PROHIBITED.	scale: nts	SHEET 1 OF 1	1
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