November 25, 2015

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

Re: G35-A103A General Permit Registration to Modify
Walen Compressor Station (047-00089)
Cranberry Pipeline Corporation

Dear Mr. Durham,

SLR International Corporation has prepared the attached G35-A General Permit Registration on behalf of Cranberry Pipeline Corporation for the Walen Compressor Station located in Gary, West Virginia (plant ID No. 047-00089). The facility is currently permitted by general permit number G35-A103A. SLR is requesting this Modification in order to update the facility registration to more accurately reflect the site's most recent gas compositional analysis measurements.

An updated wet gas analysis was taken on March 25, 2015 from the Walen Compressor Station. This sample and GLYCalc emission modeling indicate the need to increase the facility's potential to emit via a G35-A General Permit Registration. The resulting emission increases are reflected in the following table for the facility. These proposed limits do not trigger any additional permit requirements.

Pollutant	Currently Permitted Emission Limits (tpy)	Proposed Emission Limits (tpy)	Difference between Permitted and Proposed Limits (tpy)
PM/PM10/PM2.5	-	0.26	0.26
VOCs	7.74	12.65	4.91
Benzene	0.12	0.38	0.26
Toluene	0.23	0.79	0.56
Ethylbenzene	0.47	1.64	1.17
Xylene	0.73	2.28	1.55
n-Hexane	-	0.01	0.01
Total HAPs	2.91	6.45	3.54

The public notice was delivered to *The Welch News* for publication. The legal advertisement will be forwarded to your office as soon as SLR receives the original affidavit from the newspaper.

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

Sincerely,
SLR International Corporation

Jesse Hanshaw
Principal Engineer, P.E.

Cc: Mr. Brody Webster, Cranberry Pipeline Corporation

global environmental solutions

Walen Compressor Station

Plant ID No. 047-00089

Gary, West Virginia

General Permit G-35A Modification Application

SLR Ref: 116.00400.00131

November 2015

General Permit G-35A Modification Application

Walen Compressor Station, Plant ID No. 047-00089
Gary, West Virginia

Prepared for:

Cranberry Pipeline Corporation
c/o Cabot Oil & Gas Corporation
900 Lee Street, East
Suite 1500
Charleston, West Virginia 25301

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

Chris Boggess
Associate Engineer

Jesse Hanshaw
Principal Engineer P.E.

CONTENTS

APPLICATION FOR PERMIT

ATTACHMENTS

Notes:

ATTACHMENT H	Not Applicable- No control devices are used at this facility.
ATTACHMENT M	Not Applicable- No Siting Criteria Waiver is necessary due to existing facility
ATTACHMENT O	Not Applicable- Emission Summary Sheets used for G-70A applications

APPLICATION FOR PERMIT

General Permit G-35A Modification Application

Walen Compressor Station, Plant ID No. 047-00089
Gary, West Virginia

Cranberry Pipeline Corporation
c/o Cabot Oil & Gas Corporation
900 Lee Street East, Suite 1500
Charleston, West Virginia

November 2015

WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF AIR QUALITY
601 57th Street, SE
Charleston, WV 25304
Phone: (304) 926-0475 • *www.dep.wv.gov/daq*

APPLICATION FOR GENERAL PERMIT REGISTRATION

CONSTRUCT, MODIFY, RELOCATE OR ADMINISTRATIVELY UPDATE

A STATIONARY SOURCE OF AIR POLLUTANTS

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

CHECK WHICH TYPE OF GENERAL PERMIT REGISTRATION YOU ARE APPLYING FOR:

☐ **G10-D –** Coal Preparation and Handling	☐ **G40-C –** Nonmetallic Minerals Processing
☐ **G20-B –** Hot Mix Asphalt	☐ **G50-B –** Concrete Batch
☐ **G30-D –** Natural Gas Compressor Stations	☐ **G60-C** - Class II Emergency Generator
☐ **G33-A –** Spark Ignition Internal Combustion Engines	☐ **G65-C –** Class I Emergency Generator
■ **G35-A –** Natural Gas Compressor Stations (Flare/Glycol Dehydration Unit)	☐ **G70-A –** Class II Oil and Natural Gas Production Facility

SECTION I. GENERAL INFORMATION

1. Name of applicant (as registered with the WV Secretary of State's Office):
Cranberry Pipeline Corporation

2. Federal Employer ID No. **(FEIN):**
042989934

3. Applicant's mailing address:

900 Lee Street East
Suite 1500
Charleston, WV 25301

4. Applicant's physical address:

628 River Drive
Pineville, WV 24874

5. If applicant is a subsidiary corporation, please provide the name of parent corporation: **Cabot Oil and Gas Corporation**

6. **WV BUSINESS REGISTRATION.** Is the applicant a resident of the State of West Virginia? ■ **YES** ☐ **NO**

- IF **YES,** provide a copy of the Certificate of **Incorporation/ Organization / Limited Partnership** (one page) including any name change amendments or other Business Registration Certificate as **Attachment A**.
- IF **NO,** provide a copy of the **Certificate of Authority / Authority of LLC / Registration** (one page) including any name change amendments or other Business Certificate as **Attachment A**.

SECTION II. FACILITY INFORMATION

7. Type of plant or facility (stationary source) to be constructed, modified, relocated or administratively updated (e.g., coal preparation plant, primary crusher, etc.):
Natural Gas Compressor Station with Dehydration Unit

8a. Standard Industrial Classification AND 8b. North American Industry

Classification (SIC) code: **1311** System (NAICS) code: **211111**

9. DAQ Plant ID No. (for existing facilities only):
047 - 00089

10. List all current 45CSR13 and other General Permit numbers associated with this process (for existing facilities only):
G35-A103A

A: PRIMARY OPERATING SITE INFORMATION

11A. Facility name of primary operating site:	12A. Address of primary operating site:
Walen Compressor Station	Mailing: P.O. Box 1589 Pineville, WV 24874 Physical: 628 River Drive Pineville, WV 24874

13A. Does the applicant own, lease, have an option to buy, or otherwise have control of the proposed site? ■ **YES** ☐ **NO**

– IF **YES**, please explain: Lease

– IF **NO**, YOU ARE NOT ELIGIBLE FOR A PERMIT FOR THIS SOURCE.

14A. – For **Modifications or Administrative Updates** at an existing facility, please provide directions to the present location of the facility from the nearest state road;

– For Construction or Relocation permits, please provide directions to the proposed new site location from the nearest state road. Include a **MAP** as **Attachment F**.

Traveling South on County Route 13 from Gary, turn right onto County Rd. 13/02 (Ream #6). Take County Rd. 13/02 for approximately 7 miles to the top of ridge. Take a right at this "T" in the road and follow this access road approximately 0.75 miles. At this point there are a few intersecting roads around this area so, you will want to stay on the main road to the right, which will take you around the Northeast ridge for another 0.75 miles directly to the Walen site.

15A. Nearest city or town:	16A. County:	17A. UTM Coordinates:
Gary	McDowell	Northing (KM): 4133.271 Easting (KM): 448.581 Zone: 17

18A. Briefly describe the proposed new operation or change (s) to the facility:	19A. Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits):
This permit application will address an increase in emissions associated to the dehydration unit.	Latitude: 37.34422 Longitude: -81.58052

B: 1ST ALTERNATE OPERATING SITE INFORMATION (only available for G20, G40, & G50 General Permits)

11B. Name of 1st alternate operating site:	12B. Address of 1st alternate operating site:
_____ _____	Mailing:_____ Physical:_____ _____

13B. Does the applicant own, lease, have an option to buy, or otherwise have control of the proposed site? ☐ **YES** ☐ **NO**

– IF **YES**, please explain: _____

– IF **NO**, YOU ARE NOT ELIGIBLE FOR A PERMIT FOR THIS SOURCE.

14B. – For **Modifications or Administrative Updates** at an existing facility, please provide directions to the present location of the facility from the nearest state road;

– For Construction or Relocation permits, please provide directions to the proposed new site location from the nearest state road. Include a **MAP** as **Attachment F**.

_____

_____

_____

15B. Nearest city or town:	16B. County:	17B. UTM Coordinates: Northing (KM): _____ Easting (KM): _____ Zone: _____
18B. Briefly describe the proposed new operation or change (s) to the facility:		19B. Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits): Latitude: _____ Longitude: _____

C: 2ND ALTERNATE OPERATING SITE INFORMATION (only available for G20, G40, & G50 General Permits):

11C. Name of 2nd alternate operating site: _____ _____	12C. Address of 2nd alternate operating site: Mailing:_____ Physical:_____ _____

13C**.** Does the applicant own, lease, have an option to buy, or otherwise have control of the proposed site? ☐ **YES** ☐ **NO**

– IF **YES**, please explain: _____

_____

– IF **NO**, YOU ARE NOT ELIGIBLE FOR A PERMIT FOR THIS SOURCE.

14C. – For **Modifications or Administrative Updates** at an existing facility, please provide directions to the present location of the facility from the nearest state road;

– For Construction or Relocation permits, please provide directions to the proposed new site location from the nearest state road. Include a **MAP** as **Attachment F**.

_____

_____

_____

15C. Nearest city or town:	16C. County:	17C. UTM Coordinates: Northing (KM): _____ Easting (KM): _____ Zone: _____
18C. Briefly describe the proposed new operation or change (s) to the facility:		19C. Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits): Latitude: _____ Longitude: _____

20. Provide the date of anticipated installation or change: ■ If this is an **After-The-Fact** permit application, provide the date upon which the proposed change did happen: : 03 / 25 / 2015	21. Date of anticipated Start-up if registration is granted:

22. Provide maximum projected **Operating Schedule** of activity/activities outlined in this application if other than 8760 hours/year. (Note: anything other than 24/7/52 may result in a restriction to the facility's operation).

Hours per day: **24** Days per week: **7** Weeks per year: **52** Percentage of operation: **100**

SECTION III. ATTACHMENTS AND SUPPORTING DOCUMENTS

23. Include a check payable to WVDEP – Division of Air Quality with the appropriate **application fee** (per 45CSR22 and 45CSR13).

24. Include a **Table of Contents** as the first page of your application package.

All of the required forms and additional information can be found under the Permitting Section (General Permits) of DAQ's website, or requested by phone.

25. Please check all attachments included with this permit application. Please refer to the appropriate reference document for an explanation of the attachments listed below.

■ ATTACHMENT A : CURRENT BUSINESS CERTIFICATE
■ ATTACHMENT B: PROCESS DESCRIPTION
■ ATTACHMENT C: DESCRIPTION OF FUGITIVE EMISSIONS
■ ATTACHMENT D: PROCESS FLOW DIAGRAM
■ ATTACHMENT E: PLOT PLAN
■ ATTACHMENT F: AREA MAP
■ ATTACHMENT G: EQUIPMENT DATA SHEETS AND REGISTRATION SECTION APPLICABILITY FORM
☐ ATTACHMENT H: AIR POLLUTION CONTROL DEVICE SHEETS
■ ATTACHMENT I: EMISSIONS CALCULATIONS
■ ATTACHMENT J: CLASS I LEGAL ADVERTISEMENT
■ ATTACHMENT K: ELECTRONIC SUBMITTAL
■ ATTACHMENT L: GENERAL PERMIT REGISTRATION APPLICATION FEE
☐ ATTACHMENT M: SITING CRITERIA WAIVER
■ ATTACHMENT N: MATERIAL SAFETY DATA SHEETS (MSDS)
☐ ATTACHMENT O: EMISSIONS SUMMARY SHEETS
☐ OTHER SUPPORTING DOCUMENTATION NOT DESCRIBED ABOVE (Equipment Drawings, Aggregation Discussion, etc.)

Please mail an original and two copies of the complete General Permit Registration Application with the signature(s) to the DAQ Permitting Section, at the address shown on the front page of this application. Please DO NOT fax permit applications. For questions regarding applications or West Virginia Air Pollution Rules and Regulations, please refer to the website shown on the front page of the application or call the phone number also provided on the front page of the application.

SECTION IV. CERTIFICATION OF INFORMATION

This General Permit Registration Application shall be signed below by a Responsible Official. A Responsible Official is a President, Vice President, Secretary, Treasurer, General Partner, General Manager, a member of a Board of Directors, or Owner, depending on business structure. A business may certify an Authorized Representative who shall have authority to bind the Corporation, Partnership, Limited Liability Company, Association, Joint Venture or Sole Proprietorship. Required records of daily throughput, hours of operation and maintenance, general correspondence, Emission Inventory, Certified Emission Statement, compliance certifications and all required notifications must be signed by a Responsible Official or an Authorized Representative. If a business wishes to certify an Authorized Representative, the official agreement below shall be checked off and the appropriate names and signatures entered. Any administratively incomplete or improperly signed or unsigned Registration Application will be returned to the applicant.

FOR A CORPORATION (domestic or foreign)

☐ I certify that I am a President, Vice President, Secretary, Treasurer or in charge of a principal business function of the corporation

FOR A PARTNERSHIP

☐ I certify that I am a General Partner

FOR A LIMITED LIABILITY COMPANY

☐ I certify that I am a General Partner or General Manager

FOR AN ASSOCIATION

☐ I certify that I am the President or a member of the Board of Directors

FOR A JOINT VENTURE

☐ I certify that I am the President, General Partner or General Manager

FOR A SOLE PROPRIETORSHIP

☐ I certify that I am the Owner and Proprietor

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

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

Signature _____
(please use blue ink) Responsible Official Date

Name & Title Brody Webster – Safety & Environmental Manager (North)
(please print or type)

Signature _____ 11/25/15
(please use blue ink) Authorized Representative (if applicable) Date

Applicant's Name Cranberry Pipeline Corporation

Phone & Fax (304) 347 – 1642 (304) 347 - 1635
Phone Fax

Email: brodywebster@cabotog.com

Attachment R
AUTHORITY OF CORPORATION
OR OTHER BUSINESS ENTITY (DOMESTIC OR FOREIGN)

TO: The West Virginia Department of Environmental Protection, Division of Air Quality

DATE: **October 8**, **2015**

ATTN.: Director

Corporation's / other business entity's Federal Employer I.D. Number **042989934**

The undersigned hereby files with the West Virginia Department of Environmental Protection, Division of Air Quality, a permit application and hereby certifies that the said name is a trade name which is used in the conduct of an incorporated business or other business entity.

Further, the corporation or the business entity certifies as follows:

(1) **BRODY WEBSTER** (is/are) the authorized representative(s) and in that capacity may represent the interest of the corporation or the business entity and may obligate and legally bind the corporation or the business entity.

(2) The corporation or the business entity is authorized to do business in the State of West Virginia.

(3) If the corporation or the business entity changes its authorized representative(s), the corporation or the business entity shall notify the Director of the West Virginia Department of Environmental Protection, Division of Air Quality, immediately upon such change.

President or Other Authorized Officer
(Vice President, Secretary, Treasurer or other official in charge of a principal business function of the corporation or the business entity)

(If not the President, then the corporation or the business entity must submit certified minutes or bylaws stating legal authority of other authorized officer to bind the corporation or the business entity).

Secretary

CABOT OIL & GAS CORPORATION
CRANBERRY PIPELINE CORPORATION
Name of Corporation or business entity

ATTACHMENT A

BUSINESS CERTIFICATE

General Permit G-35A Modification Application

Walen Compressor Station, Plant ID No. 047-00089
Gary, West Virginia

Cranberry Pipeline Corporation
c/o Cabot Oil & Gas Corporation
900 Lee Street East, Suite 1500
Charleston, West Virginia

November 2015

WEST VIRGINIA
STATE TAX DEPARTMENT
BUSINESS REGISTRATION
CERTIFICATE

ISSUED TO:
CRANBERRY PIPELINE CORPORATION
900 LEE ST E 1700
CHARLESTON, WV 25301-1741

BUSINESS REGISTRATION ACCOUNT NUMBER: **1006-3673**

This certificate is issued on: 06/1/2011

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

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

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

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

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

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

atL006 v.4
L1111698560

ATTACHMENT B

PROCESS DESCRIPTION

General Permit G-35A Modification Application

Walen Compressor Station, Plant ID No. 047-00089
Gary, West Virginia

Cranberry Pipeline Corporation
c/o Cabot Oil & Gas Corporation
900 Lee Street East, Suite 1500
Charleston, West Virginia

November 2015

PROCESS DESCRIPTION

Introduction

The facility currently operates under West Virginia New Source Review (NSR) General Permit G35-A103A. On behalf of Cranberry Pipeline Corporation (Cranberry) SLR is requesting this modification in order to update the facility registration to more accurately reflect the most recent site measurements.

Recent wet gas analyses from the Walen Compressor Station indicate that a modification is required to reflect the facility's adjusted emission levels from the dehydration unit still vent. The source's Potential to Emit (PTE) has been adjusted and new emission limits are proposed so that the facility remains within permitted throughput constraints. The proposed emission limits will not trigger new permitting program requirements (e.g. Title V Major Source).

Proposed Update

This application involves the following:

- Increase of emissions limitations set forth by the previous permit due to recent wet gas sampling and analysis
- An update of the PTE for the storage vessel T02 based on new annual throughputs
- Addition of storage vessel T03
- An update of emissions from truck loading and fugitive leaks

The new emission estimates reflect the need to increase the VOC and Hazardous Air Pollutant (HAP) levels. These changes to emissions are a result of the increase to HAP and C8+ gas fractions measured within the wet gas inlet to the contactor column.

All other operating parameters on the dehydration unit were set to its maximum capacity. The lean TEG is recirculated through the unit by a gas-driven Kimray TEG pump, model 5020SC. The pump has a maximum pump rate of 0.83 GPM. The gas throughput was modeled to reflect the station's maximum flow of 10 MMscf/d. Additionally, the inlet water content was assumed to be saturated at 141 psig and 53 F, which is the facility's average operating conditions. The outlet is assumed to be pipeline quality NG at 7 lb H20/MMscf.

Pipeline liquids and produced water are separated at the station's inlet, dehy, and compressor separators. These separation by products are transferred to two different above ground storage tanks (AST) represented in the equipment table as T02 and T03. The flashing emissions from in addition to tank working and breathing losses have been included within this application to better represent the storage vessel's PTE. The

emission estimates for the tank are based on direct measurement pressurized liquid testing and E&P Tanks simulation analysis taken at a representative Cranberry Pipeline's site. The throughput was based on a maximum of 5 bbls/d.

As a result of this proposed permit revision, the tank flashing potential, loading losses and fugitive equipment leaks will be more accurately accounted for along with the new assessment of dehydration emissions based on updated gas measurement.

ATTACHMENT C

DESCRIPTION OF FUGITIVE EMISSIONS

General Permit G-35A Modification Application

Walen Compressor Station, Plant ID No. 047-00089
Gary, West Virginia

Cranberry Pipeline Corporation
c/o Cabot Oil & Gas Corporation
900 Lee Street East, Suite 1500
Charleston, West Virginia

November 2015

FUGITIVE EMISSIONS

"Fugitive emissions" means those emissions which could not reasonably pass through a stack, chimney, vent, or other functionally equivalent opening. Fugitive leaks are leaks from sealed surfaces associated with process equipment. Pollutants of concern include HAPs, VOC, and CH_4 contained in the gas.

Equipment specific to the gas production and processing operations, which result in fugitive emissions includes equipment such as separators, pipelines, and pumps. Pneumatic devices such as gas actuated pumps and pressure/level controllers also result in fugitive emissions. Fugitive emissions may also result from process upsets such as pressure relief device releases due to over-pressure. Other process-related sources of emissions include fugitive emissions from flanges, valves, connectors, and fittings, and emissions from routine maintenance activities involving equipment depressurization (blowdown) or complete purging and filter replacement.

The amount of gas vented by pressure and level controllers is dependent on the manufacturer, application, age, and orifice size. In general, controllers in liquid service have larger orifices than those in pressure service. Valves in liquid service are designed to quickly open or close to avoid throttling which can erode the valve seat and reduce the life of the valve. Emissions from gas actuated pumps will be impacted by the gas composition, fuel supply pressure, discharge head (pressure), and the flow rate of the liquid pumped, since manufacturer pump curves estimate gas use based on these variables. Factors affecting blow down emissions include maintenance schedules, line pressures, and the volume of gas relieved. More frequent maintenance results in more frequent gas relief.

Fugitive emissions at Walen Compressor Station may emanate from some or all of the following and are listed within Attachment I:

1. Storage tanks
2. Emergency and process vents
3. Gas actuated pumps
4. Loading losses (storage tank to tanker truck)
5. Pneumatic devices
6. Blowdown & blowout
7. Equipment leaks (connections, flanges, open ended lines, valves)

ATTACHMENT D

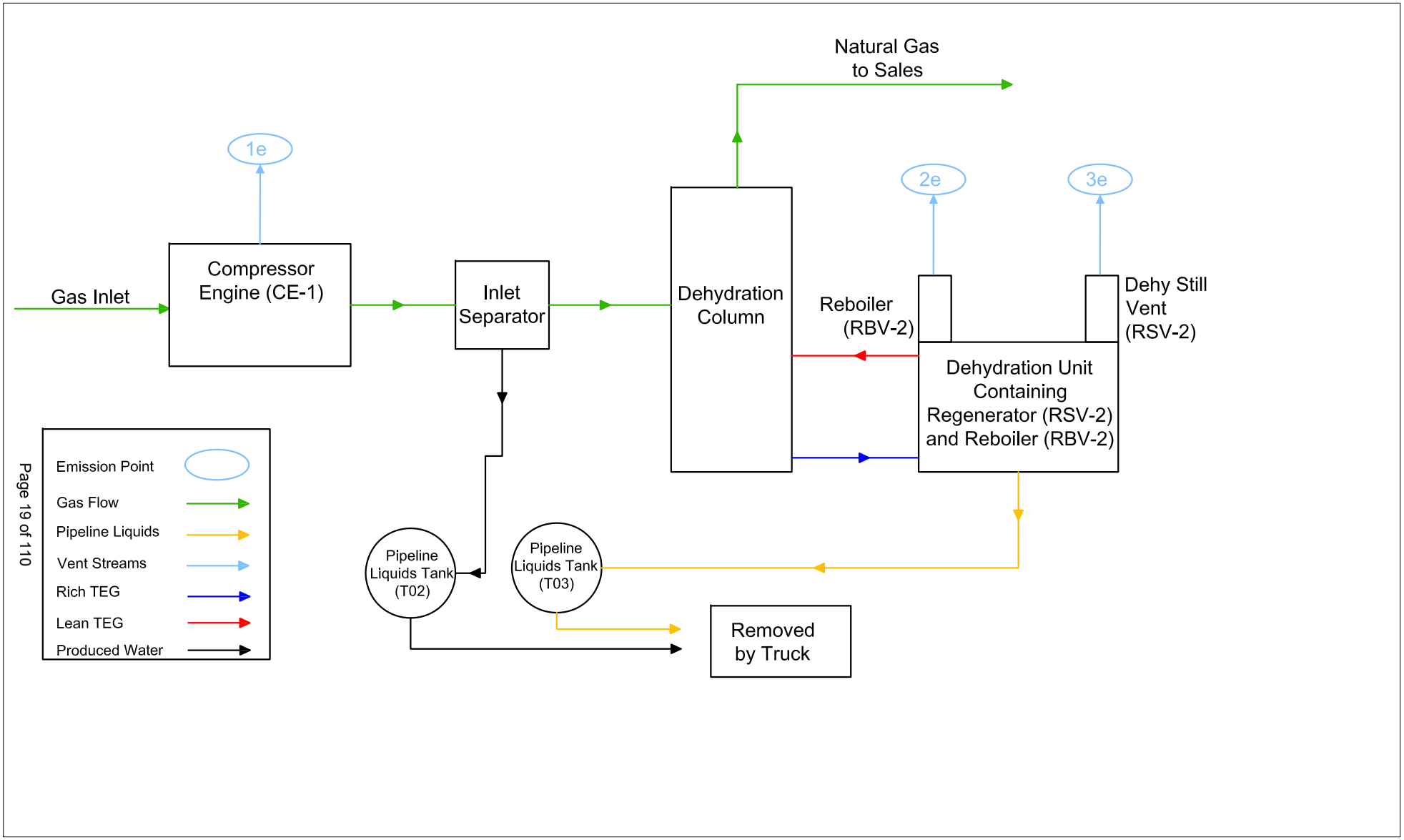
PROCESS FLOW DIAGRAM

General Permit G-35A Modification Application

Walen Compressor Station, Plant ID No. 047-00089
Gary, West Virginia

Cranberry Pipeline Corporation
c/o Cabot Oil & Gas Corporation
900 Lee Street East, Suite 1500
Charleston, West Virginia

November 2015



Process Flow Diagram
Cranberry Pipeline Corporation
Walen Compressor Station - ID # 047-00089
Gary, West Virginia

11/25/2015

ATTACHMENT E

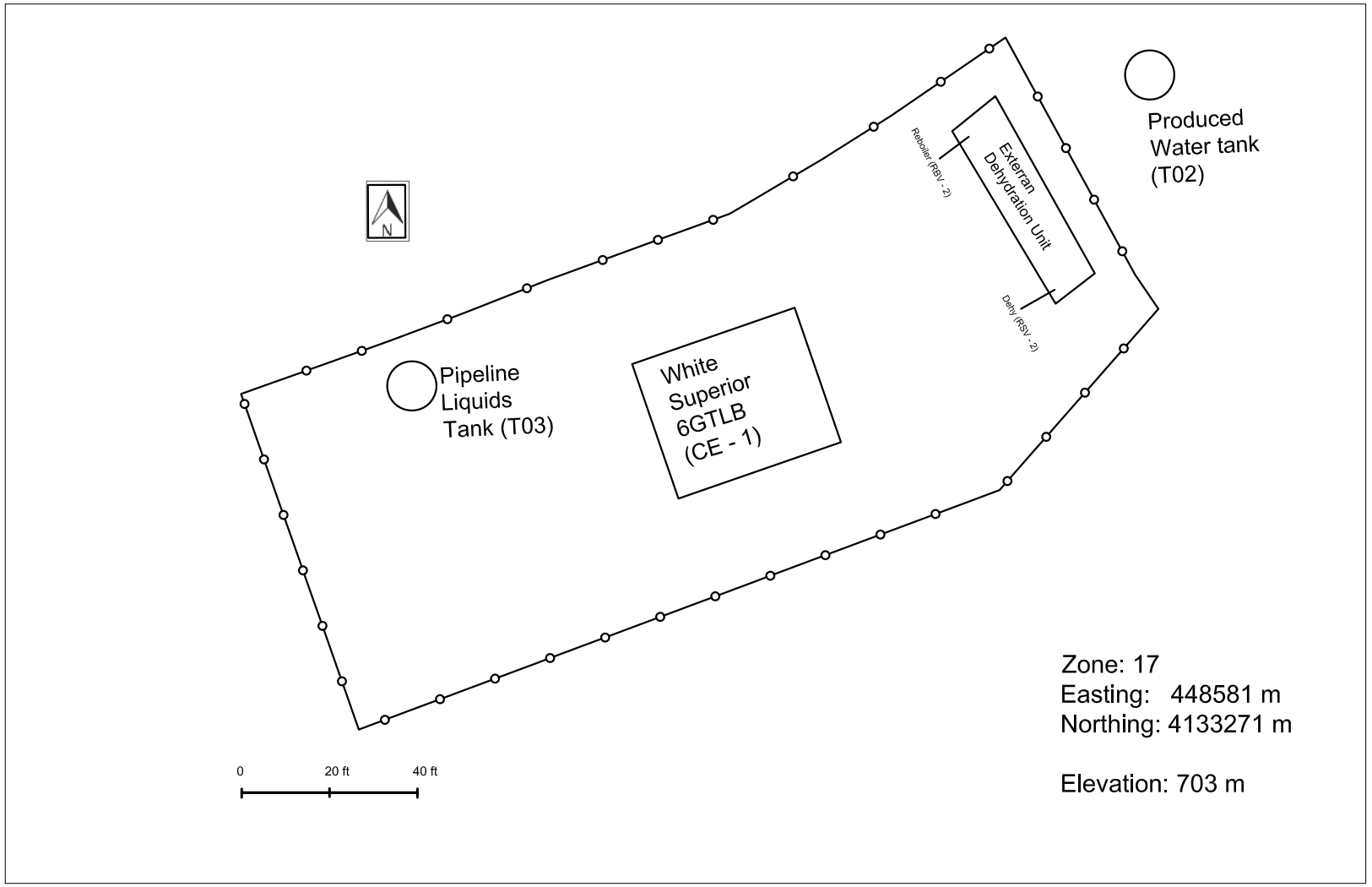
PLOT PLAN

General Permit G-35A Modification Application

Walen Compressor Station, Plant ID No. 047-00089
Gary, West Virginia

Cranberry Pipeline Corporation
c/o Cabot Oil & Gas Corporation
900 Lee Street East, Suite 1500
Charleston, West Virginia

November 2015



Plot Plan
Cranberry Pipeline Corporation
Walen Compressor Station - ID# 047 00089
Gary, West Virginia

ATTACHMENT F

AREA MAP

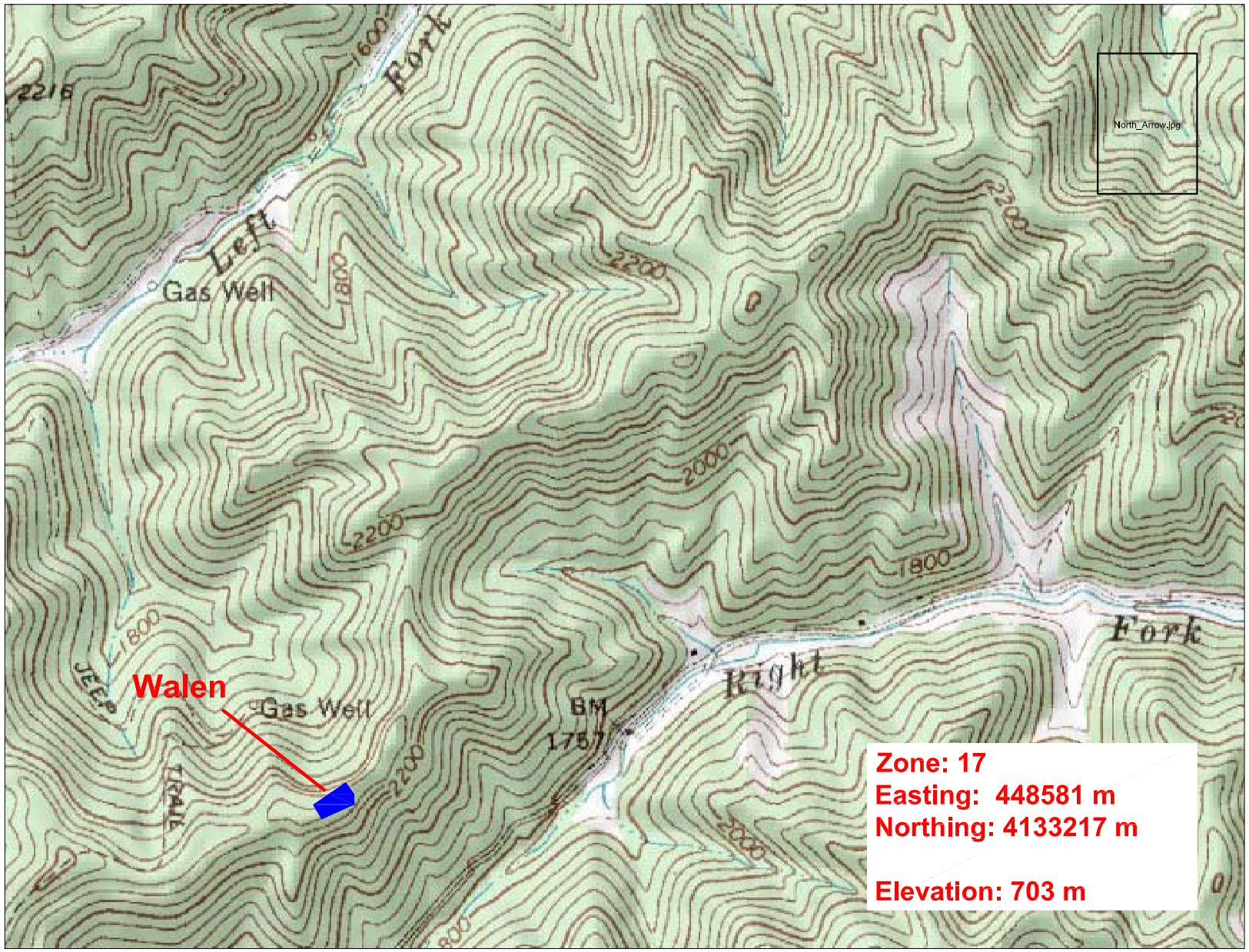
General Permit G-35A Modification Application

Walen Compressor Station, Plant ID No. 047-00089
Gary, West Virginia

Cranberry Pipeline Corporation
c/o Cabot Oil & Gas Corporation
900 Lee Street East, Suite 1500
Charleston, West Virginia

November 2015


Walen Compressor Station
Attachment F
Legend
Walen Compressor Station
13/01
Lower Wall Rd
103
Church St
1st St
Gary
Vensus Rd
Murry Ln
13/02
Walen
Page 23 of 110
11/25/2015
Google earth
© 2015 Google
N
4000 ft


North_Arrow.jpg
Left
Fork
Gas Well
Walen
Gas Well
Right
Fork
BM
1757
JEEP
TRAIL
2216
1600
1800
2200
2000
2400
Zone: 17
Easting: 448581 m
Northing: 4133217 m
Elevation: 703 m

ATTACHMENT G

AFFECTED SOURCE SHEETS

General Permit G-35A Modification Application

Walen Compressor Station, Plant ID No. 047-00089
Gary, West Virginia

Cranberry Pipeline Corporation
c/o Cabot Oil & Gas Corporation
900 Lee Street East, Suite 1500
Charleston, West Virginia

November 2015

General Permit G35-A Registration
Section Applicability Form

General Permit G35-A was developed to allow qualified registrants to seek registration for a variety of sources. These sources include internal combustion engines, boilers, reboilers, line heaters, tanks, emergency generators, dehydration units not subject to MACT standards, dehydration units not subject to MACT standards and being controlled by a flare control device, dehydration units not subject to MACT standards and being controlled by recycling the dehydration unit back to flame zone of reboiler, dehydration units not subject to MACT standards being controlled by a thermal oxidizer, and permit exemptions including the less than 1 ton/year benzene exemption, the 40CFR63 Subpart HH - Annual Average Flow of Gas Exemption (3 mmscf/day), and the 40CFR63 Subpart HHH - Annual Average Flow of Gas Exemption (10 mmscf/day). All registered facilities will be subject to Sections 1.0, 1.1, 2.0, 3.0, and 4.0.

General Permit G35-A allows the registrant to choose which sections of the permit that they wish to seek registration under. Therefore, please mark which sections that you are applying for registration under. Please keep in mind, that if this registration is approved, the issued registration will state which sections will apply to your affected facility.

Section 5	Reciprocating Internal Combustion Engines (R.I.C.E.)*	☒
Section 6	Boilers, Reboilers, and Line Heaters	☒
Section 7	Tanks	☒
Section 8	Emergency Generators	☐
Section 9	Dehydration Units Not Subject to MACT Standards	☒
Section 10	Dehydration Units Not Subject to MACT Standards and being controlled by a flare control device	☐
Section 11	Dehydration Units Not Subject to MACT Standards being controlled by recycling the dehydration unit back to the flame zone of the reboiler	☐
Section 12	Dehydration Units Not Subject to MACT Standards and being controlled by a thermal oxidizer	☐
Section 13	Permit Exemption (Less than 1 ton/year of benzene exemption)	☒
Section 14	Permit Exemption (40CFR63 Subpart HH – Annual average flow of gas exemption (3 mmscf/day))	☐
Section 15	Permit Exemption (40CFR63 Subpart HHH – Annual average flow of gas exemption (10 mmscf/day))	☐
Section 16	Standards of Performance for Stationary Spark Ignition Internal Combustion Engines (40CFR60 Subpart JJJJ)	☐

*** Affected facilities that are subject to Section 5 may also be subject to Section 16. Therefore, if the applicant is seeking registration under both sections, please select both.**

NATURAL GAS FIRED BOILER/LINE HEATER DATA SHEET

Source ID #[1]	Status[2]	Design Heat Input (mmBtu/hr)[3]	Hours of Operation (hrs/yr)[4]	Fuel Heating Value (Btu/scf)[5]
RBV-1	EXIST	0.20	8760	1020

1. Enter the appropriate Source Identification Numbers (Source ID #) for each boiler or line heater located at the compressor station. Boilers should be designated BLR-1, BLR-2, BLR-3, etc. Heaters or Line Heaters should be designated HTR-1, HTR-2, HTR-3, etc. Enter glycol dehydration unit Reboiler Vent data on the *Glycol Dehydration Unit Data Sheet*.
2. Enter the Status for each boiler or line heater using the following:

   EXIST Existing Equipment NEW Installation of New Equipment
   REM Equipment Removed
3. Enter boiler or line heater design heat input in mmBtu/hr.
4. Enter the annual hours of operation in hours/year for each boiler or line heater.
5. Enter the fuel heating value in Btu/standard cubic foot.

STORAGE TANK DATA SHEET

Source ID #[1]	Status[2]	Content[3]	Volume[4]	Dia[5]	Throughput[6]	Orientation[7]	Liquid Height[8]
T02	EXIST	Pipeline Liquids	1000	6	76650	VERT	2.75
T03	NEW	Pipeline Liquids	200	3	76650	VERT	1.5

1. Enter the appropriate Source Identification Numbers (Source ID #) for each storage tank located at the compressor station. Tanks should be designated T01, T02, T03, etc.
2. Enter storage tank Status using the following:

   EXIST Existing Equipment NEW Installation of New Equipment
   REM Equipment Removed
3. Enter storage tank content such as condensate, pipeline liquids, glycol (DEG or TEG), lube oil, etc.
4. Enter storage tank volume in gallons.
5. Enter storage tank diameter in feet.
6. Enter storage tank throughput in gallons per year.
7. Enter storage tank orientation using the following:

   VERT Vertical Tank HORZ Horizontal Tank
8. Enter storage tank average liquid height in feet.

NATURAL GAS COMPRESSOR/GENERATOR ENGINE DATA SHEET

Source Identification Number[1]		CE – 1			
Engine Manufacturer and Model		White Superior 6GTLB			
Manufacturer's Rated bhp/rpm		825/900			
Source Status[2]		ES			
Date Installed/Modified/Removed[3]		2004			
Engine Manufactured/Reconstruction Date[4]		Pre-2006			
Is this a Certified Stationary Spark Ignition Engine according to 40CFR60 Subpart JJJJ? (Yes or No)[5]		No			
Engine, Fuel and Combustion Data	Engine Type[6]	LB4S			
	APCD Type[7]	None			
	Fuel Type[8]	PQ			
	H_2S (gr/100 scf)	0.25			
	Operating bhp/rpm	825/900			
	BSFC (Btu/bhp-hr)	7150			
	Fuel throughput (ft^3/hr)	5,783.1			
	Fuel throughput ($MMft^3$/yr)	51.37			
	Operation (hrs/yr)	8,760			
Reference[9]	Potential Emissions[10]	lbs/hr	tons/yr	lbs/hr	tons/yr
AP	NO_X	3.63	15.9		
AP	CO	6.37	27.9		
AP	VOC	1.37	6.0		
AP	SO_2	0.003	0.015		
AP	PM_{10}	0.06	0.25		
AP	Formaldehyde	0.31	1.36		

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

2. Enter the Source Status using the following codes:

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

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

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

5. Is the engine a certified stationary spark ignition internal combustion engine according to 40CFR60 Subpart JJJJ. If so, the engine and control device must be operated and maintained in accordance with the manufacturer's emission-related written instructions. You must keep records of conducted maintenance to demonstrate compliance, but no performance testing is required. If the certified engine is not operated and maintained in accordance with the manufacturer's emission-related written instructions, the engine will be considered a non-certified engine and you must demonstrate compliance according to 40CFR§60.4243a(2)(i) through (iii), as appropriate.

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

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

LB2S	Lean Burn Two Stroke	RB4S	Rich Burn Four Stroke
LB4S	Lean Burn Four Stroke		

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

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

8. Enter the Fuel Type using the following codes:

PQ	Pipeline Quality Natural Gas	RG	Raw Natural Gas

9. Enter the Potential Emissions Data Reference designation using the following codes. Attach all referenced data to this *Compressor/Generator Data Sheet(s)*.

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

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

NATURAL GAS GLYCOL DEHYDRATION UNIT DATA SHEET

General Glycol Dehydration Unit Data		Manufacturer and Model		Exterran			
		Max Dry Gas Flow Rate (mmscf/day)		10.0			
		Design Heat Input (mmBtu/hr)		0.20			
		Design Type (DEG or TEG)		TEG			
		Source Status[2]		MS			
		Date Installed/Modified/Removed[3]		2015			
		Regenerator Still Vent APCD[4]		None			
		Fuel HV (Btu/scf)		1,020			
		H_2S Content (gr/100 scf)		0.25			
		Operation (hrs/yr)		8760			
Source ID #[1]	Vent	Reference[5]	Potential Emissions[6]	lbs/hr	tons/yr		
Reboiler (RBV-2)	Reboiler Vent	AP	NO_X	0.02	0.09		
		AP	CO	0.02	0.07		
		AP	VOC	0.00	0.00		
		AP	SO_2	0.00	0.00		
		AP	PM_{10}	0.00	0.01		
Dehy (RSV-2)	Glycol Regenerator Still Vent	GR	VOC	1.25	5.49		
		GR	Benzene	0.08	0.37		
		GR	Toluene	0.18	0.78		
		GR	Ethylbenzene	0.37	1.64		
		GR	Xylenes	0.52	2.28		
		GR	n-Hexane	0.00	0.01		

1. Enter the appropriate Source Identification Numbers for the glycol dehydration unit Reboiler Vent and glycol Regenerator Still Vent. The glycol dehydration unit Reboiler Vent and glycol Regenerator Still Vent should be designated RBV-1 and RSV-1, respectively. If the compressor station incorporates multiple glycol dehydration units, a *Glycol Dehydration Unit Data Sheet* shall be completed for each, using Source Identification #s RBV-2 and RSV-2, RBV-3 and RSV-3, etc.

2. Enter the Source Status using the following codes:

NS	Construction of New Source	ES	Existing Source
MS	Modification of Existing Source	RS	Removal of Source

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

4. Enter the Air Pollution Control Device (APCD) type designation using the following codes:

NA	None	CD	Condenser
FL	Flare	CC	Condenser/Combustion Combination
TO	Thermal Oxidizer		

5. Enter the Potential Emissions Data Reference designation using the following codes:

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

6. Enter the Reboiler Vent and glycol Regenerator Still Vent Potential to Emit (PTE) for the listed regulated pollutants in lbs per hour and tons per year. The glycol Regenerator Still Vent potential emissions may be determined using the most recent version of the thermodynamic software model GRI-GLYCalc™ (Radian International LLC & Gas Research Institute). Attach all referenced Potential Emissions Data (or calculations) and the GRI-GLYCalc *Aggregate Calculations Report* to this *Glycol Dehydration Unit Data Sheet(s)*. This PTE data shall be incorporated in the *Emissions Summary Sheet*.

Include a copy of the GRI-GLYCalc™ analysis. This includes a printout of the aggregate calculations report, which shall include emissions reports, equipment reports, and stream reports.

***An explanation of input parameters and examples, when using GRI-GLYCalc™ is available on our website.**

West Virginia Department of Environmental Protection

DIVISION OF AIR QUALITY : (304) 926-0475
WEB PAGE: http:\\www.wvdep.org

Division of Air Quality

40 CFR Part 63; Subpart HH & HHH Registration Form

Complete this form for any oil and natural gas production or natural gas transmission and storage facility that uses an affected unit under HH/HHH, whether subject or not.

Section A: Facility Description		
Affected facility actual annual average natural gas throughput (scf/day): 1,400,000		
Affected facility actual annual average hydrocarbon liquid throughput: (bbl/day): None		
The affected facility processes, upgrades, or stores hydrocarbon liquids prior to custody transfer.	Yes	X No
The affected facility processes, upgrades, or stores natural gas prior to the point at which natural gas (NG) enters the NG transmission and storage source category or is delivered to the end user.	**X** Yes	No
The affected facility is: ☐ prior to a NG processing plant ☐ a NG processing plant ☒ prior to the point of custody transfer and there is no NG processing plant		
The affected facility transports or stores natural gas prior to entering the pipeline to a local distribution company or to a final end user (if there is no local distribution company).	Yes	X No
The affected facility exclusively processes, stores, or transfers black oil.	Yes	X No
Initial producing gas-to-oil ratio (GOR): _____scf/bbl API gravity: _____degrees		

Section B: Dehydration Unit (if applicable) [1]		
Description: **Manufacture: EXterran Model #:**		
Date of Installation: **2014**	Annual Operating Hours: **8760**	Burner rating (MMbtu/hr): **0.20**
Exhaust Stack Height (ft): **25**	Stack Diameter (ft): **1.0**	Stack Temp (^{o}F): **350** (Still Vent) **212**
Glycol Type: ☒ TEG ☐ EG ☐ Other:		
Glycol Pump Type: ☐ Electric ☒ Gas	If gas, what is the volume ratio? ____0.08_____ACFM/gpm	
Condenser installed? ☐ Yes ☒ No	Exit Temp. _____ ^{o}F	Condenser Pressure _____psig
Incinerator/flare installed? ☐ Yes ☒ No	Destruction Eff. _____%	
Other controls installed? ☐ Yes ☒ No	Describe:	
Wet Gas[2]: Gas Temp.: 53.44 ^{o}F	Gas Pressure 140.75 psig	
(Upstream of Contact Tower) Saturated Gas? ☒ Yes ☐ No	If no, water content 200 lb/MMSCF	
Dry Gas: Gas Flowrate(MMSCFD) Actual 1.4	Design 10.0	
(Downstream of Contact Tower) Water Content 7.0 lb/MMSCF		
Lean Glycol: Circulation rate (gpm) Actual[3] 0.46	Maximum[4] 0.83	
Pump make/model: Kimray 5020SC		
Glycol Flash Tank (if applicable): **NA** Temp.: _____ ^{o}F	Pressure _____ psig	Vented? Yes ☐ No ☐
If no, describe vapor control:		
Stripping Gas (if applicable): **NA** Source of gas:	Rate _____ scfm	

Please attach the following required dehydration unit information:

1. System map indicating the chain of custody information. See Page 43 of this document for an example of a gas flow schematic. It is not intended that the applicant provide this level of detail for all sources. The level of detail that is necessary is to establish where the custody transfer points are located. This can be accomplished by submitting a process flow diagram indicating custody transfer points and the natural gas flow. However, the DAQ reserves the right to request more detailed information in order to make the necessary decisions.
2. Extended gas analysis from the Wet Gas Stream including mole percents of C_1-C_8, benzene, ethylbenzene, toluene, xylene and n-Hexane, using Gas Processors Association (GPA) 2286 (or similar). A sample should be taken from the inlet gas line, downstream from any inlet separator, and using a manifold to remove entrained liquids from the sample and a probe to collect the sample from the center of the gas line. GPA standard 2166 reference method or a modified version of EPA Method TO-14, (or similar) should be used.
3. GRI-GLYCalc Ver. 3.0 aggregate report based on maximum Lean Glycol circulation rate and maximum throughput.
4. Detailed calculations of gas or hydrocarbon flow rate.

Section C: Facility NESHAPS Subpart HH/HHH status

Affected facility status: (choose only one)

- ☐ Subject to Subpart HH
- ☐ Subject to Subpart HHH
- ☒ Not Subject because:
  - ☒ < 10/25 TPY
  - ☐ Affected facility exclusively handles black oil
  - ☐ The facility wide actual annual average NG throughput is < 650 thousand scf/day and facility wide actual annual average hydrocarbon liquid is < 250 bpd
  - ☐ No affected source is present

COMPRESSOR STATION EMISSION SUMMARY SHEET FOR CRITERIA POLLUTANTS

Compressor Station						Registration Number (Agency Use) G35-A				
	Potential Emissions (lbs/hr)					Potential Emissions (tons/yr)				
Source ID No.	NO_X	CO	VOC	SO_2	PM_{10}	NO_X	CO	VOC	SO_2	PM_{10}
SEE ATTACHMENT I										

COMPRESSOR STATION EMISSION SUMMARY SHEET FOR HAZARDOUS/TOXIC POLLUTANTS

Compressor Station							Registration Number (Agency Use) G35-A					
	Potential Emissions (lbs/hr)						Potential Emissions (tons/yr)					
Source ID No.	Benzene	Ethyl-benzene	Toluene	Xylenes	n-Hexane	Formalde-hyde	Benzene	Ethyl-benzene	Toluene	Xylenes	n-Hexane	Formalde-hyde
SEE ATTACHMENT I												

General Permit Levels and Fee Structure
Construction, Modification, Relocation, Administrative Update

Class II General Permits – G10-C (Coal Preparation and Handling), G20-B (Hot Mix Asphalt), G30-B (Natural Gas Compressor Stations), G35-A (Natural Gas Compressor Stations with Flares/Glycol Dehydration Units), G40-B (Nonmetallic Minerals Processing), G50-B (Concrete Batch Plant), G60-B (Emergency Generators), and G70-A (Natural Gas Production Facilities Located at the Well Site)

Class I General Permits – G33-A (Spark Ignition Internal Combustion Engines $\geq$ 25HP $\leq$ 500 HP and G65-B(Emergency Generators)

General Permit	Public Notice	Review Period as per 45CSR13	Application Fee	Criteria	Application Type
Class II General Permit (Construction)	30 days (applicant)	45 days	$500 + applicable NSPS fee + applicable NESHAP fee	6 lb/hr and 10 tpy of any regulated air pollutant OR 144 lb/day of any regulated air pollutant, OR 2 lb/hr of any hazardous air pollutant OR 5 tpy of aggregated HAP OR 45CSR27 TAP (10% increase if above BAT triggers or increase to BAT triggers) or subject to applicable standard or rule, but subject to specific eligibility requirements	Registration Application
Class II General Permit (Modification)	30 days (applicant)	45 days	$500 + applicable NSPS fee + applicable NESHAP fee	Same as Class II General Permit (Construction)	Registration Application
Administrative Update (Class I)	None	45 days	None	Decrease in emissions or permanent removal of equipment OR more stringent requirements or change in MRR that is equivalent or superior	Registration Application or Written Request
Administrative Update (Class II)	30 days (applicant)	45 days	$300 + applicable NSPS fee + applicable NESHAP fee	No change in emissions or an increase less than Class II Modification levels	Registration Application
Relocation	30 days (applicant)	45 days	$500 + applicable NSPS fee + applicable NESHAP fee	No emissions increase or change in facility design or equipment	Registration Application
Class I General Permit	None	45 days	$250	Same as Class II General Permit (Construction) but subject to specific eligibility requirements	Registration Application

ATTACHMENT H

AIR POLLUTION CONTROL DEVICE SHEETS NOT APPLICABLE (SEE NOTE)

Note: No Air Pollution Control Device affiliated with this Compressor Station.

General Permit G-35A Modification Application

Walen Compressor Station, Plant ID No. 047-00089
Gary, West Virginia

Cranberry Pipeline Corporation
c/o Cabot Oil & Gas Corporation
900 Lee Street East, Suite 1500
Charleston, West Virginia

November 2015

ATTACHMENT I

EMISSIONS CALCULATIONS

General Permit G-35A Modification Application

Walen Compressor Station, Plant ID No. 047-00089
Gary, West Virginia

Cranberry Pipeline Corporation
c/o Cabot Oil & Gas Corporation
900 Lee Street East, Suite 1500
Charleston, West Virginia

November 2015

Table 1. Annual Potential To Emit (PTE) Summary
Cranberry Pipeline Corporation - Walen Compressor Station

Criteria Pollutants

Proposed PTE - Criteria Pollutants

Source	PM	PM10	PM2.5	SO2	NOx	CO	VOC	CO2e
Engines (ton/yr)	0.245	0.245	0.245	0.015	15.900	27.900	6.000	3023.129
Reboiler (ton/yr)	0.007	0.007	0.007	0.001	0.086	0.072	0.005	102.568
Dehydration Unit (ton/yr)	-	-	-	-	-	-	5.486	271.023
Storage Tanks (ton/yr)	-	-	-	-	-	-	0.639	-
Truck Loading (ton/yr)	-	-	-	-	-	-	0.280	-
Fugitives (ton/yr)	-	-	-	-	-	-	0.236	5.484
Total Emissions (ton/yr)	0.252	0.252	0.252	0.016	15.986	27.972	12.646	3402.205
Total Emissions (lb/hr)	0.058	0.058	0.058	0.004	3.650	6.386	2.887	776.759

Previous Emission Summary (G35-A103A) - Criteria Pollutants

Source	PM	PM10	PM2.5	SO2	NOx	CO	VOC	CO2e
Engines (ton/yr)	-	-	-	-	15.90	27.90	6.000	-
Reboiler (ton/yr)	-	-	-	-	0.09	0.07	-	-
Dehydration Unit (ton/yr)	-	-	-	-	-	-	1.740	-
Storage Tanks (ton/yr)	-	-	-	-	-	-	-	-
Truck Loading (ton/yr)	-	-	-	-	-	-	-	-
Fugitives (ton/yr)	-	-	-	-	-	-	-	-
Total Emissions (ton/yr)	0.000	0.000	0.000	0.000	15.990	27.970	7.740	0.000
Total Emissions (lb/hr)	0.000	0.000	0.000	0.000	3.651	6.386	1.767	0.000

Proposed Difference of Emissions - Criteria Pollutants

	PM	PM10	PM2.5	SO2	NOx	CO	VOC	CO2e
Total Emissions (ton/yr)	0.252	0.252	0.252	0.016	-0.004	0.002	4.906	3402.205

Hazardous Air Pollutants (HAPs)

Proposed PTE - HAPs

Source	Benzene	Toluene	Ethylbenzene	Xylene	n-Hexane	Formaldehyde	Total HAPs
Engines (ton/yr)	0.0114	0.0105	0.0010	0.0048	-	1.3642	1.392
Reboiler (ton/yr)	1.80E-06	2.92E-06	-	-	-	6.44E-05	6.91E-05
Dehydration Unit (ton/yr)	0.364	0.777	1.630	2.275	0.009	-	5.056
Storage Tanks (ton/yr)	-	-	-	-	-	-	-
Truck Loading (ton/yr)	-	-	-	-	-	-	-
Fugitives (ton/yr)	-	-	-	-	-	-	-
Total Emissions (ton/yr)	0.375	0.788	1.631	2.279	0.009	1.364	6.448
Total Emissions (lb/hr)	0.086	0.180	0.372	0.520	0.002	0.311	1.472

Previous Emission Summary (G35-A103A) - HAPs

Source	Benzene	Toluene	Ethylbenzene	Xylene	n-Hexane	Formaldehyde	Total HAPs
Engines (ton/yr)	-	-	-	-	-	1.36	1.360
Reboiler (ton/yr)	-	-	-	-	-	-	-
Dehydration Unit (ton/yr)	0.120	0.230	0.470	0.730	-	-	1.550
Storage Tanks (ton/yr)	-	-	-	-	-	-	-
Truck Loading (ton/yr)	-	-	-	-	-	-	-
Fugitives (ton/yr)	-	-	-	-	-	-	-
Total Emissions (ton/yr)	0.120	0.230	0.470	0.730	0.000	1.360	2.910
Total Emissions (lb/hr)	0.027	0.053	0.107	0.167	0.000	0.311	0.664

Proposed Difference of Emissions - HAPs

	Benzene	Toluene	Ethylbenzene	Xylene	n-Hexane	Formaldehyde	Total HAPs
Total Emissions (ton/yr)	0.255	0.558	1.161	1.549	0.009	0.004	3.538

Table 2. Tank Emissions
Cranberry Pipeline Corporation - Walen Compressor Station

Emission Unit	Tank Contents	Control Devices	Tank Throughput (bbls/day)	Flashing/Working/Breathing Em. Factor (lbs/bbls)		VOC Emissions (lbs/day)	VOC Emissions (lb/hr)	VOC Emissions (tons/yr)
T02	PPL	None	5	0.350	(1)	1.75	0.07	0.32
T03	PPL	None	5	0.350	(1)	1.75	0.07	0.32
Total						3.50	0.15	0.64

Calculations: Em(VOC) lb/day = Throughput (bbls/day) X (Em factor lbs VOC/bbl)

Notes:

(1) Flashing/Working/Breathing losses calculated from pressurized liquid sample taken by FESCO and modeled using E+P Tanks 2.0. The sample was taken from the Putnam B6 site on 4-25-13 and is assumed to be representative worst case with respect to Walen

Table .3 Natural Gas-Fired Compressor Emissions
Cranberry Pipeline Corporation - Walen Compressor Station

Pollutant	Emission Factor			PTE per Engine (lb/hr)	PTE per Engine[(a)] (tons/yr)
Criteria Pollutants					
PM/PM10/PM2.5	9.50E-03	lb/MMBtu	(2)	5.60E-02	2.45E-01
SO_2	5.88E-04	lb/MMBtu	(2)	3.47E-03	1.52E-02
NOx	6.15E-01	lb/MMBtu	(1)	3.63	15.90
CO	1.08E+00	lb/MMBtu	(1)	6.37	27.90
VOC	2.32E-01	lb/MMBtu	(1)	1.37	6.00
Hazardous Air Pollutants					
1,1,2,2-Tetrachloroethane	4.00E-05	lb/MMBtu	(2)	2.36E-04	1.03E-03
1,1,2-Trichloroethane	3.18E-05	lb/MMBtu	(2)	1.88E-04	8.22E-04
1,3-Butadiene	2.67E-04	lb/MMBtu	(2)	1.57E-03	6.90E-03
1,3-Dichloropropene	2.64E-05	lb/MMBtu	(2)	1.56E-04	6.82E-04
Acetaldehyde	8.36E-03	lb/MMBtu	(2)	4.93E-02	2.16E-01
Acrolein	5.14E-03	lb/MMBtu	(2)	3.03E-02	1.33E-01
Benzene	4.40E-04	lb/MMBtu	(2)	2.60E-03	1.14E-02
Carbon Tetrachloride	3.67E-05	lb/MMBtu	(2)	2.16E-04	9.48E-04
Chlorobenzene	3.04E-05	lb/MMBtu	(2)	1.79E-04	7.85E-04
Chloroform	2.85E-05	lb/MMBtu	(2)	1.68E-04	7.36E-04
Ethylbenzene	3.97E-05	lb/MMBtu	(2)	2.34E-04	1.03E-03
Ethylene Dibromide	4.43E-05	lb/MMBtu	(2)	2.61E-04	1.14E-03
Formaldehyde	5.28E-02	lb/MMBtu	(2)	0.311	1.364
Methanol	2.50E-03	lb/MMBtu	(2)	1.47E-02	6.46E-02
Methylene Chloride	2.00E-05	lb/MMBtu	(2)	1.18E-04	5.17E-04
Naphthalene	7.44E-05	lb/MMBtu	(2)	4.39E-04	1.92E-03
PAH (POM)	2.69E-05	lb/MMBtu	(2)	1.59E-04	6.95E-04
Styrene	2.36E-05	lb/MMBtu	(2)	1.39E-04	6.10E-04
Toluene	4.08E-04	lb/MMBtu	(2)	2.41E-03	1.05E-02
Vinyl Chloride	1.49E-05	lb/MMBtu	(2)	8.79E-05	3.85E-04
Xylenes	1.84E-04	lb/MMBtu	(2)	1.09E-03	4.75E-03
Total HAP				**0.416**	**1.822**
Greenhouse Gas Emissions					
CO_2	116.89	lb/MMBtu	(3)	6.89E+02	3.02E+03
CH_4	2.2E-03	lb/MMBtu	(3)	1.30E-02	5.70E-02
N_2O	2.2E-04	lb/MMBtu	(3)	1.30E-03	5.70E-03
CO_2e[(b)]	-	-		690.21	3023.13

Calculations: If emission factor note 1 is used, use calculation (a). If emission factor note 2 or 3 is used, use calculation (b).

(a) Annual emissions (tons/yr) = [Emission Factor (g/HP-hr)]x[Power Output (HP)] x [Hours of Operation (hrs/yr)] x [Number of engines]x[1.10231131x10^-6(ton/gram)]

(b) Annual emissions (tons/yr) = [Emission Factor (lbs/MMBtu)] x Brake Specific Fuel Consumption (BTU/HP-hr)] x Power Output (HP)] x [Number of engines] x [8760 (hrs/yr)] x [1 ton/2000 lbs)

Engine Power Output (kW) =	615	
Engine Power Output (hp) =	825	
Number of Engines Operating at a Time =	1	
Average BSFC (BTU/HP-hr) =	7,150	(5)
Heat Content Natural Gas(Btu/scf) =	1,020.0	(6)
Fuel Throughput (ft3/hr) =	5,783.1	(7)
PTE Hours of Operation =	8,760	

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

Global Warming Potential (GWP)

CO_2	1	(8)
CH_4	25	(8)
N_2O	298	(8)

Notes:

(1) Manufacturers Spec Sheet

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

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

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

(6) Value obtained from AP-42, section 4.1.1.

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

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

Table 4. Dehydration Unit Still Vent Emissions
Cranberry Pipeline Corporation - Walen Compressor Station

Source	PTE (lb/hr)	PTE (lb/day)	PTE[(1)] (tons/yr)	PTE lb/hr With 20% Buffer	PTE TPY With 20% Buffer
Criteria Pollutants					
VOC	1.0438	25.0521	4.5720	1.253	5.486
Air Pollutants					
Propane	0.0074	0.1781	0.0325	0.009	0.039
Isobutane	0.0045	0.1090	0.0199	0.005	0.024
n-Butane	0.0091	0.2181	0.0398	0.011	0.048
Isopentane	0.0005	0.0132	0.0024	0.001	0.003
n-Pentane	0.0007	0.0175	0.0032	0.001	0.004
Cyclopentane	0.0025	0.0603	0.0110	0.003	0.013
n-Hexane	0.0018	0.0433	0.0079	0.002	0.009
Cyclohexane	0.0068	0.1638	0.0299	0.008	0.036
Other Hexanes	0.0013	0.0312	0.0057	0.002	0.007
Heptanes	0.0050	0.1211	0.0221	0.006	0.027
Methylcyclohexane	0.0117	0.2816	0.0514	0.014	0.062
2, 2, 4-Trimethylpentane	0.0026	0.0614	0.0112	0.003	0.013
Benzene	0.0692	1.6619	0.3033	0.083	0.364
Toluene	0.1479	3.5496	0.6478	0.177	0.777
Ethylbenzene	0.3102	7.4444	1.3586	0.372	1.630
Xylenes	0.4328	10.3863	1.8955	0.519	2.275
C8+ Heavies	0.0296	0.7107	0.1297	0.036	0.156
Total HAPs	0.9619	23.0855	4.2131	1.154	5.056
Greenhouse Gas Emissions					
CO_2			-		
CH_4	2.0626	49.5019	9.0341	2.475	10.841
N_2O	-	-	-		
$CO_2e^{(a)}$	51.56	1237.55	225.85	61.88	271.023

Calculations:

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

CO_2	1	(2)
CH_4	25	(2)
N_2O	298	(2)

Notes:

(1) Emissions Calculated utilizing GRI-GLYCalc and reflect Combined Regenerator Vent/ Flash Gas Emissions

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

Table 5. Reboiler Rates and Emissions
Cranberry Pipeline Corporation - Walen Compressor Station

Pollutant	Emission Factor			Emissions (lb/hr)	Emissions (tons/yr) (a)
Criteria Pollutants					
PM/PM10/PM2.5	7.6	lb/MMcf	(1)	1.49E-03	6.53E-03
SO_2	0.6	lb/MMcf	(1)	1.18E-04	5.15E-04
NOx	100	lb/MMcf	(2)	1.96E-02	8.59E-02
CO	84	lb/MMcf	(2)	1.65E-02	7.21E-02
VOC	5.5	lb/MMcf	(1)	1.08E-03	4.72E-03
Hazardous Air Pollutants					
Arsenic	2.0E-04	lb/MMcf	(3)	3.92E-08	1.72E-07
Benzene	2.1E-03	lb/MMcf	(4)	4.12E-07	1.80E-06
Beryllium	1.2E-05	lb/MMcf	(3)	2.35E-09	1.03E-08
Cadmium	1.1E-03	lb/MMcf	(3)	2.16E-07	9.45E-07
Chromium	1.4E-03	lb/MMcf	(3)	2.75E-07	1.20E-06
Cobalt	8.4E-05	lb/MMcf	(3)	1.65E-08	7.21E-08
Dichlorobenzene	1.2E-03	lb/MMcf	(4)	2.35E-07	1.03E-06
Formaldehyde	7.5E-02	lb/MMcf	(4)	1.47E-05	6.44E-05
Hexane	1.8E+00	lb/MMcf	(4)	3.53E-04	1.55E-03
Lead	5.0E-04	lb/MMcf	(3)	9.80E-08	4.29E-07
Manganese	3.8E-04	lb/MMcf	(3)	7.45E-08	3.26E-07
Mercury	2.6E-04	lb/MMcf	(3)	5.10E-08	2.23E-07
Naphthalene	6.1E-04	lb/MMcf	(4)	1.20E-07	5.24E-07
Nickel	2.1E-03	lb/MMcf	(3)	4.12E-07	1.80E-06
PAH/POM	1.3E-03	lb/MMcf	(4)	2.53E-07	1.11E-06
Selenium	2.4E-05	lb/MMcf	(3)	4.71E-09	2.06E-08
Toluene	3.4E-03	lb/MMcf	(4)	6.67E-07	2.92E-06
Total HAP	**1.9E+00**	**lb/MMCF**		3.71E-04	1.62E-03
Greenhouse Gas Emissions					
CO_2	116.89	lb/MMBtu	(5)	**23.38**	**102.395**
CH_4	2.2E-03	lb/MMBtu	(5)	**4.41E-04**	**1.93E-03**
N_2O	2.20E-04	lb/MMBtu	(5)	**4.41E-05**	**1.93E-04**
CO_2e[(b)]	-	-		**23.40**	**102.501**
Total				**23.417**	**102.568**

Calculations:

(a) Annual emissions (tons/yr) = [Fuel usage (MMBTU/hr) x Annual Hours of Operation (hr/yr) x (mmcf/1020mmbtu) x (Em Factor (lb/mmcf) / (2000 lb/ton)

Number Reboilers	1	
Fuel Use (MMBtu/hr) =	0.2	
Hours of Operation (hr/yr)=	8760	
PTE Fuel Use (MMcf/yr) =	1.7	(7)

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

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

Notes:

(1) AP-42, Chapter 1.4, Table 1.4-2. Emission Factors For Criteria Pollutants and Greenhouse Gases From Natural Gas Combustion, July 1998.

(2) AP-42, Chapter 1.4, Table 1.4-1. Emission Factors For Nitrogen Oxides (Nox) and Carbon Monoxide(CO) From Natural Gas Combustion, July 1998.

(3) AP-42, Chapter 1.4, Table 1.4-4. Emission Factors For Metals From Natural Gas Combustion, July 1998.

(4) AP-42, Chapter 1.4, Table 1.4-3. Emission Factors for Speciated Organic Compounds from Natural Gas Combustion, July 1998.

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

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

(7) MMBtu to MMcf conversion factor is 1020. AP-42, Chapter 1.4

Table 6. Fugitive Leak Emissions
Cranberry Pipeline Corporation - Walen Compressor Station

Pollutant	Emission Factor			PTE[(a)] Gas Service (tons/yr)
Valves	9.9E-03	lb/hr/source	(1)	3.08
Low Bleed Pneumatic Valves	9.9E-03	lb/hr/source	(1)	1.56
Flanges	8.6E-04	lb/hr/source	(1)	1.13
Connector	4.4E-04	lb/hr/source	(1)	0.58
Other Points in Gas Service	1.9E-02	lb/hr/source	(1)	1.50
Total Gas Released	-	-		7.86
Total VOC Released (gas service)			(b)	**0.24**
			CO2e	5.48

Calculations:

(a) Annual emissions (tons/yr) = [Emission Factor (lb/hr/source)] x [Number of Sources] x [Hours of Operation per Year] x [0.0005 tons/ lb]

(b) Gas sample from Walen gas analysis as worst case at 3 wt % VOC

Number of Components in Gas Service

Valves=	71	(2)
Low Bleed Pneumatic Valves=	36	(2)
Connectors=	301	(2)
Other Points in Gas Service =	8	(2)
Maximum Hour of Operation =	8,760	

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

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

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

Table 7. Truck Loading (TL) VOC Emissions
Cranberry Pipeline Corporation - Walen Compressor Station

Contents	Volume Transferred [3]	Loading Loss [(a)] (lb VOC/1000gal)	PTE VOC Emissions (lb/hr)	PTE VOC Emissions (ton/yr) [(b)]
Pipeline Liquids	153,300 gal/yr	3.659	0.064	0.280
Total			**0.064**	**0.280**

Calculations:

(a) Loading Loss (lbs/1000 gal) = 12.46x[Saturation Factor] x [True Vapor Pressure of Liquid Loaded (psia)] x[Molecular Weight of Vapors(lbs/lbmole)]/ [Temperature of Bulk Liquid Loaded(°R)]

(b) Annual Emissions(tons/yr) = [Loading Loss (lb VOC/ 1000 gal)]*[Volume Transferred(gal/yr)]/1000/2000

	Pipeline liquids	
Saturation factor	0.60	Note [(1)]
Pvap (psia)	7.70	Note [(2)]
Molecular Weight Vap (lb/lbmol)	33.37	Note [(2)]
Bulk Liquid Tempurature (F)	65.00	Note [(2)]

Notes:

(1) AP-42 Section 5.2

(2) Putnam B6 Compressor Station Pressurized Separator Sampling and Emission Estimation Report, August 2013

(3) Annual rates based on maximum throughput of 5 bbls/d

SUPERIOR

CleanBurn™ II Gas Engine Model 6GTLB

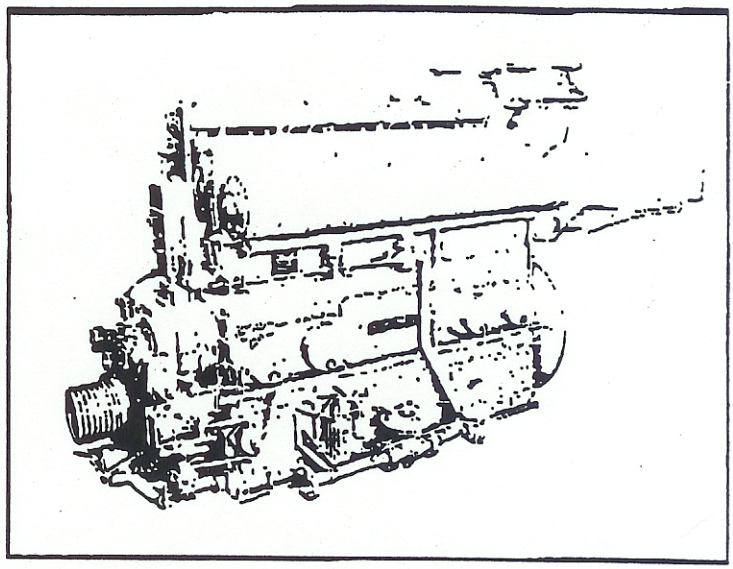
Standard Equipment

- **Air Intake Connection:** 12"-150# inlet flange.
- **Bearings:** Heavy duty precision trimetal, adapted for bearing temperature sensors.
- **Cylinder Heads:** Individual, "prechambered" with pilot check valve, water cooled with one intake and one exhaust valve per head, stellite faced valves and valve inserts.
- **Cylinder Block:** With removable wet cylinder liners.
- **Connecting Rods:** Forged steel, H-section, rifle drilled, machined for bearing temperature sensors.
- **Controls:** Electronic air/fuel panel controls engine mounted exhaust wastegate valve, pneumatic starting logic controls engine mounted start and run fuel valve.
- **Cooler, Lube Oil:** Shell and tube type, mounted and piped.
- **Crankcase Doors:** Pressure relief doors (Bicera type).
- **Crankshaft:** Bedded, forged steel, counterweighted, dynamically balanced.

  Engine Bed: Heavy duty, deeply ribbed.

  Exhaust Manifold: Dry type, insulation blanketed.
- **Filter, Lube Oil:** Full flow off engine.
- **Flywheel:** With ring gear and barring holes.
- **Fuel System:** Fuel injected with electronic air-fuel control.
- **Governor:** Hydraulic UG8L with manual speed setting.
- **Ignition:** High energy capacitor discharge Altronic III, non-shielded primary and secondary with electronic ignition advance.
- **Intercooler:** Rectangular, fin type, separate water system, 3" water connections with companion flanges, thermostat unmounted.
- **Pistons:** Oil cooled, cast iron, 6 ring design.
- **Pumps:** Jacket Water; built-in centrifugal, belt driven, 4"-150# inlet flange.
  Lube Oil; gear type with pressure regulating valve.
  Prelube; manual, mounted and piped.
- **Sheave, Crankshaft:** 6 "C" section and 2 "B" section grooves.
- **Shutdowns:** Overspeed; electronic with automatic reset.
  Turbine inlet temperature; (relays in pyrometer).
- **Starter Motor:** One air/gas starter motor, with strainer, lubricator, quick opening valve and brackets, engine mounted.
- **Thermocouples/Temperature Monitoring:** 50 ft. leads, type 'J' — individual cylinder exhaust thermocouples, turbocharger inlet and final exhaust thermocouples, unmounted magneto powered digital pyrometer.
- **Thermometers, Oil and Jacket Water:** In and out, (4) dial type.

  Thermostat, Jacket Water: With full flow bypass, 4" inlet connections, unmounted.
- **Turbocharger:** High capacity, exhaust driven, 14"-150# outlet flange.
- **Optional Equipment:** Available upon request.



Specifications — (Full Load Data)

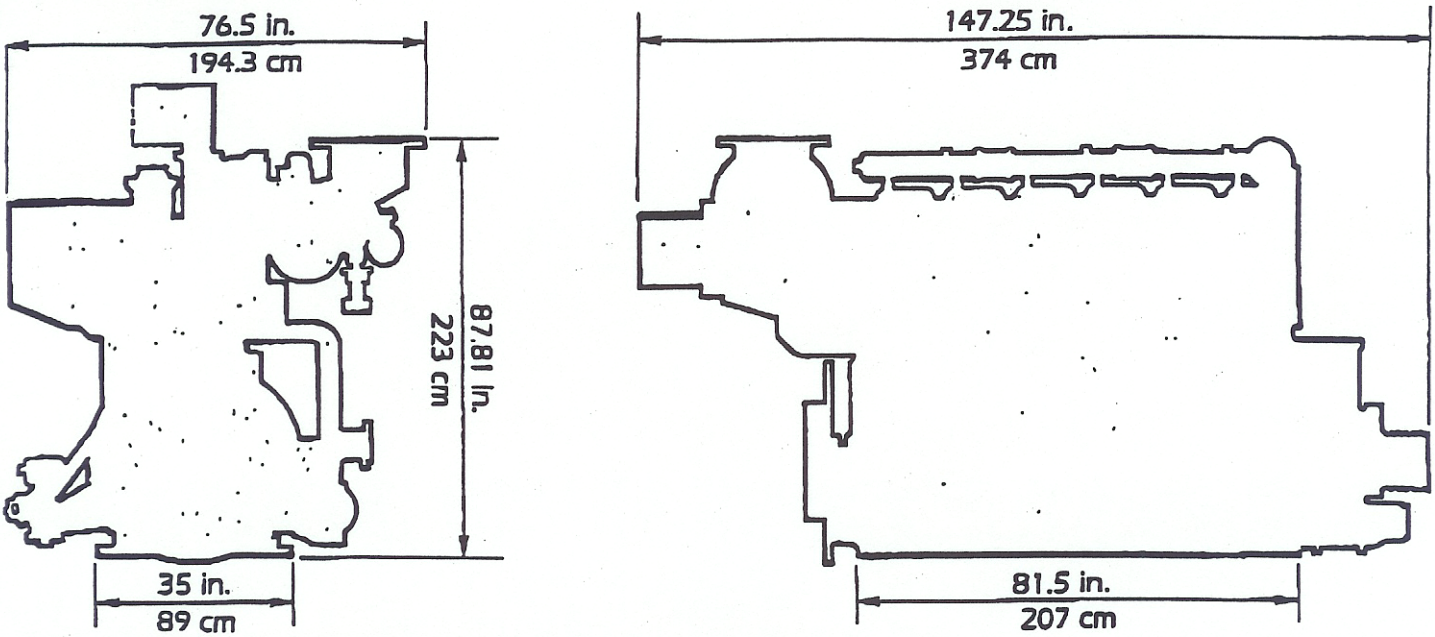
4-Stroke Cycle, Turbocharged, Intercooled, Fuel Injected

Configuration & no. of cylinders		Inline 6
Bore/Stroke	in.	10x10-1/2
Displacement	cu. in.	4948
BMEP	psi	146.7
Compression Ratio		8.20 : 1
BSFC @ 900 rpm	Btu/bhp-hr	7150
Speed — rated/range	rpm	900/600-900
Torque — constant over range	ft. lbs.	4814
Piston speed @ 900 rpm	fpm	1575
Power @ 900 rpm	bhp (kW)	825 (615)
Fuel gas pressure	psig	35 - 40
Starting air pressure	psig	150
Engine air flow requirement	scfm	1885
Air intake pressure drop-max.	in. H_2O	10
Exhaust flow	lbs./min.	149
Exhaust temp.	°F	1080
Exhaust back pressure-max.	in. H_2O	10
Heat rejection — jacket water	Btu/min.[1]	12500
Heat rejection — lube oil & intercooler	Btu/min.[2]	8350
Lube oil system — engine only	gal.	65
Lube oil flow thru filter	gpm	35
Cooling water system	gal.	50
Jacket water pump flow	gpm	275
Intercooler water pump flow	gpm	100
Engine weight — dry (approx)	lbs.	20000
Rotation — from flywheel end		counter-clockwise

[1] Given 180° F jacket water out of engine.
[2] 120° F water to engine required.

Model 6GTLB

Dimensions:



Note: Above dimensions are approximate and not to be used for construction purposes.

Performance Data (full load):

RPM	BHP (kW)	Fuel Consumption (BTU/BHP-HR)	*Emissions (TONS/YEAR)		
		BSFC	NO_X	CO	**NMHC
900	825 (615)	7150	15.9	27.9	6.0
750	688 (513)	7050	13.3	19.9	5.0
600	550 (410)	7400	21.2	18.1	4.0

*Exhaust Emissions-full load & speed (gm/bhp-hr) NO_X 2.0, CO 3.5, NMHC 0.75
**Denotes non-methane hydrocarbons

Conversions:

Torque (ft/lbs) = $\frac{5252 \times \text{bhp}}{\text{rpm}}$

BMEP (psi) = $\frac{\text{Torque} \times 150.8}{824.67 \times (\#\text{ of Cyls.})}$

Emissions (gms/bhp-hr) = $\frac{103.6 \times \text{tpy}}{\text{bhp}}$

Qualifying Conditions: Emissions & BSFC

- Ratings based on 130°F air manifold temperature.
- For NO_X requirements less than those expressed above, trade-offs between NO_X and BSFC will be evaluated on a specific case basis.
- Emissions are based on pipeline quality gas — i.e., LHV = 900 BTU/ft³ ± 15% and CH_4 content greater than 90%.

Rating Conditions:

- Superior engines are rated per DEMA standards; i.e., continuous-duty, full load operation w/10% overload for 2 hours maximum in any 24 hour period.
- Ratings are based on pipeline quality gas. Performance may vary depending on fuel composition.
- Consult Superior for ratings above 4000' elevation or 100°F.

Note: Standard equipment, specifications and data are subject to change without notice.

SUPERIOR

Cooper Industries
Ajax-Superior Division
1401 Sheridan Avenue
Springfield, OH 45501
Telephone: (513) 327-4200
Fax: (513) 327-4487

GRI-GLYCalc VERSION 4.0 - SUMMARY OF INPUT VALUES

Case Name: Walen gas report from sample taken on 3-11-2015
File Name: N:\West Virginia\Cabot\Projects\2015\Air Permits\Walen- Admin Update\GlyCalc\GLYCalc Walen PTE 08-14-2015.ddf
Date: October 02, 2015

DESCRIPTION:

Description: PTE- Permit Modification

Annual Hours of Operation: 8760.0 hours/yr

WET GAS:

Temperature: 53.44 deg. F
Pressure: 140.75 psig
Wet Gas Water Content: Saturated

Component	Conc. (vol %)
Carbon Dioxide	0.0943
Nitrogen	1.2282
Methane	97.0717
Ethane	1.3204
Propane	0.0540
Isobutane	0.0166
n-Butane	0.0250
Isopentane	0.0010
n-Pentane	0.0010
Cyclopentane	0.0010
n-Hexane	0.0010
Cyclohexane	0.0010
Other Hexanes	0.0010
Heptanes	0.0010
Methylcyclohexane	0.0010
2,2,4-Trimethylpentane	0.0010
Benzene	0.0010
Toluene	0.0010
Ethylbenzene	0.0010
Xylenes	0.0010
C8+ Heavies	0.0010

DRY GAS:

Flow Rate: 10.0 MMSCF/day
Water Content: 7.0 lbs. H2O/MMSCF

LEAN GLYCOL:

Glycol Type: TEG
Water Content: 1.5 wt% H2O
Flow Rate: 0.8 gpm

PUMP:

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

GRI-GLYCalc VERSION 4.0 - AGGREGATE CALCULATIONS REPORT

Case Name: Walen gas report from sample taken on 3-11-2015
File Name: N:\West Virginia\Cabot\Projects\2015\Air Permits\Walen- Admin Update\GlyCalc\GLYCalc Walen PTE 08-14-2015.ddf
Date: October 02, 2015

DESCRIPTION:

Description: PTE- Permit Modification

Annual Hours of Operation: 8760.0 hours/yr

EMISSIONS REPORTS:

UNCONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	2.0626	49.502	9.0341
Ethane	0.0757	1.817	0.3316
Propane	0.0074	0.178	0.0325
Isobutane	0.0045	0.109	0.0199
n-Butane	0.0091	0.218	0.0398
Isopentane	0.0006	0.013	0.0024
n-Pentane	0.0007	0.018	0.0032
Cyclopentane	0.0025	0.060	0.0110
n-Hexane	0.0018	0.043	0.0079
Cyclohexane	0.0068	0.164	0.0299
Other Hexanes	0.0013	0.031	0.0057
Heptanes	0.0050	0.121	0.0221
Methylcyclohexane	0.0117	0.282	0.0514
2,2,4-Trimethylpentane	0.0026	0.062	0.0112
Benzene	0.0693	1.662	0.3033
Toluene	0.1479	3.549	0.6478
Ethylbenzene	0.3102	7.444	1.3586
Xylenes	0.4328	10.387	1.8955
C8+ Heavies	0.0296	0.711	0.1297
Total Emissions	3.1821	76.371	13.9377
Total Hydrocarbon Emissions	3.1821	76.371	13.9377
Total VOC Emissions	1.0438	25.052	4.5720
Total HAP Emissions	0.9645	23.147	4.2244
Total BTEX Emissions	0.9601	23.042	4.2052

EQUIPMENT REPORTS:

ABSORBER

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

Calculated Absorber Stages:	1.25	
Calculated Dry Gas Dew Point:	5.71	lbs. H2O/MMSCF
Temperature:	53.4	deg. F
Pressure:	140.8	psig
Dry Gas Flow Rate:	10.0000	MMSCF/day
Glycol Losses with Dry Gas:	0.0037	lb/hr
Wet Gas Water Content:	Saturated	
Calculated Wet Gas Water Content:	64.98	lbs. H2O/MMSCF
Calculated Lean Glycol Recirc. Ratio:	2.02	gal/lb H2O

Component	Remaining in Dry Gas	Absorbed in Glycol
Water	8.77%	91.23%
Carbon Dioxide	99.97%	0.03%
Nitrogen	100.00%	0.00%
Methane	100.00%	0.00%
Ethane	99.99%	0.01%
Propane	99.98%	0.02%
Isobutane	99.97%	0.03%
n-Butane	99.95%	0.05%
Isopentane	99.94%	0.06%
n-Pentane	99.92%	0.08%
Cyclopentane	99.68%	0.32%
n-Hexane	99.82%	0.18%
Cyclohexane	99.27%	0.73%
Other Hexanes	99.87%	0.13%
Heptanes	99.55%	0.45%
Methylcyclohexane	98.92%	1.08%
2,2,4-Trimethylpentane	99.81%	0.19%
Benzene	91.95%	8.05%
Toluene	85.42%	14.58%
Ethylbenzene	73.45%	26.55%
Xylenes	62.95%	37.05%
C8+ Heavies	98.43%	1.57%

REGENERATOR

No Stripping Gas used in regenerator.

Component	Remaining in Glycol	Distilled Overhead
Water	22.08%	77.92%
Carbon Dioxide	0.00%	100.00%
Nitrogen	0.00%	100.00%
Methane	0.00%	100.00%
Ethane	0.00%	100.00%
Propane	0.00%	100.00%
Isobutane	0.00%	100.00%
n-Butane	0.00%	100.00%
Isopentane	0.43%	99.57%
n-Pentane	0.44%	99.56%
Cyclopentane	0.48%	99.52%
n-Hexane	0.47%	99.53%
Cyclohexane	3.16%	96.84%
Other Hexanes	0.92%	99.08%
Heptanes	0.49%	99.51%
Methylcyclohexane	3.96%	96.04%

2,2,4-Trimethylpentane	1.42%	98.58%
Benzene	4.99%	95.01%
Toluene	7.90%	92.10%
Ethylbenzene	10.41%	89.59%
Xylenes	12.91%	87.09%
C8+ Heavies	11.97%	88.03%

STREAM REPORTS:

WET GAS STREAM

Temperature: 53.44 deg. F
Pressure: 155.45 psia
Flow Rate: 4.17e+005 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	1.37e-001	2.71e+001
Carbon Dioxide	9.43e-002	4.57e+001
Nitrogen	1.23e+000	3.78e+002
Methane	9.71e+001	1.71e+004
Ethane	1.32e+000	4.37e+002
Propane	5.40e-002	2.62e+001
Isobutane	1.66e-002	1.06e+001
n-Butane	2.50e-002	1.60e+001
Isopentane	1.00e-003	7.94e-001
n-Pentane	1.00e-003	7.94e-001
Cyclopentane	1.00e-003	7.71e-001
n-Hexane	1.00e-003	9.48e-001
Cyclohexane	1.00e-003	9.26e-001
Other Hexanes	1.00e-003	9.48e-001
Heptanes	1.00e-003	1.10e+000
Methylcyclohexane	1.00e-003	1.08e+000
2,2,4-Trimethylpentane	1.00e-003	1.26e+000
Benzene	1.00e-003	8.59e-001
Toluene	1.00e-003	1.01e+000
Ethylbenzene	1.00e-003	1.17e+000
Xylenes	1.00e-003	1.17e+000
C8+ Heavies	1.00e-003	1.87e+000
Total Components	100.00	1.81e+004

DRY GAS STREAM

Temperature: 53.44 deg. F
Pressure: 155.45 psia
Flow Rate: 4.17e+005 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	1.20e-002	2.38e+000
Carbon Dioxide	9.44e-002	4.56e+001
Nitrogen	1.23e+000	3.78e+002
Methane	9.72e+001	1.71e+004
Ethane	1.32e+000	4.37e+002

Propane	5.41e-002	2.62e+001
Isobutane	1.66e-002	1.06e+001
n-Butane	2.50e-002	1.60e+001
Isopentane	1.00e-003	7.93e-001
n-Pentane	1.00e-003	7.93e-001
Cyclopentane	9.99e-004	7.69e-001
n-Hexane	1.00e-003	9.46e-001
Cyclohexane	9.94e-004	9.19e-001
Other Hexanes	1.00e-003	9.47e-001
Heptanes	9.97e-004	1.10e+000
Methylcyclohexane	9.91e-004	1.07e+000
2,2,4-Trimethylpentane	1.00e-003	1.25e+000
Benzene	9.21e-004	7.90e-001
Toluene	8.56e-004	8.66e-001
Ethylbenzene	7.36e-004	8.58e-001
Xylenes	6.31e-004	7.35e-001
C8+ Heavies	9.86e-004	1.84e+000
Total Components	100.00	1.81e+004

LEAN GLYCOL STREAM

Temperature: 53.44 deg. F
Flow Rate: 8.30e-001 gpm

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.85e+001	4.60e+002
Water	1.50e+000	7.01e+000
Carbon Dioxide	3.23e-013	1.51e-012
Nitrogen	1.14e-013	5.31e-013
Methane	1.81e-018	8.45e-018
Ethane	2.98e-009	1.39e-008
Propane	4.04e-011	1.89e-010
Isobutane	2.20e-011	1.03e-010
n-Butane	3.92e-011	1.83e-010
Isopentane	5.11e-007	2.39e-006
n-Pentane	6.96e-007	3.25e-006
Cyclopentane	2.62e-006	1.22e-005
n-Hexane	1.83e-006	8.54e-006
Cyclohexane	4.77e-005	2.23e-004
Other Hexanes	2.58e-006	1.20e-005
Heptanes	5.29e-006	2.47e-005
Methylcyclohexane	1.04e-004	4.85e-004
2,2,4-Trimethylpentane	7.93e-006	3.71e-005
Benzene	7.79e-004	3.64e-003
Toluene	2.72e-003	1.27e-002
Ethylbenzene	7.71e-003	3.60e-002
Xylenes	1.37e-002	6.42e-002
C8+ Heavies	8.62e-004	4.02e-003
Total Components	100.00	4.67e+002

RICH GLYCOL AND PUMP GAS STREAM

Temperature: 53.44 deg. F
Pressure: 155.45 psia

Flow Rate: 8.86e-001 gpm
NOTE: Stream has more than one phase.

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.29e+001	4.60e+002
Water	6.41e+000	3.17e+001
Carbon Dioxide	4.02e-003	1.99e-002
Nitrogen	9.16e-003	4.54e-002
Methane	4.16e-001	2.06e+000
Ethane	1.53e-002	7.57e-002
Propane	1.50e-003	7.41e-003
Isobutane	9.17e-004	4.54e-003
n-Butane	1.83e-003	9.08e-003
Isopentane	1.13e-004	5.61e-004
n-Pentane	1.48e-004	7.34e-004
Cyclopentane	5.11e-004	2.53e-003
n-Hexane	3.65e-004	1.81e-003
Cyclohexane	1.43e-003	7.06e-003
Other Hexanes	2.63e-004	1.30e-003
Heptanes	1.02e-003	5.06e-003
Methylcyclohexane	2.47e-003	1.22e-002
2,2,4-Trimethylpentane	5.26e-004	2.60e-003
Benzene	1.47e-002	7.29e-002
Toluene	3.24e-002	1.61e-001
Ethylbenzene	6.99e-002	3.46e-001
Xylenes	1.00e-001	4.97e-001
C8+ Heavies	6.79e-003	3.36e-002
Total Components	100.00	4.95e+002

REGENERATOR OVERHEADS STREAM

Temperature: 212.00 deg. F
Pressure: 14.70 psia
Flow Rate: 5.76e+002 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	9.05e+001	2.47e+001
Carbon Dioxide	2.98e-002	1.99e-002
Nitrogen	1.07e-001	4.54e-002
Methane	8.48e+000	2.06e+000
Ethane	1.66e-001	7.57e-002
Propane	1.11e-002	7.41e-003
Isobutane	5.15e-003	4.54e-003
n-Butane	1.03e-002	9.08e-003
Isopentane	5.11e-004	5.59e-004
n-Pentane	6.68e-004	7.31e-004
Cyclopentane	2.37e-003	2.52e-003
n-Hexane	1.38e-003	1.80e-003
Cyclohexane	5.35e-003	6.84e-003
Other Hexanes	9.88e-004	1.29e-003
Heptanes	3.31e-003	5.04e-003
Methylcyclohexane	7.88e-003	1.17e-002
2,2,4-Trimethylpentane	1.48e-003	2.57e-003
Benzene	5.84e-002	6.93e-002
Toluene	1.06e-001	1.48e-001
Ethylbenzene	1.93e-001	3.10e-001

Xylenes	2.69e-001	4.33e-001
C8+ Heavies	1.15e-002	2.96e-002
Total Components	100.00	2.80e+001

R.L. Laughlin®
Natural Gas Consultants Since 1970

Website www.rllco.com
Phone 304-776-7740
Email CustomerService@rllco.com

- Certificate of Analysis -

Company Name: SLR-CABOT

Final Report

Report Date: 3/25/2015
Report Number: 30101-0
Chain of Custody #: 119563
Lab Analyst: WG

Project Comments: NG EXTENDED

Lab ID: 15032308
Sample Type: Natural Gas
Your Sample ID: WALEN

Date Sampled: 3/11/2015 7:55:00AM
Date Received: 3/19/2015
Analysis Date: 03/23/15

Method	Analyte	Result	Units	MDL/PQL
Collection	Sampler	RSJ	-	
GPA 2145	Temperature (heating value)	60.0	°F	
	Temperature (density)	60.0	°F	
	Atmospheric Pressure	14.696	PSIA	
per GPA 2172	Molar Mass	16.4810	-	
	Relative Density	0.5700	-	
	Compressibility Factor	0.9980	-	
per GPA 2172	Btu/Gal	59482.0	BTU/Gal	
	Btu/Ideal CF	1011.0	BTU/Ideal CF	
	Btu/Real CF	1013.1	BTU/Real CF	
GPA 2286	Helium	0.0588	Mole %	0.001
	Hydrogen	0.1310	Mole %	0.001
	Nitrogen	1.2282	Mole %	0.001
	Oxygen	<0.0010	Mole %	0.001
	Methane	97.0717	Mole %	0.001
	Carbon Dioxide	0.0943	Mole %	0.001
	Ethane	1.3204	Mole %	0.001
	Propane	0.0540	Mole %	0.001
	I-Butane	0.0166	Mole %	0.001
	N-Butane	0.0250	Mole %	0.001
	I-Pentane	<0.0010	Mole %	0.001
	N-Pentane	<0.0010	Mole %	0.001
	Hexanes Plus	<0.0010	Mole %	0.001
	Carbon Monoxide	<0.0010	Mole %	0.001

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Lab ID: 15032308
Sample Type: Natural Gas
Your Sample ID: WALEN

Date Sampled: 3/11/2015 7:55:00AM
Date Received: 3/19/2015
Analysis Date: 03/23/15

Method	Analyte	Result	Units	MDL/PQL
GPA 2286	2,2-Dimethylbutane	<0.0010	Mole %	0.001
	2,3-Dimethylbutane	<0.0010	Mole %	0.001
	2-Methylpentane	<0.0010	Mole %	0.001
	3-Methylpentane	<0.0010	Mole %	0.001
	N-Hexane	<0.0010	Mole %	0.001
	2,2-Dimethylpentane	<0.0010	Mole %	0.001
	Methylcyclopentane	<0.0010	Mole %	0.001
	Benzene	<0.0010	Mole %	0.001
	3-dimethylpentane	<0.0010	Mole %	0.001
	Cyclohexane	<0.0010	Mole %	0.001
	2-Methylhexane/2,3-Dimethylpentane	<0.0010	Mole %	0.001
	3-Methylhexane	<0.0010	Mole %	0.001
	3-Dimethylcyclopentane	<0.0010	Mole %	0.001
	3-Ethylpentane	<0.0010	Mole %	0.001
	2,2,4-Trimethylpentane	<0.0010	Mole %	0.001
	N-Heptane	<0.0010	Mole %	0.001
	Methylcyclohexane	<0.0010	Mole %	0.001
	2,5-Dimethylhexane	<0.0010	Mole %	0.001
	1,t-2,c-4-trimethylcyclopentane	<0.0010	Mole %	0.001
	2,2,3-Trimethylpentane	<0.0010	Mole %	.001
	Toluene	<0.0010	Mole %	0.001
	2-Methylheptane	<0.0010	Mole %	0.001
	4-Methylheptane	<0.0010	Mole %	0.001
	3-Methylheptane	<0.0010	Mole %	0.001
	2,2,5-trimethylhexane	<0.0010	Mole %	0.001
	N-Octane	<0.0010	Mole %	0.001
	2,2,4,4-tetramethylpentane	<0.0010	Mole %	0.001
	2,2,4-trimethylhexane	<0.0010	Mole %	0.001
	isopropylcyclopentane	<0.0010	Mole %	0.001
	2,2-dimethylheptane	<0.0010	Mole %	0.001
	2,4-dimethylheptane	<0.0010	Mole %	0.001

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Lab ID: 15032308
Sample Type: Natural Gas
Your Sample ID: WALEN

Date Sampled: 3/11/2015 7:55:00AM
Date Received: 3/19/2015
Analysis Date: 03/23/15

Method	Analyte	Result	Units	MDL/PQL
GPA 2286	2,2,3-trimethylhexane	<0.0010	Mole %	0.001
	Ethylbenzene	<0.0010	Mole %	0.001
	2,2,3,3-tetramethylpentane	<0.0010	Mole %	0.001
	1,t-2,t-4-trimethylcyclohexane	<0.0010	Mole %	0.001
	M/P Xylene	<0.0010	Mole %	0.001
	2-Methyloctane	<0.0010	Mole %	0.001
	O-Xylene	<0.0010	Mole %	0.001
	3-Methyloctane	<0.0010	Mole %	0.001
	1,1,2-trimethylcyclohexane	<0.0010	Mole %	0.001
	isobutylcyclopentane	<0.0010	Mole %	0.001
	N-Nonane	<0.0010	Mole %	0.001
	1,c-2,t-3,trimethylcyclohexane	<0.0010	Mole %	0.001
	Isopropylbenzene	<0.0010	Mole %	0.001
	2,2-dimethyloctane	<0.0010	Mole %	0.001
	isopropylcyclohexane	<0.0010	Mole %	0.001
	Cyclooctane	<0.0010	Mole %	0.001
	n-butylcyclopentane	<0.0010	Mole %	0.001
	propylcyclohexane	<0.0010	Mole %	0.001
	N-Propylbenzene	<0.0010	Mole %	0.001
	m-ethyltoluene	<0.0010	Mole %	0.001
	p-ethyltoluene	<0.0010	Mole %	0.001
	1,3,5-Trimethylbenzene	<0.0010	Mole %	0.001
	2-methylnonane	<0.0010	Mole %	0.001
	3-ethyloctane	<0.0010	Mole %	0.001
	3-methylnonane	<0.0010	Mole %	0.001
	t-butylbenzene	<0.0010	Mole %	0.001
	n-decane	<0.0010	Mole %	0.001
	i-butylbenzene	<0.0010	Mole %	0.001
	sec-butylbenzene	<0.0010	Mole %	0.001
	T-Butylcyclohexane	<0.0010	Mole %	0.001
	n-Butylcyclohexane	<0.0010	Mole %	0.001

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Lab ID: 15032308
Sample Type: Natural Gas
Your Sample ID: WALEN

Date Sampled: 3/11/2015 7:55:00AM
Date Received: 3/19/2015
Analysis Date: 03/23/15

Method	Analyte	Result	Units	MDL/PQL
GPA 2286	n-Butylbenzene	<0.0010	Mole %	0.001
	n-undecane	<0.0010	Mole %	0.001

Joe Arnold
Laboratory QA/QC Manager

ATTACHMENT J

CLASS I LEGAL ADVERTISEMENT

General Permit G-35A Modification Application

Walen Compressor Station, Plant ID No. 047-00089
Gary, West Virginia

Cranberry Pipeline Corporation
c/o Cabot Oil & Gas Corporation
900 Lee Street East, Suite 1500
Charleston, West Virginia

November 2015

AIR QUALITY PERMIT NOTICE
Notice of Application

Notice is given that Cranberry Pipeline Corporation has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a General Permit Registration for a natural gas compression and dehydration station located on County Rd. 13/02 near Gary, in McDowell County, West Virginia. The latitude and longitude coordinates are 37.34422 and -81.58052.

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

Pollutant	Tons/yr
PM/PM_{10}/$PM_{2.5}$	0.26
VOCs	4.91
Benzene	0.26
Toluene	0.56
Ethylbenzene	1.17
Xylene	1.55
n-hexane	0.01
Total HAPs	3.54

Modification of operation will take place upon issuance of permit. Written comments will be received by the West Virginia Department of Environmental Protection, Division of Air Quality, 601 57th Street, SE, Charleston, WV 25304, for at least 30 calendar days from the date of publication of this notice.

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

Dated this the XXth day of November, 2015.

By: Cranberry Pipeline Corporation
Brody Webster
Safety and Environmental Manager
900 Lee Street East, Suite 1500
Charleston, WV 25301

ATTACHMENT K

ELECTRONIC SUBMITTAL DISKETTE

General Permit G-35A Modification Application

Walen Compressor Station, Plant ID No. 047-00089
Gary, West Virginia

Cranberry Pipeline Corporation
c/o Cabot Oil & Gas Corporation
900 Lee Street East, Suite 1500
Charleston, West Virginia

November 2015

ATTACHMENT L

GENERAL PERMIT REGISTRATION APPLICATION FEE

General Permit G-35A Modification Application

Walen Compressor Station, Plant ID No. 047-00089
Gary, West Virginia

Cranberry Pipeline Corporation
c/o Cabot Oil & Gas Corporation
900 Lee Street East, Suite 1500
Charleston, West Virginia

November 2015

THIS DOCUMENT HAS A COLORED BACKGROUND AND MICROPRINTING IN THE SIGNATURE LINE, MAGNIFY TO VERIFY ORIGINAL CHECK.

CRANBERRY PIPELINE CORPORATION
PO BOX 4544, Houston, TX 77210-4544

Check Number 2900222178 56-1544/441 633681747

Check Date 11/10/15

JPMorgan Chase Bank, N.A.
Columbus, Ohio 43271

********3,000 DOLLARS ***00 CENTS

*********3,000.00
THREE COMMA ZERO ZERO ZERO PERIOD ZERO ZERO

TO THE ORDER OF

WVDEP - OFFICE OF AIR QUALITY 62332
601 57TH ST SE
CHARLESTON WV 25304 2345

CRANBERRY PIPELINE CORPORATION

Scott C Schroeder

AUTHORIZED REPRESENTATIVE

ACCOUNTS PAYABLE

VOID AFTER 90 DAYS

THIS DOCUMENT CONTAINS A TRUE WATERMARK AND VISIBLE FIBERS

⑈2900222178⑈ ⑆044115443⑆ 633681747⑈

ATTACHMENT M

SITING CRITERIA WAIVER
NOT APPLICABLE (SEE NOTE)

Note: No Siting Criteria Waiver is necessary due to existing facility.

General Permit G-35A Modification Application

Walen Compressor Station, Plant ID No. 047-00089
Gary, West Virginia

Cranberry Pipeline Corporation
c/o Cabot Oil & Gas Corporation
900 Lee Street East, Suite 1500
Charleston, West Virginia

November 2015

ATTACHMENT N

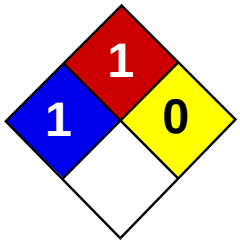
MATERIAL SAFETY DATA SHEETS (MSDS)

General Permit G-35A Modification Application

Walen Compressor Station, Plant ID No. 047-00089
Gary, West Virginia

Cranberry Pipeline Corporation
c/o Cabot Oil & Gas Corporation
900 Lee Street East, Suite 1500
Charleston, West Virginia

November 2015



Health	1
Fire	1
Reactivity	0
Personal Protection	J

Material Safety Data Sheet
Triethylene glycol MSDS

Section 1: Chemical Product and Company Identification

Product Name: Triethylene glycol

Catalog Codes: SLT2644

CAS#: 112-27-6

RTECS: YE4550000

TSCA: TSCA 8(b) inventory: Triethylene glycol

CI#: Not available.

Synonym: 2,2'-[1,2-Ethanediylbis(oxy)]bisethanol

Chemical Formula: C6H14O4

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Triethylene glycol	112-27-6	100

Toxicological Data on Ingredients: Triethylene glycol: ORAL (LD50): Acute: 17000 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of eye contact (irritant), of ingestion. Slightly hazardous in case of inhalation. Inflammation of the eye is characterized by redness, watering, and itching.

Potential Chronic Health Effects:
Very hazardous in case of eye contact (irritant). Slightly hazardous in case of inhalation. CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to kidneys, the nervous system. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact: No known effect on skin contact, rinse with water for a few minutes.

Serious Skin Contact: Not available.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation: Not available.

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: 371°C (699.8°F)

Flash Points: CLOSED CUP: 177°C (350.6°F). OPEN CUP: 165.5°C (329.9°F).

Flammable Limits: LOWER: 0.9% UPPER: 9.2%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Absorb with an inert material and put the spilled material in an appropriate waste disposal. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. Avoid contact with eyes If ingested, seek medical advice immediately and show the container or the label.

Storage:

Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Combustible materials should be stored away from extreme heat and away from strong oxidizing agents.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection: Splash goggles. Lab coat.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Boots. Gloves. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Hygroscopic liquid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 150.18 g/mole

Color: Colorless.

pH (1% soln/water): Not available.

Boiling Point: 285°C (545°F)

Melting Point: -5°C (23°F)

Critical Temperature: Not available.

Specific Gravity: 1.1274 (Water = 1)

Vapor Pressure: Not available.

Vapor Density: 5.17 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility: Easily soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Eye contact. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 17000 mg/kg [Rat].

Chronic Effects on Humans: The substance is toxic to kidneys, the nervous system.

Other Toxic Effects on Humans:
Very hazardous in case of ingestion. Slightly hazardous in case of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Triethylene glycol TSCA 8(b) inventory: Triethylene glycol

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC): R41- Risk of serious damage to eyes.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 1

Reactivity: 0

Personal Protection: j

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Not applicable. Lab coat. Not applicable. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:31 PM

Last Updated: 05/21/2013 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Processed Natural Gas
Product Code: None
Synonyms: Dry Gas
Generic Name: Natural Gas
Chemical Family: Paraffin hydrocarbon

Responsible Party: Unocal Corporation
Union Oil Company of California
14141 Southwest Freeway
Sugar Land, Texas
77478

For further information contact MSDS Coordinator
8am - 4pm Central Time, Mon - Fri: 281-287-5310

EMERGENCY OVERVIEW

24 Hour Emergency Telephone Numbers:

For Chemical Emergencies:
Spill, Leak, Fire or Accident
Call CHEMTREC
North America: (800)424-9300
Others: (703)527-3887(collect)

For Health Emergencies:
California Poison
Control System
(800)356-3129

Health Hazards: Use with adequate ventilation.

Physical Hazards: Flammable gas. Can cause flash fire. Gas displaces oxygen available for breathing. Keep away from heat, sparks, flames, or other sources of ignition (e.g., static electricity, pilot lights, mechanical/electrical equipment). Do not enter storage areas or confined space unless adequately ventilated.

< Physical Form: Gas
< Appearance: Colorless
< Odor: Odorless in the absence of H2S or mercaptans

NFPA HAZARD CLASS: Health: 1 (Slight)
Flammability: 4 (Extreme)
Reactivity: 0 (Least)

2. COMPOSITION/INFORMATION ON INGREDIENTS

HAZARDOUS COMPONENTS	% Weight	EXPOSURE GUIDELINE		
		Limits	Agency	Type
Methane CAS# 74-82-8	98	1000 ppm	MSHA	TWA
Carbon Dioxide CAS# 124-38-9	0-5	5000 ppm	ACGIH	TWA
		30000 ppm	ACGIH	STEL
		5000 ppm	OSHA	TWA
		5000 ppm	MSHA	TWA
		5000 ppm	Cal.OSHA	TWA
		30000 ppm	Cal.OSHA	STEL
Nitrogen CAS# 7727-37-9	0-5	1000 ppm	MSHA	TWA
Ethane CAS# 74-84-0	1	1000 ppm	MSHA	TWA

Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

3. HAZARDS IDENTIFICATION

POTENTIAL HEALTH EFFECTS:

Eye: Not expected to be an eye irritant.

Skin: Skin contact is unlikely. Skin absorption is unlikely.

Inhalation (Breathing): Asphyxiant. High concentrations in confined spaces may limit oxygen available for breathing.

Ingestion (Swallowing): This material is a gas under normal atmospheric conditions and ingestion is unlikely.

Signs and Symptoms: Light hydrocarbon gases are simple asphyxiants which, at high enough concentrations, can reduce the amount of oxygen available for breathing. Symptoms of overexposure can include shortness of breath, drowsiness, headaches, confusion,

decreased coordination, visual disturbances and vomiting, and are reversible if exposure is stopped. Continued exposure can lead to hypoxia (inadequate oxygen), cyanosis (bluish discoloration of the skin), numbness of the extremities, unconsciousness and death. High concentrations of carbon dioxide can increase heart rate and blood pressure.

Cancer: No data available.

Target Organs: No data available.

Developmental: Limited data - See Other Comments, below.

Other Comments: High concentrations may reduce the amount of oxygen available for breathing, especially in confined spaces. Hypoxia (inadequate oxygen) and respiratory acidosis (increased carbon dioxide in blood), during pregnancy may have adverse effects on the developing fetus. Exposure during pregnancy to high concentrations of carbon monoxide, which is produced during the combustion of hydrocarbon gases, can also cause harm to the developing fetus.

Pre-Existing Medical Conditions: None known.

4. FIRST AID MEASURES

Eye: If irritation or redness develops, move victim away from exposure and into fresh air. Flush eyes with clean water. If symptoms persist, seek medical attention.

Skin: First aid is not normally required. However, it is good practice to wash any chemical from the skin.

Inhalation (Breathing): If respiratory symptoms develop, move victim away from source of exposure and into fresh air. If symptoms persist, seek medical attention. If victim is not breathing, immediately begin artificial respiration. If breathing difficulties develop, oxygen should be administered by qualified personnel. Seek immediate medical attention.

Ingestion (Swallowing): This material is a gas under normal atmospheric conditions and ingestion is unlikely.

5. FIRE FIGHTING MEASURES

Flammable Properties: Flash Point: Not applicable (gas)
OSHA Flammability Class: Flammable gas
LEL / UEL: No data
Autoignition Temperature: 800-1000°F

Unusual Fire & Explosion Hazards: This material is flammable and may be ignited by heat, sparks, flames, or other sources of ignition (e.g., static electricity, pilot lights, or mechanical/electrical equipment). Vapors may travel considerable distances to a source of ignition where they can ignite, flashback, or explode. May create vapor/air explosion hazard indoors, outdoors, or in sewers. If container is not properly cooled, it can rupture in the heat of a fire. Closed containers exposed t extreme heat can rupture due to pressure buildup.

Extinguishing Media: Dry chemical or carbon dioxide is recommended. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces.

Fire Fighting Instructions: For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear. When the potential chemical hazard is unknown, in enclosed or confined spaces, or when explicitly required by DOT, a self-contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8). Isolate immediate hazard area, keep unauthorized personnel out. Stop spill/release if it can be done with minimal risk. If this cannot be done, allow fire to burn. Move undamaged containers from immediate hazard area if it can be done with minimal risk. Stay away from ends of container. Water spray may be useful in minimizing or dispersing vapors. Cool equipment exposed to fire with water, if it can be done with minimal risk.

6. ACCIDENTAL RELEASE MEASURES

Flammable. Keep all sources of ignition and hot metal surfaces away from spill/release. The use of explosion-proof equipment is recommended. Stay upwind and away from spill/release. Notify persons down wind of spill/release, isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done with

minimal risk. Wear appropriate protective equipment including respiratory protection as conditions warrant (see Section 8). Notify fire authorities and appropriate federal, state, and local agencies. Water spray may be useful in minimizing or dispersing vapors (see Section 5).

7. HANDLING AND STORAGE

Handling: The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes). Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits (see Section 2 and 8). Use good personal hygiene practice.

Storage: Keep container(s) tightly closed. Use and store this material in cool, dry, well-ventilated areas away from heat, direct sunlight, hot metal surfaces, and all sources of ignition. Post area "No Smoking or Open Flame." Store only in approved containers. Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage. Outdoor or detached storage is preferred.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits (see Section 2), additional ventilation or exhaust systems may be required. Where explosive mixtures may be present, electrical systems safe for such locations must be used (see appropriate electrical codes).

Personal Protective Equipment (PPE):

Respiratory: Wear a positive pressure air supplied respirator in oxygen deficient environments (oxygen content <19.5%). A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements must be followed whenever workplace conditions warrant a respirator's use.

Skin: Not required based on the hazards of the material. However, it is considered good practice to wear gloves when handling chemicals.

Eye/Face: While contact with this material is not expected to cause irritation, the use of approved eye protection to safeguard against potential eye contact is considered good practice.

Other Protective Equipment: A source of clean water should be available in the work area for flushing eyes and skin. Impervious clothing should be worn as needed. Self-contained respirators should be available for non-routine and emergency situations.

9. PHYSICAL AND CHEMICAL PROPERTIES

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm).

Flash Point: Not applicable (gas)
Flammable/Explosive Limits (%): No data
Autoignition Temperature: 800-1000°F
Appearance: Colorless
Physical State: Gas
Odor: Odorless in the absence of H2S or mercaptans
Vapor Pressure (mm Hg): No data
Vapor Density (air=1): <1
Boiling Point: -259°F
Freezing/Melting Point: No data
Solubility in Water: Slight
Specific Gravity: 0.30+ (Air=1)
Percent Volatile: 100 vol.%
Evaporation Rate (nBuAc=1): N/A (Gas)

10. STABILITY AND REACTIVITY

Chemical Stability: Stable under normal conditions of storage and handling.

Conditions To Avoid: Avoid all possible sources of ignition (see Sections 5 & 7).

Incompatible Materials: Avoid contact with strong oxidizing agents.

Hazardous Decomposition Products: Combustion can yield carbon dioxide and carbon monoxide.

Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

No definitive information available on carcinogenicity, mutagenicity, target organs or developmental toxicity.

12. DISPOSAL CONSIDERATIONS

This material, if discarded as produced, would be a RCRA "characteristic" hazardous waste due to the characteristic(s) of ignitability (D001). If the material is spilled to soil or water, characteristic testing of the contaminated materials is recommended. Further, this material is subject to the land disposal restriction in 40 CFR 268.40 and may require treatment prior to disposal to meet specific standards. Consult state and local regulations to determine whether they are more stringent than the federal requirements.

Container contents should be completely used and containers should be emptied prior to discard. Container rinsate could be considered a RCRA hazardous waste and must be disposed of with care and in full compliance with federal, state and local regulations. Larger empty containers, such as drums, should be returned to the distributor or to a drum reconditioner. To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

13. TRANSPORT INFORMATION

DOT Proper Shipping Name / Technical Name: Hydrocarbon Gas, Liquified N.O.S. (Methane)
Hazard Class or Division: 2.1
ID #: UN1965

14. REGULATORY INFORMATION

This material contains the following chemicals subject to the reporting requirements of **SARA 313** and 40 CFR 372:

--None--

Warning: This material contains the following chemicals which are known to the State of California to cause cancer, birth defects or

other reproductive harm, and are subject to the requirements of **California Proposition 65** (CA Health & Safety Code Section 25249.5):

--None Known--

This material has not been identified as a carcinogen by NTP, IARC, or OSHA.

EPA (CERCLA) Reportable Quantity: --None--

15. DOCUMENTARY INFORMATION

Issue Date: 03/18/03
Previous Issue Date: 11/29/99
Product Code: None
Previous Product Code: None

16. DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES

The information in this document is believed to be correct as of the date issued. **HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THIS INFORMATION, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE.** This information and product are furnished on the condition that the person receiving them shall make his own determination as to the suitability of the product for his particular purpose and on the condition that he assume the risk of his use thereof.

MATERIAL SAFETY DATA SHEET

1 PRODUCT AND COMPANY IDENTIFICATION

Product Name: Natural Gas Liquids

Synonyms: NGL, Y-Grade

Manufacturer Name:
Williams, Inc.
One Williams Center
Tulsa, OK 74172
USA

Emergency Telephone:
888-677-2370

Non-emergency Telephone:
800-688-7507

Intended Use: Industrial use

2 HAZARDS IDENTIFICATION

Emergency Overview
Physical State: Compressed, liquified gas
Color: Clear and colorless
Odor: Hydrocarbon

DANGER!
Gas reduces oxygen available for breathing. Prolonged or repeated contact may dry skin and cause dermatitis.
Flammable gas - may cause flash fire. Compressed gas.

Potential Health Effects

Inhalation: Suffocation (asphyxiant) hazard - if allowed to accumulate to concentrations that reduce oxygen below safe breathing levels. Due to oxygen deficiency inhalation of gas may cause dizziness, light-headedness, headache, nausea and loss of coordination. Continued inhalation may result in unconsciousness.

Eye Contact: Direct contact with cold gas may cause eye damage from frostbite.

Skin Contact: Prolonged or repeated contact may dry skin and cause dermatitis. Contact with cold gas might cause frostbites, in some cases with tissue damage.

Ingestion: This material is a gas under normal atmospheric conditions and ingestion is unlikely.

Target Organ(s): | Central nervous system | Eye | Skin |

Potential Physical / Chemical Effects: Inert gas and/or simple asphyxiant. Reduces oxygen available for breathing. Flammable gas - may cause flash fire. If the cylinders are heated it will cause rise in

pressure with risk of bursting. Contact with compressed gas can cause damage (frostbite) due to rapid evaporative cooling.

OSHA Regulatory Status: This product is hazardous according to OSHA 29CFR 1910.1200.

3 COMPOSITION / INFORMATION ON INGREDIENTS

General Information: The product contains:

Chemical Name	CAS-No.	Concentration*
†Heptane	142-82-5	< 30%
†Propane	74-98-6	< 15%
†Butane	106-97-8	< 15%
†2-methylbutane	78-78-4	< 15%
†Octane	111-65-9	< 10%
†Isobutane	75-28-5	< 10%
†Pentane	109-66-0	< 10%
†n-Hexane	110-54-3	< 8%
†2-Methylpentane	107-83-5	< 6%
†Decane	124-18-5	< 5%
†Nonane	111-84-2	< 5%
†3-Methylpentane	96-14-0	< 5%
†2,2-Dimethylbutane	75-83-2	< 5%
†Ethane	74-84-0	< 5%

* All concentrations are in percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.
† This chemical is hazardous according to OSHA/WHMIS criteria.

4 FIRST AID MEASURES

Inhalation: Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory tract irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation. Get medical attention if symptoms persist.

Eye Contact: If frostbite occurs, immediately flush eyes with plenty of warm water (not exceeding 105°F/41°C) for at least 15 minutes. If easy to do, remove contact lenses. Get medical attention immediately.

Skin Contact: Immediately remove contaminated clothing and shoes and wash skin with soap and plenty of water. Get medical attention if symptoms occur. If frostbite occurs, immerse affected area in warm water (not exceeding 105°F/41°C). Keep immersed for 20 to 40 minutes. Get medical attention immediately.

Ingestion: This material is a gas under normal atmospheric conditions and ingestion is unlikely.

5 FIRE-FIGHTING MEASURES

Extinguishing Media: Use fire-extinguishing media appropriate for surrounding materials.

Unsuitable Extinguishing Media: Not applicable.

Special Fire Fighting Procedures: Evacuate area. Remove pressurized gas cylinders from the immediate vicinity. Cool containers exposed to flames with water until well after the fire is out. Close the valve if no risk is involved. Do not extinguish a leaking gas fire unless leak can be stopped. If leak cannot be stopped and no danger to surrounding area allow the fire to burn out. Fight fire from a protected location. Prevent buildup of vapors or gases to explosive concentrations.

Unusual Fire & Explosion Hazards: Flammable gas - may cause flash fire. Containers can burst violently when heated, due to excess pressure build-up. Gases may form explosive mixtures with air.

Hazardous Combustion Products: Carbon Oxides

Protective Measures: Self-contained breathing apparatus, operated in positive pressure mode and full protective clothing must be worn in case of fire.

6 ACCIDENTAL RELEASE MEASURES

Personal Precautions: If leakage cannot be stopped, evacuate area. Check oxygen content before entering the area. Avoid contact with cold gas. See Section 8 of the MSDS for Personal Protective Equipment.

Spill Cleanup Methods: Ventilate well, stop flow of gas or liquid if possible. Allow gas to evaporate. Remove sources of ignition. Beware of the explosion danger. Do not allow chemical to enter confined spaces such as sewers due to explosion risk.

7 HANDLING AND STORAGE

Handling: Open valve slowly. Control oxygen content in the workplace as described in section 8 of the MSDS. Secure that cylinders are not exposed to heat. Keep away from ignition sources such as heat/sparks/open flame - No smoking. Use non-sparking hand tools and explosion-proof electrical equipment. Avoid contact with eyes, skin, and clothing. Ground container and transfer equipment to eliminate static electric sparks.

Storage: Flammable compressed gas storage. Keep container tightly closed in a cool, well-ventilated place. Secure cylinders in an upright position at all times, close all valves when not in use. Secure cylinders from falling or being knocked over. Should be stored and transported separately from oxygen and other oxidizers. Ground container and transfer equipment to eliminate static electric sparks. Store away from incompatible materials.

8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Limits:

Chemical Name	Source	Type	Exposure Limits	Notes
2,2-Dimethylbutane	CA. Alberta OELs	TWA	1760 mg/m³ 500 ppm	
2,2-Dimethylbutane	CA. Alberta OELs	STEL	3500 mg/m³ 1000 ppm	
2,2-Dimethylbutane	CA. British Columbia OELs	TWA	200 ppm	
2,2-Dimethylbutane	CA. Ontario OELs	TWA	1760 mg/m³ 500 ppm	
2,2-Dimethylbutane	CA. Ontario OELs	STEL	3520 mg/m³ 1000 ppm	
2,2-Dimethylbutane	CA. Quebec OELs	TWA	1760 mg/m³ 500 ppm	
2,2-Dimethylbutane	CA. Quebec OELs	STEL	3500 mg/m³ 1000 ppm	

2,2-Dimethylbutane	MEX. OELs	TWA	1760 mg/m³ 500 ppm	
2,2-Dimethylbutane	MEX. OELs	STEL	3500 mg/m³ 1000 ppm	
2,2-Dimethylbutane	US. ACGIH TLV	STEL	1000 ppm	
2,2-Dimethylbutane	US. ACGIH TLV	TWA	500 ppm	
2,2-Dimethylbutane	US. NIOSH Guide	IDLH	-	
2-Methylpentane	CA. Alberta OELs	TWA	1760 mg/m³ 500 ppm	
2-Methylpentane	CA. Alberta OELs	STEL	3500 mg/m³ 1000 ppm	
2-Methylpentane	CA. British Columbia OELs	TWA	200 ppm	
2-Methylpentane	CA. Ontario OELs	STEL	3520 mg/m³ 1000 ppm	
2-Methylpentane	CA. Ontario OELs	TWA	1760 mg/m³ 500 ppm	
2-Methylpentane	CA. Quebec OELs	TWA	1760 mg/m³ 500 ppm	
2-Methylpentane	CA. Quebec OELs	STEL	3500 mg/m³ 1000 ppm	
2-Methylpentane	MEX. OELs	TWA	1760 mg/m³ 500 ppm	
2-Methylpentane	MEX. OELs	STEL	3500 mg/m³ 1000 ppm	
2-Methylpentane	US. ACGIH TLV	STEL	1000 ppm	
2-Methylpentane	US. ACGIH TLV	TWA	500 ppm	
2-Methylpentane	US. NIOSH Guide	IDLH	-	
2-methylbutane	CA. Alberta OELs	TWA	1770 mg/m³ 600 ppm	
2-methylbutane	CA. British Columbia OELs	TWA	600 ppm	
2-methylbutane	CA. Ontario OELs	TWA	1770 mg/m³ 600 ppm	
2-methylbutane	CA. Ontario OELs	STEL	2210 mg/m³ 750 ppm	
2-methylbutane	US. ACGIH TLV	TWA	600 ppm	
2-methylbutane	US. NIOSH Guide	IDLH	1500 ppm	
2-methylbutane	US. OSHA Z-1 PEL	TWA	2950 mg/m³ 1000 ppm	
3-Methylpentane	CA. Alberta OELs	STEL	3500 mg/m³ 1000 ppm	
3-Methylpentane	CA. Alberta OELs	TWA	1760 mg/m³ 500 ppm	
3-Methylpentane	CA. British Columbia OELs	TWA	200 ppm	
3-Methylpentane	CA. Ontario OELs	TWA	1760 mg/m³ 500 ppm	
3-Methylpentane	CA. Ontario OELs	STEL	3520 mg/m³ 1000 ppm	
3-Methylpentane	CA. Quebec OELs	STEL	3500 mg/m³ 1000 ppm	
3-Methylpentane	CA. Quebec OELs	TWA	1760 mg/m³ 500 ppm	
3-Methylpentane	MEX. OELs	STEL	3500 mg/m³ 1000 ppm	
3-Methylpentane	MEX. OELs	TWA	1760 mg/m³ 500 ppm	
3-Methylpentane	US. ACGIH TLV	TWA	500 ppm	
3-Methylpentane	US. ACGIH TLV	STEL	1000 ppm	
3-Methylpentane	US. NIOSH Guide	IDLH	-	
Butane	CA. British Columbia OELs	STEL	750 ppm	
Butane	CA. British Columbia OELs	TWA	600 ppm	
Butane	CA. Ontario OELs	TWA	1900 mg/m³ 800 ppm	
Butane	MEX. OELs	TWA	1900 mg/m³ 800 ppm	
Butane	US. NIOSH Guide	IDLH	-	
Ethane	CA. Alberta OELs	Limit value not established	-	Simple asphyxiant.
Ethane	CA. British Columbia OELs	TWA	1000 ppm	
Ethane	CA. Ontario OELs	TWA	1000 ppm	
Ethane	MEX. OELs	Limit value not	-	Simple asphyxiant.

		established		
Ethane	US. ACGIH TLV	TWA	1000 ppm	
Heptane	CA. Alberta OELs	STEL	2050 mg/m³ 500 ppm	
Heptane	CA. Alberta OELs	TWA	1640 mg/m³ 400 ppm	
Heptane	CA. British Columbia OELs	TWA	400 ppm	
Heptane	CA. British Columbia OELs	STEL	500 ppm	
Heptane	MEX. OELs	STEL	2000 mg/m³ 500 ppm	Skin
Heptane	MEX. OELs	TWA	1600 mg/m³ 400 ppm	Skin
Heptane	US. ACGIH TLV	STEL	500 ppm	
Heptane	US. ACGIH TLV	TWA	400 ppm	
Heptane	US. NIOSH Guide	IDLH	750 ppm	
Heptane	US. OSHA Z-1 PEL	TWA	2000 mg/m³ 500 ppm	
Isobutane	CA. Ontario OELs	TWA	1900 mg/m³ 800 ppm	
Isobutane	US. ACGIH TLV	TWA	1000 ppm	
Nonane	CA. Alberta OELs	TWA	1050 mg/m³ 200 ppm	
Nonane	CA. British Columbia OELs	TWA	200 ppm	
Nonane	CA. Ontario OELs	TWA	1050 mg/m³ 200 ppm	
Nonane	CA. Quebec OELs	TWA	1050 mg/m³ 200 ppm	
Nonane	MEX. OELs	STEL	1300 mg/m³ 250 ppm	
Nonane	MEX. OELs	TWA	1050 mg/m³ 200 ppm	
Nonane	US. ACGIH TLV	TWA	200 ppm	
Nonane	US. NIOSH Guide	IDLH	-	
Octane	CA. Alberta OELs	TWA	1401 mg/m³ 300 ppm	
Octane	CA. British Columbia OELs	TWA	300 ppm	
Octane	CA. Ontario OELs	STEL	1750 mg/m³ 375 ppm	
Octane	CA. Ontario OELs	TWA	1400 mg/m³ 300 ppm	
Octane	CA. Quebec OELs	TWA	1400 mg/m³ 300 ppm	
Octane	CA. Quebec OELs	STEL	1750 mg/m³ 375 ppm	
Octane	MEX. OELs	TWA	1450 mg/m³ 300 ppm	
Octane	MEX. OELs	STEL	1800 mg/m³ 375 ppm	
Octane	US. ACGIH TLV	TWA	300 ppm	
Octane	US. NIOSH Guide	IDLH	1000 ppm	
Octane	US. OSHA Z-1 PEL	TWA	2350 mg/m³ 500 ppm	
Pentane	CA. Alberta OELs	TWA	1770 mg/m³ 600 ppm	
Pentane	CA. British Columbia OELs	TWA	600 ppm	
Pentane	CA. Ontario OELs	STEL	2210 mg/m³ 750 ppm	
Pentane	CA. Ontario OELs	TWA	1770 mg/m³ 600 ppm	
Pentane	MEX. OELs	STEL	2250 mg/m³ 760 ppm	
Pentane	MEX. OELs	TWA	1800 mg/m³ 600 ppm	
Pentane	US. ACGIH TLV	TWA	600 ppm	
Pentane	US. NIOSH Guide	IDLH	1500 ppm	
Pentane	US. OSHA Z-1 PEL	TWA	2950 mg/m³ 1000 ppm	
Propane	CA. Alberta OELs	STEL	2700 mg/m³ 1500 ppm	
Propane	CA. Alberta OELs	TWA	1800 mg/m³ 1000 ppm	
Propane	CA. British Columbia OELs	TWA	1000 ppm	
Propane	CA. Ontario OELs	TWA	1000 ppm	
Propane	CA. Quebec OELs	TWA	1800 mg/m³ 1000 ppm	
Propane	MEX. OELs	Limit value	-	Simple

		not established		asphyxiant.
Propane	US. ACGIH TLV	TWA	1000 ppm	
Propane	US. NIOSH Guide	IDLH	2100 ppm	
Propane	US. OSHA Z-1 PEL	TWA	1800 mg/m³ 1000 ppm	
n-Hexane	CA. Alberta OELs	TWA	176 mg/m³ 50 ppm	Skin
n-Hexane	CA. British Columbia OELs	TWA	20 ppm	Skin
n-Hexane	CA. Ontario OELs	TWA	176 mg/m³ 50 ppm	
n-Hexane	MEX. OELs	TWA	176 mg/m³ 50 ppm	
n-Hexane	US. ACGIH TLV	TWA	50 ppm	Skin
n-Hexane	US. NIOSH Guide	IDLH	1100 ppm	
n-Hexane	US. OSHA Z-1 PEL	TWA	1800 mg/m³ 500 ppm	

Engineering Controls: Provide shower facilities near the work place. In confined spaces, make sure the area is well-ventilated and sufficient oxygen (19.5%) exists before entry. Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Use explosion-proof ventilation equipment.

Respiratory Protection: If engineering controls do not maintain airborne concentrations below recommended exposure limits (where applicable) or to an acceptable level (in countries where exposure limits have not been established), an approved respirator must be worn. Respirator type: Use positive pressure air supplied respirator for uncontrolled releases. Follow respirator protection program requirements (OSHA 1910.134 and ANSI Z88.2) for all respirator use. Seek advice from supervisor on the company's respiratory protection standards.

Eye Protection: Risk of contact: Wear approved safety goggles.

Hand Protection: Thermally protective gloves are recommended. If contact with forearms is likely, wear gauntlet style gloves.

Skin Protection: Apron and long sleeves are recommended. Risk of contact: Wear appropriate clothing to prevent freezing of skin.

Hygiene Measures: Practice good housekeeping.

Environmental Exposure Controls: Environmental manager must be informed of all major spillages.

9 PHYSICAL AND CHEMICAL PROPERTIES

Color: Clear and colorless
Odor: Hydrocarbon
Odor Threshold: No data available.
Physical State: Compressed, liquified gas
pH: Not applicable
Melting Point: No data available.
Freezing Point: No data available.
Boiling Point: -96°C (-141°F) - -170°C (-274°F)
Flash Point: <-40°C (-40°F) (Closed Cup)

Evaporation Rate: No data available.
Flammability (Solid): No data available.
Flammability Limit - Upper (%): No data available.
Flammability Limit - Lower (%): No data available.
Vapor Pressure: No data available.
Vapor Density (Air=1): 1 - 3
Specific Gravity: 0.63892
Solubility in Water: No data available.
Solubility (Other): No data available.
Partition Coefficient (n-Octanol/water): No data available.
Autoignition Temperature: No data available.
Decomposition Temperature: No data available.
Viscosity: No data available.
Percent Volatile: 100 %w
Explosive Properties: No data available

10 STABILITY AND REACTIVITY

Stability: Stable under the prescribed storage conditions.

Conditions to Avoid: Heat may cause the containers to explode.

Incompatible Materials: Strong oxidizing agents.

Hazardous Decomposition Products: No data available.

11 TOXICOLOGICAL INFORMATION

Specified Substance(s)
Acute Toxicity:

Chemical Name	Test Results
Butane	Inhalation LC50 (4 hour(s), Rat): 658 g/m³
Heptane	Inhalation LC50 (4 hour(s), Rat): 103 mg/m³

Listed Carcinogens: None.

Product Information
Acute Toxicity:
Test Results: No test data available for the product.

Other Acute: Contact with liquefied gas can cause damage (frostbite) due to rapid evaporative cooling. Gas reduces oxygen available for breathing.

Chronic Toxicity: No additional adverse health effects noted.

12 ECOLOGICAL INFORMATION

Ecotoxicity: No data available.

Mobility: Not relevant, due to the form of the product.

Persistence and Degradability: Not relevant.

Bioaccumulation Potential: Not relevant.

13 DISPOSAL CONSIDERATIONS

General Information: The packaging should be collected for reuse.

Disposal Methods: Disposal recommendations are based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

RCRA Information: D001

Container: Since emptied containers retain product residue, follow label warnings even after container is emptied.

14 TRANSPORT INFORMATION

DOT
UN No.: UN1971
Proper Shipping Name: Natural gas, compressed
Class: 2.1
Packing Group: (N/A)
Label(s): 2.1

TDG
UN No.: UN1971
Proper Shipping Name: Natural gas, compressed
Class: 2.1
Packing Group: (N/A)

IATA
UN No.: UN1971
Proper Shipping Name: Natural gas, compressed
Class: 2.1
Packing Group: (N/A)
Label(s): Flamm. gas

IMDG
UN No.: UN1971
Proper Shipping Name: Natural gas, compressed
Class: 2.1
Packing Group: (N/A)
EmS No.: F-D, S-U

15 REGULATORY INFORMATION

Canadian Controlled Products Regulations: This product has been classified according to the hazard

criteria of the Canadian Controlled Products Regulations, Section 33, and the MSDS contains all required information.

WHMIS Classification: A, B1

Mexican Dangerous Statement: This product is dangerous according to Mexican regulations.

Inventory Status

This product or all components are listed or exempt from listing on the following inventory: DSL, EINECS, TSCA

US Regulations

CERCLA Hazardous Substance List (40 CFR 302.4):

Chemical Name	RQ
2-Methylpentane	100 lbs
2,2-Dimethylbutane	100 lbs
3-Methylpentane	100 lbs
Butane	100 lbs
2-methylbutane	100 lbs
Ethane	100 lbs
Heptane	100 lbs
Isobutane	100 lbs
n-Hexane	5000 lbs
Nonane	100 lbs
Octane	100 lbs
Pentane	100 lbs
Propane	100 lbs

SARA Title III

Section 302 Extremely Hazardous Substances (40 CFR 355, Appendix A): Not regulated.

Section 311/312 (40 CFR 370):

[X] Acute (Immediate) [ ] Chronic (Delayed) [X] Fire [ ] Reactive [X] Pressure Generating

Section 313 Toxic Release Inventory (40 CFR 372): Not regulated.

Chemical Name	CAS-No.	Reporting threshold for other users	Reporting threshold for manufacturing and processing
n-Hexane	110-54-3	10000 lbs	25000 lbs

For reporting purposes: the De Minimis Concentration for a toxic chemical in a mixture is 0.1% for carcinogens as defined in 29 CFR 1910.1200(d)(4) or 1% for others.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130):
2-methylbutane; Pentane; Ethane; Isobutane; Butane; Propane

Clean Water Act Section 311 Hazardous Substances (40 CFR 117.3): Not regulated.

Drug Enforcement Act: Not regulated.

TSCA

TSCA Section 4(a) Final Test Rules & Testing Consent Orders: 2-methylbutane; Heptane; Nonane; Pentane

TSCA Section 5(a)(2) Final Significant New Use Rules (SNURs) (40CFR 721, Subpt. E): Not regulated.

TSCA Section 5(e) PMN-Substance Consent Orders: Not regulated.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D): 2-methylbutane; Heptane; Nonane; Pentane

State Regulations

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): Not regulated.

Massachusetts Right-To-Know List: 2,2-Dimethylbutane; 2-Methylpentane; 2-methylbutane; 3-Methylpentane; Butane; Ethane; Heptane; Isobutane; Nonane; Octane; Pentane; Propane; n-Hexane

Michigan Critical Materials List (Michigan Natural Resources and Environmental Protection Act (Act. 451 of 1994)): Not regulated.

Minnesota Hazardous Substances List: 2,2-Dimethylbutane; 2-Methylpentane; 2-methylbutane; 3-Methylpentane; Butane; Decane; Ethane; Heptane; Isobutane; Nonane; Octane; Pentane; Propane; n-Hexane

New Jersey Right-To-Know List: 2,2-Dimethylbutane; 2-Methylpentane; 2-methylbutane; 3-Methylpentane; Butane; Decane; Ethane; Heptane; Isobutane; Nonane; Octane; Pentane; Propane; n-Hexane

Pennsylvania Right-To-Know List: 2,2-Dimethylbutane; 2-Methylpentane; 2-methylbutane; 3-Methylpentane; Butane; Decane; Ethane; Heptane; Isobutane; Nonane; Octane; Pentane; Propane; n-Hexane

Rhode Island Right-To-Know List: 2-methylbutane; Butane; Decane; Ethane; Heptane; Nonane; Octane; Pentane; Propane; n-Hexane

16 OTHER INFORMATION

HAZARD RATINGS

	Health Hazard	Fire Hazard	Instability	Special Hazard
NFPA	1	4	0	NONE

Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe
NFPA Label colored diamond code: Blue - Health; Red - Flammability; Yellow - Instability; White - Special Hazards

	Health Hazard	Flammability	Physical Hazard	Personal Protection
HMIS	1	4	0	--

Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe
HMIS Label colored bar code: Blue - Health; Red - Flammability; Orange - Physical Hazards; White - Special

Issue Date: 11/6/2009
Supercedes Date: New
SDS No.: 1027335
Disclaimer: This information is provided without warranty. The information is believed to be correct. This information should be used to make an independent determination of the methods to safeguard workers and the environment.

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name	Natural Gas Condensate, Sweet or Sour
Synonyms	Sweet Condensate, Sour Condensate, Lease Condensate (Sweet or Sour), Field Condensate (Sweet or Sour), Casing Head Gasoline (Sweet or Sour), Natural Gas Liquids (Sweet or Sour), Gas Drips (Sweet or Sour), Natural Gas Condensate C2-C8 (Sweet or Sour)
Chemical Family	Petroleum Hydrocarbon
Intended Use	Feedstock
MARPOL Annex I Category	Naphthas and Condensates
Supplier	J.P. Morgan Ventures Energy Corp. 383 Madison Avenue, 10th Floor New York, NY 10017 JP Morgan Commodities Canada Corp. Suite 600, Vintage Towers II, 326 11th Avenue SW Calgary, Alberta T2R 0C5
24 Hour Emergency Numbers	**Chemtrec:** 800-424-9300 **JP Morgan Technical Information:** 212-834-5788 (USA), 403-532-2000 (Canada) **California Poison Control:** 800-356-3219

2. HAZARDS IDENTIFICATION

GHS Classification

H224	Flammable liquid – Category 1
H304	May be fatal if swallowed and enters airways – Category 1
H319	Eye damage/irritation – Category 2
H335	May cause respiratory irritation – Category 3
H336	Specific target organ toxicity (single exposure) – Category 3
H350	Carcinogenicity – Category 1B
H411	Hazardous to the aquatic environment, chronic toxicity – Category 2

Hazards Not Otherwise Classified

May contain or release poisonous hydrogen sulfide gas

Label Elements

Signal Words Danger

GHS Hazard Statements

H224	Extremely flammable liquid and vapor
H350	May cause cancer
H304	May be fatal if swallowed and enters airways
H319	Causes serious eye irritation
H336	May cause drowsiness or dizziness
H315	Causes skin irritation
H331	Toxic if inhaled
H411	Toxic to aquatic life with long lasting effects

GHS Precautionary Statements

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
P240	Ground/bond container and receiving equipment

2. HAZARDS IDENTIFICATION

P241	Use explosion-proof electrical/ventilating/lighting 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
P361, P352, P362	IF ON SKIN OR HAIR: Remove/take off immediately all contaminated clothing. Wash with plenty of soap and water. Take off contaminated clothing and wash before reuse.
P305,P351,P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P313	If eye irritation persists, get medical advice/attention
P301,P310	IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
P331	Do NOT induce vomiting
P304,P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P312	Call a POISON CENTER or doctor/physician if you feel unwell
P370,P378	In case of fire: Use dry chemical, carbon dioxide, or foam for extinction
P391	Collect spillage
P405	Store locked up
P403,P233, P235	Store in a well-ventilated place. Keep container tightly closed, Keep cool
P501	Dispose of contents/container to approved facility

3. COMPOSITION / INFORMATION ON INGREDIENTS

Components	CAS Registration No.	Concentration (%)
Natural Gas Condensate C2-C8	68919-39-1	100
Benzene	71-43-2	0.1 - 5
n-Butane	106-97-8	5 - 15
Cyclohexane	110-82-7	< 1 - 5
Ethyl Benzene	100-41-4	< 1 - 3
n-Heptane	142-82-5	10 - 20
n-Hexane	110-54-3	2 - 50
Hexane (all isomers)	mixture	2 - 50
Hydrogen Sulfide	7783-06-4	< 0.1 - 20
Methylcyclohexane	108-87-2	5 - 10
n-Nonane	111-84-2	5 - 15
n-Octane	111-65-9	10 - 20
n-Pentane	109-66-0	5 - 20
n-Propane	74-98-6	<1 - 8
Toluene	108-88-3	< 1 - 15
1,2,4 Trimethyl Benzene	95-63-6	< 1 – 4
Xylene, all isomers	1330-20-7	< 1 – 12

4. FIRST AID MEASURES

Inhalation (Breathing) Move the exposed person to fresh air. If not breathing, clear airways and give artificial respiration. If breathing is difficult, humidified oxygen should be administered by qualified personnel. Seek medical attention if breathing difficulties continue.

4. FIRST AID MEASURES

Eye Contact

Flush eyes with water for at least 15 minutes. Hold eyelids apart to ensure complete irrigation of the eye. Remove contact lenses, if worn, after initial flushing. Do not use eye ointment. Seek medical attention.

Skin Contact

Remove contaminated shoes and clothing, and flush affected areas with large amounts of water. If skin surface is damaged, apply a clean dressing and seek medical attention. If skin surface is not damaged, clean affected area thoroughly with mild soap and water. Seek medical attention if tissue appears damaged or if pain or irritation persists. Launder or discard contaminated clothing.

Ingestion (Swallowing)

Aspiration hazard. Do not induce vomiting or give anything by mouth because the material can enter the lungs and cause severe lung damage. If spontaneous vomiting is about to occur, place victim's head below knees. If victim is drowsy or unconscious, place on the left side with head down. Do not leave victim unattended and observe closely for adequacy of breathing. Seek medical attention
.

Most Important Symptoms and Effects

Acute: Headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue
Delayed: Dry skin and possible irritation with repeated or prolonged exposure

Potential Acute Health Effects

Inhalation: Breathing high concentrations may be harmful. Mist or vapor can irritate the throat and lungs. Breathing this material may cause central nervous system depression with symptoms including nausea, headache, dizziness, fatigue, drowsiness or unconsciousness. This material may contain or liberate hydrogen sulfide, a poisonous gas with the smell of rotten eggs. Hydrogen sulfide and other hazardous vapors may evolve and collect in the headspace of storage tanks or other enclosed vessels. The smell disappears rapidly because of olfactory fatigue so odor may not be a reliable indicator of exposure. Effects of overexposure include irritation of the eyes, nose, throat and respiratory tract, blurred vision, photophobia (light sensitivity) and pulmonary edema (fluid accumulation in lungs). Severe exposures can result in nausea, vomiting, muscle weakness or convulsions, respiratory failure and death.
Eye Contact: This product can cause eye irritation from short-term contact with liquid, mists or vapors. Symptoms include stinging, watering, redness and swelling. Effects may be more serious with repeated or prolonged contact. Hydrogen sulfide vapors may cause moderate to severe eye irritation and photophobia (light sensitivity).
Skin Contact: This product is a skin irritant. Contact may cause redness, itching, burning and skin damage.
Ingestion: Ingestion may result in nausea, vomiting, diarrhea and restlessness. Aspiration (inadvertent suction) of liquid into the lungs must be avoided as even small quantities in the lungs can produce chemical pneumonitis, pulmonary edema or hemorrhage and even death.

Potential Chronic Health Effects

Chronic effects of overexposure are similar to acute effects including central nervous system (CNS) effects and CNS depression. Effects may also include irritation of the digestive tract, irritation of the respiratory tract, nausea, vomiting and skin dermatitis.

Notes to Physician

This material may contain or liberate hydrogen sulfide. In high doses, hydrogen sulfide may produce pulmonary edema and respiratory depression or paralysis. The first priority in treatment should be providing adequate ventilation and administering 100% oxygen. If unresponsive to supportive care, nitrites (amyl nitrite by inhalation or sodium nitrite by I.V.) may be an effective antidote, if delivered within the first few minutes of exposure. For adults, the dose is 10 ml of a 3$NaNO_2$ solution (0.5 gm $NaNO_2$ in 15 ml water) IV over 2 to 4 minutes. The dosage should be adjusted in children or in the

4. FIRST AID MEASURES

presence of anemia and methemoglobin levels, arterial blood gases, and electrolyties should be monitored.

Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of hydrocarbon solvents (e.g., in enclosed spaces or with deliberate abuse). The use of other drugs with less arrhythmogenic potential should be considered. If sympathomimetic drugs are administered, observe for the development of cardiac arrhythmias.

Ingestion of this product or subsequent vomiting may result in aspiration of light hydrocarbon liquid, which may cause pneumonitis. Inhalation overexposure can produce toxic effects, monitor for respiratory distress. If cough or breathing difficulties develop, evaluate for upper respiratory tract inflammation, bronchitis and pneumonitis.

Skin contact may aggravate an existing dermatitis. High pressure injection injuries may cause necrosis of underlying tissue regardless of superficial appearance.

Federal regulations (29 CFR 1910.1028) specify medical surveillance programs for certain exposures to benzene above the action level or PEL (specified in Section (i)(1)(i) of the Standard). In addition, employees exposed in an emergency situation shall, as described in Section (i)(4)(i), provide a urine sample at the end of the shift for measurement of urine phenol.

5. FIRE FIGHTING MEASURES

Flammability Classification
OSHA Classification (29 CFR 1910.1200): Flammable Liquid
NFPA Class-1B Flammable Liquid
NFPA Ratings: Health: 3, Flammability: 4, Reactivity: 0

Flash Point
< -46^{o}C, < -50^{o}F (ASTM D-56)

Flammable Limits
Lower Limit: < 1%
Upper Limit: 10%

Autoignition Temperature
232^{o}C, 450^{o}F

Combustion Products
Highly dependent on combustion conditions. Fume, smoke, carbon monoxide, carbon dioxide, sulfur and nitrogen oxides, aldehydes and unburned hydrocarbons.

Fire and Explosion Hazards
This material is extremely flammable and can be ignited by heat, sparks, flames or other sources of ignition (e.g., static electricity, pilot lights, mechanical/electrical equipment and electronic devices such as cell phones, computers, calculators and pagers which have not been certified as intrinsically safe). Vapors are heavier than air and can accumulate in low areas. May create vapor/air explosion hazard indoors, in confined spaces, outdoors or in sewers. Vapors may travel considerable distances to a remote source of ignition where they can ignite, flash back or explode. Product can accumulate a static charge that may cause a fire or explosion. A product container, if not properly cooled, can rupture in the heat of a fire.

Extinguishing Media
Dry chemical, carbon dioxide or foam is recommended. Water spray is recommended to cool or protect exposed materials or structures. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Water may be

5. FIRE FIGHTING MEASURES

ineffective for extinguishment, unless used under favorable conditions by experienced fire fighters.

Fire Fighting Use water spray to cool fire-exposed containers and to protect personnel. Isolate immediate hazard area and keep unauthorized personnel out. Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water. Avoid spreading burning liquid with water used for cooling. For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear protective clothing. When the potential chemical hazard is unknown, in enclosed or confined spaces, or when explicitly required by regulations, a self-contained breathing apparatus should be worn. Wear other appropriate protective equipment as conditions warrant.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions Extremely Flammable. Spillage of liquid product will create a fire hazard and may form an explosive atmosphere. Keep all sources of ignition and hot metal surfaces away from spill/release. The use of explosion-proof electrical equipment is recommended. Product may contain or release poisonous hydrogen sulfide gas. If the presence of dangerous amounts of H_2S around the spilled product is suspected, additional or special actions may be warranted including access restrictions and the use of protective equipment. Stay upwind and away from spill/release. Isolate immediate hazard area and keep unauthorized personnel out. Wear appropriate protective equipment as conditions warrant per Exposure Controls/Personal Protection guidelines.

Environmental Precautions Stop the leak if it can be done without risk. Prevent spilled material from entering waterways, sewers, basements or confined areas. Contain release to prevent further contamination of soils, surface water or groundwater. Clean up spill as soon as possible using appropriate techniques such as applying non-combustible absorbent materials or pumping. All equipment used when handling the product must be grounded. A vapor suppressing foam may be used to reduce vapors. Use clean non-sparking tools to collect absorbed material. Where feasible and appropriate, remove contaminated soil.

Methods for Containment and Clean Up Immediate cleanup of any spill is recommended. Build dike far ahead of spill for containment and later recovery or disposal of spilled material. Absorb spill with inert material such as sand or vermiculite and place in suitable container for disposal. If spilled on water, remove with appropriate equipment like skimmers, booms or absorbents. In case of soil contamination, remove contaminated soil for remediation or disposal in accordance with applicable regulations.

Reporting Report spills/releases as required, to appropriate local, state and federal authorities. US Coast Guard and Environmental Protection Agency regulations require immediate reporting of spills/release that could reach any waterway including intermittent dry creeks. Report spill/release to the National Response Center at (800) 424-8802. In case of accident or road spill, notify Chemtrec at (800) 424-9300.

7. HANDLING AND STORAGE

Precautions for Safe Handling Extremely flammable. May vaporize easily at ambient temperatures. The vapor is heavier than air and may create an explosive mixture of vapor and air. Beware of accumulation in confined spaces and low lying areas.

7. HANDLING AND STORAGE

Use non-sparking tools and explosion-proof equipment. Open container slowly to relieve any pressure. Bond and ground all equipment when transferring from one vessel to another. Can accumulate static charge by flow or agitation. Can be ignited by static discharge. Explosion-proof electrical equipment is recommended and may be required by fire codes.

Warning! Use of this material in spaces without adequate ventilation may result in the generation of hazardous levels of combustion products and/or inadequate oxygen levels for breathing. Odor is an inadequate warning for hazardous conditions.

To prevent and minimize fire or explosion risk from static accumulation and discharge, effectively bond and/or ground product transfer system. Do not use electronic devices (such as cellular phones, computers, calculators, pagers, etc.) in or around any fueling operation or storage area unless the devices are certified as intrinsically safe. Electrical equipment and fittings should comply with local fire codes.

Precautions for Safe Storage

Use and store this material in cool, dry, well-ventilated areas away from heat, direct sunlight, hot metal surfaces and all sources of ignition. Post area warnings: 'No Smoking or Open Flame'. Keep away from incompatible material. Outdoor or detached storage of portable containers is preferred. Indoor storage should meet OSHA standards and appropriate fire codes.

In a tank, barge or other closed container, the vapor space above materials containing hydrogen sulfide may result in concentrations of H_2S immediately dangerous to life or health. Check atmosphere for oxygen content, H_2S and flammability prior to entry.

Portable containers should never be filled while they are in or on a motor vehicle or marine craft. Static electricity may ignite vapors when filling non-grounded containers or vehicles on trailers. To avoid static buildup, do not use a nozzle lock open device. Use only approved containers. Keep containers tightly closed. Place the container on the ground before filling. Keep the nozzle in contact with the container during filling.

Empty containers retain liquid and vapor residues and can be dangerous. Do NOT pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat, flame, sparks, static electricity or other sources of ignition; they may explode and cause injury or death. Do not attempt to refill or clean containers since residue is difficult to remove. Empty drums should be completely drained, properly closed and returned to the supplier or a qualified drum reconditioner. All containers should be disposed of in an environmentally safe manner in accordance with government regulations.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Component	ACGIH Exposure Limits	OSHA Exposure Limits	NIOSH Exposure Limits
Natural Gas Condensate	300 ppm TWA 500 ppm STEL (as gasoline)	300 ppm TWA 500 ppm STEL (as petroleum distillate (naphtha))	450 ppm TWA 1100 ppm IDLH (as petroleum distillate (naphtha))
Benzene	0.5 ppm TWA 2.5 ppm STEL Skin	1 ppm TWA 5 ppm STEL Skin	0.5 ppm TWA 1 ppm STEL Skin 500 ppm IDLH
n-Butane	800 ppm TWA		800 ppm TWA

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Component	ACGIH Exposure Limits	OSHA Exposure Limits	NIOSH Exposure Limits
Cyclohexane	100 ppm TWA	300 ppm TWA	300 ppm TWA 1300 ppm IDLH
Ethyl Benzene	100 ppm TWA 125 ppm STEL	100 ppm TWA 125 ppm STEL	100 ppm TWA 125 ppm STEL 800 ppm IDLH
n-Heptane	400 ppm TWA 500 ppm STEL	500 ppm TWA	85 ppm TWA 440 ppm Ceiling 750 ppm IDLH
n-Hexane	50 ppm TWA Skin	500 ppm TWA	50 ppm TWA 1100 ppm IDLH
Hexane (all isomers)	500 ppm TWA 1000 ppm STEL		100 ppm TWA 510 ppm IDLH Ceiling
Hydrogen Sulfide	10 ppm TWA 15 ppm STEL	20 ppm Ceiling 50 ppm Peak	10 ppm Ceiling 100 ppm IDLH
Methylcyclohexane	400 ppm TWA	500 ppm TWA	400 ppm TWA 1200 ppm IDLH
n-Nonane	200 ppm TWA		200 ppm TWA
n-Octane	300 ppm TWA	500 ppm TWA	75 ppm TWA 385 ppm Ceiling 1000 ppm IDLH
n-Pentane	600 ppm TWA	1000 ppm TWA	120 ppm TWA 610 ppm Ceiling 1500 ppm IDLH
n-Propane	2500 ppm TWA	1000 ppm TWA	1000 ppm TWA 2100 ppm IDLH
Toluene	50 ppm TWA Skin	200 ppm TWA 300 ppm Ceiling 500 ppm Peak-10 min	100 ppm TWA 150 ppm STEL 500 ppm IDLH
1,2,4 Trimethyl Benzene	25 ppm TWA	25 ppm TWA	25 ppm TWA
Xylene, all isomers	100 ppm TWA 150 ppm STEL	100 ppm TWA 150 ppm STEL	900 ppm IDLH

Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional for further information.

ACGIH - American Conference of Government Industrial Hygienists, OSHA - Occupational Safety and Health Administration, NIOSH - National Institute for Industrial Safety and Health, TWA - Time Weighted Average (8 hour average for ACGIH and OSHA, 10 hour average for NIOSH), STEL - 15 Minute Short Term Exposure Level, Skin - indicates potential for cutaneous absorption of liquid or vapor through the eyes or mucous membranes, Ceiling - Ceiling Level, Peak - Acceptable peak over the ceiling concentration for a specified number of minutes, IDLH - Immediately Dangerous to Life and Health

Personal Protective Equipment

General Considerations Consider the potential hazards of this material, applicable exposure limits, job activities and other substances in the work place when designing engineering controls and selecting personal protective equipment.

Engineering Controls Use process enclosures, local exhaust ventilation or other engineering controls to maintain airborne levels below the recommended exposure limits. An emergency eye wash station and safety shower should be located near the work station.

Personal Protective Equipment

Personal Protective Equipment

If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, personal protective equipment (PPE) is recommended. A hazard assessment of the work should be conducted by a qualified professional to determine what PPE is required.

Respiratory Protection

A respiratory protection program that meets or exceeds OSHA 29 CFR 1910.134 and ANSI Z.88.2 should be followed whenever workplace conditions warrant the use of a respirator. When airborne concentrations are expected to exceed the established exposure limits given in Section 8, use a NIOSH approved air purifying respirator equipped with organic vapor cartridges/canisters. Use a full-face positive-pressure supplied air respirator in circumstances where air-purifying respirators may not provide adequate protection or where there may be the potential for airborne exposure above the exposure limits. If exposure concentration is unknown, IDLH conditions exist or there is a potential for exposure to hydrogen sulfide above exposure limits, use a NIOSH approved self contained breathing apparatus (SCBA) or equivalent operated in a pressure demand or other positive pressure mode.

Eye Protection

Eye protection that meets or exceeds ANSI Z.87.1 is recommended if there is a potential for liquid contact to the eyes. Safety glasses equipped with side shields are recommended as minimum protection in industrial settings. Chemical goggles should be worn during transfer operations or when there is a likelihood of misting, splashing or spraying of this material. A face shield may be necessary depending on conditions of use.

Skin and Body Protection

Avoid skin contact. Wear long-sleeved fire-retardant garments while working with flammable and combustible liquids. Additional chemical-resistant protective gear may be required if splashing or spraying conditions exist. This may include an apron, arm covers, impervious gloves, boots and additional facial protection.

Hand Protection

Avoid skin contact. Use impervious gloves (e.g., PVC, neoprene, nitrile rubber). Check with glove suppliers to confirm the breakthrough performance of gloves. PVC and neoprene may be suitable for incidental contact. Nitrile rubber should be used for longer term protection when prolonged or frequent contact may occur. Gloves should be worn on clean hands and hands should be washed after removing gloves. Also wash hands with plenty of mild soap and water before eating, drinking, smoking, using toilet facilities or leaving work.

Special Considerations

Workplace monitoring plans should consider the possibility that heavy metals such as mercury may concentrate in process vessels and equipment presenting the possibility of exposure during sampling and maintenance operations. Mercury and other heavy metals may be present in trace quantities in crude oil, raw natural gas and condensates. Storage and processing of these materials can result in these metals, including elemental mercury, accumulating in enclosed vessels and piping, typically at the low point of the processing equipment. Mercury may also concentrate in sludges, sands, scales, waxes and filter media.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Clear to dark brown liquid	**Physical Form**	Liquid
Odor	Strong hydrocarbon, sulfurous odor possible	**Odor Threshold**	Not established
pH	Neutral	**Vapor Pressure**	5 - 15 psi (Reid)
Vapor Density	>1 (air = 1)	**Boiling Point/Range**	-20-1000^{o}F/-17-538^{o}C

9. PHYSICAL AND CHEMICAL PROPERTIES

Percent Volatile	>50%	**Partition Coefficient**	Not established
Specific Gravity	0.6 - 0.8 @ 60°F	**Density**	6.3 lb/gal @ 60°F
Molecular Weight	Not determined	**Evaporation Rate**	Not established
Flash Point	<100°F/<38°C	**Test Method**	ASTM D-56
Explosive Limits	< 1% LEL, 10% UEL	**Autoignition Temperature**	450°F/232°C
Solubility in Water	Slightly soluble in water		

10. STABILITY AND REACTIVITY

Stability Stable under normal anticipated storage and handling temperatures and pressures. Extremely flammable liquid and vapor. Vapor can cause flash fire.
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Conditions to Avoid Avoid high temperatures and all possible sources of ignition. Prevent vapor accumulation.

Incompatibility (Materials to Avoid) Avoid contact with strong oxidizing agents such as strong acids, alkalies, chlorine and other halogens, dichromates or permanganates, which can cause fire or explosion.

Hazardous Decomposition Products Hazardous decomposition products are not expected to form curing normal storage. The use of hydrocarbon fuel in an area without adequate ventilation may result in hazardous levels of combustion products (e.g., oxides of carbon, sulfur and nitrogen, benzene and other hydrocarbons) and/or dangerously low oxygen levels.

Hazardous Polymerization Not known to occur

11. TOXICOLOGICAL INFORMATION

Overview This product is a clear to dark brown liquid with a strong hydrocarbon odor. It may also have a sulfurous or rotten egg odor. Hydrogen sulfide, an extremely flammable and very toxic gas is expected to be present. This product is a volatile and extremely flammable liquid that may cause flash fires. Keep away from heat, sparks and flames and other sources of ignition. This product contains benzene, which may cause cancer or be toxic to blood forming organs. It contains material that has caused cancer based on animal data. Never siphon this product by mouth. If swallowed, this product may be aspirated into the lungs and cause lung damage or death.

This material may contain benzene and ethyl benzene at concentrations above 0.1%. Benzene is considered to be a known human carcinogen by OSHA, IARC and NTP. IARC has ethyl benzene, gasoline and gasoline engine exhaust as possibly carcinogenic to humans (Group 2B) based on laboratory animal studiesal studies.

Toxicological Information of the Material.

Acute Toxicity **Dermal:** Low Toxicity: LD50 > 2000 mg/kg (rabbit)
Causes mild skin irritation. Repeated exposure may cause skin dryness or cracking that can lead to dermatitis.

Inhalation: Hydrogen Sulfide is Extremely Toxic: LC100 = 600 ppm(v), 30 min (man)

11. TOXICOLOGICAL INFORMATION

Product expected to have low degree of toxicity by inhalation: LC 50 > 5.2 mg/l (vapor)
Effect of overexposure may include irritation of the digestive tract, irritation of the respiratory tract, nausea, vomiting, diarrhea and signs of central nervous system depression (e.g., headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue). Continued inhalation may result in unconsciousness and/or death.

Ingestion: Product expected to have low degree of toxicity by ingestion: Oral LD50 > 5 g/kg (rat), > 10 g/kg (mice)
Aspiration into the lungs when swallowed or vomited may cause chemical pneumonitis which can be fatal.

Eye Damage / Irritation Causes serious eye irritation.

Sensitization **Skin:** Not expected to be a skin sensitizer
Respiratory: Not expected to be a respiratory sensitizer

Specific Target Organ Toxicity **Single Exposure:** High concentrations may cause irritation of the skin, eyes, digestive tract, irritation of the respiratory tract, nausea, vomiting, diarrhea and signs of central nervous system depression (e.g., headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue). Continued inhalation may result in unconsciousness and/or death.

Repeated Exposure: Two year inhalation studies of wholly vaporized unleaded gasoline and 90 day studies of various petroleum naphthas did not produce significant target organ toxicity in laboratory animals. Nephropathy in male rates, characterized by the accumulation of alpha-2-uglobulin in epithelial cells of the proximal tubules was observed, however follow up studies suggest that these changes are unique to the male rat.

Conditions Aggravated by Overexposure Disorders of the organs or organ systems that may be aggravated by significant exposure to this material or its components include the skin, respiratory system, liver, kidneys, CNS, cardiovascular system and blood-forming system.

Carcinogenicity May cause cancer based on component information.

Two year inhalation studies of vaporized unleaded gasoline produced an increased incidence of kidney tumors in male rats and liver tumors in female mice. Repeated skin application of various petroleum naphthas in mice for two years resulted in an increased incidence of skin tumors but only in the presence of severe skin irritation. Follow up mechanistic studies suggest that the occurrence of these tumors may be the consequence of promotional process and not relevant to human risk assessment. Epidemiology data collected from a study of more than 18,000 petroleum marketing and distribution workers showed no increased risk of leukemia, multiple myeloma or kidney cancer from gasoline exposure.

Unleaded gasoline has been identified as a possible carcinogen by the International Agency for Research on Cancer.

Germ Cell Mutagenicity Inadequate information available, not expected to be mutagenic.

11. TOXICOLOGICAL INFORMATION

Reproductive and Developmental Toxicity

Not expected to cause reproductive or developmental toxicity. No evidence of developmental toxicity was found in pregnant laboratory animals (rats and mice) exposed to high vapor concentrations of unleaded gasoline and petroleum naphthas via inhalation. A two generation reproductive toxicity study of vapor recovery gasoline did not adversely affect reproductive function or offspring survival and development.

Additional Information

Hydrogen Sulfide (H_2S). This material may contain or liberate H_2S, a poisonous gas with the smell of rotten eggs. Odor is not a reliable indicator of exposure because olfactory fatigue causes the smell to disappear. H_2S has a broad range of effects depending on the airborne concentration and length of exposure:
10 ppm: eye and respiratory tract irritation
100 ppm: coughing, headache, dizziness, nausea, eye irritation, loss of sense of smell in minutes
200 ppm: potential for pulmonary edema after 20 minutes
500 ppm: loss of consciousness after short exposures, potential for respiratory arrest
1000 ppm: Immediate loss of consciousness may lead rapidly to death, prompt cardiopulmonary resuscitation may be required.

Toxicological Information of Components

Benzene 71-43-2

Acute Data:
Dermal LD50 > 9400 mg/kg (Rabbit), (Guinea Pig)
LC50 = 9980 ppm (Mouse); 10000 ppm/7hr (Rat)
Oral LD50 = 4700 mg/kg (Mouse); 930 mg/kg (Rat); 5700 mg/kg (Mammal)
Carcinogenicity: Benzene is an animal carcinogen and is known to produce acute myelogenous leukemia (a form of cancer) in humans. Benzene has been identified as a human carcinogen by NTP, IARC and OSHA.
Target Organs: Prolonged or repeated exposures to benzene vapors has been linked to bone marrow toxicity which can result in blood disorders such as leukopenia, thrombocytopenia, and aplastic anemia. All of these diseases can be fatal.
Developmental: Exposure to benzene during pregnancy demonstrated limited evidence of developmental toxicity in laboratory animals. The effects seen include decreased body eight and increased skeletal variations in rodents. Alterations in hematopoeisis have been observed in the fetuses and offspring of pregnant mice.
Mutagenicity: Benzene exposure has resulted in chromosomal aberrations in human lymphocytes and animal bone marrow cells, and DNA damage in mammalian cells in vitro

Cyclohexane 110-82-7

Acute Toxicity:
Dermal LD50 => 2 g/kg (Rabbit)
LC50 > 4,044 ppm (4-hr, Rat)
Oral LD50 > 2 g/kg (Rat)
Target Organs: Cyclohexane can cause eye, skin and mucous membrane irritation, CNS depressant and narcosis at elevated concentrations. In experimental animals exposed to lethal concentrations by inhalation or oral route, generalized vascular damage and degenerative changes in the heart, lungs, liver, kidneys and brain were identified.
Developmental: Cyclohexane has been the focus of substantial testing in laboratory animals. Cyclohexane was not found to be genotoxic in several tests including unscheduled DNA synthesis, bacterial and mammalian cell mutation assays, and in vivo chromosomal aberration. An increase in chromosomal aberrations in bone marrow cells of rats exposed to cyclohexane was reported in the 1980's. However, a careful reevaluation of slides from this study by the laboratory which conducted the study indicates these findings were in error, and that no significant chromosomal effects were

11. TOXICOLOGICAL INFORMATION

observed in animals exposed to cyclohexane. Findings indicate long-term exposure to cyclohexane does not promote dermal tumorigenesis.

Ethyl Benzene 100-41-4

Acute Toxicity:
Dermal LD50 = 17800 mg/kg (Rabbit)
LC50 = 4000 ppm/4 hr; 13367 ppm (Rat)
Oral LD50 = 3500 mg/kg (Rat)
Carcinogenicity: Rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study demonstrated limited evidence of kidney, liver, and lung cancer. Ethyl benzene has been listed as a possible human carcinogen by IARC. Ethyl benzene has not been listed as a carcinogen by NTP or OSHA.
Target Organs: In rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study there was mild damage to the kidney (tubular hyperplasia), liver (eosinophilio foci,hypertrophy, necrosis), thyroid (hyperplasia) and pituitary (hyperplasia).

n-Hexane 110-54-3

Acute Toxicity:
Dermal LD50 = >2,000 mg/kg (Rabbit)
LC50 > 3,367 ppm (4 hr, Rat)
Oral LD50 > 5,000 mg/kg (Rat)
Target Organs: Excessive exposure to n-hexane can result in peripheral neuropathies. The initial symptoms are symmetrical sensory numbness and paresthesias of distal portions of the extremities. Motor weakness is typically observed in muscles of the toes and fingers but may also involve muscles of the arms, thighs and forearms. The onset of these symptoms may be delayed for several months to a year after the beginning of exposure. The neurotoxic properties of n-hexane are potentiated by exposure to methyl ethyl ketone and methyl isobutyl ketone. Prolonged exposure to high concentrations of n-hexane (>1,000 ppm) has resulted in decreased sperm count and degenerative changes in the testes of rats but not those of mice.

Hydrogen Sulfide 7783-06-4

Acute Toxicity:
Dermal - No data
LCLo= 600 ppm, 30 min (Human)
Hydrogen sulfide concentrations will vary significantly depending on the source and sulfur content of the product. Sweet natural gas condensate (<0.5% sulfur) may contain toxicologically significant levels of hydrogen sulfide in the vapor spaces of bulk storage tanks and transport compartments. Concentrations of H_2S as low as 10 ppm over an 8 hour workshift may cause eye or throat irritation. Prolonged breathing of 50-100 ppm H_2S vapors can produce significant eye and respiratory irritation. Sour condensates commonly contain extremely high concentrations of H_2S (500-70,000 ppm) in the vapor spaces of bulk storage vessels. Exposure to 250-600 ppm for 15-30 minutes can produce headache, dizziness, nervousness, staggering gait, nausea and pulmonary edema or bronchial pneumonia. Concentrations >1,000 ppm will cause immediate unconsciousness and death through respiratory paralysis. Rats and mice exposed to 80 ppm H_2S, 6 hrs/day, 5 days/week for 10 weeks, did not produce any toxicity except for irritation of nasal passages. H_2S did not affect reproduction and development (birth defects or neurotoxicity) in rats exposed to concentrations of 75-80 ppm or 150 ppm H_2S, respectively. Over the years a number of acute cases of H_2S poisonings have been reported. Complete and rapid recovery is the general rule. However, if the exposure was sufficiently intense and sustained causing cerebral hypoxia (lack of oxygen to the brain), neurologic effects such as amnesia, intention tremors or brain damage are possible.

Toluene 108-88-3

Acute Toxicity:
Dermal LD50 = 14 g/kg (Rabbit)

11. TOXICOLOGICAL INFORMATION

LC50 = 8,000 ppm (4-hr, Rat)
Oral LD50 = 2.5 - 7.9 g/kg (Rat)
Target Organs: Epidemiology studies suggest that chronic occupational overexposure to toluene may damage color vision. Subchronic and chronic inhalation studies with toluene produced kidney and liver damage, hearing loss and central nervous system (brain) damage in laboratory animals. Intentional misuse by deliberate inhalation of high concentrations of toluene has been shown to cause liver, kidney, and central nervous system damage, including hearing loss and visual disturbances.
Developmental: Exposure to toluene during pregnancy has demonstrated limited evidence of developmental toxicity in laboratory animals. The effects seen include decreased fetal body weight and increased skeletal variations in both inhalation and oral studies.

1,2,4 Trimethyl Benzene 95-63-6
Acute Toxicity:
Dermal LD50 = No data available
LC50 = 18 gm/m^3/4hr (Rat)
Oral LD50 = 3-6 g/kg (Rat)

Xylenes 1330-20-7
Acute Toxicity:
Dermal LD50 >3.16 ml/kg (Rabbit)
LC50= 5000 ppm/4 hr. (Rat)
Oral LD50 = 4300 mg/kg (Rat)
Target Organs: A six week inhalation study with xylene produced hearing loss in rats.
Developmental: Both mixed xylenes and the individual isomers produced limited evidence of developmental toxicity in laboratory animals. Inhalation and oral administration of xylene resulted in decreased fetal weight, increased incidences of delayed ossification, skeletal variations and resorptions.

12. ECOLOGICAL INFORMATION

Toxicity

This material is expected to be toxic to aquatic organisms with the potential to cause long term adverse effects in the aquatic environment. Acute aquatic toxicity studies on samples of gasoline and naphtha streams show acute toxicity values greater than 1 mg/l and mostly in the range of 1 to 100 mg/l. These tests were carried out on water accommodated fractions in closed systems to prevent evaporative loss. Results are consistent with the predicted aquatic toxicity of these substances based on their hydrocarbon composition.

Classification H411, Chronic Category 2

96 hours LC50: 8.3 mg/l (Cyprinodon variegatus)
96 hours LC50: 1.8 mg/l (Mysidopsis bahia)
48 hours LC50: 3.0 mg/l (Daphnia magna)
96 hours LC50: 2.7 mg/l (Oncorhynchus mykiss)

Coating action of oil can kill birds, plankton, aquatic life, algae and fish.

Persistence and Degradability

This material is not readily biodegradable. Most of the nonvolatile constituents are inherently biodegradable. Some of the highest molecular weight components are persistent in water. The individual hydrocarbon components of this material are differentially soluble in water with aromatic hydrocarbons tending to be more water soluble than aliphatic hydrocarbons. If spilled, the lighter components will generally

12. ECOLOGICAL INFORMATION

evaporate but depending on local environmental conditions (temperature, wind, soil type, mixing or wave action in water, etc), photo-oxidation and biodegradation, the remainder may become dispersed in the water column or absorbed to soil or sediment. Because of their differential solubility, the occurrence of hydrocarbons in groundwater will be at different proportions than the parent material. Under anaerobic conditions, such as in anoxic sediments, rates of biodegradation are negligible.

Persistence per IOPC Fund Definition: Non-Persistent

Bioaccumulative Potential: Contains components with the potential to bioaccumulate. The octanol water coefficient values measured for the hydrocarbon components of this material range from 3 to greater than 6, and therefore would be considered as having the potential to bioaccumulate.

Mobility: **Air:** Contains volatile components. Lighter components will volatilize in the air. In air, the volatile hydrocarbons undergo photodegradation by reaction with hydroxyl radicals with half lives varying from 0.5 days for n-dodecane to 6.5 days for benzene.
Water: Spreads on a film on the surface of water. Significant proportion of spill will remain after one day. Lower molecular weight aromatic hydrocarbons and some polar compounds have low but significant water solubility. Some higher molecular weight compounds are removed by emulsification and these also slowly biodegrade while others adsorb to sediment and sink. Heavier fractions agglomerate to form tars, some of which sink.
Soil: Some constituents may be mobile and contaminate groundwater.

Other Adverse Effects: Films form on water and may affect oxygen transfer and damage organisms.

13. DISPOSAL CONSIDERATIONS

Recover or recycle if possible. It is the responsibility of the generator to determine the toxicity and physical properties of the material generated so as to properly classify the waste and ensure disposal methods comply with applicable regulations.

This material, if discarded as produced, is not a RCRA "listed" hazardous waste. However, it should be fully characterized for ignitability (D001), reactivity (D003) and benzene (D018) prior to disposal (40 CFR 261). Use which results in chemical or physical change or contamination may subject it to regulation as a hazardous waste. Along with properly characterizing all waste materials, consult state and local regulations regarding the proper disposal of this material.

Do not dispose of tank water bottoms by draining onto the ground. This will result in soil and groundwater contamination. Waste arising from spillage or tank cleaning should be disposed of in accordance with applicable regulations.

Container contents should be completely used and containers should be emptied prior to discard. Container rinsate could be considered a RCRA hazardous waste and must be disposed of with care and in full compliance with federal, state and local regulations. Larger empty containers, such as drums, should be returned to the distributor or to a qualified drum reconditioner. To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

14. TRANSPORTATION INFORMATION

United States Department of Transportation (US DOT) **Transportation of Dangerous Goods (TDG) Canada**	**Shipping Description:** Petroleum Distillates, n.o.s., 3, UN1268, I or II **Shipping Name:** Petroleum Distillates, n.o.s (contains natural gas condensate) **Hazard Class and Division:** 3 **ID Number:** UN1268 **Packing Group:** I or II **Label:** Flammable Liquid **Placard:** Flammable **Reportable Quantity:** None established for this material **Emergency Response Guide:** 128
International Maritime Dangerous Goods Code (IMDG)	**Shipping Description:** Petroleum Distillates, n.o.s., 3, UN1268, I or II **Shipping Name:** Petroleum Distillates, n.o.s (contains natural gas condensate) **Hazard Class and Division:** 3 **UN Number:** 1268 **Label:** Flammable Liquid **EMS Guide:** F-E, S-E Not a DOT Marine Pollutant per 49 CFR 71.8
European Agreements Concerning the International Carriage by Rail (RID) and by Road (ADR)	**Shipping Name**: Petroleum Distillates, n.o.s (contains natural gas condensate) **Hazard Class:** 3 **Packing Group:** I or II **Label:** Flammable Liquid **Danger Number:** 33 **UN Number:** 1268
International Civil Aviation Organization / International Air Transport Association (ICAO/IATA)	**Shipping Name:** Petroleum Distillates, n.o.s (contains natural gas condensate) or Natural Gasoline **UN/ID Number:** UN1268 **Hazard Class/Division:** 3 **Packing Group:** I or II **Labels:** Flammable **Emergency Response Guide:** 3H

15. REGULATORY INFORMATION

United States Federal Regulatory Information

EPA TSCA Inventory	This product and/or its components are listed on the Toxic Substances Control Act (TSCA) Inventory
EPA SARA 302/304 Emergency Planning and Notification	This material contains the following chemicals subject to reporting under the Superfund Amendments and Reauthorization Act of 1986 (SARA): Material contains hydrogen sulfide, considered an extremely hazardous substance. TPQ– 500 lb, EPCRA RQ – 100 lb
EPA SARA 311/312 (Title III Hazard Categories)	Acute Health: Yes Chronic Health: Yes Fire Hazard: Yes Pressure Hazard: No Reactive Hazard: No

15. REGULATORY INFORMATION

EPA SARA Toxic Chemical Notification and Release Reporting (40 CFR 372) and CERCLA Reportable Quantities (40 CFR 302.4)

Component	CAS Number	Concentration	RQ
Benzene	71-43-2	< 5 %	10 lb
Cyclohexane	110-82-7	< 5 %	1000 lb
Ethyl Benzene	100-41-4	< 3 %	1000 lb
n-Hexane	110-54-3	< 50 %	5000 lb
Toluene	108-88-3	< 15 %	1000 lb
1,2,4 Trimethyl Benzene	95-63-6	< 4 %	not listed
Xylene, all isomers	1330-20-7	< 12 %	100 lb

CERCLA Section 101(14) excludes crude oil and crude oil fractions, including hazardous constituents of petroleum, from the definition of hazardous substances. The petroleum exclusion applies to this product.

EPA CWA and OPA

This product is classified as an oil under Section 311 of the Clean Water Act (CWA) and Oil Pollution Act of 1990 (OPA), subject to spill reporting requirements.

Canadian Regulatory Information

DSL/NDSL Inventory

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the SDS contains all the information required by the Regulations..

Workplace Hazardous Materials Information System (WHMIS) Hazard Class

B2 - Flammable Liquid
D1A – Material Causing Immediate and Serious Toxic Effects - Very Toxic Material
D2A: Material Causing Other Toxic Effects Very Toxic
D2B - Material Causing Other Toxic Effects - Toxic Material

European Union Regulatory Information

Labeling

Product is dangerous as defined by the European Union Dangerous Substances / Preparations Directives
Contains: Low Boiling Point Naphtha

Symbol

F+ Extremely Flammable
T Toxic
N Dangerous for the Environment

Risk Phrases

R12-45-38-65-67-51/53
Extremely flammable. May cause cancer. Irritating to skin. Harmful: may cause lung damage if swallowed. Vapors may cause drowsiness and dizziness. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety Phrases

S16-53-45-2-23-24-29-43-62
Keep away from sources of ignition – No smoking. Avoid exposure – obtain special instructions before use. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Keep out of reach of children. Do not breathe vapor. Avoid contact with skin. Do not empty into drains. In case of fire use foam/dry powder/CO_2. If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label.

15. REGULATORY INFORMATION

California Proposition 65
This product may contain detectable quantities of the following chemicals, known to the State of California to cause cancer, birth defects, or other reproductive harm and which may be subject to the warning requirements of California Proposition 65. Chemicals known to the State of California to cause cancer, birth defects or other reproductive harm are created by the combustion of this product.
Carcinogens: Benzene, Ethyl Benzene
Developmental Toxicity: Benzene, Toluene
Male Reproductive Toxicity: Benzene

Carcinogen Identification by International Agency for Research on Cancer

	Group 1	Carcinogenic to Humans	Benzene
	Group 2A	Probably Carcinogenic to Humans	
	Group 2B	Possibly Carcinogenic to Humans	Ethyl Benzene, Gasoline, Gasoline Engine Exhaust
	Group 3	Not Classifiable	Toluene, Xylenes

16. OTHER INFORMATION

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ATTACHMENT O

EMISSION SUMMARY SHEETS
NOT APPLICABLE (SEE NOTE)

Note: Attachment O applies to General Permit G-70 Applications

General Permit G-35A Modification Application

Walen Compressor Station, Plant ID No. 047-00089
Gary, West Virginia

Cranberry Pipeline Corporation
c/o Cabot Oil & Gas Corporation
900 Lee Street East, Suite 1500
Charleston, West Virginia

November 2015

PERMIT SUMMARY

General Permit G-35A Modification Application

Walen Compressor Station, Plant ID No. 047-00089
Gary, West Virginia

Cranberry Pipeline Corporation
c/o Cabot Oil & Gas Corporation
900 Lee Street East, Suite 1500
Charleston, West Virginia

November 2015

FINAL PERMIT

General Permit G-35A Modification Application

Walen Compressor Station, Plant ID No. 047-00089
Gary, West Virginia

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c/o Cabot Oil & Gas Corporation
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Charleston, West Virginia

November 2015