

1. IDENTIFICATION

Product Identifier	NATURAL GAS LIQUIDS
Synonyms	NGL, LPG, Liquid Petroleum Gas
Chemical Description	Liquids and gases extracted from natural gas production.
Product Use	Feedstock, fuel
Manufacturer/Supplier	CENOVUS ENERGY INC. 500 Centre Street SE, PO Box 766 Calgary, AB T2P 0M5
Prepared By	Cenovus Energy Inc. Health and Safety
Phone Number	1-403-766-2000
Emergency Telephone	Cenovus 1-877-458-8080 CANUTEC 1-613-996-6666 (Canada); 1-888-226-8832 (Toll Free) CHEMTRAC 1-800-424-9300

2. HAZARDS IDENTIFICATION

Hazard Classifications	Flammable Gases – Category 1 Gases Under Pressure – Liquefied Gas Acute Toxicity – Inhalation – Category 2 Carcinogenicity – Category 1 Specific Target Organ Toxicity (Single Exposure) – Category 3 Aspiration Hazard – Category 1 Simple Asphyxiant – Category 1
Hazard Pictogram(s)	   
Signal Word	Danger
Hazard Statement(s)	Fatal if inhaled. Extremely flammable gas. Contains gas under pressure; may explode if heated. Benzene component of this substance may cause cancer. May cause drowsiness or dizziness. May be fatal if swallowed and enters airway. May displace oxygen and cause rapid suffocation. <i>Sulfur compounds in this material may decompose to release hydrogen sulfide gas which may accumulate to potentially lethal concentrations in enclosed air spaces.</i>
Label Elements	
Prevention	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective equipment. In case of inadequate ventilation, wear respiratory protection. Do not breathe gas or vapours. Use only outdoors or in a well-ventilated area. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
Response	If exposed or concerned: get medical advice. If swallowed: immediately call a poison center or a doctor if you feel unwell. Do not induce vomiting. If inhaled: remove person to fresh air and keep comfortable for breathing. Immediately call emergency medical service if unwell. Leaking gas fire: do not extinguish, unless leak can be stopped safely. In case of leakage, eliminate all ignition sources.

Storage	Store locked up. Protect from sunlight. Store in a well-ventilated place. Keep container tightly closed.
Disposal	Dispose of container in accordance with local, regional, national, and international regulations.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Hazardous Ingredients	CAS Number	Approximate Concentration (% w/w)
Natural gas condensates	64741-48-6	100
which contains:		
Butane	106-97-8	5– 40
Propane	74-98-6	0 – 20
Pentane	109-66-0	10 - 25
Hexanes (all isomers)	Not available	10 – 20
Heptanes +	Not available	20 – 70
Benzene	71-43-2	Up to 2.5
Hydrogen Sulfide	7783-06-04	up to 50 ppm

4. FIRST AID MEASURES

Inhalation	Be aware of potential hydrogen sulfide – ensure own safety. Don appropriate PPE including SCBA (Self-Contained Breathing Apparatus) or SABA (Supplied Air Breathing Apparatus) before assisting the victim. Remove person to fresh air. If person is not breathing, give artificial respiration. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. If necessary, give additional oxygen once breathing is restored if trained to do so. Get prompt medical attention.
Eye Contact	Flush eyes with large amounts of lukewarm water for 15 minutes, lifting upper and lower lids at intervals. Seek medical attention if irritation persists.
Skin Contact	If freezing occurs, gently bathe affected area in luke warm water. Do not rub. Do not try to remove clothing if it is frozen to the skin. If burning occurs, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin. Remove and isolate contaminated clothing and shoes. Get medical attention.
Ingestion	Not a significant route of exposure.
Most Important Symptoms	Fatal at high concentrations due to hydrogen sulfide. Induces unconsciousness at high concentrations. Displaces available oxygen at high concentrations.

5. FIRE FIGHTING MEASURES

General Fire Hazards	See Section 9 for Flammability Properties. Extremely flammable. Easily ignited by heat, sparks or flames. Will form explosive mixtures with air. Do not extinguish a leaking gas fire unless leak can be stopped. Exercise caution against a Boiling Liquid Expanding Vapour Explosion (BLEVE).
Hazardous Combustion Products	Carbon monoxide, nitrogen oxides, methane.

Extinguishing Media	Foam, CO ₂ , dry chemical.
Firefighting Equipment/Instructions	Explosive accumulations can build up in areas of poor ventilation. Use water spray to cool fire-exposed containers, and to disperse gas if leak has not ignited. If safe to do so, cut off fuel and allow flame to burn out.

6. ACCIDENTAL RELEASE MEASURES

Notification Procedures	In the event of a spill or accidental release, notify relevant authorities in accordance with applicable regulations (see Section 15).
Personal precautions and Protective Equipment	Avoid direct contact with material. Stay upwind of release. Isolate the immediate hazard area and keep unnecessary and unprotected people away. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8). Eliminate all sources of ignition. Provide explosion-proof clearing ventilation, if possible.
Environmental precautions	Prevent material from entering soil, waterways, drains, sewers, or confined areas.
Cleanup measures	If safe to do so, stop gas flow. Remove all ignition sources. Provide clearing ventilation if possible. Prevent from entering confined spaces. In case of soil contamination, remove contaminated soil for remediation and disposal in accordance with local regulations (see Section 13). Notify the appropriate regulatory authorities of reportable releases.

7. HANDLING AND STORAGE

Handling	Handle under adequate ventilation. Avoid contact with the liquid or liquid-cooled equipment. Avoid inhalation. Extreamly flammable gas. Bond and ground transfers to prevent static discharge. Avoid sparking conditions. Never subject a cylinder to severe mechanical shock. Review grounding and bonding requirements in NFPA-70 and/or API RP 2003.
Storage	Store in a dry, well-ventilated place away from heat, strong sunlight, and ignition sources. Keep cool. Use approved containers only. Follow regulatory requirements and best practices for container storage. Empty product containers or vessels may contain explosive vapours. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition. Use non-sparking tools. Separate from incompatible material (see Section 10). This material can displace available oxygen for breathing (see Section 11).
Caution	Hydrogen sulfide may accumulate in headspaces of tanks and other equipment, even when concentrations in the liquid product are low. Factors increasing this hazard potential include heating, agitation and contact of the liquid with acid or acid salts. Assess the exposure risk by gas monitoring. Wear air supplying breathing apparatus if necessary. Overexposure to hydrogen sulfide may cause dizziness, headache, nausea and possibly unconsciousness and death.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Occupational Exposure Limits
(8-hour TWA unless otherwise noted)

Hazardous Ingredients	Alberta	Saskatchewan	OSHA PEL	ACGIH TLV
Butane (C4)	1,000 ppm (C2-C4)	1,000 ppm (C1-C4)	-	Maintain minimum ambient oxygen partial pressure of 132 torr, or 18% depending on
Propane (C3)		1,250 ppm STEL (C1-C4)	1,000 ppm	

				altitude and weather
Pentane	600 ppm	600 ppm	1000 ppm	1000 ppm
Hexanes	500 ppm 50 ppm (n-hexane)	500 ppm 50 ppm (n-hexane)	500 ppm (n-hexane)	500 ppm 50 ppm (n-hexane)
Benzene	0.5 ppm; 2.5 ppm STEL, Skin	--	1 ppm; 5 ppm STEL; Petroleum Industry: 10 ppm; 25 ppm (C)	0.5 ppm 2.5 ppm STEL
Hydrogen Sulfide	10 ppm; 15 ppm (C)	--	20 ppm (C)	1 ppm 5 ppm STEL

Engineering Controls	Use only in well-ventilated areas. Local exhaust ventilation required in confined areas. Use explosion-proof equipment and non-sparking tools where conditions may generate an explosive atmosphere.
Hygiene Measures	Handle in accordance with good industrial hygiene and safety practices. Do not smoke. Avoid skin exposure. Avoid breathing in the vapour. Wash hands with soap and water before eating, drinking, smoking, or using toilet facilities. Routinely launder PPE to remove contamination. Use care when laundering to prevent the formation of flammable vapours which could ignite via washer or dryer.
Respirator	Where concentrations may exceed exposure limits, use full-face, positive pressure self-contained breathing apparatus (SCBA); or supplied-air breathing apparatus (SABA).
Gloves	Wear protective gloves appropriate to the risk of handling the container or material. Cold-Insulating gloves may be required.
PPE Eye wear	Wear protective eyewear appropriate to the risk of handling the container or material.
Footwear	As per safety policy.
Clothing	As per fire protection policy.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquified gas	Appearance:	Colourless
Odour:	Rotten eggs (Hydrogen sulfide)	Odour Threshold (ppm):	Not available
Specific Gravity:	0.6 – 0.7	pH:	Not applicable
Vapour Pressure (mmHg, 38°C):	Not available	RVP (kPa):	Not available
Vapour Density (air=1):	Not available	Evaporation Rate:	Not available
Boiling Range (°C, D-7169):	Not available	Initial Boiling Pt. (°C):	42 (as propane)
Flash Point (°C) & Method:	-7 (as hexane)	Freezing Pt. (°C):	-180
Upper Explosive Limit (%) v/v:	10 (as propane)	Lower Explosive Limit (%) v/v:	1 (as hexane)
Auto-Ignition Temp. (°C):	220 (as hexane)		
Sensitivity to Impact:	No	Sensitivity to Static Discharge:	Yes, may ignite
Octanol/Water Coefficient:	Not available	Solubility in Water	Slight

10. STABILITY AND REACTIVITY

Chemical Stability Stable under normal, ambient conditions.

Hazardous Reactions	Not known to occur.
Conditions to Avoid	High temperatures, open flames, sparks, welding, smoking and other ignition sources.
Incompatibility	Incompatible with strong oxidizing agents.
Hazardous Decomposition Products	Oxides of carbon.
Synergistic Materials/Products	None reported.

11. TOXICOLOGICAL INFORMATION

Acute Exposure Initial detection of H₂S odour at about 0.1 ppm. Irritation of eyes, nose and throat occurs. Hydrogen sulfide may cause loss of sense of smell at about 100 ppm H₂S. At higher concentrations lung irritation, drowsiness, unconsciousness, respiratory failure, and possible death can occur. Eye contact may cause irritation and swelling. Rapidly expanding gas or vaporized liquid may cause frostbite to skin and eyes. Evidence exists that propane and butane may cause drowsiness and even unconsciousness at concentrations far below those required for oxygen deficiency, for example 10% LEL and above.

Hazardous Ingredients	Result	Species	Dose	Exposure
Natural Gas (petroleum), raw liquid mix	LD50 Oral LD50 Dermal	Rat Rat	5,000 mg/kg 2,000 m/gkg	- -
Propane	LC50 EC50 (CNS)	Rat	>800,000 ppm 280,000 ppm	15 min 10 min
Butane	LC50	Mouse	520,400 ppm	2 hr
Pentane	LD50 Oral LC50	Rat Rat	>2000 mg/kg >25.3 mg/L	- 4 hr
n-Hexane	LD50	Old Rat Young Adult Rat	24 mL/kg 49 mL/kg	-
Benzene	LD50 Oral LD50 Dermal LC50 Inhalation	Rat Rabbit Rat	1620 mg/kg >8260 mg/kg 14000 ppm	- - 4 hours
Hydrogen Sulfide	LC50 Inhalation LC50 Inhalation	Rat Mouse	444 ppm/ 0.701 mg/L 335 ppm	4 hours 4 hours

Chronic Exposure H₂S may cause fatigue, headache, dizziness, and bronchitis. Due to presence of benzene, long term exposure may increase the risk of anemia and leukemia. Repeated skin contact may increase the risk of skin cancer.

Health Effects **Irritant:** Not available **Reproductive Toxicity:** Not available
Skin Sensitization: No **Teratogenicity:** Not available
Respiratory Sensitization: No **Mutagenicity:** Possibly
Carcinogenicity: Yes

Carcinogenicity **Benzene**
ACGIH A1-Confirmed Human Carcinogen

IARC, OSHA, US NTP – There is sufficient evidence that benzene is carcinogenic to man.

Hydrogen Sulfide

Hydrogen sulfide is not considered to be mutagenic or a reproductive or developmental toxicant.

ACGIH, IARC, OSHA, US NTP – Hydrogen sulfide is not listed as a carcinogen.

12. ECOLOGICAL INFORMATION

Ecotoxicity	Expected to be harmful to aquatic organisms. May cause long-term adverse effects in the aquatic environment. Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations.
Biodegradation	Inherently biodegradable in water.
Bioaccumulation	Has the potential to bioaccumulate (aquatic / sediment).
Atmospheric Oxidation	More volatile component expected to degrade rapidly in air.
Photolysis	More water soluble component expected to degrade at a moderate rate in water when exposed to sunlight.
Mobility	More volatile component, highly volatile, will partition rapidly to air. Not expected to partition to sediment and wastewater solids. Less volatile component, low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

13. DISPOSAL CONSIDERATIONS

Disposal	Dispose of contents/container/contaminated soil in accordance with local, regional, national, and/or international regulations. Empty containers or liners may retain a residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed.
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14. TRANSPORT INFORMATION

Regulatory Information	UN Number	Proper Shipping Name	Class	PG	Label	Additional Information
TDG	UN1075	LIQUEFIED PETROLEUM GAS, Not Odorized	2.1	-	LIQUEFIED PETROLEUM GAS	
DOT	UN1075	LIQUEFIED PETROLEUM GAS, Not Odorized	2.1	-	LIQUEFIED PETROLEUM GAS	49 CFR 173.302, 173.306
IMDG	UN1075	LIQUEFIED PETROLEUM GAS, Not Odorized	2.1	-	LIQUEFIED PETROLEUM GAS	EMS:F-D, S-UE
ICAO/IATA	UN1075	LIQUEFIED PETROLEUM GAS, Not Odorized	2.1	-	LIQUEFIED PETROLEUM GAS	Forbidden, Cargo Aircraft Only ERG Code: 10L

North American Emergency Response Guide Number: 115

Emergency Response Assistance Plan (ERAP) Number: ERP2-0010-302; 1-800-265-0212

15. REGULATORY INFORMATION

Canadian Classification This product has been classified in accordance with the hazard criteria of the Hazardous Products Regulation (HPR) and the SDS contains all of the information required by the CPR.

WHMIS 1988 Classification: A, B1, B2, D2A

Canada. Domestic Substances List (DSL), as amended through December 14, 2016

Hydrogen sulfide (H2S)

Butane

Propane

Benzene

: Pentane

Hexane

US Federal and State Regulations The contents of this SDS comply with the OSHA Hazard Communication Standard 29 CFR 1910.1200.

EPCRA (SARA Title III) Section 302 Extremely Hazardous Substance (EHS) (40 CFR 355, Appendix A)

HYDROGEN SULFIDE

The EHS Reportable Quantity (RQ) is 100 lbs.

Threshold Planning Quantity is 500 lbs

EPCRA (SARA Title III) Section 313 Toxic Chemical Release Inventory (TRI) Reporting for RY 2015 (as amended December 2015)

HYDROGEN SULFIDE

De Minimis Concentration for Section 313 is 1.0 %.

Reporting threshold for manufacturing and processing: 25000 lbs

Reporting threshold for other uses: 10000 lbs

BENZENE

De Minimis Concentration for Section 313 is 0.1 %.

Reporting threshold for manufacturing and processing: 25000 lbs

Reporting threshold for other uses: 10000 lbs

N-HEXANE

De Minimis Concentration for Section 313 is 1.0 %.

Reporting threshold for manufacturing and processing: 25000 lbs

Reporting threshold for other uses: 10000 lbs

CERCLA Hazardous Substances [other than radionuclides] (40 CFR 302.4) (as amended by 75 FR 78918, Dec. 17, 2010)

CAS RN: 7783-06-4

Name: HYDROGEN SULFIDE

The Reportable Quantity (RQ) is 100 lbs.

CAS RN: 106-97-8

Name: Butane

The Reportable Quantity (RQ) is 100 lbs.

CAS RN: 74-98-6

Name: Propane

The Reportable Quantity (RQ) is 100 lbs.

CAS RN: 71-43-2

Name: BENZENE

The Reportable Quantity (RQ) is 10 lbs.

CAS RN: 109-66-0

Name: Pentane

The Reportable Quantity (RQ) is 100 lbs.

CAS RN: 110-54-3

Name: HEXANE

The Reportable Quantity (RQ) is 5000 lbs.

Clean Water Act Section 307(a)(1) Toxic Pollutants (40 CFR 401.15)

CAS RN: 71-43-2

Name: BENZENE

Clean Air Act Section 111, SOCMi Intermediate or Final Volatile Organic Compounds (40 CFR 60.489)

CAS RN: 71-43-2

Name: BENZENE

CAS RN: 109-66-0

Name: PENTANE

Clean Air Act Section 112(i) High-Risk Hazardous Air Pollutants (40 CFR 63.74)

CAS RN: 71-43-2

Name: BENZENE

Weighting factor is 10

Clean Air Act Section 112(r) Accidental Release Prevention (40 CFR 68.130)

HYDROGEN SULFIDE

Regulated Toxic Substance

Threshold Quantity is 10000 lbs.

Toxic Endpoint is 0.042 mg/L.

BUTANE, PROPANE, PENTANE

Regulated Flammable Substance (excludes fuel used or held for sale at a retail facility)

Threshold Quantity is 10000 lbs.

DHS. Chemical Facility Anti-Terrorism Standards (6 CFR 27, Appendix A) [Final Rule, November 20, 2007]

HYDROGEN SULFIDE

Release Minimum Concentration (%; ACG = A Commercial Grade): 1.00

Release Screening Threshold Quantity (STQ) (lbs): 10000

Theft Minimum Concentration (%; ACG = A Commercial Grade): 23.73

Theft Screening Threshold Quantity (STQ) (lbs): 45

Release - Toxic

Theft - Weapons of Mass Effect (WME)

BUTANE

Release Minimum Concentration (%; ACG = A Commercial Grade): 1.00

Release Screening Threshold Quantity (STQ) (lbs): 10000

Release – Flammables

PROPANE

Release Minimum Concentration (%; ACG = A Commercial Grade): 1.00

Release Screening Threshold Quantity (STQ) (lbs): 60000

Release – Flammables

PENTANE

Release Minimum Concentration (%; ACG = A Commercial Grade): 1.00

Release Screening Threshold Quantity (STQ) (lbs): 10000

Release - Flammables

Hazardous Organic NESHAP (HON) Hazardous Air Pollutants (40 CFR 63.100-.107, Table 2)

BENZENE

HEXANE

OSHA Specifically Regulated Substances in Subpart Z to 29 CFR 1910 Specifications & Labeling (29 CFR 1910.1001-.1053) (Mar. 25, 2016)

Benzene

Hazards to be addressed while classifying: Cancer; Central Nervous System; Blood; Aspiration; Skin; Eye; Respiratory Tract Irritation; Flammability

Year First Listed as Known Carcinogen: 1987

Label elements for shipped and stored containers shall comply with shall comply with appendix C.

See 29 CFR 1910.1028 for specific standard.

USA. Toxic Substances Control Act (TSCA) Chemical Substances Inventory (July 2016)

Hydrogen sulfide (H₂S)

Butane

Propane

Benzene

Pentane

Hexane

NFPA 704 Rating:

Flammability:4, Instability/Reactivity:0, Health:4

16. OTHER INFORMATION

Guide to Abbreviations: 15min = 15 minutes; ACGIH = American Conference of Governmental Hygienists; C = Ceiling; CAS = Chemical Abstracts Service Registry; CEPA = Canadian Environmental Protection Act; CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act; DOT = Department of Transport; EMS = Environmental Management System; ERG = Emergency Response Guide IARC = International Agency for Research on Cancer; ICAO/IATA = International Civil Aviation Organization/International Air Transport Association; IMDG = International Marine Dangerous Goods; GHS = Globally Harmonized System of Classification and Labeling of Chemicals; lbs = pounds; mg/L = milligrams per litre; OEL = Occupational Exposure Limit; OSHA = Occupational Safety and Health Administration; PEL = Permissible Exposure Limit; PG = Packing Group; PPE = Personal Protective Equipment; SDS = Safety Data Sheet; Skin = danger of skin absorption; SARA = Superfund Amendments and Reauthorization Act; STEL = Short Term Exposure Limit; TDG = Transportation of Dangerous Goods; TLV = Threshold Limit Value; TSCA = Toxic Substances Control Act; TWA = Time-Weighted Average; TPQ = Threshold Planning Quantity; w/w = weight per weight; WHMIS = Workplace Hazardous Materials Information System

Date of preparation is noted in the footer of this document.