

Appendix 15: Material Safety Data Sheets



Safety Data Sheet




Petroleum crude oil

1. Identification

GHS product identifier: Petroleum crude oil	Version #: 01
Synonyms: Oil Crude Crude oil	Issue date: 07/31/2013
	Revision date: 07/31/2016
	Supersedes date: Previous to 07/31/2013
CAS #: Mixture	
Recommended use: Product produced at Encana well sites for sale.	
Recommended restrictions: Use in accordance with this SDS.	
Manufacturer: Encana Oil & Gas (USA) Inc. 370 17 th Street, Suite 1700 Denver, CO 80202	
Emergency phone #: 866-244-0062 911	Email: SDS@encana.com

2. Hazard identification

GHS classification & label elements

Signal word: Warning			
Type of Hazard		Category	Hazard Symbol
Physical Hazards	Flammable liquids	2	
Health Hazards	Skin corrosion/irritation Germ cell mutagenicity Carcinogenicity Reproductive toxicity Specific target organ toxicity Single exposure, narcotic effects Aspiration hazard	2 1B 1B 2 3 NA 1	
Environmental Hazards	Hazardous to aquatic environment, long-term hazard	2	

Hazard statement

- Highly flammable liquid and vapor.
- May be fatal if swallowed and enters airways.
- Causes skin irritation.
- May cause drowsiness or dizziness.
- May cause cancer.
- May cause genetic defects.
- Suspected of damaging fertility.
- Suspected of damaging a fetus.

Precautionary statement

Prevention:

- Keep away from heat/sparks/open flames/hot surfaces.
- No smoking.
- Keep container tightly closed.
- Use personal protective equipment to prevent contact as determined by assessing hazards and likely routes of exposure.
- Avoid breathing gas/mist/vapors/spray—use only outdoors or in a well-ventilated area.
- Do not handle until all safety precautions have been read and understood.
- Wash hands thoroughly after handling.

Response:

- Take all contaminated clothing off immediately.
- Rinse skin with water / shower.
- Wash with plenty of water.
- If skin irritation occurs, get medical advice/attention.
- Wash contaminated clothing before reuse.
- If exposed or concerned, get medical advice/attention.
- If inhaled, remove person to fresh air and keep comfortable for breathing.
- If ingested, immediately call a poison center/doctor. Do not induce vomiting.

Storage:

- Store in a well-ventilated place. Keep cool. Store locked up.

Disposal:

- Dispose of contents/container in accordance with local/regional/national/international regulations.

Specific hazard:

- Breathing of high vapor concentrations may cause dizziness, light-headedness, headache, nausea, and loss of coordination.
- Continued inhalation may result in unconsciousness.
- Prolonged or repeated contact with skin may cause redness, itching, irritation, eczema/chapping, and oil acne.

- Prolonged and repeated contact with the product may cause skin cancer.
- May cause damage to the liver.
- Components of the product may be absorbed into the body through the skin.
- Droplets of the product aspirated into the lungs through ingestion or vomiting may cause a serious chemical pneumonia.
- Material will float and can be re-ignited on surface of water.

Hazards not otherwise classified:

- None.

3. Composition / information on ingredients

Components	Common Synonyms	CAS #	Percent (1)
Decane (and heavier hydrocarbons)		124-18-5, etc.	<80W
Octane		111-65-9	<10W
Butane		106-97-8	<5V
Heptane		142-82-5	<5W
Nonane		111-84-2	<5W
Pentane		109-66-0	<5W
n-Hexane		110-54-3	<5W
Toluene		108-88-3	<1W
Xylenes		95-47-6	<1W
Benzene		71-43-2	<0.1W

Notes: V=volume, W=weight. (1) All concentrations are in percent by weight unless ingredient is a gas. Gas concentrations are listed as percent by volume.

4. First aid measures

First aid procedures

Inhalation:

- Move to fresh air.
- If breathing is difficult, give oxygen.
- Get medical attention if discomfort develops or persists.

Skin contact:

- Immediately remove contaminated clothing.
- Wash with soap and water.
- Continue to rinse for up to 15 minutes.
- In case of rashes, wounds, or other skin disorders, seek medical attention and bring along this SDS.

Eye contact:

- Remove any contact lenses and open eyelids wide apart.
- Immediately flush with plenty of water for up to 15 minutes.
- Get medical attention if irritation develops or persists.

Ingestion:

- Immediately rinse mouth and drink plenty of water or milk.
- Keep person under observation.
- Do not induce vomiting.
- If vomiting occurs, keep head low.
- Transport immediately to hospital and take this SDS.
- Never give anything by mouth to an unconscious person.

**Most important symptoms
(effects acute & delayed)**

- Irritation of eyes and mucous membranes.
- Skin irritation.
- Dermatitis.
- Ingestion may cause irritation and malaise.
- Droplets of the product aspirated into the lungs through ingestion or vomiting may cause a serious chemical pneumonia.

Notes to physician

Treat symptomatically. The effects might be delayed.

General advice

Get medical attention if any discomfort develops.

5. Fire-fighting measures

Flammable properties

- This is a highly flammable liquid and vapor.
- Explosive vapor/air mixtures may be formed even at normal room temperatures.
- See Sections 9 and 10 for physical/chemical and stability/reactive properties.
- NFPA: Health: 2, Flammability: 2, Instability: 0.

Extinguishing media

Suitable	Do not use
<ul style="list-style-type: none">▪ Dry chemical▪ Carbone dioxide (CO₂)▪ Sand▪ Earth▪ Water spray <i>or</i>▪ Regular foam	<ul style="list-style-type: none">▪ Water jet, which will spread the fire▪ Using foam and water on the same surface; water destroys foam.

Protection of fire-fighters

Specific hazards arising from product	Protective equipment and precautions
<ul style="list-style-type: none">▪ Thermal decomposition may produce smoke and lower-molecular-weight organic compounds, whose composition have not been characterized.▪ Sulfur oxides (SO_x).▪ Nitrogen oxides (NO_x).	<ul style="list-style-type: none">▪ Self-contained breathing apparatus (SCBA) and full protective clothing must be worn when fighting fire in an enclosed or inadequately ventilated area.

Fire-fighting equipment / instructions

- Move containers of product from fire area if you can do it without risk.
- Use water spray to cool unopened containers.
- Cool containers with flooding quantities of water until well after fire is out.

6. Accidental release measures

Personal precautions

- Stay upwind.
- Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area).
- Avoid contact with skin.
- Wear suitable protective clothing, gloves, and eye/face protection.

Environmental precautions

- Prevent spreading over a wide area (e.g., by using containment or oil barriers).
- Do not contaminate water.
- Contact local authorities in case of spillage to drain / aquatic environment.

Methods of containment

- Stop the flow of material, if this is without risk.
- Dike far ahead of spill for later disposal.

Methods for cleaning up

- Remove sources of ignition.
- Beware of the explosion danger.
- Small spills: absorb spillage with non-combustible and absorbent material.
- Large spills: remove with vacuum trucks or pump to storage/salvage vessels.
- Use a non-combustible material, such as vermiculite, sand, or earth, to soak up the product and place into a container for later disposal.
- Ensure that waste and contaminated materials are collected and removed from the work area as soon as possible in a suitably labeled container.
- Wash area with soap and water.
- If necessary dike the product with dry earth, sand, or similar non-combustible materials.

7. Handling and storage

Safe handling precautions

- The product is highly flammable. Explosive vapor/air mixtures may be formed even at normal room temperatures.
- Restrict access to the work area to only the people handling the product.
- Should be handled in closed systems, if possible.
- Avoid contact with eyes, skin, and clothing.
- Avoid inhalation of vapors.
- Wear appropriate personal protective equipment.
- Ground container and transfer equipment to eliminate static electric sparks.
- Vapors are heavier than air and may travel along the floor and in the bottom of containers.
- Immediately change contaminated clothes.
- Do not eat, drink, or smoke when using the product.
- Observe good hygiene practices.
- HMIS®: Health: 2, Flammability: 2, Physical hazards: 0.

Conditions for safe storage including incompatibilities

Follow rules for flammable liquids.

- Keep away from heat, sparks, and open flame.
- Keep in a cool, well-ventilated place.
- Keep away from food, drink, and animal feeding areas and materials.
- Store away from incompatible materials: strong acids and strong oxidizing agents (Section 10).

8. Exposure controls / personal protection

Occupational exposure limits

Components	Limit Type	OSHA PEL	ACGIH TLV	NIOSH REL
Heptane (CAS 142-82-5)	STEL	None	500 ppm	440 ppm
	TWA	500 ppm	400 ppm	85 ppm
n-Hexane (CAS 110-54-3)	TWA	500 ppm	50 ppm	50 ppm
	STEL	375 ppm	None	385 ppm (Ceiling)
Octane (CAS 111-65-9)	TWA	500 ppm	300 ppm	75 ppm
	STEL	1000 ppm	600 ppm	610 ppm
Pentane (CAS 109-66-0)	TWA	1000 ppm	600 ppm	120 ppm
	STEL	None	200 ppm	200 ppm
Nonane (CAS 111-84-2)	TWA	None	200 ppm	200 ppm
Xylenes	STEL	None	150 ppm	150 ppm

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Components	Limit Type	OSHA PEL	ACGIH TLV	NIOSH REL
(CAS 95-47-6)	TWA	100 ppm	100 ppm	100 ppm
Toluene (1)	STEL	300 ppm	None	150 ppm
CAS (108-88-3)	TWA	200 ppm	20 ppm	100 ppm
Benzene (1)	STEL	5 ppm	2.5 ppm	1 ppm
(CAS 71-43-2)	TWA	1 ppm	0.5 ppm	0.1 ppm
Decane				
(CAS 124-18-5)		None	None	None
Butane				
(CAS 106-97-8)	TWA	None	None	800 ppm

Notes: STEL=short-term exposure limit; PEL=permissible exposure limit; ppm=parts per million;

REL=recommended exposure limit; TVL=threshold limit value; TWA=time-weighted average.

(1) Limits contained in 29 CFR 1910.1000 Z-2 may apply. (2) All values are based on 2012 standards.

Recommended monitoring procedures

Follow standard monitoring procedures per established OSHA or NIOSH methods. In the absence of occupational exposure limits for this product, it is recommended that the above-mentioned limits are followed.

Engineering controls

- Provide adequate ventilation and minimize the risk of inhalation of vapors and oil mist.
- Provide easy access to water supply and eye wash facilities.
- Use explosion-proof equipment.

Personal protective equipment

Eye/face protection:

- Wear chemical-resistant goggles / face shield.

Skin protection:

- Anti-static, flame-resistant, and chemical resistant protective clothing is recommended.
- Wear protective gloves, such as nitrile or butyl rubber.
- Be aware that the liquid may penetrate gloves over time; frequent glove change is advised. Suitable gloves can be recommended by the glove supplier.

Respiratory protection:

- An approved respirator must be worn 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).
- Respirators do not protect against potentially explosive environments.
- Industrial hygienists should monitor personal exposure to determine the need for a respirator.

General hygiene

- When using, do not eat, drink, or smoke.
- Wash hands after handling.

- Launder contaminated clothing before reuse.
- Working clothes should be kept separately from other clothes.
- Handle in accordance with good hygiene and safety practices.
- Observe any medical surveillance requirements.

9. Physical and chemical properties

Physical state	Liquid
Form	Liquid
Color	Dark brown, black, with green or yellow tint
Odor	Hydrocarbon
Odor threshold	Not available
pH	Not available
Melting point / freezing point	Not available
Initial boiling point	Not available
Boiling range	Not available
Flash point	38°C (100°F)
Evaporation rate	Not available
Flammability (solid, gas)	Not applicable
Lower explosive limit (by volume)	0.8%
Upper explosive limit by volume	8.0%
Vapor pressure	0.5–200 mmHg at 20°C
Vapor density	2.5–5.0
Relative density	0.7–0.95
Solubility(ies)	Insoluble
Partition coefficient (n-octanol/water)	2.1–5.5
Auto-ignition temperature	>260°C
Decomposition temperature	Not available
Viscosity	Not available
Explosive properties	Not available
Oxidizing properties	Not available

10. Stability and reactivity

Reactivity

The product is stable and non-reactive under normal conditions of use, storage, and transport.

Chemical stability	Stable at normal conditions.
Possibility of hazardous reactions	Hazardous polymerization does not occur.
Conditions to avoid	<ul style="list-style-type: none">▪ Heat▪ Sparks▪ Flames▪ Elevated temperatures▪ Contact with incompatible materials
Incompatible materials	<ul style="list-style-type: none">▪ Strong acids▪ Strong oxidizing agents
Hazardous decomposition products	Thermal decomposition or combustion may liberate carbon oxides and other toxic gases or vapors.

11. Toxicological information

Routes of exposure	<p>Ingestion:</p> <ul style="list-style-type: none">▪ Ingestion may cause irritation and malaise. <p>Inhalation:</p> <ul style="list-style-type: none">▪ Breathing of high concentrations of vapors may cause dizziness, light-headedness, headache, nausea, and loss of coordination.▪ Continued inhalation may result in unconsciousness. <p>Absorption:</p> <ul style="list-style-type: none">▪ May be absorbed through skin or eyes.
Toxicological effects	<p>Occupational exposures to the substance or mixture may cause adverse effects.</p> <p>Acute effects:</p> <ul style="list-style-type: none">▪ Human evidence indicates that the product has very low acute oral, dermal, or inhalation toxicity.▪ However, it can produce severe injury if taken into the lung as a liquid, and there may be profound central nervous system depression following prolonged exposure to high levels of vapor.▪ Breathing high concentrations may cause dizziness, light-headedness, headache, nausea, and loss of coordination.▪ Continued inhalation may result in unconsciousness.▪ Irritant effect on skin: may irritate and cause stomach pain, vomiting,

diarrhea, and nausea.

Chronic effects:

- Prolonged or repeated contact with skin may cause redness, itching, irritation, eczema, chapping, and oil acne.
- May cause damage to the liver, kidney, and central nervous system.
- Contains n-hexane, which can cause prolonged damage to the peripheral nervous system.

**Skin corrosion/
irritation**

- Causes skin irritation.
- Repeated exposure may cause skin dryness or cracking.
- May be absorbed through the skin.

Eye irritation

- May cause eye irritation on direct contact.

Sensitization

- May cause eczema-like skin disorders (dermatitis).
- May cause photosensitization, evidenced by repeated occurrence of dermatitis or rash on exposure to sunlight.

Local effects

- Irritating to eyes and skin.
- Dermatitis.
- Irritation of eyes and mucous membranes.
- Irritation of nose and throat.

Mutagenicity

May cause genetic defects.

Carcinogenicity

May cause cancer.

Benzene

Agency	Classification
ACGIH	A1 Confirmed human carcinogen.
IARC	1 Carcinogenic to humans.
US NTP Report on Carcinogens	Known To Be Human Carcinogen.
US OSHA Specifically Regulated Substances (29 CFR 1910.101-1050)	Cancer hazard.

Toluene and xylenes

ACGIH	A4 Not classifiable as a human carcinogen.
IARC	3 Not classifiable as to carcinogenicity to humans.

**Reproductive
toxicity**

Suspected of damaging fertility or the fetus.

Symptoms

- Skin irritation, dermatitis.
- Irritation of eyes and mucus membranes.
- Irritation of nose and throat.

Specific target organ toxicity—single exposure Not available.

Specific target organ toxicity Not available.

Toxicity Data

Components	Species	Concentration
Benzene (CAS 71-43-2) Acute <i>Oral</i> LD50	Rate	930 mg/kg
Butane (CAS 106-97-8) Acute <i>Inhalation</i> LC50	Rat	658 mg/L, 4 Hours
Decane (CAS 124-18-5) Acute <i>Inhalation</i> LC50	Mouse	72.3 mg/L, 2 Hours
Heptane (CAS 142-82-5) Acute <i>Inhalation</i> LC50	Rat	103 mg/L, 4 Hours
Nonane (CAS 111-84-2) Acute <i>Inhalation</i> LC50	Rat	3200 mg/L, 4 Hours
Octane (CAS 111-65-9) Acute <i>Inhalation</i> LC50	Rat	118 mg/L, 4 Hours
Pentane (CAS 109-66-0) Acute <i>Inhalation</i> LC50	Rat	364 mg/L, 4 Hours

Notes: **LC50**=half maximal lethal concentration; **LD50**=Half maximal lethal dose; **mg/kg**=milligrams/kilogram; **mg/L**=milligrams per liter.

12. Ecological information

Ecotoxicological data

Components	Dose	Species	Test Results
Benzene (CAS 71-43-2)			
Crustacea	EC50	Water flea (<i>Daphnia magna</i>)	8.76–15.6 mg/L, 48h
Fish	LC50	Rainbow trout, donaldson trout (<i>Oncorhynchus mykiss</i>)	5 mg/L, 96h
Decane (CAS 124-18-5)			
Fish	LC50	Sheepshead minnow (<i>Cyprinodon variegatus</i>)	>500 mg/L, 96h
n-Hexane (CAS 110-54-3)			
Fish	LC50	Fathead minnow (<i>Pimephales promelas</i>)	2.101–2.981 mg/L, 96h
Pentane (CAS 109-66-0)			
Crustacea	EC50	Daphnia (not specified)	2.3 mg/L, 48h
Fish	LC50	Fish (not specified)	3.1 mg/L, 96h
Toluene (CAS 108-88-3)			
Crustacea	EC50	Water flea (<i>Daphnia magna</i>)	5.46–9.83 mg/L, 48h
Fish	LC50	Coho salmon, silver salmon (<i>Oncorhynchus kisutch</i>)	5.5 mg/L, 96h
Xylenes (CAS 95-47-6)			
Crustacea	EC50	Water flea (<i>Daphnia magna</i>)	0.78–2.51 mg/L, 48h
Fish	LC50	Rainbow trout, donaldson trout (<i>Oncorhynchus mykiss</i>)	5.59–11.6 mg/L, 96h

Notes: EC50=half maximal effective concentration; h=hours; LC50=half maximal lethal concentration; mg/L=,milligrams per liter.

Ecotoxicity Oil spills are generally hazardous to the environment.

Environmental effects This product contains volatile organic compounds, which have a potential to create photochemical ozone.

Aquatic toxicity Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Bioaccumulative potential Has the potential to bioaccumulate.

Partition coefficient (n/octanol/water [log K_{ow}])

Benzene (CAS 71-43-2)	2.13
Toluene (CAS 108-88-3)	2.73
Butane (CAS 106-97-8)	2.89

Xylenes (CAS 95-47-6)	3.12
Pentane (CAS 109-66-0)	3.39
n-Hexane (CAS 110-54-3)	3.9
Heptane (CAS 142-82-5)	4.66
Decane (CAS 124-18-5)	5.01
Octane (CAS 111-65-9)	5.18
Nonane (CAS 111-84-2)	5.46

Mobility in soil

In general, crude oil has a low mobility in soil. However, the components in crude oil have varying degrees of mobility:

- Decane, nonane, octane, heptane, and butane have high koc values and are immobile or have low mobility in soil.
- Xylenes, toluene, n-Hexane, pentane, and benzene have a low koc value and are considered to have moderate to high mobility in soil.

Soil Organic Carbon-Water Partitioning Coefficient (K_{oc})

Benzene (CAS 71-43-2)	79
Pentane (CAS 109-66-0)	80
n-Hexane (CAS 110-54-3)	130
Toluene (CAS 108-88-3)	37–178
Xylenes (CAS 95-47-6)	39–365
Butane (CAS 106-97-8)	900
Heptane (CAS 142-82-5)	8,200
Octane (CAS 111-65-9)	16,000
Nonane (CAS 111-84-2)	28,000
Decane (CAS 124-18-5)	22,200–42,700

Water solubility

The product is insoluble in water. It will spread on the water surface or the saturated zone. However, as the product degrades, some of the components will dissolve in water, especially the aromatic fractions (e.g., benzene and toluene). The alkanes (e.g., octane, nonane, and decane) are considered hydrophobic and to have a low solubility.

Other adverse effects

Toxic to aquatic life with long-lasting effects. The product contains volatile organic compounds which have the potential to create photochemical ozone. Oil spills are generally hazardous to the environment.

13. Disposal considerations

Disposal methods

Dispose in accordance with all applicable regulations. This material and its container must be disposed of as hazardous waste.

Waste from residues/unused products

Dispose of in accordance with regulations. Follow all applicable EPA requirements for disposal of waste.

Hazardous waste code US RCRA Hazardous Waste U List: Reference

- Benzene (CAS 71-43-2): U019
- Toluene (CAS 108-88-3): U220
- Xylene (CAS 95-47-6): U239

Contaminated packaging Since emptied containers may retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

UN number	UN1267
UN proper shipping name	Petroleum crude oil
Transport hazard class(es)	3
Packing group	III
Environmental hazards: Marine pollutant	Yes
Labels required	3
Special provisions	144, 357, IB2, T4, TP1, TP8
Packaging exceptions	150
Packaging non bulk	202
Packaging bulk	242
Special precautions for user	Read safety instructions, SDS, and emergency procedures before handling.

IATA

UN number	UN1267
UN proper shipping name	Petroleum crude oil
Transport hazard class(es)	3
Packaging group	III
Environmental hazards	Yes
Labels required	3
ERG Code	3L
Special precautions for user	Read safety instructions, SDS, and emergency procedures before handling.

IMDG

UN number	UN1267
UN proper shipping name	Petroleum Crude Oil
Transport hazard class(es)	3
Packaging group	III
Environmental hazards: Marine pollutant	Yes
Labels required	3
EmS	F-E, S-E
Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	Not applicable. However, this product is a liquid and, if transported in bulk, is covered under MARPOL73/78, Annex I.
General information	This product is covered under the scope of MARPOL Annex I.

15. Regulatory information

US federal regulations

This product is a Hazardous Chemical, as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200. All components are on the U.S. EPA TSCA Inventory List.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Benzene (CAS 71-43-2) 29 CFR 1910.1028

CERCLA (Superfund) reportable quantity

Benzene (CAS 71-43-2)	10 lbs
Butane (CAS 106-97-8)	not listed
Decane (CAS 124-18-5)	not listed
Heptane (CAS 142-82-5)	not listed
n-Hexane (CAS 110-54-3)	5,000 lbs
Nonane (CAS 111-84-2)	not listed
Octane (CAS 111-65-9)	not listed
Pentane (CAS 109-66-0)	not listed
Toluene (CAS 108-88-3)	1,000 lbs
Xylenes (CAS 95-47-6)	1,000 lbs

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

- Immediate Hazard: Yes
- Delayed Hazard: Yes
- Fire Hazard: Yes
- Pressure Hazard: No
- Reactivity Hazard: No
- SARA 302 Extremely hazardous substance: No

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Benzene (CAS 71-43-2)
n-Hexane (CAS 110-54-3)
Toluene (CAS 108-88-3)
Xylenes (CAS 95-47-6)

International Inventories

Country(s) or region	Inventory name	On inventory (Yes/No) *
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
US & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

Notes: *A Yes indicates this product complies with the inventory requirements administered by the governing country(s).

16. Other information, including date of preparation or last version

Issue date 07/31/2013

Revision date: 07/31/2016

Version # 01

References IARC Monographs. Overall Evaluation of Carcinogenicity (Volumes 1–102)
IUCLID. Hazardous Substances Data Bank.

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.



Safety Data Sheet


Natural gas, sweet

1. Identification

GHS product identifier: Natural gas, sweet	Version #: 01
Synonyms: Compressed natural gas CNG	Issue date: 07/31/2013
	Revision date: 07/31/2016
	Supersedes date: Previous to 07/31/2013
CAS #: Mixture	
Recommended use: Product produced at Encana well sites or processing facilities for processing or sale.	
Recommended restrictions: Use in accordance with this SDS.	
Manufacturer: Encana Oil & Gas (USA) Inc. 370 17th Street, Suite 1700 Denver, CO 80202	
Emergency phone #: 866-244-0062 911	Email: SDS@encana.com

2. Hazard identification

GHS classification & label elements

Signal word: Danger			
Type of Hazard		Category	Hazard Symbol
Physical Hazards	Flammable gasses Compressed gas	1 NA	
Health Hazards	None	None	None
Environmental Hazards	None	None	None

Hazard statement

- Extremely flammable gas.
- Contains gas under pressure; may explode if heated.

Precautionary statement

Prevention:

- Keep away from heat, sparks, open flames, and hot surfaces.
- No smoking.

Response:

- Leaking gas fire: do not extinguish unless leak can be stopped safely.
- Eliminate all ignition sources if safe to do so.

Storage:

- Protect from sunlight.
- Storage in a well-ventilated place.

Disposal:

- Dispose of waste and residues in accordance with local authority requirements.

Hazards not otherwise classified:

None.

3. Composition / information on ingredients

Components	Common Synonyms	CAS #	Percent (by volume)
Methane		74-82-8	55–95
Ethane		74-84-0	<20
Propane		74-98-6	<10
Butane		106-97-8	<3.5
Isobutane		75-28-5	<2
2-Methylbutane	Isopentane	78-78-4	<1.5
Ethyl mercaptan	Ethanethiol	75-08-1	<0.01

Notes: Ethyl mercaptan may be present in the product as an odorant.

4. First aid measures

First aid procedures

Inhalation:

- Remove victim to fresh air.
- If not breathing, clear airway and start mouth-to-mouth artificial respiration or use a bag-mask respirator.
- Get immediate medical attention.
- If the victim is having trouble breathing, transport to medical care and, if available, give supplemental oxygen.

Skin contact:

- Frostbite: do not remove clothes, but flush with copious amounts of lukewarm water.
- Call an ambulance and continue to flush during transportation to hospital.

Eye contact:

- Frostbite: immediately and briefly flush with lukewarm, gently flowing water.
- Cover both eyes with a sterile dressing.
- Immediately obtain medical attention.

Ingestion:

- This material is a gas at normal atmospheric conditions; ingestion is unlikely.

Most important symptoms/effects (acute & delayed)

- Narcosis
- Behavioral changes
- Decrease in motor functions

Indication of immediate medical attention and special treatment

- Inhalation overexposure can produce toxic effects.
- Monitor for respiratory distress.
- If cough or difficulty in breathing develops, evaluate for upper respiratory tract inflammation, bronchitis, and pneumonitis.
- Administer supplemental oxygen with assisted ventilation, as required.

Notes to physician

- This material (or a component) may sensitize the myocardium to the effects of sympathomimetic amines.
- Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in individuals exposed to this material.
- Administration of sympathomimetic drugs should be avoided.

General information

Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

5. Fire-fighting measures

Flammable properties

- Extremely flammable gas.
- Contains gas under pressure; may explode if heated or under fire.
- See Sections 9 and 10 for physical/chemical and stability/reactive properties.
- NFPA: Health: 1, Flammability: 4, Instability: 0.

Extinguishing media

Suitable	Do not use
<ul style="list-style-type: none">▪ Carbon dioxide	<ul style="list-style-type: none">▪ None

Suitable	Do not use
<ul style="list-style-type: none"> Dry powder <i>or</i> Water fog 	

Protection of fire-fighters

Specific hazards arising from the chemical	Protective equipment and precautions
<ul style="list-style-type: none"> During fire, gases hazardous to health may be formed. 	<ul style="list-style-type: none"> Fire-fighters should wear appropriate protective equipment and a self-contained breathing apparatus (SCBA) with full face-piece operated in positive pressure mode if fighting fire in poorly ventilated area. Use approved gas detectors in confined spaces. Gas cylinders and pressure vessels can burst violently when heated, due to excess pressure build-up.

Fire-fighting equipment / instructions

- In the event of fire or explosion, do not breathe fumes, evacuate area, and check oxygen content before entering area.
- Remove pressurized gas cylinders from the immediate vicinity.
- Turn leaking cylinder with the leak up to prevent escape of gas in liquid state.
- Stop leak if you can do so without risk.
- Fight fire from a safe distance.
- Water spray should be used to cool gas cylinders and pressure vessels.

6. Accidental release measures

Personal precautions

- Stay upwind.
- Ventilate closed spaces before entering.
- Eliminate all ignition sources (smoking, flares, sparks, or flames) in area.
- Wear suitable protective clothing, gloves, and eye/face protection (See Section 8 of this SDS).
- Vaporization upon release—rapid expansion possible.

Environmental precautions

- Stop leak if possible without any risk.
- Basements and cellars must be evacuated.
- Contact local authorities in case of spillage to drain / aquatic environment.

Methods of containment

- Stop leak if possible without risk.
- Prevent entry of natural gas into waterway, sewers, or confined areas.

Methods for cleaning up

- Ventilate well, stop flow of gas if possible.
- Remove ignition sources.
- Do not enter confined spaces, such as sewers, due to explosion risk.

7. Handling and storage

Handling

- Avoid contact with eyes, skin, and clothing.
- Avoid breathing gas.
- This material is an asphyxiant and can displace oxygen necessary for breathing.
- Wear appropriate personal protective equipment.
- The product is extremely flammable.
- HMIS®: Health: 1, Flammability: 4, Physical hazards: 0.

Storage and incompatibilities

- May form explosive mixtures in presence of oxidizing substances (e.g., gas and dust).
- Keep in cool, well-ventilated area.
- Avoid heat, sparks, open flames, and other ignition sources.
- Ground container and transfer equipment to eliminate static electric sparks.
- Store away from incompatible materials: oxidizing agents (Section 10).
- Store cylinders of product in accordance with regulatory requirements and recognized best practices.

8. Exposure controls / personal protection

Occupational exposure limits

Components	Limit Type	OSHA PEL	ACGIH TLV	NIOSH REL
Methane (CAS 74-82-8)	TWA	None	1,000 ppm	None
Ethane (CAS 74-84-0)	TWA	None	1,000 ppm	None
Propane (CAS 74-98-6)	TWA	1,000 ppm	1,000 ppm	1,000 ppm
Butane (CAS 106-97-8)	TWA	None	1,000 ppm	800 ppm
Isobutane (CAS 75-28-5)	TWA	None	1000 ppm	800 ppm
2-Methylbutane (CAS 78-78-4)	TWA	None	600 ppm	None
Ethyl mercaptan (CAS 75-08-1)	Ceiling	10 ppm	None	0.5 ppm
	TWA	None	0.5 ppm	None

Notes: PEL=permissible exposure limit; ppm=parts per million; REL=recommended exposure limit; TVL=threshold limit value; TWA=time-weighted average. All values are based on 2012 standards.

Engineering controls

- Explosion proof exhaust ventilation should be used.
- Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended occupational exposure limits.
- Provide adequate ventilation and minimize the risk of inhalation of gas.

Personal protective equipment

Eye/face protection:

- Risk of contact: wear goggles/face shield.

Skin protection:

- Risk of contact: wear cold insulating gloves.
- Suitable gloves can be recommended by the glove supplier.
- Anti-static and flame-retardant protective clothing is recommended.

Respiratory protection:

- Use appropriate respiratory protection if ventilation is inadequate.
- Industrial hygienists should monitor personal exposure to determine the need for a respirator.

General hygiene

- Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, or smoking.
- Routinely wash work clothing and protective equipment to remove contaminants.
- Observe any medical surveillance requirements.

9. Physical and chemical properties

Physical state	Gas
Form	Not available
Color	Clear, colorless
Odor	Odorless in raw, unprocessed form. Sales gas may be odorized with ethyl mercaptan to aid in leak detection. Gas with added ethyl mercaptan has the odor of rotten eggs.
Odor threshold	Not available
pH	Not available
Melting point / freezing point	-296.7°F (-182.6 °C)
Initial boiling point	Not available
Boiling range	Not available
Flash point	<238°F (<114.4 °C)
Evaporation rate	Not available
Flammability (solid, gas)	Not applicable
Lower explosive limit (by volume)	2%
Upper explosive limit by volume	15%

Vapor pressure	300–600 psi in pipeline
Vapor density	0.5–0.94
Relative density	Not available
Solubility(ies)	Not available
Partition coefficient (n-octanol/water)	1.09
Auto-ignition temperature	Not available
Decomposition temperature	Not available
Viscosity	Not available
Dynamic viscosity temperature	930.2°F (499°C)

10. Stability and reactivity

Reactivity	The product is non-reactive under normal conditions of use, storage, and transport.
Chemical stability	Stable under normal temperature conditions. Heat may cause the containers to explode.
Possibility of hazardous reactions	Hazardous polymerization does not occur.
Conditions to avoid	Heat, sparks, and flames
Incompatible materials	Strong oxidizing agents
Hazardous decomposition products	<ul style="list-style-type: none"> Carbon dioxide (CO₂) Carbon monoxide

11. Toxicological information

Toxicological data

Components	Limit Type	Test Results
Methane (CAS 74-82-8)		
Acute Inhalation LC50	Mouse	326 mg/m ³ , 2 hours
Propane (CAS 74-98-6)		
Acute Inhalation LC50	Rat	>1,442.847 mg/L, 15 minutes

Butane (CAS 106-97-8)

Acute
Inhalation
LC50

Rat

658 mg/L, 4 hours

2-Methylbutane (CAS 78-78-4)

Acute
Inhalation
LC50

Mouse

450 mg/L, 2 hours

Notes: LC50=half maximal lethal concentration; **mg/L**=milligrams per liter;
mg/m³=milligrams per cubic meter.

Routes of exposure

Ingestion:

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

Inhalation:

- Suffocation (asphyxiant) hazard—if allowed to accumulate to concentrations that reduce oxygen below safe breathing levels.

Skin contact:

- Contact with compressed gas can cause damage (frostbite) due to rapid evaporative cooling.

Eye contact:

- Contact with liquefied gas can cause damage (frostbite) due to rapid evaporative cooling.
- Permanent eye damage or blindness could result.

Toxicological effects

- Narcosis.
- Behavioral changes.
- Decrease in motor or central nervous system functions.

Acute toxicity:

- Contact with compressed gas can cause damage (frostbite) due to rapid evaporative cooling.
- Asphyxiants displace oxygen in the air and can cause symptoms of oxygen deprivation (asphyxiation).

Chronic effects:

- Prolonged or repeated exposure to high concentrations may affect the central nervous system.

**Skin corrosion/
irritation**

Contact with liquefied gas may cause frostbite and tissue damage.

**Serious eye damage
/ eye irritation**

Not classified.

**Respiratory
sensitization**

Not classified.

Skin sensitization

Not a skin sensitizer.

Mutagenicity	Not classified.
Carcinogenicity	Not classified.
Reproductive toxicity	Not classified.
Specific target organ toxicity—single exposure	Not classified.
Specific target organ toxicity—repeated exposure	Not classified.
Aspiration hazard	Suffocation (asphyxiant) hazard if allowed to accumulate to concentrations that reduce oxygen below safe breathing levels.
Other effects	<p>Effects to components of natural gas:</p> <ul style="list-style-type: none">▪ Propane. Studies in laboratory animals indicate exposure to extremely high levels of propane (1–10 vol-% in air) may cause cardiac arrhythmias (irregular heartbeats), which can be serious or fatal.▪ Butanes. Studies in laboratory animals indicate exposure to extremely high levels of butanes (1–10 or higher vol-% in air) may cause cardiac arrhythmias (irregular heartbeats), which can be serious or fatal.▪ Pentanes. Studies of pentanes isomers in laboratory animals indicate exposure to extremely high levels (roughly 10 vol%) may cause cardiac arrhythmias (irregular heartbeats), which can be serious or fatal. <p>Exposure to this material may cause adverse effects or damage to the following organ systems:</p> <ul style="list-style-type: none">▪ Central nervous system▪ Heart▪ Eyes▪ Skin

12. Ecological information

Ecotoxicity	Not expected to be harmful to aquatic organisms.
Environmental effects	Not available.
Persistence and degradability	The product is readily biodegradable.
Bioaccumulative potential	The product is not expected to bioaccumulate.

Partition coefficient (n/octanol/water [$\log K_{ow}$])

Encana Natural Gas	1.09
2-Methylbutane (CAS 78-78-4)	2.3
Butane (CAS 106-97-8)	2.89
Ethane (CAS 74-84-0)	1.81
Isobutane (CAS 75-28-5)	2.76
Methane (CAS 74-82-8)	1.09
Propane (CAS 74-98-6)	2.36

Mobility in soil

This product is a gas, which, if spilled, preferentially volatilizes into air instead of adsorbing to soil. However, gases can dissolve in water at the spill site and move through soil.

Most of the components of natural gas have a low mobility in soil. Isobutane and methane have a high mobility in soil. Methane, as a gas, is also mobile in soil.

Soil Organic Carbon-Water Partitioning Coefficient (K_{oc})

Isobutane (CAS 75-28-5)	35
Methane (CAS 74-82-8)	90
Ethane (CAS 74-84-0)	230
Propane (CAS 74-98-6)	460
2-Methylbutane (CAS 78-78-4)	520
Butane (CAS 106-97-8)	900
Encana Natural Gas	NV

Water solubility

This product is a gas, which, if spilled, preferentially volatilizes into air instead of dissolving in water; however, the components of the product are water soluble.

Other adverse effects

This product contains volatile organic compounds, which have the potential to create photochemical ozone.

13. Disposal considerations

Disposal methods

In its present state, this product is not a hazardous waste when discarded or disposed of according to Federal regulations (40 CFR 261.4 (b)(4)). Under RCRA, it is the responsibility of the user of the product to determine, at the time of disposal, whether the product meets RCRA criteria for hazardous waste.

Local disposal regulations

Dispose in accordance with all applicable regulations.

Waste from residues/unused products

Dispose of in accordance with regulations.

Hazardous waste code

D001: Waste Flammable material with a flash point <140 °F

Contaminated packaging

Since emptied cylinders may retain product residue, follow label warnings even after cylinder is emptied.

14. Transport information

DOT

UN number	UN1971
UN proper shipping name	Natural gas, compressed with high methane content
Transport hazard class(es)	2.1
Packing group	Not available
Subsidiary class(es)	Not available
Labels required	2.1
Packaging exceptions	306
Packaging non bulk	302
Packaging bulk	302
Special precautions for user	Read safety instructions, SDS, and emergency procedures before handling.

IATA

UN number	UN1971
UN proper shipping name	Natural gas, compressed with high methane content
Transport hazard class(es)	2.1
Subsidiary class(es)	Not available
Packaging group	Not available
Labels required	Not available
ERG Code	10L
Special precautions for user	Read safety instructions, SDS, and emergency procedures before handling.

IMDG

UN number	UN1971
UN proper shipping name	Natural gas, compressed with high methane content
Transport hazard class(es)	2.1
Subsidiary class(es)	Not available
Packaging group	Not available
Labels required	2.1
EmS	F-D, S-U

Special precautions for user	Read safety instructions, SDS, and emergency procedures before handling.
Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	No information available

15. Regulatory information

US federal regulations This product is a Hazardous Chemical, as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

All components are on the U.S. EPA TSCA Inventory List.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D) None

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001–1050) None

CERCLA (Superfund) reportable quantities Not listed

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

- Immediate Hazard: Yes
- Delayed Hazard: Yes
- Fire Hazard: Yes
- Pressure Hazard: No
- Reactivity Hazard: No
- SARA 302 Extremely hazardous substance: No
- SARA 311/312 hazardous chemicals: No

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List Not regulated

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

- 2-Methylbutane (CAS 78-78-4)
- Butane (CAS 106-97-8)
- Ethane (CAS 74-84-0)
- Isobutane (CAS 75-28-5)
- Methane (CAS 74-82-8)
- Propane (CAS 74-98-6)

Safe Drinking Water Act (SDWA) Not regulated.

Drug Enforcement Administration (DEA). List 2, Essential Chemicals (21 CFR 1310.02(b) and Not regulated.

**1310.04(f)(2) and Chemical
Code Number**

**Drug Enforcement
Administration (DEA). List 1
& 2 Exempt Chemical
Mixtures (21 CFR
1310.12(c))** Not regulated

**DEA Exempt Chemical
Mixtures Code Number** Not regulated

**Food and Drug
Administration** Not regulated

International Inventories

Country(s) or region	Inventory name	On inventory (Yes/No) *
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
US & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

Notes: *A Yes indicates this product complies with the inventory requirements administered by the governing country(s).

16. Other information, including date of preparation or last version

Issue date 07/31/2013

Revision date: 07/31/2016

Version # 01

References ACGIH

EPA: Acquire database

NLM: Hazardous Substances Data Base

US. IARC Monographs on Occupational Exposures to Chemical Agents

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.



Safety Data Sheet




Produced water, sweet

1. Identification

GHS product identifier: Produced water, sweet	Version #: 01
Synonyms:	Issue date: 07/31/2013
	Revision date: 07/31/2016
	Supersedes date: Previous to 07/31/2013
CAS #: Mixture	
Recommended use: Product produced at Encana well sites. Includes liquids, except for natural gas condensates generated from a producing well.	
Recommended restrictions: Use in accordance with this SDS.	
Manufacturer: Encana Oil & Gas (USA) Inc. 370 17 th Street, Suite 1700 Denver, CO 80202	
Emergency phone #: 866-244-0062 911	Email: SDS@encana.com

2. Hazard identification

GHS classification & label elements

Signal word: Danger			
Type of Hazard		Category	Hazard Symbol
Physical Hazards	Flammable liquids	3	
Health Hazards	Skin corrosion/irritation Reproductive toxicity	3 2	
Environmental Hazards	Hazardous to the aquatic environment, long-term hazard	2	

Hazard statement

- Causes mild skin irritation.
- Suspected of damaging fertility.
- Toxic to aquatic life with long-lasting effects.

Precautionary statement

Prevention:

- Do not handle until all safety precautions have been read and understood.
- Obtain special instructions before use.
- Keep away from flames and hot surfaces— no smoking.
- Use personal protective equipment to prevent contact, as determined by assessing hazards and likely routes of exposure.
- Wear protective gloves, eye protection, and face protection.
- Avoid release to the environment.

Response:

- In case of fire, use alcohol-resistant foam, carbon dioxide, dry powder, or water fog for extinction.
- If exposed or concerned, get medical advice/attention.
- Collect spillage if safe to do so.

Storage:

- Store in a well-ventilated place.
- Keep cool.
- Store locked up.

Disposal:

- Dispose of contents in accordance with local, regional, national, and international regulations.

Special hazards

- Direct contact with eyes may cause temporary irritation.
- Prolonged contact may cause dryness of the skin.

Hazards not otherwise classified:

- None.

3. Composition / information on ingredients

Components	Common Synonyms	CAS #	Percent (by weight)
Octane		111-65-9	1–<10%
Decane		124-18-5	1–<5%
Heptane		142-82-5	1–<5%
n-Hexane		110-54-3	0.1–<2.5%

4. First aid measures

First aid procedures

Inhalation:

- Move to fresh air.
- Get medical attention if discomfort develops or persists.

Skin contact:

- Remove contaminated clothing.
- Wash with soap and water.
- For rashes, wounds, or other skin disorders, seek medical attention and bring along this SDS.

Eye contact:

- Remove any contact lenses and open eyelids wide apart.
- Immediately flush with plenty of water for up to 15 minutes.
- Get medical attention if irritation or symptoms persists

Ingestion:

- Rinse mouth.
- Never give anything by mouth to an unconscious person.
- Do not induce vomiting unless told to do so by a poison control center or doctor.

Most important symptoms/effects (acute & delayed)

- May cause redness and pain.
- May cause eye irritation on direct contact.

Notes to physician

- Treat symptomatically.
- The effects might be delayed.

General advice

Get medical attention if any discomfort develops.

5. Fire-fighting measures

Flammable properties

- The product is flammable.
- Heating may generate vapors which may form explosive vapor/air mixtures.
- See Sections 9 and 10 for physical/chemical and stability/reactive properties
- NFPA: Health: 1, Flammability: 2, Instability: 0.

Extinguishing media

Suitable	Do not use
<ul style="list-style-type: none">▪ Water spray▪ Fog	<ul style="list-style-type: none">▪ Water jet, which will spread the fire.▪ Simultaneous use of foam and water on the same surface, as water destroys the foam.

Suitable	Do not use
<ul style="list-style-type: none"> Carbon dioxide (CO₂) Dry chemical <i>or</i> Alcohol-resistant foam 	

Protection of fire-fighters

Specific hazards arising from the chemical	Protective equipment and precautions
<ul style="list-style-type: none"> Heating may generate vapors, which may form explosive vapor/air mixtures. 	<ul style="list-style-type: none"> Fire-fighters must wear full protective clothing & a self-contained breathing apparatus (SCBA) when in poorly ventilated area.

Fire-fighting equipment / instructions

- Use standard firefighting procedures and consider the hazards of other involved materials.
- Move containers of product, if possible, from fire area if you can do it without risk.
- Use water spray to cool unopened containers.
- Cool containers with flooding quantities of water until well after fire is out.

6. Accidental release measures

Personal precautions	<ul style="list-style-type: none"> Avoid prolonged and repeated contact. Wear suitable protective clothing; for personal protection, see Section 8 of this SDS.
Environmental precautions	<ul style="list-style-type: none"> Avoid discharge into drains, water courses, or onto the ground.
Methods of containment	<ul style="list-style-type: none"> Do not allow to enter drains, sewers, or watercourses.
Methods for cleaning up	<ul style="list-style-type: none"> Small spills: absorb spillage with suitable absorbent material. Large spills: use a non-combustible material like vermiculite, sand, or earth to soak up the product and place into a container for later disposal. For waste disposal, see Section 13 of this SDS.

7. Handling and storage

Handling	<ul style="list-style-type: none"> Avoid contact with eyes and prolonged or repeated contact with skin. Pregnant women should not work with the product, if there is any risk of exposure. Keep away from heat, spark, open flames, and other sources of ignition. Wash hands after handling and before eating.
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- Observe good hygiene practices.
- HMIS®: Health: 1, Flammability: 2, Physical hazards: 0.

Storage and incompatibilities

- Follow rules for flammable liquids.
- Keep away from heat, sparks, and open flame.
- Keep in a cool, well-ventilated place.
- Keep away from food, drink, and animal feeding materials.
- Keep away from incompatible materials: water reactive materials and strong oxidizing agents (Section 10).
- Store locked up.

8. Exposure controls / personal protection

Occupational exposure limits

Components	Limit Type	OSHA PEL	ACGIH TLV	NIOSH REL
Heptane (CAS 142-82-5)	STEL TWA	None 500 ppm	500 ppm 400 ppm	440 ppm 85 ppm
n-Hexane (CAS 110-54-3)	TWA	500 ppm	50 ppm	50 ppm
Octane (CAS 111-65-9)	STEL TWA	375 ppm 500 ppm	None 300 ppm	385 ppm (Ceiling) 75 ppm

Notes: PEL=permissible exposure limit; ppm=parts per million; REL=recommended exposure limit; TVL=threshold limit value; TWA=time-weighted average. * Limits contained in 29 CFR 1910.1000 Z-2 may apply. All values are based on 2012 standards.

Recommended monitoring

Follow standard monitoring procedures per established OSHA or NIOSH methods.

Engineering controls

- Provide adequate ventilation and minimize the risk of inhalation of vapors.
- Provide easy access to water supply and eye wash facilities.
- Use explosion-proof equipment.

Personal protective equipment

Eye/face protection:

- Risk of contact: wear safety glasses with side shields (or goggles).

Skin protection:

- Risk of contact: wear appropriate chemical resistant clothing to prevent any possibility of skin contact.

Respiratory protection:

- An approved respirator must be worn 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).
- Respirators do not protect against a potentially flammable environment; appropriate precautions must be taken in potentially explosive environments.

- Industrial hygienists should monitor personal exposure to determine the need for a respirator.

General hygiene

- When using, do not eat, drink, or smoke.
- Wash hands after handling.
- Launder contaminated clothing before reuse.
- Private clothes and working clothes should be kept separate.
- Handle in accordance with good hygiene and safety practice.
- Observe any medical surveillance requirements.

9. Physical and chemical properties

Physical state	Liquid
Form	Liquid
Color	Colorless to brown
Odor	Hydrocarbon
Odor threshold	Not available
pH	4.3–6.8
Melting point / freezing point	-15–32°F (-26.1–0°C)
Initial boiling point	212°F (100°C)
Boiling range	Not available
Flash point	84–210°F (28.9–98.9°C)
Evaporation rate	Not available
Flammability (solid, gas)	Not available
Flammability limits in air, lower to upper (% by volume)	Not available
Vapor pressure	0.1–1.8 psi (Reid Vapor Pressure at 100°F).
Vapor density	Not available
Relative density	1.01–1.08
Solubility(water)	Soluble
Partition coefficient (n-octanol/water)	Not available
Auto-ignition temperature	Not applicable
Pour point	Not available
Viscosity	Not available
Oxidizing properties	Not available
Explosive properties	Not available
Decomposition temperature	Not applicable

10. Stability and reactivity

Reactivity	Not available.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	Hazardous polymerization does not occur.
Conditions to avoid	<ul style="list-style-type: none">Excessive heat.Contact with incompatible materials.
Incompatible materials	<ul style="list-style-type: none">Water reactive materials.Strong oxidizing agents.
Hazardous decomposition products	<ul style="list-style-type: none">None known.

11. Toxicological information

Toxicological data

Component	Species	Test Results
Decane (CAS 124-18-5)		
Acute <i>Inhalation</i>		
LC50	Mouse	72.3 mg/L, 2 hours
Heptane (CAS 142-82-5)		
Acute <i>Inhalation</i>		
LC50	Rat	103 mg/L, 4 hours
Octane (CAS 111-65-9)		
Acute <i>Inhalation</i>		
LC50	Rat	118 mg/L, 4 Hours

Notes: LC50=half maximal lethal concentration; mg/L-milligrams per liter.

Routes of exposure	<ul style="list-style-type: none">AbsorptionEye contactInhalation of vapor
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Toxicological effects	Occupational exposure to the substance or mixture may cause adverse effects. Acute toxicity: <ul style="list-style-type: none">▪ Skin irritation.▪ Ingestion may cause irritation and malaise. Chronic effects: <ul style="list-style-type: none">▪ Can cause kidney, liver, and central nervous system damage.▪ Prolonged or repeated contact with skin may cause redness, itching, irritation, eczema/chapping, and oil acne.▪ Contains n-hexane, prolonged or repeated exposures to which may cause damage to the peripheral nervous system (e.g., fingers, feet, and arms).
Skin corrosion/irritation	Irritating to skin.
Serious eye damage / eye irritation	Not classified.
Sensitization	Not a skin sensitizer.
Local effects	<ul style="list-style-type: none">▪ May cause eye irritation.▪ May produce skin irritation or contact dermatitis.
Mutagenicity	Not classified.
Carcinogenicity	Not classified.
Reproductive toxicity	Suspected of damaging fertility.
Symptoms	<ul style="list-style-type: none">▪ May cause redness and pain.▪ May cause eye irritation on direct contact.
Epidemiology	No data available.
Absorption hazard	Not classified.

12. Ecological information

Ecological data

Components	Dose	Species	Test Results
Decane (CAS 124-18-5)			
Fish	LC50	Sheepshead minnow (<i>Cyprinodon variegatus</i>)	>500 mg/L, 96h

Components	Dose	Species	Test Results
Heptane (CAS 142-82-5)			
Fish	LC50	Mozambique tilapia (<i>Tilapia mossambica</i>)	375 mg/L, 96h
n-Hexane (CAS 110-54-3)			
Fish	LC50	Fathead minnow (<i>Pimephales promelas</i>)	2.101–2.981 mg/L, 96h

Notes: LC50=half maximal lethal concentration; mg/L-milligrams per liter.

Ecotoxicity Toxic to aquatic organisms; may cause long-term adverse effects in the aquatic environment.

Environmental effects Toxic to aquatic life with long lasting effects.

Persistence and degradability Expected to be inherently biodegradable.

Bioaccumulative potential Has the potential to bioaccumulate.

Partition coefficient (n/octanol/water [$\log K_{ow}$])

n-Hexane (CAS 110-54-3)	3.9
Heptane (CAS 142-82-5)	4.66
Decane (CAS 124-18-5)	5.01
Octane (CAS 111-65-9)	5.18

Mobility in soil This product mostly contains water, which has a high mobility in soil. The organic components, however, have varying degrees of mobility:

- Decane, octane, and heptane have high koc values and are immobile or have low mobility in soil.
- n-Hexane has a low koc value and is considered to have high mobility in soil.

Soil organic carbon-water partition coefficient (koc)

n-Hexane (CAS 110-54-3)	130
Heptane (CAS 142-82-5)	8,200
Octane (CAS 111-65-9)	16,000
Decane (CAS 124-18-5)	22,200–42,700

Water solubility The product is water soluble; however, the alkane components are considered hydrophobic and have a very low water solubility.

Other adverse effects None known.

13. Disposal considerations

Disposal methods	Dispose of in accordance with all applicable regulations.
Local disposal regulations	Dispose of in accordance with all applicable regulations.
Waste from residues / unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be sent to an approved handling site for recycling, recovery, or disposal.

14. Transport information

DOT

UN number	UN1267
UN proper shipping name	Petroleum crude oil, Marine pollutant
Transport hazard class(es)	3
Packing group	III
Environmental hazards: Marine pollutant	Yes
Labels required	3
Special provisions	144, 357, B1, IB3, T2, TP1
Packaging exceptions	150
Packaging non bulk	203
Packaging bulk	242
Special precautions for user	Read safety instructions, SDS, and emergency procedures before handling.

IATA

UN number	UN1267
UN proper shipping name	Petroleum crude oil
Transport hazard class(es)	3
Packaging group	III
Environmental hazards	Not available.
Labels required	Not available
ERG Code	Not available
Special precautions for user	Not available

IMDG

UN number	UN1267
UN proper shipping name	Petroleum Crude Oil
Transport hazard class(es)	3
Packaging group	III
Environmental hazards: Marine pollutant	Yes
Labels required	3
EmS	F-E, S-E
Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	Not applicable
General information	Not applicable

15. Regulatory information

US federal regulations This product is not a hazardous chemical.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001–1050) None.

CERCLA (Superfund) reportable quantity

n-Hexane (CAS 110-54-3)	5,000 lbs
Heptane (CAS 142-82-5)	Not listed
Octane (CAS 111-65-9)	Not listed
Decane (CAS 124-18-5)	Not listed

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

- Immediate Hazard: Yes
- Delayed Hazard: Yes
- Fire Hazard: Yes
- Pressure Hazard: No
- Reactivity Hazard: No
- SARA 302 Extremely hazardous substance: No
- SARA 311/312 hazardous chemicals: No

International Inventories

Country(s) or region	Inventory name	On inventory (Yes/No) *
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances	Yes

Country(s) or region	Inventory name	On inventory (Yes/No) *
	(EINECS)	
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
US & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

Notes: *A Yes indicates this product complies with the inventory requirements administered by the governing country(s).

16. Other information, including date of preparation or last version

Issue date 07/31/2013

Revision date: 07/31/2016

Version # 01

References IARC Monographs. Overall Evaluation of Carcinogenicity (Volumes 1–102)
IUCLID. Hazardous Substances Data Bank.

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.