

4415.0120 **DESCRIPTION OF PROPOSED PIPELINE AND ASSOCIATED FACILITIES**

Subpart 1. Pipeline Design Specifications.

The specifications for pipeline design and construction are assumed to be in compliance with all applicable state and federal rules or regulations unless determined otherwise by the state or federal agency having jurisdiction over the enforcement of such rules or regulations. For public information purposes, the anticipated pipeline design specifications must include but are not limited to:

A. pipe size (outside diameter) in inches;

Alberta Clipper Project: 36 inches
Southern Lights Diluent Project: 20 inches

B. pipe type;

Steel

C. nominal wall thickness in inches;

Alberta Clipper Project: 0.375 to 0.469 inch
Southern Lights Diluent Project: 0.250 inch

D. pipe design factor;

API 5L Grade X70

E. longitudinal or seam joint factor;

1.00

F. class location and requirements, where applicable;

Not applicable (applies to natural gas pipelines)

G. specified minimum yield strength in pounds per square inch (psi); and

70,000 psi

H. tensile strength in pounds per square inch.

82,000 psi

Subpart 2. Operating Pressure.

Operating pressure must include:

A. operating pressure (psi);

Alberta Clipper Project: 900 psi (at station discharge)
Southern Lights Diluent Project: 1,250 psi (at station discharge)

B. maximum allowable operating pressure (psi).

Alberta Clipper Project: 1,050 to 1,313 psi
Southern Lights Diluent Project: 1,260 psi

Subpart 3. Description of associated facilities.

For public information purposes, the applicant shall provide a general description of all pertinent associated facilities on the right-of-way.

Alberta Clipper Project:

In Minnesota, pumping facilities will be installed at three Enbridge Station sites: one near Viking, Minnesota; the Clearbrook, Minnesota Terminal; and one near Deer River, Minnesota. A schematic drawing of the new pumping units within the station sites are depicted on station plat drawings under Tab 1 of the USGS Map Book enclosed herewith as Appendix I.

Forty mainline valves will be installed in Minnesota based on preliminary engineering design. Specifically, locations of valve installations will be near major rivers, other environmentally sensitive areas, population centers, and pumping stations. Proposed valve locations are depicted on the attached route maps. A detailed engineering study will be performed and adjustments to the number and locations of valves could be made.

Southern Lights Diluent Project:

In Minnesota, pumping facilities will be installed at the Enbridge Station site at the Clearbrook, Minnesota Terminal. A schematic drawing of the new pumping units within the station sites are depicted on station plat drawings under Tab 1 of the Route Maps enclosed herewith as Appendix I.

Twenty-seven mainline valves will be installed in Minnesota based on preliminary engineering design. Specifically, locations of valve installation will be near major rivers, other environmentally sensitive areas, population centers, and pumping stations. Proposed valve locations are depicted on the attached route maps. A detailed engineering study will be performed and adjustments to the number and locations of valves could be made.

Subpart 4. Product capacity information.

The applicant shall provide information on planned minimum and maximum design capacity or throughput in the appropriate unit of measure for the types of products shipped as defined in part 4415.0010.

Alberta Clipper Project:

The Design Capacity of the 36-inch-diameter pipeline will be 500,000 barrels per day. Annual Capacity will be 450,000 barrels per day. Currently there are no plans to add facilities to increase the initial capacity of the proposed pipeline.

Southern Lights Diluent Project:

The Design Capacity of the 20-inch-diameter pipeline will be 200,000 barrels per day. Annual Capacity will be 180,000 barrels per day. Currently there are no plans to add facilities to increase the initial capacity of the proposed pipeline.

Subpart 5. Product description.

The applicant shall provide a complete listing of products the pipeline is intended to ship and a list of products the pipeline is designed to transport, if different from those intended for shipping.

Alberta Clipper Project:

The 36-inch-diameter crude oil pipeline is expected to transport the following liquid petroleum products:

Light Crude Petroleum, and
Heavy Crude Petroleum.

Southern Lights Diluent Project:

The 20-inch-diameter diluent pipeline is expected to transport the following liquid petroleum product:

Condensate

The Enbridge Mainline System in western Canada has for a number of years transported a variety of petroleum products including condensate to be used as diluent for heavy oil and oil sands bitumen. The diluent anticipated to be shipped in the Southern Lights Diluent Project consists of a liquid hydrocarbon mixture typically consisting of pentanes (carbon chain length C5) and heavier hydrocarbons. Diluent can be condensed from natural gas wells (also called "condensate") or separated from other hydrocarbons at refineries that process crude oil into gasoline, jet fuel, diesel fuel and other petroleum products.

Subpart 6. Material safety data sheet.

For each type of product that will be shipped through the pipeline, the applicant shall provide for public information purposes the material identification, ingredients, physical data, fire and explosive data, occupational exposure limits, health information, emergency and first aid procedures, transportation requirements, and other known regulatory controls.

Diluent-specific Material Safety Data Sheets (“MSDS”) are not yet available since diluent is a generic name referring to a mixture of lighter hydrocarbons, either condensate or refinery grade naphtha or a mixture of both. For references purposes, attached is an MSDS for condensate which is representative of the anticipated diluent material. In addition, attached are pipeline specifications set forth by the Applicant in its tariff/rules defining the limits on the concentrations of certain components within the diluent, such as benzene or hydrogen sulfide. Enbridge has also developed the attached Diluent Fact Sheet which has been used in public consultations and meetings.



MATERIAL SAFETY DATA SHEET

24-HOUR EMERGENCY ASSISTANCE	GENERAL ASSISTANCE	NFPA DIAMOND * <p>4 - Extreme 3 - High 2 - Moderate 1 - Slight 0 - Insignificant * - See text</p>
Gas Control (888) 650-8099 CHEMTREC Assistance (800) 424-9300	Phone (713) 650-8900 Fax (713) 821-2080	
MSDS NUMBER 1007		

MANUFACTURER/SUPPLIER: Enbridge, (U.S.), Inc.
1100 Louisiana Street, Suite 2900
Houston, Texas 77002

1. PRODUCT IDENTIFICATION

NATURAL GAS CONDENSATE

Product Name Natural Gas Condensate
Synonym/Product Name: Drip Gas, Condensate, Pipeline Liquids, Field Condensate
Chemical Family: Petroleum Hydrocarbon
Molecular Formula: Mix of heavy hydrocarbons
Molecular Weight: Varies

2. PRODUCT HAZARD SUMMARY

Health: Cancer hazard. Overexposure may cause damage to the peripheral nervous system. Use ventilation adequate to keep exposures below recommended limits. Avoid breathing vapor or mist. Avoid contact with eyes, skin or clothing. Do not taste or swallow. Wash thoroughly after handling.
HMIS Classification for Health: 1

Flammability: Flammable liquid and vapor. Keep away from heat, sparks, flames or other sources of ignition (such as static electricity, pilot lights, mechanical/electrical equipment).
HMIS Classification for Flammability: 4

Reactivity: Stable under normal conditions. Avoid all sources of ignition.
HMIS Classification for Reactivity: 0

3. PRODUCT HEALTH HAZARD INFORMATION

Ingestion: Low to moderate degree of toxicity by ingestion. Major health threat occurs from danger of breathing (aspiration) liquid drops into lungs, especially during vomiting. Ingestion may cause nausea, vomiting, diarrhea and central nervous system effects similar to alcohol intoxication.

Skin: Prolonged contact may cause mild skin irritation including redness, burning and drying and cracking of the skin. No harmful effects from skin absorption are expected.

Eye: Contact may cause mild eye irritation, including stinging, watering, redness and swelling.

Inhalation: Low to moderate degree of toxicity by inhalation. Prolonged or excessive exposure may cause irritation to the nose, throat, lungs and respiratory tract.

Signs and Symptoms: Effects of overexposure may include irritation of the nose, throat and digestive tract, nausea, vomiting, diarrhea, transient excitation followed by signs of nervous system depression (e.g., headache, drowsiness, dizziness, loss of coordination and fatigue).

Cancer: A component (benzene) is a known human cancer hazard (see Special Toxic Effects below). Benzene has the potential to cause anemia and other blood diseases, including leukemia, after repeated and prolonged exposure.

Target Organs: Overexposure to a component (toluene) may cause injury to the peripheral nervous system. There is limited evidence from animal studies that overexposure may cause injury to the male reproductive system.

Pre-Existing Medical Conditions: Conditions aggravated by exposure may include skin, respiratory (asthma-like), male reproductive and peripheral nerve disorders. Exposure to high concentrations of this material may increase the sensitivity of the heart to certain drugs. Persons with pre-existing heart disorders may be more susceptible to this effect.

Special Toxic Effects:**n-Hexane (CAS 110-54-3)**

Target Organs – Excess exposure to n-hexane can result in peripheral neuropathies. The initial symptoms are symmetrical sensory numbness and paresthesia 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.

Toluene (CAS 108-88-3)

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 damage in lab animals.

Developmental – Exposure to toluene during pregnancy has demonstrated limited evidence of developmental toxicity in lab animals.

Benzene (CAS 71-43-2)

Carcinogenicity: Benzene is a known animal carcinogen and is known to produce leukemia in humans. Benzene has been identified as a human carcinogen by NTP, IARC and OSHA.

4. FIRST AID

Ingestion: Aspiration hazard. Do not induce vomiting or give anything by mouth because this material can enter the lungs and cause severe damage. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration.

Skin Contact: Wipe material from skin and remove contaminated clothing. Cleanse affected areas thoroughly by washing with mild soap and water and, if necessary, a waterless skin cleanser. If irritation or redness develops, seek medical attention.

Eye Contact: If irritation or redness develops, move victim away from exposure and into fresh air. Flush eyes with clean water for 15 minutes, with eyelids held open. If symptoms persist, seek medical attention.

Inhalation: If respiratory symptoms or other symptoms of exposure develop, move victim away from source of exposure and into fresh air. If symptoms persist, seek immediate medical attention. If victim is not breathing, clear airway and immediately begin artificial respiration. If breathing difficulties develop, qualified personnel should administer oxygen. Seek immediate medical attention.

Notes to Physician: Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of this material (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 development of cardiac arrhythmias.

5. PERSONAL PROTECTION INFORMATION

Eye Protection: Safety glasses or goggles are recommended when there is a possibility of splashing or spraying.

Skin Protection: The use of gloves (nitrile or neoprene) is advised to prevent skin contact and possible irritation. Depending on conditions, the use of an apron or chemical protective clothing may be necessary.

Respiratory Protection: A NIOSH certified air purifying respirator with an organic vapor cartridge may be used under conditions where airborne concentrations of hydrocarbons are expected to exceed exposure limits. Protection provided by air purifying respirators is limited. Use a positive pressure air supplied respirator if there is a potential for an uncontrolled release, exposure levels are not known or any other circumstances where air purifying respirators may not provide adequate protection. A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements must be followed when workplace conditions warrant a respirator's use.

Engineering Controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, 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).

6. PHYSICAL PROPERTIES

Boiling Point:	100-1000°F
Specific Gravity:	0.6 - 0.75 @ 39.2°F (Water = 1)
Freezing/Melting Point:	ND
% Volatile:	Approximately 100%
Vapor Pressure:	ND
Vapor Density (Air = 1):	>1

ND = No Data

NA = Not Applicable

MSDS NO: 1007
Natural Gas Condensate

Viscosity	ND
% Solubility in Water:	0%
Density (lb/gal)	Varies, but estimated at 6 lb/gal
Physical State:	Liquid
pH:	ND
Appearance:	Clear to dark amber in color
Odor:	Petroleum smell

7. FIRE AND EXPLOSION DATA

Flash Point	<20°F
Autoignition Temperature:	ND
Flammability Limits In Air (% By Vol.) Lower:	Varies, est. 1.0%
Flammability Limits In Air (% By Vol.) Upper:	Varies, est. 7.0%

Basic Fire Fighting Procedures: Long-duration fires involving natural gas condensate stored in tanks may result in a boilover. The contents of the tank may be expelled beyond the containment dikes or ditches. All personnel should be kept back a safe distance when a boilover is anticipated (reference NFPA 11). 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. Isolate immediate hazard area, keep unauthorized personnel out. Stop spill/release if it can be done with minimal risk. Move undamaged containers from immediate hazard area if it can be done with minimal risk. 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. Avoid spreading burning liquid with water used for cooling purposes.

Extinguishing Media: Any extinguisher capable of handling Class B fires is recommended, including extinguishing media such as CO₂, dry chemical or foam. Water spray is recommended to cool or protect exposed materials or structures. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced fire fighters. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces.

Unusual Fire and Explosion Hazards: This material is flammable and may be ignited by heat, sparks, flames or other sources of ignition (such as 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. Vapors are heavier than air and can accumulate in low areas. If container is not properly cooled, it can rupture in the heat of a fire.

8. REACTIVITY DATA

Stability/Incompatibility: Stable under normal conditions of storage and handling. Flammable liquid and vapor. Vapor can cause flash fire.

Avoid contact with strong oxidizing agents.

Hazardous Reaction/Decomposition Products: Combustion can yield carbon dioxide, carbon monoxide, other organic compounds and non-combusted hydrocarbons.

9. ENVIRONMENTAL INFORMATION

Spill or Release to the Environment: 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 downwind of spill/release, isolate immediate hazard area and keep unauthorized personnel out. Product may release large amounts of flammable vapors (e.g., methane, ethane and propane) at or below ambient temperature depending on source and process conditions. Stop spill/release if it can be done with minimal risk. Wear appropriate protective equipment including respiratory equipment as conditions warrant. Prevent spilled material from entering sewers, storm drains, other unauthorized treatment drainage systems and natural waterways. Dike far ahead of spill for later recovery or disposal. Use foam on spills to minimize vapors. Spilled material may be absorbed into an appropriate absorbent material.

Notify fire authorities and appropriate federal, state and local agencies. Immediate cleanup of any spill is recommended. If spill of any amount into navigable waters, notify the National Response Center (800-424-8802).

Notification: Notify fire authorities and appropriate federal, state and local agencies.

Waste Disposal: Consult federal, state and local waste regulations to determine appropriate disposal options.

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.

Sara Title III Information: This material contains the following chemicals subject to the reporting requirements of SARA 313 and 40 CFR 372:

Toluene	CAS – 108-88-3	Weight % - <2.0
n-Hexane	CAS – 110-54-3	Weight % - up to 10%
Benzene	CAS – 71-43-2	Weight % - 0 – 0.3

10. REGULATORY INFORMATION

EPA Reportable Quantity: The estimated reportable quantity (RQ) for this material is based on the weight % shown below:

RQ based on benzene – The RQ for benzene is 10 pounds, which equals 3,333 pounds of natural gas condensate (556 gallons). The RQ is based on 0.3 wt. % benzene.

RQ based on n-Hexane – The RQ for n-Hexane is 5000 pounds, which equals 50,000 pounds of natural gas condensate (8,333 gallons). The RQ is based on 10 wt. % n-Hexane.

RQ based on toluene – The RQ for toluene is 1000 pounds, which equals 50,000 pounds of natural gas condensate (8,333 gallons). The RQ is based on 2 wt. % toluene.

11. SPECIAL PRECAUTIONS / SUPPLEMENTAL INFORMATION

Handling/Storage: 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. Use good personal hygiene practice.

Keep containers 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. Protect container(s) against physical damage. Outdoor or detached storage is preferred. Indoor storage should meet OSHA standards and appropriate fire codes.

Depending on the source of natural gas condensate, there could be some amount of NORM (naturally occurring radioactive materials) in the scale, deposit and sludge associated with this material. Proper measurements should be taken prior to handling this material or any equipment contaminated with this material. If NORM is indicated, refer to API Bulletin E2, "Bulletin on Management of Naturally Occurring Radioactive Materials in Oil and Gas Production," for additional information.

Empty Containers: "Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, flame, sparks or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1 and other governmental and industrial references pertaining to cleaning, repairing, welding or other contemplated operations.

12. TRANSPORTATION REQUIREMENTS

General Transportation Information:

DOT Proper Shipping Name (49 CFR 172.101):	Petroleum distillates, n.o.s. or petroleum distillates, n.o.s. (condensate)
DOT Hazard Classes (49 CFR 172.101):	3
UN/NA Code (49 CFR 172.101):	UN1268
Packing Group (49 CFR 172.101):	NA
Bill of Lading Description (49 CFR 172.202):	Petroleum distillates, n.o.s.
DOT Labels Required (49 CFR 172.101):	Flammable Liquid

Please note that the actual shipping name and associated data can vary due to the properties of the product. Other acceptable shipping names may include Gasoline UN1203, Flammable liquids, n.o.s. (pentane) UN1993 or Hydrocarbons, Liquid n.o.s. (condensate) UN3295.

13. INGREDIENTS/HEALTH HAZARD INFORMATION

Component	CAS NO.	Typical %* by weight	EXPOSURE GUIDELINE	
			PPM	Agency - Type
Natural Gas Condensate	68919-39-1	100	500	OSHA -TWA
Pentane	109-66-0	30-70	600 1000 500	ACGIH - TWA OSHA - TWA MSHA - TWA
n-Hexane	110-54-3	0-10	50 500	ACGIH - TWA (skin) OSHA - TWA
Toluene	108-88-3	0-2	50 200 300 100	ACGIH - TWA (skin) OSHA - TWA OSHA - CEIL MSHA - TWA
Benzene	71-43-2	0 - 0.3	0.5 2.5 1 5 25	ACGIH - TWA, Skin ACGIH - STEL, Skin OSHA - TWA OSHA - STEL MSHA - CEIL, Skin
Note that 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				

* Values do not reflect absolute minimums and maximums; those values may vary from time to time.

REVISION DATE: 07/31/02

REPLACES SHEET DATED: NA

COMPLETED BY: Enbridge (US) Inc. EHS Department

NOTE: The information presented herein is based on data considered to be accurate as of the date of preparation of this Material Safety Data Sheet (MSDS). However, MSDS's may not be used as a commercial specification sheet of manufacturer or seller, and no warranty or representation, express or implied, is made as to the accuracy or completeness of the foregoing data and safety information, nor is any authorization given or implied to practice any patented invention without a license. In addition, no responsibility can be assumed by vendor for any damage or injury resulting from abnormal use, from any failure to adhere to recommended practices or from any hazards inherent in the nature of the product.

**Enbridge Southern Lights
Petroleum Quality Diluent Acceptance Specifications**

March 27, 2007



*Whole Crude to be utilized unless otherwise dictated by test method.

PROPERTIES	Test Method	Units	Minimum	Maximum
Gravity, @ 60oF	ASTM 1298/5002	API	45.4	104.3
Kinematic Viscosity at 45.5oF	ASTM 445	cst		2.0
Reid vapor pressure	ASTM 323A	psia		15
Sediment and Water	ASTM 4007	Vol.%		0.5
Organic chlorides	ASTM 4929	wppm		None
BTEX	GC-FID	Wt.%		25
Benzene	GC-FID	Vol%		3
Hydrogen Sulphide	ASTM 5623 or UOP-163	wppm		50
Volatile Mercaptan Sulphur	ASTM 5623 or UOP-163	wppm		500
Sulphur, total	ASTM 2622/ 4294	wt%		1
Olefins, total	H NMR	mass %		None
MCR	ASTM 4530	Wt.%		1.6
Total Acid Number	ASTM D664	mg KOH/g		1
Mercury	ICP-MS	wppm		1
Selenium	ICP-MS	wppm		1
Oxygenates	ASTM D-4815	wt%		None
Aromatics, Total ¹	GC-FID	Vol%	2.5	

¹ Exemption from aromatics minimum is possible subject to passing Wiehe crude compatibility test
(see <http://www.solublesolutions.com/oilcomp.html>)

Enbridge is expanding its pipeline system to increase its ability to transport growing supplies of crude oil produced in Canada's vast oil sands region to meet U.S. refinery needs for secure, reliable supplies of crude stock. To facilitate oil sands production, Enbridge is also building a pipeline that will transport light hydrocarbons - - referred to as diluents - - from the U.S. Midwest to northern Alberta, where crude oil is extracted from the oil sands.

What is diluent?

Diluent is a thinning agent made up of a mixture of organic compounds containing the lighter hydrocarbons. Hydrogen and carbon make up the basis of almost all petroleum products refined from crude oil such as gasoline, jet fuel, asphalt and the petrochemicals that go into many consumer products.

Diluent components are naturally found in oil, which Enbridge employees work with on a daily basis, as it flows through our system. The lighter hydrocarbons of petroleum have been used for many years to dilute the thick crude oil that is produced in Alberta and transported on the Enbridge system. Similar products in natural gas are also referred to as "condensate."

Diluent is also used to dilute heavy crude oil produced in many production fields around the world. Large amounts of diluent are needed to dilute the heavy crude petroleum that is produced in the Canadian oil sands because it is often too thick to be pumped easily by pipeline.

Which hydrocarbons are in diluent?

Hydrocarbons make up a number of familiar substances that are separated in the refining process and are contained in many of the products we use every day, including the asphalt we drive on, the fuel in our car and the petrochemical-based plastics we all use everyday.

Like most petroleum, diluent is flammable and contains volatile substances in varying percentages. The lighter hydrocarbons included in diluent are typically naphtha, benzene and pentane. These types of hydrocarbons are also included in the gasoline we use in our vehicles. For instance, benzene accounts for about one percent of gasoline content. Naphtha is contained in shoe polish and Coleman fuel or white gas. These types of lighter hydrocarbons are included in the gasoline that is commonly transported by pipelines, trucks and railroad cars that operate in communities across the U.S. and Canada.

How is diluent made?

The light hydrocarbons that collectively are referred to as diluent are condensed from natural gas wells (hence the name "condensate,") or separated from other hydrocarbons at refineries that process crude oil into gasoline, jet fuel, diesel fuel and other petroleum products. Some of the hydrocarbons typically used as diluent are produced in Alberta - but not enough to meet the needs of growing production from the oil sands. With Canadian oil production expected to nearly double by 2020, increased supplies of diluent are needed to transport the thick Canadian crude to U.S. refineries, which produce the motor fuels and other products we depend on to power our personal vehicles and satisfy other important energy and manufacturing needs.

Refineries can generate diluent as a natural part of separating the crude oil hydrocarbons into various transportation fuels and ingredients used to produce a wide variety of consumer products. Natural gas plants separate the liquid portion of the gas stream to provide the dry gas used to heat our homes and fire our boilers. These lighter hydrocarbons, lower in octane, are typically blended into motor fuel or used in various petrochemical manufacturing processes. Diverting a portion of these lighter hydrocarbons to Alberta will facilitate the transportation of heavy crude oil to U.S. refineries, allowing them to generate the additional fuel we need. The diluent and heavy crude oil mixture will then be re-refined. A portion of the diluent can be extracted from the heavy crude oil and returned to Alberta, essentially recycled, to again facilitate transportation of heavy crude oil to the Midwest region.

Is diluent hazardous?

During normal operations there are no hazards to those who live and work along the pipeline. As with gasoline and other petroleum products, diluent should be properly handled and contained.

Enbridge maintains an aggressive pipeline integrity maintenance program and a pipeline public awareness effort to help promote the environmentally responsible and safe operation of all its pipelines. Highly trained Enbridge professionals monitor the operation of our pipelines 24 hours a day, seven days a week. We conduct regular inspections of equipment and patrol our pipeline routes no less than 26 times a year. Additionally, we communicate annually – or more often – with those who live and work near our pipelines and with local public officials regarding how we operate our facilities, while providing them with information about pipeline safety. Enbridge works diligently to verify that its pipeline systems are operated at or above the national codes and federal regulations issued by the U.S. Department of Transportation and other applicable agencies. These standards govern pipe and design specifications, construction techniques and continued safe operation of these pipeline facilities.

Enbridge works closely with local fire departments to help educate them on how to safely and appropriately respond to a pipeline incident in the unlikely event of a leak. We also include messages in our public awareness communications to nearby residents about how to identify, report and safely avoid areas where petroleum may have leaked or spilled.

Flammability: Diluent, like all hydrocarbons (crude oil, natural gas liquids) that are transported in Enbridge pipelines throughout the U.S. Midwest, is flammable. And like these other hydrocarbons, diluent requires two conditions in order to ignite: the presence of an ignition source and being released in a narrowly-defined concentration (one to seven percent diluent) with the surrounding air. Contained within a closed pipeline system, the petroleum hydrocarbons are mixed with little or no air and thus have no opportunity for ignition. Equipment installed on the Enbridge system, such as electrical equipment and motors within secured pumping stations, is designed to avoid introducing ignition sources.

Health: If released to the atmosphere, all hydrocarbons that are commonly transported in petroleum pipelines present some degree of breathing hazard depending on the product and exposure. No hazardous levels of vapors will be released from the closed pipeline system or within facilities during normal operations. In the unlikely event of a leak, those working or living nearby should move away from and upwind of the leak site in order to prevent prolonged exposure to vapors. Enbridge workers and emergency personnel have the equipment and training to check levels of hydrocarbons in the air and use appropriate personal protective equipment. In accordance with the U.S. Occupational Health and Safety Administration

oversight of worker safety, federal guidelines on individual products will provide workers and emergency responders with more detailed product information and personal protection safeguards necessary when working in confined spaces or when exposed to the product for any extended time.

Environment: The pipeline is a closed system and is designed to minimize emissions. In the unlikely event of a leak, Enbridge is prepared to respond and quickly remove spilled product. Aggressive measures are taken to remove impacted soils and, if necessary, monitor groundwater to make sure no risks are posed to nearby drinking water sources. Community drinking water sources, such as aquifers, are typically sourced from deep underground, and geological layers protect them from immediate exposure. Environmental agencies oversee response, including cleanup and steps taken to avoid potential threats to the environment or drinking water.

Diluent plays an integral role in facilitating the transportation of the heavy crude oil, which is refined to provide the fuel that we use every day. Refined petroleum products, such as petrochemicals, also serve as feedstock for the production of critical materials such as plastics, synthetic fibers and other industrial chemicals that help improve our quality of life. The use of diluent will also enable the United States to tap into growing supplies of North American crude oil in the Canadian oil sands, thereby reducing our dependence on overseas oil.



Canadian Natural

Supplier: Canadian Natural Resources Ltd.
2500, 855 2nd Street S.W.
Calgary, Alberta, Canada T2P 4J8

MATERIAL SAFETY DATA SHEET

24 Hour Emergency Telephone Number:

1-888-878-3700

1. PRODUCT IDENTIFICATION

PETROLEUM HEAVY CRUDE OIL

SYNONYMS:

1. Crude Oil Tank Bottom Sludge	5. Mineral Oil
2. Crude Oil	6. Rock Oil
3. Sour Crude	7. Coal Oil
4. Sweet Crude	8. Heavy Crude Oil

WHIMIS

Class B, Division 2: Flammable Liquid	Class D, Division 1, Subdivision A: Very Toxic Effects	Class D, Division 2, Subdivision B: Toxic Material

TDG

PRIMARY TDG: 3.1 SECONDARY TDG: 3.2	SHIPPING NAME: Petroleum Crude Oil CLASS: Flammable Liquids P.I.N.: UN1267 PACKING GROUP: II or III

DESCRIPTION: A naturally occurring mixture of paraffins, naphthenes, aromatic hydrocarbons and small amounts of sulphur and nitrogen compounds. The composition and properties will vary significantly according to source of crude. Crude oil with a sulphur content greater than 0.5 weight percent is considered sour.

APPLICATION: Used as a refinery feedstock.

2. HAZARDOUS INGREDIENTS

The following components are defined in accordance with sub-paragraph 13(a)(i) to (iv) or paragraph 14(a) of the Hazardous Product Act:

NAME	%	CAS#
Hydrocarbons (aromatic and paraffinic hydrocarbons)	100	8002-05-9
Toluene	100 ppm	108-88-3
Benzene	10 ppm	71-43-2
Xylene	100 ppm	1330-20-7
Hydrogen sulphide (H ₂ S)	10 ppm	7783-06-4

3. TYPICAL PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE:	Liquid
SPECIFIC GRAVITY:	0.7 to 1.1
DENSITY:	0.8 to 1.0
APPEARANCE/ODOUR:	Aromatic or sulphide (rotten egg) odour.

ODOUR THRESHOLD:	Not available
VAPOUR PRESSURE:	10-80 kPa @ 20°C
VAPOUR DENSITY:	Not available
EVAPORATION RATE:	Variable
BOILING POINT/RANGE:	10°C - 1100°C
FREEZING/MELTING POINT:	Not available
VISCOSITY:	Not applicable
pH:	Not available
SOLUBILITY IN WATER:	0%
COEFF. OF WATER / OIL DIST.:	Not available
PERCENT VOLATILE:	100%
MOLECULAR FORMULA:	Not applicable - mixture
MOLECULAR WEIGHT:	Not applicable - mixture

4. HEALTH HAZARD INFORMATION

Nature of Hazard

INHALATION:

May cause headache, dizziness, loss of appetite, weakness, loss of coordination, and unconsciousness. Crude oil vapours are irritating to the upper respiratory tract.

EYE CONTACT:

Crude oil vapours are moderately irritating to the eyes.

SKIN CONTACT:

Prolonged skin contact may result in defatting of the skin resulting in dry cracked skin and dermatitis.

INGESTION:

Minimal toxicity. Small amounts of this liquid ingested into the lungs from swallowing or vomiting may cause severe health effects (e.g. bronchopneumonia or pulmonary edema).

CHRONIC EFFECTS:

Benzene is a known human carcinogen and may cause damage to the bone marrow/blood making system and may result in leukemia.

TOXICITY DATA:

Product is not listed as a carcinogen by any agent, but individual components have been associated with carcinogenicity, mutagenicity, reproductive and teratogenicity properties in animal experiments.

OCCUPATIONAL EXPOSURE LIMITS (OELs) RECOMMENDED:

ACGIH:	For oil mists	5mg/m ³
	For Hydrogen sulphide	10 ppm (14mg/m ³)
	For Benzene	a TLV of 10 ppm (30 mg/m ³), and it is described as a substance of suspect carcinogenic potential in man.
Manufacturer:	For total hydrocarbons	100 ppm

5. FIRST AID MEASURES

INHALATION:

Remove individual to fresh air immediately. If breathing stops, administer artificial resuscitation. Keep victim warm and at rest. Seek medical attention.

...OVER



Canadian Natural

Supplier: Canadian Natural Resources Ltd.
2500, 855 2nd Street S.W.
Calgary, Alberta, Canada T2P 4J8

MATERIAL SAFETY DATA SHEET

24 Hour Emergency Telephone Number:

1-888-878-3700

EYE CONTACT:

Immediately flush eyes with plenty of water for at least 15 minutes and seek medical attention.

SKIN CONTACT:

Remove contaminated clothing as soon as possible. Wash exposed skin thoroughly with soap and water. If irritation develops, consult a physician.

INGESTION:

If this material is swallowed DO NOT induce vomiting. If vomiting begins, lower victim's head in an effort to prevent vomitus from entering lungs. Seek medical attention. Never give anything by mouth to an unconscious person.

EMERGENCY PROCEDURES:

Because Hydrogen sulphide inhalation can be fatal, rescuers must wear positive pressure full facepiece, self-contained or supplied air NIOSH approved respirators before attempting the rescue.

6. PREVENTATIVE AND CORRECTIVE MEASURES

SPECIAL PROTECTION INFORMATION:

Use in a well ventilated area. Adequate ventilation should be provide in the workplace to maintain the hydrocarbon vapours and hydrogen sulphide below the applicable occupational exposure level. Under normal conditions respiratory protection is not required. Respiratory protection may be required in poorly ventilated areas. Air supplied respirators or positive pressure self contained breathing apparatus is required when atmospheric concentrations of hydrocarbon vapours are likely to exceed the 10x the occupational exposure limit or when high concentration of H₂S may be present. Non-vented chemical goggles should be worn to prevent eye injury. Chemical resistant gloves, apron and/or clothing should be worn if direct contact with liquid is likely to occur. Neoprene or nitrile materials have been shown to provide effective protection against crude oil liquid.

SPILL CONTROL AND DISPOSAL:

Evacuate personnel. Eliminate all ignition sources. Contain spill and absorb with inert absorbent. Large spills should be removed with explosion proof vacuum equipment. Large pools may be covered with foam to prevent vapour evolution.

WASTE DISPOSAL METHOD:

Contaminated material should be placed in disposable containers and disposed in compliance with federal, provincial and local regulations.

7. FIRE AND EXPLOSION HAZARD

FLASH-POINT (Test Method):	-18C°
AUTO-IGNITION:	Not available
FLAMMABLE LIMITS (% Volume):	Not available

GENERAL HAZARDS:

Static discharge: Highly flammable, vapours are heavier than air and may collect in low-lying areas. Vapours may travel considerable distances to ignition sources and cause a flash fire. All storage containers and pumping equipment must be grounded.

FIRE FIGHTING:

Fire extinguishing substances: foam, water spray and dry chemical. Water may be ineffective, but water should be used to keep fire-exposed containers cool. If a leak or spill has not ignited, use water spray to disperse vapours. Use full protective equipment and self-contained breathing apparatus (SCBA) for fires in enclosed areas.

EXPLOSION/SENSITIVITY DATA:

Stable under normal conditions of temperatures and pressure..

8. REACTIVITY DATA

STABILITY:

This material is stable. Hazardous polymerization will not occur.

INCOMPATIBLE MATERIALS AND CONDITIONS TO AVOID:

Oxidizing material

HAZARDOUS DECOMPOSITION:

May release hydrogen sulphide gas when agitated. See health hazard information. Overheating or incomplete combustion may result in carbon dioxide, carbon monoxide, acrid fumes of decomposition and oxides of sulphur. Avoid head, open flame or sources of ignition. Maintain temperature below the flash-point and keep away from all ignition sources. Head spaces in storage tanks may contain toxic hydrocarbon vapours and hydrogen sulphide gas.

9. NOTES

This product contains benzene. Repeated or prolonged breathing of benzene vapours has been associated with the development of chromosomal damage in experimental animals and various blood disorders in humans ranging from aplastic anemia to leukemia. This product may also contain polycyclic aromatic hydrocarbons, which have been associated with skin and lung cancers.

ACCUTE EFFECTS:

Very with concentration of hydrogen sulphide released, from mild eye, nose and throat irritation at approximately 100 ppm, to sudden unconsciousness or death at 500 ppm.

INHALATION:

H₂S release may occur in the vapour space of storage tanks. Abnormal behaviour or sudden paralysis of breathing and unconsciousness can occur.

10. PREPARATION

Prepared by:	CNRL HEALTH AND SAFETY
Date:	DECEMBER 2004
Expires:	JANUARY 2008

CAUTION

The information contained herein is provided free of charge and is offered to the user in good faith as accurate. Certain of the information has been obtained from sources outside of the supplier and while the supplier believes such information to be correct, it cannot guarantee its accuracy or completeness.

The information contained herein relates only to the product or material set forth in Section 1 and may not be applicable or complete if such product material is used in combination with any other product or material or in any process. The information may not be applicable or complete for all individuals or if the products or material is used for a purpose or under conditions which are abnormal or not reasonable foreseeable. For greater certainty, uses other than those described in Section 1 must be reviewed with the supplier.

It is the user's obligation to consider, investigate and verify the information, to use the product safely and to comply with all applicable laws and regulations. The supplier makes no warranties, guarantees or conditions express or implied in respect of the information contained herein.



MATERIAL SAFETY DATA SHEET

HAZARDOUS INFORMATION

Material Identifier: Crude Oil - Sour

Manufacturer:
Address:

Tidal Energy Marketing Inc.
Suite 2200
350 7th Ave. S.W.
Calgary, Alberta T2P 3N9

Emergency Telephone: (403) 205-7770
Facsimile Number: (403) 205-8490

Description:

A naturally occurring mixture of paraffins, naphthenes, aromatic hydrocarbons and small amounts of sulphur and nitrogen compounds. Crude oil with a sulphur content greater than 0.5 weight percent is considered sour.

Chemical Identity:

Complex mixture of hydrocarbons and some sulphur and nitrogen compounds.

Formula:

General formula $C(n)H(2n+2)$.

Synonyms/Trade Names: Various names related to the particular production field may be applied to specific crude oil streams. Sour crude oil.

Material Use:

Refinery feedstock.

HAZARDOUS INGREDIENTS

Ingredients	CONC%	CAS NO	PIN	LC50/LD50	SPECIES	ROUTE
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Crude oil is an extremely complex mixture consisting mostly of hydrocarbons of various molecular weights. It may also contain compounds of sulphur, nitrogen and oxygen. The product is defined as a complex mixture under the terms of Section 2 of the Controlled Products Regulations and thus the ingredients of the mixture are not required to be disclosed under Section 5 of the regulations.

Crude oil		100	8002-05-9	1267		
Hydrogen Sulphide (H ₂ S)		10 ppm	7783-06-4	LC50 approx. 500 ppm	Inhalation	

REGULATORY CLASSIFICATION

WHMIS: Class B, Division 2 - Combustible Liquids
Class D, Division 2 - Subdivisions A and B - Very Toxic and Toxic Materials

TDG: Shipping Name - Petroleum Crude Oil Class 3 (6.1)
P.I.N. - UN 1267
Packing Group - II

Material Identifier: Crude Oil - Sour

NATURE OF HAZARD

- Inhalation:** May cause headaches, dizziness, loss of appetite, loss of coordination, and unconsciousness if allowed to accumulate to concentrations that reduce oxygen below safe breathing levels. Vapours are irritating to upper respiratory tract.
- Eye Contact:** Crude oil vapours are moderately irritating to the eyes.
- Skin Contact:** Prolonged skin contact may result in defatting of the skin resulting in dry cracked skin and dermatitis.
- Ingestion:** Minimal toxicity. Small amounts of this liquid ingested into the lungs from swallowing or vomiting may cause severe health effects.

Toxicological Summary:

The hazards associated with exposure to any particular crude oil stream will vary greatly and will depend for the most part on the presence or absence of one or more of a number of common components of most oil streams. It will be necessary to determine the levels of these components if present before accurate toxicological assessment can be made.

OCCUPATIONAL EXPOSURE LIMITS (OEL):

8 Hour Time Weighted Average is 10 ppm.
15 Minute Time Weighted Average is 15 ppm.
Ceiling is 20 ppm.

Flash Pt(C): - 40

Auto-ignition Temp(C): N.A.

Flammable Limits (% volume): L.E.L. N.A. U.E.L. N.A.

General Hazards:

Static discharge: Highly flammable, vapours are heavier than air and may collect in low-lying areas. Vapours may travel considerable distances to ignition sources and cause a flash fire.

Means of extinction:

Fire extinguishing substances: foam, water spray and dry chemical. Water may be ineffective, but water should be used to keep fire-exposed containers cool. If a leak or spill has not ignited, use water spray to disperse vapours.

Respiratory, fire retardant clothing, and eye protection required for fire fighting personnel. Self-contained breathing apparatus must be used in all sour areas when fighting a fire.

Material Identifier: Crude Oil - Sour**PHYSICAL PROPERTIES**

Physical State:	Liquid	Spec Gravity:	(Water = 1) 0.7 - 1.1
Odour:	Aromatic or sulphide (rotten eggs)	Odour Threshold:	N.A.
Appearance:	Usually black or green liquid	Vapour Pressure:	100 - 800 @ 20C
Vapour Density(Air=1):	N.A.	pH:	N.A.
Boiling Pt(C):	10 - 1100	Freezing Pt(C):	N.A.
Evap Rate:	Variable	%Volatile:	100
Solubility in Water:	N.A.	Coeff Water/Oil Distribution:	N.A.
Mol Wt:	N.A. - mixture		

Respiratory Protection: Use in well-ventilated areas. Adequate ventilation should be provided in the workplace to maintain the hydrocarbon vapours and hydrogen sulphide below applicable occupational exposure levels. SCBA or SABA breathing apparatus is required when atmospheric concentrations of hydrocarbon vapours or hydrogen sulphide exceed occupational exposure levels.

Skin Protection: Use chemical resistant gloves and protective wear to prevent exposure.

Eye Protection: Wear chemical goggles.

Exposure Control: General or local exhaust ventilation will prevent accumulations of vapours.

Waste Disposal: Set up barricades to prevent spread of liquid and continually monitor H₂S levels. Eliminate all sources of ignition. Prevent liquid from entering drains and sewers. Allow small amounts of liquid to evaporate with adequate ventilation. Dispose according to applicable federal, provincial and local regulations.

Handling/Storage: Bond and ground all pipelines, containers, and handling equipment. Eliminate all sources of ignition and ensure adequate ventilation.

REACTIVITY DATA

Hazard: Variable

Stability: This material is stable.

Incompatibility with: Oxidizing materials.

Reactivity Conditions: Heat or ignition sources may ignite product.

Decomposition Products: May release H₂S when agitated. Carbon dioxide and monoxide, acrid fumes and oxides of sulphur.

Material Identifier: Crude Oil – Sour**FIRST AID MEASURES**

- Inhalation:** Don breathing apparatus. Remove victim to fresh air. Commence CPR if breathing has stopped and summon medical aid immediately.
- Eye Contact:** Flush eyes with warm water for at least fifteen (15) minutes. Summon medical aid immediately.
- Skin Contact:** Remove contaminated clothing as soon as possible. Wash affected areas with warm soapy water. If irritation is severe or prolonged then victim should seek medical advise.
- Ingestion:** If this material is swallowed DO NOT induce vomiting. If vomiting begins, lower victim's head in an effort to prevent vomitus from entering lungs. Seek medical attention. Never give anything by mouth to an unconscious person.
- Emergency Procedures:** *Because hydrogen sulphide inhalation can be fatal, rescuers must wear positive pressure full face piece, self-contained breathing apparatus (SCBA) before attempting the rescue.*

10. MSDS PREPARATION

Prepared by: Jill Stevens
Title: Manager, Supply and Facilities
Phone Number: (403) 205-7724

Date Issued: May 2005.
Validity Expires: May 2008.
MSDS #: 002

Information sources: Industry publications and company correspondence.

Additional Information: L.E.L. - Lower Explosive Limit
 U.E.L. - Upper Explosive Limit
 P.I.N. - Product Identification Number
 WHMIS - Workplace Hazardous Material Information System
 TDG - Transportation Of Dangerous Goods
 N.A. - No data Available
 UN - United Nations

11. OTHER INFORMATION

This document is prepared by Tidal Energy. It is intended to provide information on the hazards of the material and to assist in the selection of appropriate control measures. It is not intended to be a substitute for a full MSDS or other safety data sheets. The information is provided for your information only and is not intended to be used for any other purpose.