Emergency Response Action Plan

ICP Annex 6

Superior Region (#866) Response Zone

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Annex 6 – Table of Contents Page

6.0 FIRST RESPONDER CHECKLIST 1
6.1 ACRONYMS / GLOSSARY 3
6.1.1 Acronyms 3
6.1.2 Glossary 9
6.2 GENERAL GUIDANCE 22
6.2.1 Contingency Plans 22
6.3 RESPONSE ZONE DESCRIPTION (INFORMATION SUMMARY) 23
6.3.1 Superior Regional County Map 29
6.4 DISCOVERY/DETECTION 31
6.4.1 Observation & Detection 31
6.4.2 Discharge Detection Alarm 31
6.4.3 Automated Discharge Detection 31
6.5 NOTIFICATION PROCEDURES 33
6.5.1 Required Notifications 33
6.5.2 Superior Region Notification Chart 34
6.5.3 Field Notifications 35
6.5.4 Control Center 36
6.5.5 Emergency Contact Information 36
6.5.6 Classification of the Incident 41
6.6 INITIAL RESPONSE 43
6.6.1 Isolation Distance 43
6.6.2 Setting Up Work Areas 45
6.6.3 Personnel Evacuation 45
6.6.4 Community Evacuation 47
6.7 OPERATIONS 49
6.7.1 Enbridge Response Management System 49
6.7.2 ICS Activation 50
6.7.3 ICS 207 Organization Chart 51
6.7.4 Operational Period Planning Cycle 52
6.7.5 ICS Common Responsibilities 53
6.7.6 Initial Response by Field Response Team 55

Annex 6 – Table of Contents Page

6.7.7 Hazard-Specific Field Response Team Guides 57
6.8 COMMUNICATIONS 89
6.9 RESPONSE EQUIPMENT 90
6.9.1 Spill Response Organizations – Internal & External Locations 91
6.9.2 Local Response Equipment 92
6.9.3 Emergency Response Time Maps 102
6.9.4 Enbridge-Owned Manned & Trailer Overview Maps 104
6.9.5 Mutual Aid Overview Map 107
6.10 ENVIRONMENTAL RESPONSE 108
6.10.1 Spills to Groundwater 108
6.10.2 Monitoring/Sampling Activities 112
6.10.3 Wildlife Management 114
6.10.4 Environmental Compliance 114
6.10.5 Environmental Documentation 115
6.10.6 Site Investigation and Remediation 116
6.11 PROTECTION, CONTAINMENT AND RECOVERY 117
6.11.1 Isolation Protection Technique Selection 117
6.11.2 Imperial/Metric Conversion Table 122
6.11.3 Freshwater Biological Disinfection 124
6.12 SAFETY DATA SHEETS (“SDS”) 126
6.13 FORMS 531

6.0 FIRST RESPONDER CHECKLIST

Form 1 of 2

Purpose: To be used when exploring a suspected or reported emergency. Safe work practices will be followed per the following guidelines (the order of these actions will depend on the situation).

EXPLORE- To be reviewed by the First Responder prior to taking any immediate action.	
☐	Determine the wind direction and approach cautiously from upwind.
☐	Explore the suspected release area only when wearing appropriate PPE using the buddy system if possible.
☐	Ensure safety of personnel in the area.
☐	Conduct a hazard assessment to determine the potential for fire, explosion and hazardous toxic vapors.
☐	Eliminate or shut off all potential ignition sources in the immediate area.
☐	Use intrinsically safe equipment (e.g., flashlights, two-way radios, gas detectors with audible alarms).
☐	Maintain regular/scheduled communication with the Control Centre and Regional Management/on-call person.
APPROACH	
☐	Verify wind direction and stay upwind.
☐	Are people injured or trapped?
☐	Are there outside people involved in rescue or evacuation?
☐	Are there immediate signs of potential hazards such as:
☐	Electrical lines down or overhead?
☐	Unidentified liquid or solid products visible?
☐	Vapors visible?
☐	Smells or breathing hazards evident?
☐	Fires, sparks or ignition sources visible?
☐	Holes, caverns, deep ditches, fast water or cliffs nearby?
☐	Is local traffic a potential problem?
☐	Ground conditions (select one) ☐ Dry ☐ Wet ☐ Icy
CONFIRM & CONTROL	
☐	Confirm identification of spilled material and check the MSDS sheets.
☐	Assess the spill threat, site safety, and parameters such as spill volume, extent and direction of movement.
☐	Has pipeline(s) been shut down?
☐	If on water, consult Control Point and HCA maps for appropriate response strategies for incoming resources.
☐	Has wind direction been confirmed and windsock erected?
☐	Has the public been protected or evacuation considered if necessary?
☐	Have all ignition sources been identified and eliminated?
☐	Establish Exclusion zone and Safe Work Areas (Hot, Warm, and Cold).
☐	Have personal protection and safety requirements been established and communicated?
☐	Is adequate fire protection equipment available and in place?
☐	Have valves been locked out if necessary?
☐	Are tank and VAC-truck electrical equipment properly grounded?
☐	Have decontamination sites and procedures been established?
☐	Are activities and events being logged/ documented?

First Responder Checklist - Continued

Form 2 of 2

COMMUNICATION	
☐	Initiate actions to notify government agencies including local authorities of area affected or at risk areas via the Control Centre, Regional Management or designate.
☐	Complete notifications for emergency call-out, including regulatory agencies. This will be done by Regional Management or designate.
☐	If excavating, has One-Call agency been notified?
☐	Has a Preliminary Incident Report been issued?
☐	Has a radio channel been established for communication between the site and other personnel in field?
CONSIDERATIONS	
☐	If appropriate, request surveillance fly-over to determine: • Size and description of oil slick; • Direction of movement; • Coordinates of leading and trailing edge of oil slick; • Sensitivities endangered; and • Areas of population that are threatened.
☐	If possible, photograph the area for situational awareness.
☐	Once support has arrived conduct transfer of command and start preparing for tactical and planning meetings.

6.1 ACRONYMS / GLOSSARY

6.1.1 Acronyms

Terminology specific to the U.S. is shaded in grey.

Acronym	Description
AAR/IP	After Action Report/ Improvement Plan
AER	Alberta Energy Regulator
ACP	Area Contingency Plan
API	American Petroleum Institute
ATV	All-Terrain Vehicle
AVP	Automated Valve Placement System
BBL	Barrel (Unit of Volume Equal to 42 Gallons)
BPD	Barrels per Day
C	Degrees Centigrade
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
CFR	Code of Federal Regulations
CGI	Combustible Gas Indicator
CMT	Crisis Management Team
CNW	Commercially Navigable Waterway (High Consequence Area)
COTP	Captain of the Port
CP	Control Point
CPM	Computational Pipeline Monitoring
CSA	Canadian Standards Association
CWA	Clean Water Act
DOCL	Documentation Unit Leader
DOSC	Deputy Operations Section Chief
DOT	U.S. Department of Transportation
DW	Drinking Water (High Consequence Area)
EAS	Emergency Alert System
EEC	Environmental Evaluation Coordinator
EH&S	Environment, Health, & Safety

Acronym	Description
EMS	Emergency Medical System
EMT	Emergency Medical Technician
ENR	Environment & Natural Resources (Northwest Territories Government)
ENVL	Environmental Unit Leader
EOC	Emergency Operations Center
EPA	U.S. Environmental Protection Agency
ERD	Emergency Response Directory
ERG	Emergency Response Guidebook
ERP	Emergency Response Plan
ERT	Emergency Response Team
ESA	Environmentally Sensitive Area (High Consequence Area)
E3RT	Enbridge Enterprise Emergency Response Team
ESD	Emergency Shutdown
FAA	Federal Aviation Administration
FE	Functional Exercise
FEMA	Federal Emergency Management Agency
FID	Flame Ionization Detector
FOSC	Federal On-Scene Coordinator
FP	Flashpoint
FRP	Facility Response Plan
FRT	Field Response Team
FSC	Finance Section Chief
FSE	Full Scale Exercises
FWPCA	Federal Water Pollution Control Act (as amended) (33 U.S.C. 1251 et seq.)
GIS	Geographic Information System
GIUE	Government-Initiated Unannounced Exercise in U.S.
GNWT	Government of Northwest Territories
GPM	Gallons Per Minute
GRP	Geographical Response Plans

Acronym	Description
HAZMAT	Hazardous Materials
HAZWOPER	Hazardous Waste Operations and Emergency Response
HCA	High Consequence Area
HPA	High Population Area (High Consequence Area)
IAP	Incident Action Plan
IC	Incident Commander
ICP	Integrated Contingency Plan
ICS	Incident Command System
IDLH	Immediately Dangerous to Life and Health
IMH	Incident Management Handbook
IMT	Incident Management Team
ISB-MGS	In-situ Burn Monitoring Group Supervisor
JIC	Joint Information Center
LEL	Lower Exposure Limit
LEPC	Local Emergency Planning Committee
LMS	Learning Management System
LNO	Liaison Officer
LOC	Level of Concern
LOSC	Local On Scene Coordinator
LPM	Line Pressure Monitor
LSC	Logistics Section Chief
MAOP	Maximum Allowable Operating Pressure
MBS	Material Balance System
NCP	National Contingency Plan
NGL	Natural Gas Liquids
NEB	National Energy Board
NIMS	National Incident Management System
NIOSH	National Institute of Standards and Technology
NPDES	National Pollutant Discharge Elimination System
NPMS	National Pipeline Mapping System

Acronym	Description
NRC	National Response Center
NRDA	Natural Resources Damage Assessment
NRS	National Response System
NRT	National Response Team
OPA	Other Populated Area (High Consequence Area)
OPA 90	Oil Pollution Act of 1990
OPR	Onshore Pipeline Regulations
ORM	Operational Risk Management
OSC	Operations Section Chief
OSHA	Federal Occupational Safety and Health Administration
OSRO	Oil Spill Response Organization
PAC	Public Awareness Committee
PAP	Public Awareness Program
PEP	Public Emergency Program
PIA	Post-Incident Analysis
PIO	Public Information Officer
PHMSA	Pipeline and Hazardous Materials Safety Administration
PLC	Programmable Logic Controller
PLM	Pipeline Maintenance
POLREP	Pollution Report
PPE	Personal Protective Equipment
PPM	Parts Per Million
PREP	National Preparedness for Response Exercise Program
PSC	Planning Section Chief
PSI	Pounds per square inch
PSIA	Pipeline Safety Improvement Act
QA/QC	Quality Assurance/ Quality Control
QI	Qualified Individual
RCP	Regional Contingency Plan
RCRA	Resource Conservation and Recovery Act

Acronym	Description
RICP	Regional Integrated Contingency Plan
ROW	Right-of-Way
RP	Recommended Practice
RRT	Regional Response Team
RSO	Radiation Safety Officer
RTTM	Real Time Transient Model
SARA	Superfund Amendments and Reauthorization Act
SCADA	Supervisory Control & Data Acquisition
SCAT	Shoreline Clean-up Assessment Team
SCBA	Self-Contained Breathing Apparatus
SDS	Safety Data Sheet (also known as Material Safety Data Sheet)
SERC	State Emergency Response Commission
SMART	Special Monitoring for Applied Response Technologies
SML	Subject Matter Lead
SOFR	Safety Officer
SONS	Spill of National Significance
SOP	Standard Operating Procedure
SOSC	State On-Scene Commander
SPC	Statistical Process Control
SPCC	Spill Prevention, Control, and Countermeasures
SSHP	Site Safety and Health Plan
TFR	Temporary Flight Restrictions
TSB	Transportation Safety Board
TTX	Table Top Exercise
UC	Unified Command
UEL	Upper Exposure Limit
USA	Unusually Sensitive Areas
USC	U.S. Code
WCD	Worst-Case Discharge

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6.1.2 Glossary

Terminology specific to the U.S. is shaded in grey.

Term	Definition
A	
Absorbent Material	Any of several materials designed to absorb oil, both hydrocarbon and non-hydrocarbon.
Access/Staging Areas	Designated areas offering access to spill sites for the gathering and deployment of spill response equipment and personnel.
Adversary	Any individual, group, organization or government that conducts, or has the intention and capability to conduct, activities detrimental to critical assets (e.g., intelligence services of host nations, political terrorist groups, criminals, rogue employees, private interest, site insiders/outsiders).
Adverse Weather	The weather conditions that will be considered when identifying response systems and equipment in a response plan for the applicable operation environment. Factors to consider include significant wave height, ice, temperature, weather-related visibility, and currents within the COTP zone under the U.S. Coast Guard / or Canadian Coast Guard in which the systems or equipment are intended to function.
Alert Levels	A progressive, qualitative measure of the likelihood of terrorist actions, from negligible to imminent, based on government or Company intelligence information. Different fixed or variable security measures may be implemented based on the level of threat to the facility.
Area Contingency Plan	A reference document prepared for the use by all agencies engaged in responding to environmental emergencies in a defined geographic area as described in the Oil Pollution Act of 1990.
Assisting Agency	An agency directly contributing tactical or service resources to another agency.
B	
Barrel ("bbl")	A barrel of crude oil is equal to 42 gallons (approximately 159 liters).
Boom	A temporary floating barrier used to contain an oil *spill*.
Boom Deployment	The placement of a boom on land or in water to contain a product release.
Business Critical Facilities	Facilities and assets, whether physical or virtual, so vital to the Company that the incapacity or destruction of such systems and assets would have a debilitating impact on people, the environment, property or economic viability of the Company.
C	
Cache	A pre-determined complement of tools, equipment, and/or supplies stored in a designated location, and available for incident use.

Term	Definition
CERCLA	The Comprehensive Environmental Response, Compensation and Liability Act, (U.S.) regarding hazardous substance releases into the environment and the clean-up of inactive hazardous waste disposal sites.
Clean-Up Contractor	Non-Company person contractually engaged to respond to and clean-up an oil spill.
Command Post	A site located in the cold zone where response decisions and activities can be planned, coordinated, and managed. The Incident Commander and regulatory bodies may operate from this location.
Company	Includes companies in the United States and in Canada.
Competent Worker	A person who, because of training and experience, is capable of identifying hazardous or dangerous conditions and has the authority to take prompt corrective measures to eliminate them.
Containment Boom	A flotation/freeboard device, made with a skirt/curtain, longitudinal strength member, and ballast unit/weight designed to entrap and contain the product for recovery.
Contamination Reduction Zone	The area between the contaminated zone and the clean zone. This area is designed to reduce the probability that in the future the area would become contaminated. Also known as the warm zone.
Contingency Plan	A document used by (1) Federal, Provincial/State, local and territorial agencies to guide entities' planning and response procedures regarding spill of oil, hazardous substances, or other emergencies; (2) a document used by industry as a response plan to spills of oil, hazardous substances, or other emergencies.
Contract or Other Approved Means	1. A written contractual agreement with a response contractor. The agreement should identify and ensure the availability of the specified personnel and equipment described under this plan within stipulated response times in the specified geographic areas; 2. Certification by the facility owner or operator that the specified personnel and equipment described under this plan are owned, operated, or under the direct control of the facility owner or operator, and are available within the stipulated times in the specified geographic areas; 3. Active membership in a local or regional oil spill removal organization that has identified specific personnel and equipment described under this plan that are available to respond to a discharge within stipulated times in the specified geographic areas.
Contractor	A company hired to complete specific work and paid directly by the Company.
Control Point ("CP")	A location downstream of a spill site on a stream or river where containment and recovery operations can occur.
Cooperating Agency	An agency supplying assistance other than direct tactical, support, or service functions or resources to the incident control effort.

Term	Definition
Crisis	An incident, emergency, or combination of circumstances that could have a significant negative impact on the public, the environment, or the Company's employees, operations, reputation, earnings, or share value.
Crisis Management Team ("CMT")	The executive group within the Company that functions away from the scene to support the Incident Management Team, facilitate planning, manage business recovery projects and address the implications of the problems and the potential impacts on the Company's viability, operability and credibility. Provides off-site strategic support.
Critical Facility	A facility that meets one or more of the following criteria: • May be considered a viable terrorist target, and a release from the facility has the potential for mass casualties or significant impact on public drinking water affecting a major population center if damaged or destroyed, would have a detrimental impact on the reliability or operability of the pipeline system, significantly impairing the ability to service a large number of customers for an extended period • If damaged or destroyed, would significantly impair other modes of transportation or other critical infrastructures (e.g., electrical power generation, telecommunications, public utility)
Critical Infrastructure	Systems and assets, whether physical or virtual, so vital to the Company that the incapacity or destruction of such systems and assets would have a debilitating impact on security, national economic security, national public health and safety or any combination thereof.
Crude Oil	Any liquid hydrocarbon mixture occurring naturally in the earth, whether or not treated to render it suitable for transportation, and includes crude oil from which certain distillate fractions may have been removed and crude oil to which certain distillate fractions may have been added.
Culturally Sensitive Areas	Current, historic, prehistoric, and archaeological resources which include deposits, structures, sites, ruins, buildings, graves, artifacts, fossils, or other objects of antiquity which provide information pertaining to historical or prehistoric culture of people as well as the natural history of the area.
D	
Damage Assessment	The process of determining and measuring damages and injury to the human environment and natural resources, including cultural resources. Damages include differences between the conditions and use of natural resources and the human environment that would have occurred without the incident, and the conditions and use that ensued following the incident. Damage assessment includes planning for restoration and determining the costs of restoration.
Dark Site	Activated to manage internal/ external communications related to any emergency.

Term	Definition
Decontamination ("Decon")	The removal of hazardous substances from personnel and equipment necessary to prevent adverse health effects.
Diluents	A generic term that encompasses any mixture of light liquid hydrocarbons used to dilute a heavier petroleum product (such as bitumen). As a common carrier, Enbridge may transport several different mixtures of diluents.
Discharge	Any spilling, leaking, pumping, pouring, emitting, emptying, or dumping.
Dispersants	Those chemical agents that emulsify, disperse, or solubilize oil into the water column or promote the surface spreading of oil slicks to facilitate dispersal of the oil into the water column.
Diversion Boom	A flotation/freeboard device, made with a skirt/curtain, longitudinal strength member, and ballast unit/weight designed to deflect or divert floating product towards a pick up point or away from certain areas.
Dredging	Underwater excavation activity where heavy equipment is used to collect and remove bottom sediments by scraping or sucking.
E	
Enbridge Enterprise Emergency Response Team ("E3RT")	Comprised of individuals from each business unit (Liquids Pipelines, Gas Processing and Pipelines, Gas Distribution) to ensure that the Company has a highly trained team of that can be called upon within the organization to respond to large scale incidents anywhere within the Company.
Emergency	An unforeseen combination of circumstances or a disruption of normal operating conditions that poses a potential threat to human life, health, property, and/or the environment if not contained, controlled, or eliminated immediately.
Emergency Operations Center ("EOC")	A pre-designated facility established by an agency or jurisdiction to coordinate the overall agency or jurisdictional response and support to an emergency response.
Emergency Organization	The chain of command used during emergency operations to provide effective management of the emergency and available resources.
Emergency Response Guidebook ("ERG")	This Guidebook is for Enbridge responders during the initial phase of a dangerous goods/hazardous materials transportation incident. It is a joint publication by the PHMSA, Transport Canada and the Secretariat of Transport and Communications of the Mexican Government.
Emergency Service	Those activities provided by the provincial/state and local governments to prepare for and carry out any activity to prevent, minimize, respond to, or recover from an emergency.
Enbridge Responder	Individual(s) employed by Enbridge who responds to a release or a potential release of hazardous substances as part of the initial response to the site for purposes of protecting nearby persons, property or the environment from the effects of the release.

Term	Definition
Environmentally Sensitive Areas ("ESA")	Streams and water bodies, aquifer recharge zones, springs, wetlands, agricultural areas, bird rookeries, endangered or threatened species (flora and fauna) habitat, wildlife preserves or conservation areas, parks, beaches, dunes, or any other area protected or managed for its natural resource value.
Exercise Design Team	A team comprised of federal, provincial/state and industry representatives with responsibility for designing an Area Exercise. The exercise design team is charged with working with the lead plan holder to develop the scope, parameters and exercise scenario, although the lead plan holder retains the final decision on these.
External First Responders, First Response Agency	A public health or safety agency (e.g. fire service or police department) charged with responding to a spill during the emergency phase and alleviating immediate danger to human life, health, safety, or property.
F	
Field Response Team ("FRT")	A team of tactical Enbridge responders who take actions at an incident scene to directly respond to the problem and its consequence. Provides on-site tactical support. This team is made up of the Pipeline Maintenance ("PLM") crew or other similar group. Also known as Spill Management Team.
Fish and Wildlife and Sensitive Environments	Areas that may be identified by either their legal designation or by evaluations of Area Committees (for planning) or members of the jurisdiction having authority in the spill response structure (during responses). These areas may include wetlands, National and Provincial/State parks, critical habitats for endangered/threatened species, wilderness and natural resource areas, marine sanctuaries and estuarine reserves, conservation areas, reserves, wildlife areas, wildlife refuges, wild and scenic rivers, recreational areas, national forests, Federal and provincial/state lands that are research national areas, heritage program areas, land trust areas, and historical and archeological sites and parks.These areas may also include unique habitats such as aquaculture sites and agricultural surface water intakes, bird nesting areas, critical biological resource areas, designated migratory routes, and designated seasonal habitats.
Function	In ICS, function refers to the five major activities in the ICS, i.e., Command, Operations, Planning, Logistics, and Finance/Administration. The term function is also used when describing the activity involved, e.g., "the planning function."
G	
Geographic Information System ("GIS")	An electronic information system that provides a geo-referenced database to support management decision-making.
H	
Handle	To transfer, transport, pump, treat, process, store, dispose of, drill for, or produce.

Term	Definition
Harmful Quantity of Oil	The presence of oil from an unauthorized discharge in a quantity sufficient either to create a visible film or sheen or discoloration upon water, shoreline, tidal flat, beach, or marsh, or to cause a sludge or emulsion to be deposited beneath the surface of the water or on a shoreline, tidal flat, beach, or marsh.
Hazardous Substance / Material	Dangerous goods (solids, liquids or gases) that can harm people, other living organisms, property, or the environment, including but not limited to substances otherwise defined as hazardous wastes, dangerous wastes, extremely hazardous wastes, oil, or pollutants that are classified by CERCLA in the U.S and Environment Canada.
Hazardous Waste Operations and Emergency Response ("HAZWOPER")	Training required in the U.S under OSHA *29CFR§1910.120*. for responders who are exposed to or potentially exposed to hazardous substances including hazardous waste. Canadian employees will be required to complete the appropriate training course based on their potential job duties in a cross border response.
Health Hazard	A chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed persons.
I	
Incident	An event affecting Company operations that may be an emergency or crisis.
Incident Action Plan ("IAP")	A document Is initially prepared at the first planning meeting that contains general control objectives reflecting the overall incident strategy, and specific action plans for the next operational period. When complete, the Incident Action Plans will include a number of attachments.
Incident Commander ("IC")	Person responsible for all aspects of the response, including developing incident objectives and managing all incident operations. This means the most qualified person, not necessarily the most senior person, on scene.
Incident Command Post	The location at which the primary command functions are executed; may be collocated with the incident base.
Incident Command System ("ICS")	A standardized on-scene emergency management system specifically designed to allow its user(s) to adopt an integrated organizational structure equal to the complexity and demands of single or multiple incidents, without being hindered by jurisdictional boundaries.
Incident Management Handbook ("IMH")	The IMH is intended to be used as an easy reference job aid for responders; designed to assist responders in the use of the National Incident Management System (Incident Command) during response operations.
Incident Management Team ("IMT")	A team that functions at and/or away from the incident scene to support tactical response operations, facilitates planning, and addresses the concerns of public and government agencies.

Term	Definition
Incident Objectives	Statements of guidance and direction necessary for the selection of appropriate strategies, and the tactical direction of resources. Incident objectives are based on realistic expectations of what can be accomplished when all allocated resources have been effectively deployed. Incident objectives must be achievable and measurable, yet flexible enough to allow for strategic and tactical alternatives.
Industry	For the purpose of these guidelines, industry means the oil and hazardous substance industry required to submit response plans and comply with exercise requirements, as specified in appropriate vessel, facility, pipeline, and Outer Continental Shelf platform regulations. The USCG, EPA, PHMSA, NEB and AER administer these regulations.
Initial Notification	The process of notifying necessary Company personnel and necessary agencies having jurisdictional authority that a spill has occurred and including all pertinent available information surrounding the incident.
Initial Remediation	Remedial action at a site to eliminate acute hazards associated with a spill. An initial clean-up action is implemented at a site when a spill of material is an actual or potentially imminent threat to public health or the environment, or difficulty of clean-up increases significantly without timely remedial action. All sites must be evaluated to determine whether initial clean-up is total clean-up; however, this will not be possible in all cases due to site conditions (e.g., a site where overland transport or flooding may occur).
Injury	A measurable adverse change, either long- or short-term, in the chemical or physical quality of the viability of a natural resource resulting either directly or indirectly from exposure to a discharge of oil, or exposure to a product of reactions resulting from a discharge of oil.
In-Situ Burning	A technique that involves the controlled burning of an oil spill at the location of the spill.
Integrated Contingency Plan ("ICP")	A plan to provide guidance to Company personnel on the immediate procedures, notifications and sustained operations in the event of an emergency response incident.
Interim Storage Site	A site used to temporarily store recovered oil or oily waste until the recovered oil or oily waste is disposed of at a permanent disposal site. Interim storage sites include trucks, barges, and other vehicles, used to store waste until the transport begins.
J	
Joint Information Center ("JIC")	A facility established within, or near, the Incident Command Post where the Information Officer and staff can coordinate and provide incident information to the public, news media, and other agencies or organizations. The JIC is normally staffed with representatives from the jurisdiction having authority and the Responsible Party.

Term	Definition
Jurisdiction	A range or sphere of authority. At an incident, public agencies have jurisdiction related to their legal responsibilities and authority for incident mitigation. Jurisdictional authority at an incident can be political/geographical (e.g., city, county, provincial/state, or Federal boundary lines), or functional (e.g., police department, health department, etc.). (See Multi-Jurisdiction).
Jurisdictional Agency	The agency having jurisdiction and responsibility for a specific geographical area, or a mandated function.
L	
Lead Agency	The government agency that assumes the lead for directing response.
Lead Provincial/ State Agency	The agency that coordinates provincial/state support to Federal and/or Local governments or assumes the lead in the absence of Federal response.
Liquid Wastes	Liquids contaminated with solids or mixed with other liquids (e.g., emulsion, contaminated soil).
Local Emergency Planning Committees ("LEPC")	A local governmental entity that identifies and catalogues potential hazards, identifies available resources, mitigates hazards when feasible, and has input into emergency plans for operations occurring in their geographical jurisdiction. According to the U.S. National Response Plan the initial response to an emergency incident or disaster is by local officials. The role of the LEPC is to anticipate and plan the initial response for foreseeable disasters in their jurisdiction.
Local On-Scene Coordinator ("LOSC")	Local Government Representative.
Location Boundaries	Areas where oil may be expected to impact during the first day of a spill event.
Lower Explosive Limit ("LEL")	Air measurement to determine the lowest concentration of vapours that support combustion. This measurement must be made prior to entry into a spill area.
N	
National Contingency Plan ("NCP")	The plan prepared in the U.S. under the FWPCA and CERCLA, and revised from time to time.
National Response Center ("NRC")	The U.S. Federal authorities to be the first notified in the event of an incident.
Natural Resource	Land, fish, wildlife, biota, air, water, groundwater, drinking water supplies, and other resources belonging to, managed by, held in trust by, appertaining to or otherwise controlled by the province/state, federal government, private parties, or a municipality.
Natural Resource Damage Assessment ("NRDA")	The process of collecting and analyzing information to evaluate the nature and extent of injuries resulting from an incident, and determine the restoration actions needed to bring injured natural resources and services back to baseline and make the environment whole for interim losses. (15CFR§990.30)

Term	Definition
National Incident Management System ("NIMS")	Identifies concepts and principles that answer how to manage emergencies from preparedness regardless of their cause, size, location or complexity.
Non-Persistent or Group I Oil	Refers to a petroleum-based oil that, at the time of shipment, consists of hydrocarbon fractions -- a) At least 50% of which by volume, distill at a temperature of 340° C (645° F); and b) At least 95% of which by volume distill at a temperature of 370° C (700° F).
Non-Petroleum Oil	Oil of any kind that is not petroleum-based. It includes, but is not limited to, animal and vegetable oils.
O	
Oil or Oils	Naturally occurring liquid hydrocarbons at atmospheric temperature and pressure coming from the earth, including condensate and natural gasoline, and any fractionation thereof, including, but not limited to, crude oil, petroleum gasoline, fuel oil diesel oil, oil sludge, oil refuse, and oil mixed with wastes other than dredged spoil.
Oil Spill Cooperative (Mutual Aid)	Multi-company cooperative organization developed by industry to assist with oil spill response and clean up. Typically, manpower and equipment are identified by a company on a voluntary basis.
Oil Spill Response Organization ("OSRO")	An entity that provides oil spill response resources, and includes any for-profit or not-for-profit contractor, cooperative, or in-house response resources that have been established in a geographic area to provide required response resources.
Oil Spill Response Contractors	Persons/Companies contracted to undertake a response action to contain and/or clean up a spill.
Oily Waste	Oil-contaminated waste resulting from an oil spill or spill response operations.
Operations Section Chief	A member of the General Staff who establishes the tactics to meet the incident objectives and directs all operational resources.
Owner or Operator	Any person, individual, partnership, corporation, association, governmental unit or public or private organization of any character.
P	
Persistent Oil	Under OPA 90, persistent oils are petroleum-based oils that do not meet the distillation criteria for non-persistent oil. Persistent oils are classified based on specific gravities as follows: • Group II – specific gravity less than .85; • Group III – specific gravity between .85 and less than .95; • Group IV – specific gravity .95 to and including 1.0.; and • Group V – specific gravity greater than 1.0.
Term	**Definition**
Physical Security	Security systems and architectural features that are intended to improve protection (e.g., fencing, doors, gates, walls, turnstiles, locks, motion detectors, vehicle barriers, hardened glass).

Term	Definition
Post-Emergency Response	The portion of a response performed after the immediate threat of a release has been stabilized or eliminated and clean-up of the sites has begun.
PREP	National Preparedness for Response Exercise Program – workable exercise program which meets the intent of section 4202(a) of the Oil Pollution Act of 1990 (OPA 90) in the United States. Enbridge follows PREP guidelines across the system in both the United States and Canada.
Procurement Unit	Functional unit within the Finance/Administration Section responsible for financial matters involving vendor contracts.
Q	
Qualified Individual ("QI")	A qualified individual is the person who is authorized to do the following: (1) activate and engage in contracting with oil spill removal organizations; (2) act as a liaison with the on-scene coordinator; and (3) obligate funds required to effectuate response activates. For Enbridge, this person is typically the Incident Commander.
R	
Regional Response Team ("RRT")	A U.S. Federal response organization, consisting of representatives from specific Federal and state agencies, responsible for regional planning and preparedness before an oil spill occurs and for providing advice to the FOSC in the event of a major or substantial spill.
Response Activities	Refers to the containment and removal of oil from the water and shorelines, the temporary storage and disposal of recovered oil, and the taking of other actions as necessary to minimize or mitigate damage to the environment.
Response Guidelines	Guidelines for initial response that are based on the types of product involved in the spill; these guidelines are utilized to determine clean-up methods and equipment.
Response Plan	A practical plan used by Industry for responding to a spill. Its features include (1) identifying the notification sequence, responsibilities, response techniques, etc. in an easy to use format; (2) using decision trees, flowcharts, and checklists to ensure the proper response for spills with varying characteristics; and (3) segregating information needed during the response from that required by regulatory agencies to prevent confusion during a spill incident.
Response Resources	The personnel, equipment, supplies and other capability necessary to perform the Response Activities identified in a Response Plan.

Term	Definition
Responsible Party	The Owner/Operator of the vessel or facility that is the spill source.
Risk	Potential for damage to or loss of an asset. Risk, in the context of process security, is the potential for a catastrophic outcome.
Rivers and Canals	A body of water confined within the Inland area that has a projected depth of 12 feet or less, including the Intracoastal Waterway and other waterways artificially created for navigation.
S	
Safety-Related Condition (Gas Only)	Any condition on a jurisdictional pipeline facility that lies within 220 yards of any building intended for human occupancy or an outdoor place of assembly or is within the right-of-way (ROW) of an active railroad or an asphalt/concrete paved road/ street / highway that meets one of the following criteria: • A material defect, physical damage or localized pitting on an effectively coated and cathodically protected pipeline operating at or above 20% SMYS and required repair as per Company procedure, • A leak in a pipeline that is characterized by the need for immediate corrective action to protect the public or property, • Unintended movement or abnormal loading by an environmental cause (e.g., earthquake, landslide, flood) that impairs the serviceability of a pipeline, applying sudden occurring movement in particular, • Any equipment malfunction or operating error that causes the pressure in a pipeline to exceed the maximum allowable operating pressure (MAOP) and the plus allowed build-up or overpressure, and • A shutdown of the pipeline or a reduction in operating pressure of 20% or more that is done in reaction to an imminent hazard or a known unsafe condition.
Site Conditions	Details of the area surrounding the facility, including shoreline descriptions, typical weather conditions, socioeconomic breakdowns, etc.
Site Emergency	Means an incident has occurred and the entire terminal, with the exception of critical employees has been sheltered on-site or evacuated.
Site Safety and Health Plan ("SSHP")	The SSHP, at minimum, addresses, includes, or contains the following elements: health and safety hazard analysis for each site task or operation, comprehensive operations work plan, personnel training requirements, personal protection equipment ("PPE") selection criteria, site-specific occupational medical monitoring requirements, air monitoring plan, site control measures, confined space entry procedures (if needed), pre-entry briefings (tailgate meetings, initial and as needed), pre-operations commencement health and safety briefing for all incident participants, and quality assurance of SSHP effectiveness.

Term	Definition
Site Security and Control	Steps that must be taken to provide safeguards needed to protect personnel and property, as well as the general public, to ensure an efficient clean-up operation.
Site Supervisor	A generic term that refers to the employee responsible for the location (i.e., Pipeline Maintenance ("PLM") coordinator/supervisor, technician, terminal supervisor), or designate.
Skimmers	Mechanical devices used to skim the surface of water and recover floating oil. There are four basic categories of skimmers; suction heads, floating weirs, oleophilic surface units, and hydrodynamic devices. These vary in efficiency depending on the type of oil and size of spill.
Sorbents	Materials ranging from natural products to synthetic polymeric foams placed in confined areas to soak up small quantities of oil. Sorbents are very effective in protecting walkways, boat decks, working areas, and previously uncontaminated or cleaned areas.
Source Control	Actions necessary to control the spill source and prevent the continued release of oil or hazardous substance(s) into the environment.
Span of Control	The number of organizational elements that may be directly managed by one person. Span of Control may vary from three to seven, and a ratio of one to five reporting elements is recommended.
Spill Observer	The first Company individual who discovers an oil spill. This individual must function as the responsible person-in-charge until relieved by an authorized supervisor.
Spill Response	All actions taken in responding to spills of oil and hazardous materials (HAZMAT), i.e., receiving and making notifications; information gathering and technical advisory phone calls; preparation for and travel to and from spill sites; direction of clean-up activities; damage assessments; report writing, enforcement investigations and actions; cost recovery; and program development.
Spill Response Personnel	Federal, Provincial/State, Local agency, and industry personnel responsible for participating in or otherwise involved in spill response. All spill response personnel will be preapproved on a list maintained in each Company region.
Stakeholders	Any person, group, or organization affected by, and having a vested interest in, the incident and/or the response operation.
State Emergency Response Commission ("SERC")	A group of officials in the U.S. appointed by the Governor to implement the provisions of Title III of the Federal Superfund Amendments and Reauthorization Act of 1986 ("SARA"). The SERC approves the State Oil and Hazardous Substance Discharge Prevention and Contingency Plan and Local ERPs.
Strategy	The general plan or direction selected to accomplish incident objectives.
Submerged Oil	Oil suspended beneath the surface or that sinks to the bottom of a body of water.

Term	Definition
Substantial Threat of a Discharge	Any incident or condition involving a facility that may create a risk of discharge of Crude Oil and Oil. Such incidents include, but are not limited to storage tank or piping failures, above ground or underground leaks, fires, explosions, flooding, spills contained within the facility, or other similar occurrences.
T	
Tactical Direction	Directions given by the Operations Section Chief including: the tactics appropriate for the selected strategy; the selection and assignment of resources; tactics implementation; and performance monitoring for each operational period.
Tactics	Deploying and directing resources during an incident to accomplish the desired objective.
Technical Specialists	Personnel with special skills or technical expertise who can be used anywhere within the ICS organization.
Temporary Flight Restrictions ("TFR")	Temporary airspace restrictions for non-emergency aircraft in the incident area. TFRs are established by the FAA to ensure aircraft safety and are normally limited to a five-nautical-mile radius and 2000 feet in altitude.
Transfer of Command	An ICS term which means the process of moving the responsibility from one incident command team to another. This term primarily relates to the Incident Commander.
Unusually Sensitive Area ("USA")	A drinking water or ecological resources area that is unusually sensitive to environmental damage from a hazardous liquid pipeline release.
V	
Vendors	Vendors are defined as external parties that provide HAZWOPER training following OSHA standards in *29CFR§1910.120* and also satisfy the OSHA recommendations for instructors in *29CFR§1910.120*; Appendix E "*Training Curriculum Guidelines*".
W	
Wildlife Rescue	Efforts made in conjunction with the appropriate jurisdictional agencies to retrieve, clean, and rehabilitate birds and wildlife affected by an oil spill.
Workers	Company employees and contract workers.

6.2 GENERAL GUIDANCE

The purpose of this Emergency Response Action Plan is to provide quick access to key types of information that are often required in the initial stage of an emergency incident. The information provided in this Emergency Response Action Plan is presented in greater detail in other sections of the Integrated Contingency Plan.

The Emergency Response Action Plan will be updated and redistributed annually. Coordinating updates and reviews of the Emergency Response Action Plan shall be the responsibility of the Emergency & Security Management Department.

6.2.1 Contingency Plans

Contingency Plans

- National Oil and Hazardous Substances Pollution Contingency Plan (NCP)
- Canada-United States Joint Inland Pollution Contingency Plan (CANUSPLAIN)
- EPA Region 5 Area Contingency Plan
- EPA Inland Area Contingency Plan
- Inland Response Tactics Manual (USCG)
- Wisconsin Contingency Plan for Hazardous Substance Discharges
- Sub-Area Geographical Response Plans (GRP):
    - Emergency Support Function 10- Wisconsin (GRP)
    - Minnesota Spill Bill (GRP)
    - Northern Michigan Sub-area Contingency Plan (GRP)
    - Western Lake Superior Area Contingency Plan (GRP)

Tactical Response Plans

- Straits of Mackinac
- Cass Lake
- Superior Terminal- Superior Bay
- Indian River
- Red River of the North

6.3 RESPONSE ZONE DESCRIPTION (INFORMATION SUMMARY)

The Superior Region Response Zone consists of two entities: Enbridge Energy, Limited Partnership and Enbridge Pipelines (Southern Lights) L.L.C. This response zone begins at the Canadian border near Neche, North Dakota and continues across northern Minnesota into Wisconsin and Michigan. The first section of this response zone includes seven pipelines (Lines 1, 2, 3, 4, 13, 65, and 67) that transport crude oil and natural gas south and diluent condensate north. The response zone continues south of Superior to the U. S. Highway 8 crossing near Ladysmith, WI with four pipelines (Lines 6A, 13, 14, and 61) transporting crude oil and diluent condensate from the Manhattan Terminal in Illinois. A 30-inch pipeline (Line 5) originates in Superior, WI that transports crude oil and natural gas liquids east across northern Wisconsin, the Upper Peninsula of Michigan and into lower Michigan with the Superior Region ending south of Indian River, MI.

Enbridge Energy, Limited Partnership includes:

- **Lines 1** (18”/20”), **2** (26”), **3** (34”), **4** (36”/48”), and **67** (36”) flow from the US/Canadian border near Gretna, Manitoba to Superior, Wisconsin;
- **Line 65** (20”) begins at the US/Canadian border near Gretna, Manitoba and terminates at Clearbrook, Minnesota;
- **Line 5** (30”) starts at Superior, Wisconsin extending east across northern Wisconsin, the upper peninsula of Michigan and into lower Michigan, terminating in Sarnia, Ontario. The Superior Region ends north of the Lewiston, Michigan station at MP 1544.25.
- **Lines 6A** (34”) and **14** (24”) begin at Superior, Wisconsin and traverse south, with Line 14 terminating at Mokena, Illinois and Line 6A terminating at Griffith, Indiana. The Superior Region ends at U.S. Hwy 8 near Ladysmith, Wisconsin for both lines.
- **Line 61** (42”) (Southern Access) extends from Superior, Wisconsin to Flanagan, Illinois. The Superior Region ends at U.S. Hwy 8 near Ladysmith, Wisconsin.

Enbridge Pipelines (Southern Lights) L.L.C.:

- **Line 13** (18”/20”) runs from Manhattan, Illinois to the US/Canadian border near Gretna, Manitoba. The Superior Region begins at U.S. Hwy 8 near Ladysmith, Wisconsin.

Superior Region valve schematics have been compressed into electronic media, and are accessible through the regional office.

Superior Region Pipelines Beginning and Ending Stationing

Line	Pipeline Sections	Begin Stationing	End Stationing	Miles	Pipeline Diameter	Product
1	Gretna, Manitoba to Clearbrook, MN	0	716,232	135.7	20”	Crude Oil & Natural Gas Liquids
1	Clearbrook, MN to Superior, WI	716,232	1,712,883	188.8	18”	Crude Oil & Natural Gas Liquids
2	Gretna, Manitoba to Superior, WI	0	1,712,887	324.4	26”	Crude Oil
3	Gretna, Manitoba to Superior, WI	0	1,712,887	324.4	34”	Crude Oil
4	Gretna, Manitoba to Donaldson, MN (MP814)	0	168,408	31.9	36”	Crude Oil
4	Donaldson, MN to Viking, MN	168,041	213,109	8.5	48”	Crude Oil
4	Donaldson, MN to Viking, MN (MP 834)	213,461	322,423	20.6	36”	Crude Oil
4	Donaldson, MN to Plummer, MN	320,971	393,021	13.6	48”	Crude Oil
4	Viking, MN to Plummer, MN (MP 874)	394,395	527,703	25.2	36”	Crude Oil
4	Viking, MN to Clearbrook, MN	526,404	545,840	3.7	48”	Crude Oil
4	Plummer, MN to Clearbrook, MN (MP 909)	547,141	647,345	19.0	36”	Crude Oil
4	Plummer, MN to Clearbrook, MN	645,406	716,261	13.4	48”	Crude Oil
4	Clearbrook, MN to Cass Lake, MN Loop (MP 940)	716,411	878,927	30.8	36”	Crude Oil
4	Cass Lake, MN Loop (MP939.87 to MP 953.04)	877,981	946,695	13.1	48”	Crude Oil
4	Clearbrook, MN to Deer River ,MN Loop (MP 996)	946,641	1,059,570	21.4	36”	Crude Oil
4	Deer River, MN Loop (MP 974.73 to MP995.83)	(127,102)*	1,173,196	22.0	48”	Crude Oil
4	Cass Lake, MN to Floodwood, MN Loop (MP1044)	1,173,151	1,306,304	25.2	36”	Crude Oil

Line	Pipeline Sections	Begin Stationing	End Stationing	Miles	Pipeline Diameter	Product
4	Floodwood, MN Loop (MP1019.73 to MP1044.33)	1,299,654	(47,009)*	24.6	48”	Crude Oil
4	Deer River, MN to Wrenshall, MN Loop (MP 1080)	1,429,072	1,512,231	15.7	36”	Crude Oil
4	Wrenshall, MN Loop (MP1060.11 to MP1079.91)	1,512,091	1,616,806	20.0	48”	Crude Oil
4	Wrenshall, MN Loop to Superior, WI (MP 1098)	1,616,840	1,712,760	19.8	36”	Crude Oil
13	Gretna, Manitoba to Clearbrook, MN	0	715,074	135.4	18”	Diluent Condensate
13	Clearbrook, MN to Superior, WI	0	1,003,300	190	20”	Diluent Condensate
13	Superior, WI to U.S. HWY 8 (Ladysmith, WI)	0	524,052	99	20”	Diluent Condensate
5	Superior, WI to Mackinaw, MI	0	1,993,306	377.5	30”	Crude Oil & Natural Gas Liquids
5	Straits of Mackinac East and West 2	1,993,306	2,015,016	8.2	20”	Crude Oil & Natural Gas Liquids
5	Straits of Mackinac to Lewiston Pump Station (MP1544.3)	2,015,016	2,378,371	68.8	30”	Crude Oil & Natural Gas
6A	Superior, WI to U.S. HWY 8 (Ladysmith, WI)	0	513,368	97.2	34”	Crude Oil
14	Superior, WI to U.S. HWY 8 (Ladysmith, WI)	0	512,719	97.1	24”	Crude Oil
61	Superior, WI to U.S. HWY 8 (Ladysmith WI)	0	523,170	99.08	42”	Crude Oil
65	Gretna, Manitoba to Clearbrook, MN	0	721,140	136.6	20”	Crude Oil
67**	**Gretna, Manitoba to Superior, WI**	**0**	**1,723,800**	**326.7**	**36”**	**Crude Oil**
	Total Pipeline Miles			**2937.38**		

The Superior Region System is comprised of:

- Approximately 2,937 miles of pipeline, with pipe diameters ranging from 18 to 48 inches;
- 24 pump stations located along the pipe; and
- Two terminal facilities with a total of 51 tanks 42 breakout tanks are located at Superior, WI and 9 tanks at Clearbrook, MN.

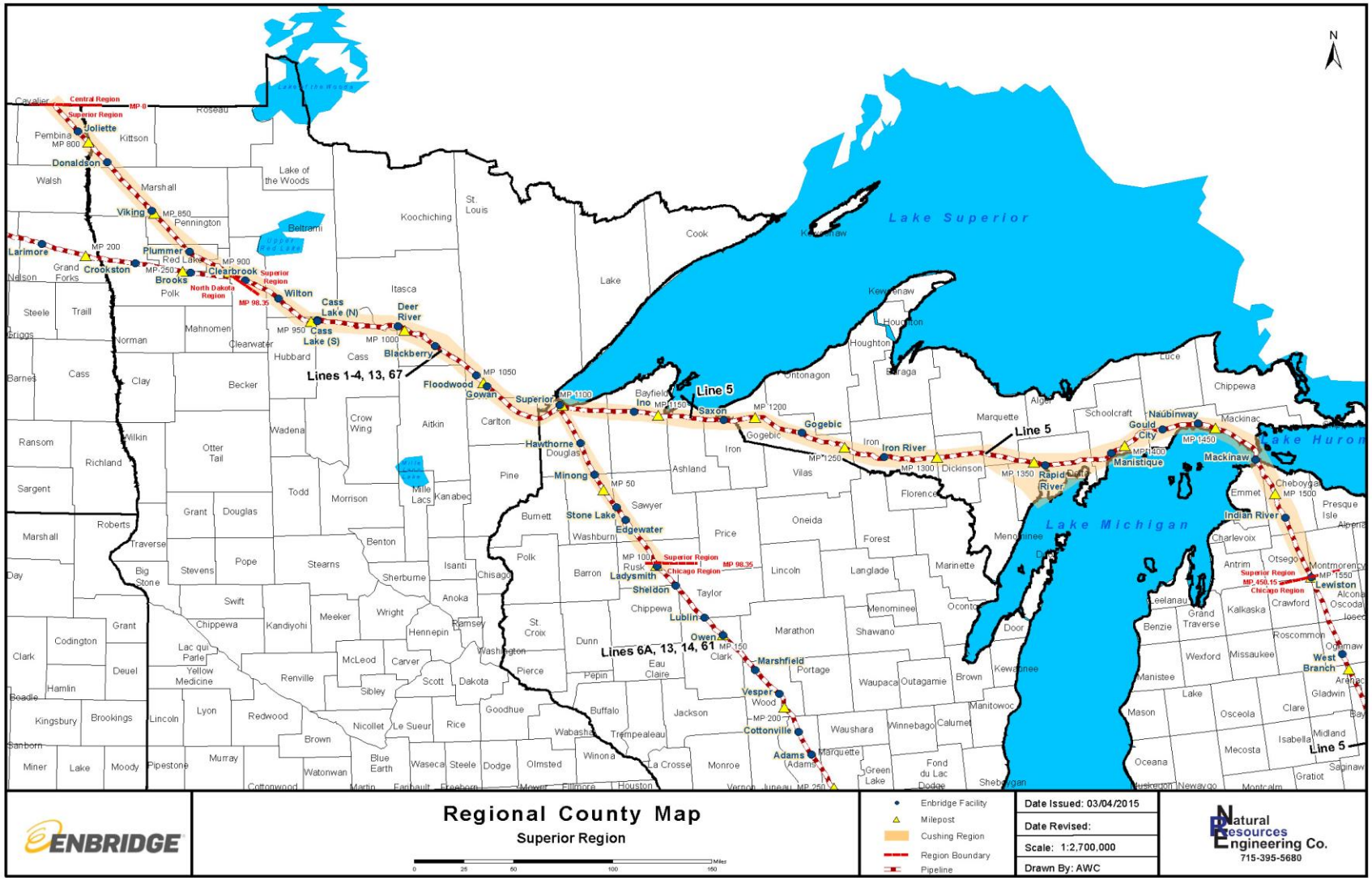
Tank Table

TANK NO.	LOCATION	DATE BUILT	TOTAL VOLUME	Total Facility Capacity (Bbls)
56	**Clearbrook**	1960	54,000	**1,264,000**
57		1960	120,000	
58		1960	80,000	
59		1972	80,000	
60		1972	80,000	
61		1994	200,000	
62		1995	200,000	
63		1995	200,000	
64		1996	250,000	
1	Superior	1973	390,000	**See Below**
2		1973	390,000	
3		1989	150,000	
4		1989	150,000	
5		1951	150,000	
6		1951	150,000	
7		1951	150,000	
8		1951	150,000	
9		1951	150,000	
10		1951	150,000	
11		1951	150,000	
12		1951	150,000	
13		1952	217,000	
14		1952	217,000	
15		1952	217,000	
16		1952	217,000	
17		1952	217,000	
18		1952	217,000	
19		1968	217,000	
20		1952	217,000	
21		1952	217,000	

TANK NO.	LOCATION	DATE BUILT	TOTAL VOLUME	Total Facility Capacity (Bbls)
22	Superior	1952	217,000	9,819,000
23		1971	217,000	
24		1971	217,000	
25		1990	217,000	
26		1994	217,000	
27		1995	217,000	
28		1969	217,000	
29		1969	217,000	
30		2000	250,000	
31		2000	250,000	
32		2003	180,000	
33		2003	180,000	
34		2007	390,000	
35		2008	250,000	
36		2010	250,000	
37		2010	250,000	
38		2010	250,000	
39		2010	250,000	
40		2010	250,000	
41		2014	550,000	
42		2014	550,000	
Total Region Capacity		**11,083,000 bbls**		

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6.3.1 Superior Regional County Map



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6.4 DISCOVERY/DETECTION

6.4.1 Observation & Detection

The detection of a discharge from the Company pipeline system may occur in a number of ways, including:

- Discharge detection by Company personnel, pipeline patrols, or the general public.
- Automated discharge detection by the SCADA system at the Control Center which monitors flow and pressure on most lines as well as breakout tank oil levels.

6.4.2 Discharge Detection Alarm

In the event of a change in pressure beyond a specified range, the operator will be signaled by an alarm which may result in the operator shutting down the associated pipeline or process equipment.

Control Center Alarm Procedures	
✓	Ensure that the pipeline pressure sensing equipment is not malfunctioning
✓	Notify supervisor/manager of any abnormal operation within no less than 10 minutes
✓	Once a determination of an unresolved fluctuation of flow restriction is made, shutdown should be made by supervisory personnel
✓	Once a shutdown decision has been made personnel will be dispatched to assess situation
✓	Until assessment has been made the pipeline will remain shut down until approval for reopening by appropriate authority
✓	The supervisor/manager will request a field inspection of the pipeline ROW in question to identify the source of the suspected leak
✓	In the event a release is discovered along the pipeline, this Plan will be activated
✓	In the event a release is not found, an investigation into the cause of the pressure change will continue until determined.

If a release is detected, personnel are directed to notify the proper authorities (see *Section 6.5-Notification Procedures*).

6.4.3 Automated Discharge Detection

Enbridge facilities are equipped with high level alarms, which sound the computerized alarm locally at the terminal. The Control Center also receives an alarm if this "high level" is reached. When the Company receives these alarms, the station is shut down, and immediate contact with the facility operator on duty or on-call personnel is established. The high level alarm is set below the tank overfill height to ensure adequate time to shut down the line before overfilling occurs.

For all Spill Detection and Mitigation Procedures refer to Core Section 1 of the Integrated Contingency Plan (“ICP”).

6.4.4 Pipeline Product Information

Product Information Data in the Superior Region Response Zone

All information on products transported by Enbridge, including the name of the product, description, physical and chemical characteristics, health and safety hazards, and initial spill handling and firefighting methods, is found in *Section 1.10 of Annex 1.* The appropriate Safety Data Sheets ("SDS") are included in this document and are also stored at each facility, in a location that is easily accessible to operators and facility personnel.

6.5 NOTIFICATION PROCEDURES

6.5.1 Required Notifications

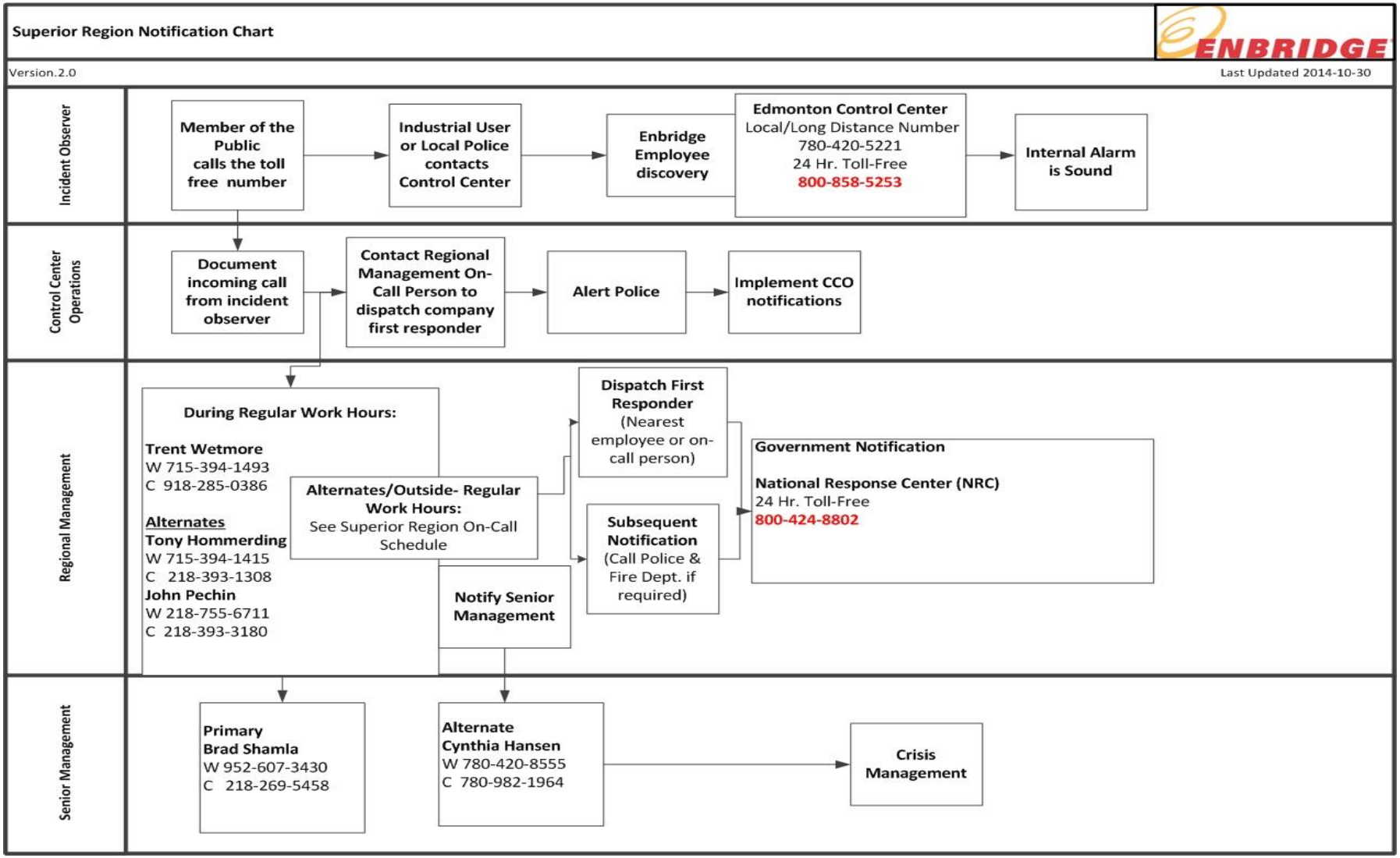
The information provided herein focuses primarily on general notifications and reporting. Relevant internal and external notifications will be found in the geographic specific Integrated Contingency Plan ("ICP") Geographical Annex along with all notification checklists applicable to that area.

The purpose of the notification process is to:

- Protect the safety of the public and responders;
- Control potential environmental effects as effectively and quickly as possible; and
- Meet regulatory requirements.

The notification process is triggered by an emergency or suspected emergency that is detected by, or reported to, the Control Center by the public, contractors, external first responders or an employee.

6.5.2 Superior Region Notification Chart



6.5.3 Field Notifications

Any person who observes or becomes aware of a release shall immediately report the incident to the Control Center and Regional Management. Information should be documented on the Receiving Emergency Information form, located in *Section 6.13 - Forms*.

Enbridge First Responder

The Enbridge Responder on-scene will:

- Establish that the scene is safe to approach
- Take action to control the situation and prevent escalation when safe to do so;
- Immediately inform the Control Center (e.g. what is happening, where it is happening, personnel involved, what is being done about it);
- Follow Section 6.5-*Notification Procedures t*o activate the Regional IMT; and
- Work with the first responding agency on scene to ensure a coordinated response.

Regional Management/Representative

As the scope of the incident requires, Regional Management will:

- Record information from the caller or the Control Center;
- Dispatch Enbridge Responder to investigate the report;
- Notify the Control Center if an Enbridge Responder has been dispatched;
- Maintain contact with the Enbridge Responder and any other personnel in order to remain current with the situation as it evolves;
- Depending on the circumstances of the emergency, consider launching aircraft for situational awareness; and
- Call response agencies/oil spill removal agencies *(Annex 2).*

6.5.4 Control Center

Any abnormal operating condition detected by the Control Center, or any reported or observed emergency or possible emergency situation, will be given an emergency status until the report is confirmed or negated. Follow up investigation and confirmation of a spill, or threat of spill, will be done immediately.

The Control Center personnel will notify:

- The Municipal/Community emergency services (if applicable and/or at the request of Regional Management);
- Regional on-call representative; and
- Others identified in the Control Center operations procedures.

The Control Center and IMT will confirm that additional notifications are completed, including those to:

- Government agencies
- Local authorities
- Response contractors

- Aboriginal groups in Canada, or Tribal Representatives in the U.S.
- Stakeholders

6.5.5 Emergency Contact Information

In Case of Emergency – 24 hr. Contacts	
Edmonton Control Center	1-800-858-5253 US or 780-420-5221
Enbridge Media Hotline	1-877-496-8142

National Response Center ("NRC")	
For a pipeline emergency, call the NRC 24 hour hotline	**800-424-8802**

Edmonton Control Center

24-Hr Toll Free	800-858-5253
Local / Long Distance	780-420-5221
Gas	888-427-7777

Enbridge Media Hotline

United States	877-496-5152
Canada	888-992-0997

Enbridge Qualified Individuals

Job Title	Name	Office #	Alternate #
Director, Superior Region Ops Svcs (QI)	Trent Wetmore	715-394-1493	918-285-0386
Sr. Manager Pipeline & Regional Services	Tony Hommerding	715-394-1415	218-393-1308
Manager, Bemidji Operations	John Pechin	218-755-6711	218-393-3180

Enbridge Incident Management Team

Response Team Position	Normal Job Title	Name	Office Number
Command Staff			
Incident Commander (IC)	Director, Superior Region Ops Svcs (QI)	Trent Wetmore	715-394-1493 c-918-285-0386
Alternate IC	Sr. Manager, Pipeline and Regional Services (QI)	Tony Hommerding	715-394-1415 c-218-393-1308
Alternate IC	Manager, Bemidji Operations (QI)	John Pechin	218-755-6711 c-218-393-3180
Deputy IC	Sr. Manager, Pipeline and Regional Services (QI)	Tony Hommerding	715-394-1415 c-218-393-1308
Deputy IC	Manager, Bemidji Operations	John Pechin	218-755-6711 c-218-393-3180
Deputy IC	Supv., Clearbrook Terminal	Bill Palmer	218-755-6711
Incident Advisor	Emergency Response Coordinator	Spencer Vassel	TBD
Alternate Incident Advisor	Emergency Response Coordinator	Scott Ritzer	780-449-2636
Safety Officer (SOFR)	Specialist I, HS&E	Lamar Kelley	715-394-1403
Alternate SOFR	Safety Coordinator	Brian Trekas	906-932-0949
Alternate SOFR	Safety Coordinator	Troy Bertagnoli	715-398-8368
Liaison Officer (LNO)	Manager Support Services	Steve Dahnke	715-394-1544
Alternate (LNO)	Safety, Training, Compliance Coordinator	Theresa Picton	715-394-1468
Legal Officer (LO)	Sr. Legal Counsel	Lisa Wilson	218-464-5709 c-715-718-1220
Alternate LO	Sr. Legal Counsel	James (Jim) Watts	218-464-5706 c-715-718-1662
Alternate LO	Sr. Legal Counsel	Arshia Javaherian	218-464-5702 c-573-427-7442
Public Information Officer (PIO)	Sr. Manager, Public Affairs LP	Lorraine Little	715-398-4677
Alternate PIO	Stakeholder Relations Specialist	Becky Haase	715-398-4691
Alternate PIO	U.S Public Awareness Specialist	Kesley Tweed	713-821-2083
General Staff			
Operations Section Chief (OSC)	Manager Pipeline Maintenance Serv.	Tim Pollock	218-755-6723
Alternate OSC	Supervisor, Pipeline Serv.	Marty Feil	218-755-6729
Alternate OSC	Supervisor, Pipeline Serv.	Ron Hautamaki	715-398-8348
Deputy OSC	Supervisor, Pipeline Serv.	Mike Paradise	906-233-4001
Deputy OSC	Supervisor, Pipeline Serv.	Jamie Nelson	218-681-7195
Staging Area Manager	Supervisor, Pipeline Serv.	Dan Peterson	906-932-0949
Alternate	Lead, PLM	Marty Feil	218-755-6729
Alternate	Sr. Project Coordinator	Paul Snobl	218-755-6715
Planning Section Chief (PSC)	Sr. Region Engineer	Chris Zupancich	715-398-4737
Alternate	Sr. Region Engineer	Tom Prew	715-398-4703
Deputy PSC	Technical Supervisor LP US Superior Region	Brendan Fouts	715-398-8311
Deputy PSC	Associate Engineer II	Brent Eliason	715-394-1545

Enbridge Incident Management Team (*cont.*)

Response Team Position	Normal Job Title	Name	Office Number
Situation Unit Leader (SITL)	Sr. Region Engineer	Steve Letko	715-394-0705
Alternate	Sr. Project Coordinator	Paul Snobl	218-755-6715
Environmental Unit Leader (ENVL)	Environment Analyst	Alex Smith	715-398-4795
Alternate ENVL	Environmental Preparedness Coordinator II	Crystal Smith	715-394-0709
Alternate ENVL	Supervisor, Environment	Joe Peteson	715-398-4753
Documentation Unit Leader (DOCL)	Contract Engineer	Leslie Semler	715-394-1456
Alternate DOCL	Region Engineer	Ben Bouska	715-395-3639
Alternate DOCL	Region Engineer	James Lawson	715-398-4880
Resource Unit Leader (RESL)	Contract Engineer	Leslie Semler	715-394-1456
Alternate RESL	N/A	N/A	N/A
Alternate RESL	N/A	N/A	N/A
Logistics Section Chief (LSC)	Supv., Clearbrook Terminal	Bill Palmer	218-776-3310
Alternate	Supv., Technical Serv.	Vance Peters	218-755-6714
Alternate	Manager, Superior Operations	Jerry Christoff	715-398-8357
Deputy LSC	Lead, Terminal	Tom Peterson	715-398-8327
Alternate DLSC	Sr. Region Engineer	Chris Zupancich	715-398-4737
Alternate DLSC	Sr. Region Engineer	Tom Prew	715-398-4703
Finance Section Chief (FSC)	Region Accountant	Ann Reckinger	715-398-4711
Alternate FSC	Project Clerk	Megan Michelizzi	715-394-1521
Alternate FSC	Sr. Manager, Accounting	Ron Motley	713-821-2172

Oil Spill Response Organizations (OSRO)

Primary	
Marine Pollution Control Corp. (MPC) - (Superior)	24 Hr. 313-849-2333
Secondary	
1. Future Environmental - (Cushing)	24 Hr. 866-579-6900
2. Clean Harbors - (North Dakota)	24 Hr. 800-645-8265
3. Clean Harbors - (Chicago)	24 Hr. 800-645-8265

To request Emergency Assistance, the Requesting Party or its Affiliate shall contact the Designated Representative of the Responding Party. A formal written request from the Requesting Party's Designated Representative shall follow in the form set out in the Schedule "B" within twenty-four (24 hours). Designated Representative means the person(s) authorized to request or release company resources to receive or provide Emergency Assistance as requested, as set out in the Designated Representative Contact List.

Emergency Services

Emergency Services in most areas by calling 911, when out of area use local numbers:

County/City/Station	Sheriff Call 911	Police Call 911	Fire Call 911	DEM	Ambulance Call 911	Hospital Call 911	Highway Patrol/ State Police
NORTH DAKOTA							
Thief River Falls Area - L1-4 & 67 MP773.72 to 896.0							
Gretna, Manitoba, CA		204-945-5555	204-945-5555	204-945-5555	204-945-5555	204-945-5555	*
Pembina - Neche	701-265-4122		Neche 701-886-7422 Pembina 701-825-6625		701-265-8259		
Pembina- Cavalier, Joliette Station	701-265-4122		Cavalier 701-265-4342 Drayton 701-454-3599	701-265-4849	701-265-8259	Neche 701-265-8461 Grand Forks 701-780-5000	701-795-3832

Emergency Services (*cont.*)

Emergency Services in most areas by calling 911, when out of area use local numbers:

County/City/Station	Sheriff Call 911	Police Call 911	Fire Call 911	DEM	Ambulance Call 911	Hospital Call 911	Highway Patrol/ State Police
MINNESOTA							
Kittson- Hallock, Joliette Station	218-843-3535		Hallock 218-843-3535 Kennedy 218-674-4485	218-843-2113	218-843-3535	218-843-3612	218-681-0943
Marshall- Warren, Viking Station	218-745-5411		Argyle 218-478-3314 Warren 218-745-5411 Newfolden 218-874-7135	218-745-5841	218-478-3314	Warren 218-745-4211 Thief River Falls 218-681-4240	218-681-0943
Pennington- Thief River Falls, PLM	218-681-6161	218-681-6161	218-681-3943	218-681-6161	218-681-4084	218-681-4240	218-681-0943
Pennington- St. Hilaire			218-964-5280				218-681-0943
Polk- Crookston	218-281-0431			218-281-0437			
Red Lake- Plummer, Plummer Station	218-253-2996		Plummer 218-465-4231 Red Lake Falls 218-253-2105 Oklee 218-796-5788	218-253-2996	Red Lake Falls 218-253-2996 Thief River Falls 218-681-4240	218-681-4240	218-681-0943
Bemidji Area - L1-4 & 67 MP 896.0 to 1032							
Clearwater- Clearbrook, Clearbrook Terminal	218-694-6226	218-776-3490	Clearbrook 218-776-3335 Shevlin 218-785-2101 Bagley 218-694-2686 Gonvick 218-487-5770	218-694-6226	218-694-6226	218-694-6501	218-681-0943
Beltrami- Bemidji, Wilton Station,Bem PLM	218-333-9111	218-333-9111	Bemidji 218-751-8001 Shevlin 218-243-2175 Solway 218-467-3350	218-333-8320	218-444-3328	218-751-5430	218-681-0943
Hubbard- Park Rapids	218-732-3331			218-732-2588			218-828-2230
Cass- Cass Lake, N. & S. Cass Lake Stations	218-547-1424	218-335-2351 Tribal 218-335-8277 888-622-9225	218-335-6195	218-547-1424	218-335-6363	218-751-5430	218-828-2230
Itasca- Deer River, Deer River Station	218-326-3477	218-246-2525	Grand Rapids 218-326-7639 Deer River 218-246-8261 Cohasset 218-328-5723	218-327-4496	218-326-3477	Deer River 218-246-2900 Grand Rapids 218-326-3401	218-749-7720
Itasca- Grand Rapids, Blackberry Station	218-326-3477		Grand Rapids 218-326-7639 Warba 218-492-1445 Goodland 218-492-1420	218-327-4496	218-326-3477	218-326-3401	218-749-7720
Aitkin- Jacobson	218-927-7435		218-752-6631	218-927-7435			218-749-7720
WISCONSIN							
Superior Area - L1-4 & 67 MP 1032 to 1096.95							
Itasca- Warba	218-326-3477		218-492-1445	218-327-4496	218-326-3477	218-326-3401	218-749-7720
Aitkin- Aitkin	218-927-7435			218-927-7435			218-749-7720
St. Louis- Floodwood, Floodwood Station	218-726-2340	218-476-2239	218-476-2238	218-625-3960	218-476-2238	Grand Rapids 218-326-3401 Duluth 218-786-4020	218-723-4885
St. Louis- Floodwood, Gowan Station	218-726-2340	218-476-2239	218-476-2238	218-625-3960	218-476-2238	218-786-4020	218-723-4885
St. Louis- Brookston			218-879-6916				
St. Louis- Duluth	218-726-2340	218-730-5400 USCG 218-720-5286	218-730-4390	218-625-3960	218-722-0807	218-786-4020 218-249-5555	218-723-4885
Carlton- Cloquet	218-384-3236	218-879-1247	Cloquet 218-879-6514 Culver Twp 218-879-5053	218-384-9141	218-384-4158	218-879-4641	218-723-4885
Carlton- Carlton	218-384-3236		218-384-4158	218-384-9141	218-384-4158	218-879-4641	218-723-4885
Carlton- Wrenshall	218-384-3236		218-384-4670	218-384-9141	218-384-4158	218-879-4641	218-723-4885
Douglas- Superior, Terminal & PLM	715-395-1371	715-395-7234	715-394-0227	715-395-1391	715-722-0807	715-817-7000	715-635-2141

Emergency Contact Information - 6.5.5a

ENBRIDGE

Emergency Services (*cont.*)

Emergency Services in most areas by calling 911, when out of area use local numbers:

County/City/Station	Sheriff Call 911	Police Call 911	Fire Call 911	DEM	Ambulance Call 911	Hospital Call 911	Highway Patrol/ State Police
Superior Area - L-5 MP 0 to 1137.3							
Bayfield	715-373-6120		Maple 715-363-2520 Iron River 715-372-4394	715-373-6113	715-372-4394	715-685-5500	715-635-2141
Superior Area - Superior Terminal L-6A & L-14 MP 0 to MP 97.23							
Douglas- Superior, Superior Terminal & PLM	715-395-1371	715-395-7234	715-394-0227	715-395-1391	715-394-4432	715-817-7000	715-635-2141
Douglas- Solon Springs, Hawthorne Station	715-395-1371		715-378-4111	715-395-1391	Gordon,WI 715-394-4432 Superior,WI 715-376-2640	715-817-7000	715-635-2141
Washburn- Minong, Minong Station	715-468-4720	715-466-2266	Minong 715-466-2324 Gordon 715-376-2221	715-468-4730	Minong 715-466-2324 Spooner 715-635-6179	Hayward 715-934-4321 Spooner 715-635-2111	715-635-2141
Sawyer- Stone Lake, Stone Lake Station	715-634-4858		Stone Lake 715-865-2616 Hayward 715-634-1311 LCO 715-634-9800	715-634-5213	715-634-4322	715-934-4321	715-635-2141
Sawyer- Stone Lake, Edgewater Station	715-634-4858		Stone Lake 715-865-2616 Hayward 715-634-1311 LCO 715-634-9800	715-634-5213	715-634-4322	715-934-4321	715-635-2141
Rusk- Ladysmith	715-532-2189	715-532-2186	715-532-2186	715-532-2121	715-532-2121	715-532-5561	715-635-2141
Ironwood Area - L-5 MP 1137.3 to 1318.54							
Bayfield- Iron River, Ino Station	715-373-6120		715-373-6120	715-373-6113	715-373-6120	715-685-5500	715-635-2141 or 715-635-7725 (ER)
Ashland- Ashland	715-685-7640	715-682-7062	715-682-7052	715-685-7640 X456	715-682-7052	715-685-5500	715-635-2141 or 715-635-7725 (ER)
Ashland- Odanah		715-682-7023	715-682-7155	715-682-7111	715-682-7052	715-685-5500	715-635-2141 or 715-635-7725 (ER)
Iron- Saxon, Saxon Station	715-561-3800		715-561-2121	715-561-3266	715-561-4444	715-685-5500	715-635-2141 or 715-635-7725 (ER)
MICHIGAN							
Gogebic- Ironwood, Ironwood PLM	906-667-0203	906-932-1234	906-932-1235	906-667-0204	906-932-4444	906-932-2525	906-229-5372
Gogebic- Bessemer	906-667-0203	906-224-9691	906-364-3706	906-667-0203	906-932-4444	906-932-2525	906-229-5372
Gogebic- Wakefield	906-667-0203	906-224-9691		906-667-0203	906-932-4444	906-932-2525	906-229-5372
Gogebic- Marenisco, Gogebic Station	906-667-0203	906-458-4539	906-787-2463	906-667-0203	906-932-4444	906-932-2525	906-229-5372
Gogebic- Watersmeet	906-667-0203	906-224-9691 Tribal Police 906-358-4313	906-358-4623	906-667-0203	906-667-0203	906-265-6121	906-229-5372
Iron- Iron River, Iron River Station	906-875-6669	906-265-4321	906-265-5720	906-875-6669	906-265-0412	906-265-0412	906-774-2122
Iron- Crystal Falls	906-875-6669	906-875-3012	906-875-5555	906-875-6669	906-265-0412	906-265-0412	906-774-2122
Dickenson- Iron Mountain	906-774-6262		906-774-6262	906-774-6262	906-774-6262		906-774-2122
Escanaba Area - L-5 MP1318.54 to 1548.57							
Marquette- Marquette	906-225-8435			906-475-1134	906-475-9912	906-228-9440	906-475-9922
Delta- Escanaba, Rapid River Station		906-786-5911	906-786-5911	906-786-5911	906-786-5911	906-786-3311	906-428-4412
Schoolcraft- Manistique, Manistique Station	906-341-2122	906-341-2134	906-341-2134	906-789-5173	906-341-2134	906-341-3200	906-387-4550
Mackinac- Gould City, Gould Station	800-643-1911	906-293-5151	906-293-5151	906-643-6731	906-293-5151	906-293-9200	906-387-4550
Mackinac, Naubinway, Naubinway Station	800-643-1911	906-293-5151	906-293-5151	906-643-6731	906-293-5151	906-293-9200	906-387-4550
Mackinac, St. Ignace, N. Straits Valve Yard	800-643-1911	906-643-6077	906-643-8754	DEM 906-643-6731 USCG 906-635-3233	800-643-1911	906-643-8585	231-627-9974
Emmet. Mackinaw City, Mackinaw Station	231-347-2036	231-436-7861 Tri-County Dispatch 231-439-3300	231-347-2500	DEM 855-515-1624 USCG 906-635-3233	231-533-8040	231-627-5601	231-627-9974
Cheboygan, Indian River, Indian River Station	231-627-3155	231-238-9481	231-625-2097	855-515-1624	231-627-5601	231-627-5601	231-627-9974
Otsego, Vanderbilt/Gaylord	989-732-7858	*	*	989-731-0290	*	989-731-2140 (24 Hr.)	989-732-2778

Federal Agencies

National Response Center (NRC)	**24 Hr. 800-424-8802**
(in Washington DC)	202-267-2675
Transportation Security Administration (TSA)	866-289-9673
National Transportation Safety Board - HQ	800-683-9369
Occupational Safety & Health Administration - HQ	800-321-6742
Army Corps of Engineers	800-621-8431
Environmental Protection Agency - Region 5 (Includes: IL, IN, MI, MN, OH, WI)	312-353-2000
Environmental Protection Agency - Region 8 (Includes: CO, MT, ND, SD, UT, WY)	303-312-6575
OSHA - Region 5 (Includes: IL, IN, MI, MN, OH, WI)	312-353-2220
OSHA - Region 8 (Includes: CO, MT, ND, SD, UT, WY)	720-264-6550
U.S. Department of Homeland Security - U.S. Coast Guard	410-576-2525
PHMSA - Central Region	816-329-3800
PHMSA - Western Region	720-963-3160
OSHA - Region 5 (Includes: IL, IN, MI, MN, OH, WI)	312-353-2220
OSHA - Region 8 (Includes: CO, MT, ND, SD, UT, WY)	972-850-4145
Bureau of Land Management - Northeastern States Field Office - Milwaukee, WI North Dakota Field Office	414-297-4400 701-227-7700
USCG - Marine Safety Office - Milwaukee	414-747-7182

State Agencies

Michigan	
EMD/Michigan Department of State Police 4000 Collins Rd P.O. Box 30457 Lansing MI 48909-1959 http://michigan.gov/documents/PC_LIST_15889_7.pdf	517-335-4650 517-373-8481
Michigan Dept. of Environmental Quality (within Michigan) (PEAS)	800-292-4706
Michigan Dept. of Environmental Quality (outside Michigan)	517-373-7660
Michigan Public Service Commission - Dave Chislea	517-241-6123
Michigan Fire Dept. Local Numbers: http://www.dleg.state.mi.us/fire_directory/sr_firedir_county.asp	
Field Offices:	
Crystal Falls	906-875-6622
Marquette	906-228-6561
Newberry	906-293-5131
Gaylord	989-732-3541
Bay City	989-684-9141
Jackson	517-780-7690
USCG – Marine Safety Offices:	
Detroit	313-568-9580
Sault Ste. Marie	906-635-3233
Duluth	218-720-5286
Minnesota	
Minnesota Emergency Response Commission 444 Cedar Street, Suite 223 St. Paul, MN 55101	651-201-7400
State Duty Officer – Division of Emergency Management	800-422-0798 (24 hr.)
State Duty Officer (out of state) (Steve Lee)	651-649-5451
MN Department of Health, Northwest Region, Public Health Preparedness Consultant	218-340-0543 (24 hr.)
Duluth Port Captain – Lake Superior - Press 1 after hrs.	218-720-5286
Minnesota Pollution Control Agency (MPCA)	800-657-3864
Spills Unit St. Paul - Steve Lee	651-649-5451
Duluth Branch - Steve Leppala	218-723-4660
Detroit Lakes Office - William Haapala (Regional Director)	218-847-1519
Doug Bellefeuille - Spills Unit	218-847-1519
Switchboard	651-296-6300
Carlton County Public Health -Terri Allen	218-879-4511
St. Louis County Public Health - Guy Petersen	218-725-5222

State Agencies (*cont.*)

North Dakota	
North Dakota Department of Emergency Services – Division of Homeland Security P.O. 5511 Bismarck, ND 58504	701-328-8100
North Dakota Dept of Health – Division of Emergency Mgmt	701-328-2121 (Out of State)
North Dakota Dept of Health – Division of Emergency Mgmt	800-472-2121 (In State- 24 hr.)
U.S. EPA Region VIII Office (Denver)	800-227-8917 303-312-6312
U.S. EPA Region V Office (Chicago)	800-621-8431 312-353-2000
U.S. Fish and Wildlife Services (Game and Fish):	
Minot/Devil's Lake	701-662-3617
Bismarck	701-328-6300
Riverdale	701-654-7475
Williston	701-774-4320
Upper Souris Nat'l. Wildlife Refuge	701-468-5467
Greenway Specialist- Grand Forks (Kim Greendahl)	701-738-8746
North Dakota Industrial Commission- Oil & Gas Div.	701-328-8020
Division of Environmental Engineering (burn permits)	701-328-5188
Army Corps of Engineers:	
Grand Forks	701-594-5016
Devils Lake	701-665-2010
Williston	701-572-4939
Riverdale	701-654-7411
Lake Manager- Ryan Newman Ext. 248	701-654-7414
Souris Calley Animal Shelter	701-852-6133
Wisconsin	
Wisconsin Emergency Management 2400 Wright St., Rm 213 P.O. Box 7865 Madison, WI 53704	608-242-3210
Wisconsin Division of Emergency Government-Madison - Brian Satula	608-242-3232
Wisconsin DNR- Emergency Spill Hotline	800-943-0003 (24 hr.) 608-267-7454 (Office)
Wisconsin Emergency Management	608-242-3232

State Emergency Response Commission (SERC)

SERC	Name	Title	Agency	Address	City	Phone	Verified
Michigan	Michael Young	Specialist	Michigan SARA Title III Program Dept. of Environmental Quality	401 Ketchum St.	Bay City, MI 48708	984-894-6238	7/15/15
	Jay Eickholt		Emergency Management & Homeland Security Division - MI Dept. of State Police	4000 Collins Rd. PO Box 30636	Lansing, MI 48909-8136	517-333-4416	7/15/15
Minnesota	Kevin Reed		Minnesota Homeland Security & Emergency Management	445 Minnesota St. Ste. 223	St. Paul, MN 55101-6223	651-201-7408	7/15/15
North Dakota	Ray DeBoer	Coordinator	Haz-Chem Program for ND Dept. of Emergency Services	Fraine Barracks Lane, Bld. 35 PO Box 5511	Bismarck, ND 58504	701-328-8100 701-328-8112	7/15/15
	Jeff Thompson	Officer	Haz-Chem Program for ND Dept. of Emergency Services	Fraine Barracks Lane, Bld. 35 PO Box 5511	Bismarck, ND 58504	701-328-8216 701-328-9921	7/15/15
Wisconsin	Brian M. Satula	Administrator	Wisconsin Emergency Management	2400 Wright St., Rm 213 PO Box 7865	Madison, WI 53704	608-242-3210	7/15/15

ENBRIDGE

Local Emergency Planning Committees (LEPC)

LEPC Name (County)	Street	City	St	Zip Code	Contact Person Name	Phone	Verified
MICHIGAN LEPC							
Cheboygan	PO Box 480	Petoskey	MI	49770	Megan Anderson	855-515-1624	7/16/15
Delta	Delta Co. Emergency Management 310 Ludington St., Ste. 113	Escanaba	MI	49829	Bob Berbohm	906-789-5173	7/16/15
Dickinson	300 E. D St., P.O. Box 609	Iron Mountain	MI	49801	Sheriff Scott Celello	906-774-6262	7/16/15
Emmet	PO Box 480	Petoskey	MI	49770	Megan Anderson	855-515-1624	7/16/15
Gogebic	100 W. Iron St.	Bessemer	MI	49911	James Loeper	906-667-1118	7/16/15
Iron	Iron County Courthouse 2 S. Sixth St., Ste. 2	Crystal Falls	MI	49920	Steven Gagnea	906-875-0602	7/16/15
Mackinac	100 S. Marley St.	St. Ignace	MI	49781	Mike Kasper	906-430-1466	7/16/15
Marquette	180 US Hwy. 41 E.	Negaunee	MI	49866	Teresa Schwalbach, EMS	906-475-1134	7/16/15
Otsego	PO Box 642	Gaylord	MI	49734	Jon Deming	989-732-9085	7/16/15
Schoolcraft	300 Walnut St.	Manistique	MI	49854	Bob Berbohm	906-789-5173	7/16/15
WISCONSIN LEPC							
Rusk	311 Miner Ave. E.	Ladysmith	WI	54848	Thomas Hall, EMS	715-532-2121	7/16/15
Iron	300 Taconite St.	Hurley	WI	54534	Stacy Ofstad, EMS	715-561-3266	7/16/15
Douglas	1316 N. 14th St., Ste. 10	Superior	WI	54880-1674	Keith Kesler	715-395-1391	7/16/15
Bayfield	117 E Sixth St., PO Box 423	Washburn	WI	54891	Jan Victorson	715-373-6113	7/16/15
Ashland	220 6th St. E.	Ashland	WI	54806	Dorothy Tank	715-685-7640 X456	7/16/15
Sawyer	10610 Main St., Ste 89	Hayward	WI	54843	Patricia Sanchez, Director EMS	715-634-2004	7/16/15
Washburn	PO Box 429, 421 Hwy. 63	Shell Lake	WI	54871	Carol Buck	715-468-4730	7/16/15
MINNESOTA LEPC							
Region 2 LEPC	402 SE,11th St.	Grand Rapids	MN	55744	Roy Holmes, Coordinator	218-259-2221	7/16/15
St. Louis	2030 N Arlington Ave N	Duluth	MN	55803	Paul Lee, Coordinator	218-625-3960 218-336-4341	7/16/15
					Steve Steblay, Director	218-336-4340	7/16/15
St. Louis	100 N 5th Ave W, Room 103	Duluth	MN	55802	Ross Litman, Sheriff	218-625-2341	7/16/15
Carlton	317 Walnut Ave, PO Box 530	Carlton	MN	55718	Brian Belich	218-384-9518	7/16/15
Itasca	440 First Ave NE	Grand Rapids	MN	55744	Victor Williams, Coordinator	218-326-3477	7/16/15
Aitkin	217 Second St NW, Ste. 185	Aitkin	MN	56431	Scott Turner	218-927-7420	7/16/15
					Karla White	218-927-7436	7/16/15
Cass	300 Minnesota Ave, PO Box 1119	Walker	MN	56484	Kerry Swenson	218-547-7437	7/16/15
Region 3 LEPC	12337 152nd St.	Park Rapids	MN		Heather Winkleblack	218-766-2301 (cell)	7/16/15
Region 3 RRC		Warren	MN		Mark Jones, Chair	218-201-0098 218-745-4211	7/16/15
Kittson	410 South 5th, Suite 104,PO Box 504	Hallock	MN	56728	Barb O'Hara	218-843-2113	7/16/15
Marshall	208 E. Colvin, Courthouse, Ste. 5	Warren	MN	56762	Josh Johnston, Director	218-745-5841	7/16/15
Pennington	101 Main Ave N	Thief River Falls	MN	56701	Erik Beitel	218-683-7087	7/16/15
Red Lake	124 Main Ave N, PO Box 306	Red Lake Falls	MN	56750	Mitch Bernstein	218-253-2996	7/16/15
Polk	600 Bruce St, PO Box 416	Crookston	MN	56716	Jody Beauchane, Director	218-470-8263	7/16/15
Clearwater	213 Main Ave N, Dept. 102	Bagley	MN	56621	Larry Olson	218-694-6226	7/16/15
Beltrami	613 Minnesota Ave NW	Bemidji	MN	56601	Chris Muller	218-333-8386	7/16/15
Hubbard	301 Court Ave	Park Rapids	MN	56470	Brian Halbasch	218-732-2588 218-732-2502	7/16/15
NORTH DAKOTA LEPC							
Pembina	301 Dakota St. W., #8	Cavalier	ND	58220	Andrew Kirking	701-265-4849	7/16/15

Electrical Utilities

Location	Organization	Telephone Number
THIEF RIVER FALLS AREA - MP 773.72 TO 896.0		
Joliette Station		
Power Company	NODAK Power Co.	800-732-4373
Phone Company	Polar Telephone Co.	800-284-7127
Donaldson Station		
Power Company	Otter Tail Power Co.	218-281-3632
Phone Company	Wiskstrom Telephone Co.	218-436-2121
Viking Station		
Power Company	Otter Tail Power Co.	218-281-3632
Phone Company	Wiskstrom Telephone Co.	218-436-2121
Plummer Station		
Power Company	Otter Tail Power Co.	218-281-3632
Phone Company	Garden Valley Telephone Co	800-448-8260
BEMIDJI AREA - MP 896.0 TO 1032.0		
Clearbrook Terminal		
Power Company	Otter Tail Power Co.	218-281-3632
Phone Company	Garden Valley Telephone Co.	800-448-8260
Wilton Station		
Power Company	Otter Tail Power Co.	218-281-3632
Phone Company	Century Link	24hr. 800-954-1211
Cass Lake Station		
Power Company	Otter Tail Power Co.	218-281-3632
Phone Company	Century Link	24 hr. 800-954-1211
North Cass Lake Station		
Power Company	Otter Tail Power Co.	218-281-3632
Phone Company	Century Link	24 hr. 800-954-1211
Deer River Station		
Power Company	Minnesota Power	800-228-4966
Phone Company	Paul Bunyan Communications Daytime	888-586-3100
Phone Company	Paul Bunyan Communications Evening	800-475-8309
Blackberry Station		
Power Company	Lake Country Power	800-421-9959
Phone Company	Century Link	24 hr. 800-954-1211
SUPERIOR AREA MP 1032 TO 1137.3 - LINE 5		
Floodwood Station		
Power Company	Minnesota Power	800-228-4966
Phone Company	Frontier	877-462-1266
Phone Company	Century Link	800-954-1211
Phone Company	ATT repair	800-222-3000
Gowan Station		
Power Company	Lake Country Power	800-421-9959
Phone Company	Frontier	877-462-1266
Phone Company	Century Link	800-954-1211
Phone Company	ATT repair	800-222-3000
Superior Terminal		
Power Company	Superior Water Light & Power (SWL&P)	715-394-2300
Phone Company	Cisco (Managed by Enbridge IT)	800-821-5253
SUPERIOR AREA - SUPERIOR TERMINAL TO 97.23 - LINES 6 & 14		
Superior Terminal		
Power Company	Superior Water Light & Power (SWL&P)	715-394-2300
Phone Company	Cisco (Managed by Enbridge IT)	800-821-5253
Hawthorne Station		
Power Company	Superior Water Light & Power (SWL&P)	715-394-2300
Phone Company	Century Link	800-824-2877
Minong Station		
Power Company	Superior Water Light & Power (SWL&P)	715-394-2300
Phone Company	Century Link	800-824-2877
Phone Company	AT&T	800-480-8088 or 888-611-2344
Stone Lake Station		
Power Company	Xcel Energy	800-895-1999
Phone Company	Century Link	800-824-2877
Phone Company	AT&T	800-480-8088 or 888-611-2344

Electrical Utilities *(cont.)*

Location	Organization	Telephone Number
SUPERIOR AREA - SUPERIOR TERMINAL TO 97.23 - LINES 6 & 14 (cont.)		
Edgewater Station		
Power Company	Xcel Energy	800-895-1999
Phone Company	Century Link	800-824-2877
Phone Company	AT&T	800-480-8088 or 888-611-2344
IRONWOOD AREA - MP 1137.3 TO 1318.54		
Ino Station		
Power Company	Xcel Energy	800-895-1999
Phone Company	Chequamegon Telephone Co. (Norvado:powered by Cheqtel) Mess. Machine Evenings	715-798-3303
Saxon Station		
Power Company	Xcel Energy	800-895-1999
Phone Company	Century Link	800-824-2877
Gogebic Station		
Power Company	Xcel Energy	800-895-1999
Phone Company	Upper Peninsula Telephone Co.	906-639-2110 (message machine after hours)
Iron River Station		
Power Company	Upper Peninsula Power Co.	800-511-7720
Phone Company	AT&T	800-480-8088 or 888-611-2344
ESCANABA AREA - MP 1318.54 TO 1548.57		
Rapid River Station		
Power Company	Upper Peninsula Power Co.	800-562-7809 or 800-562-7680
Phone Company	AT&T	800-480-8088 or 888-611-2344
Manistique Station		
Power Company	Cloverland (previously Edison Sault- WEPCO)	906-635-6800
Phone Company	Century Link	800-824-2877
Gould City Station		
Power Company	Cloverland (previously Edison Sault- WEPCO)	906-635-6800
Phone Company	AT&T	800-480-8088 or 888-611-2344
Naubinway Station		
Power Company	Cloverland (previously Edison Sault- WEPCO)	906-635-6800
Phone Company	Ameritech	800-480-8088 or 888-611-2344
Mackinaw Station		
Power Company	Consumers Energy	800-477-5050
Phone Company	AT&T	800-480-8088 or 888-611-2344
Indian River Station		
Power Company	Consumers Power	800-477-5050
Phone Company	AT&T	800-480-8088 or 888-611-2344

ENBRIDGE

Enbridge (U.S.) - Required Release Notifications

In the event of a release on our pipeline system or at our facilities, the following shall serve as a guide for initial notification/reporting required within the first 24-hours, or sooner where noted.
As Federal, State and internal criteria all differ, each box must be independently reviewed to ensure all notifications are made.

EMERGENCY NOTIFICATION RESPONSIBILITIES

PERSONNEL	FUNCTION	INFORMATION SOURCE	RESPONSIBILITIES
ENBRIDGE EMPLOYEE	Communicates possible emergency.	Public notification or observed incident.	- **RECORDS** information on the Receiving Emergency Information Form. - **GIVES** caller precautions and instructions (found after the Receiving Emergency Information Form), as required. - **ALERTS** pipeline control centre. - **TAKES** appropriate field action.
QUALIFIED INDIVIDUAL	Coordinates verification, management, communication, and field response activities.	Control Center Operations	- **RECORDS** information on log. - **ENSURES** Enbridge Responder has been dispatched to verify report. Stresses safety precautions. - **ENSURES** Emergency Response (Police, EMS, Fire) have been notified. Provides same with updated information and confirms whether assistance is needed. - **CONFIRMS** whether Enbridge or Public personnel require evacuation. - **ENSURES** that the appropriate Supervisor, PLM Services/Crew have been alerted. - **PROCEEDS** to Regional Office or command post. - **CALLS** Vice-President, Operations or designee. - **MAINTAINS** contact with verifier and Control Center. - **MAKES** a decision when it is safe to consider the emergency under control and authorize action (restart line, recall verifiers, etc.) - **COORDINATES** additional verification efforts as necessary. - **INVOKES** the Emergency Response Plan. - **ALERTS** other pipeline companies if/when required. - **NOTIFIES** appropriate Government agencies (including the TSB/DOT), as required. - **COMPLETES** Release Alert.

INTERNAL COMPANY NOTIFICATIONS

INITIATE THE NOTIFICATION PROCESS
Procedure: If an Enbridge employee outside of the control center is the first person to discover or receive the initial call on a release, they need make only one call that serves to secure a line shutdown, initiate a response and initiate proper internal notification.

CONDITION	WHO TO NOTIFY
1. A release of any quantity requiring an operating change/shutdown, or 2. An outside caller reports a suspected or confirmed release	Contact: Edmonton Control Center immediately - Liquids (U.S.) 800-858-5253 Alternate Number: 780-420-5221 Gas 888-427-7777 Contact: Notify Regional On-Call Manager Regional On-Call Manager will notify Qualified Individual
1. A release or spill of crude oil or hazardous substance occurs that does not require an operating change/shutdown, but meets one of the following criteria: - Any NGL/natural gas release - Any release/spill/contamination meeting state or federal notification requirement (see DOT-REGULATED PIPELINE-RELATED SPILLS: EXTERNAL NOTIFICATIONS section).	Contact: Notify Regional On-Call Manager Regional On-Call Manager will notify Qualified Individual

CONTROL CENTER ACTION AND NOTIFICATIONS
Procedure: If Control Center receives notification or observes operating conditions where a release is suspected, line operation is terminated and the Control Center initiates and/or continues the notification process by alerting the Qualified Individual or on-call designee. In addition, local law enforcement is notified and assistance requested, if necessary.

CONDITION	WHO TO NOTIFY
1. An Enbridge or outside caller reports a suspected or confirmed release, or 2. An alarm condition necessitates a line shutdown, or 3. The line is shutdown under the 10 minute rule as a result of abnormal operation.	Complete: Receiving Emergency Information Form Contact: Qualified Individual Local law enforcement Other Control Centers Field verifier if authorized by Qualified Individual. Consider contacting fire/other public officials (emergency management).

QUALIFIED INDIVIDUAL (OR DESIGNEE) - CRITERIA FOR INTERNAL NOTIFICATIONS/REPORTING
Procedure: Upon receiving notification of a suspected or confirmed release, the Qualified Individual is responsible for verifying and/or initiating response. Depending upon the specifics of a confirmed release or spill, further internal notifications must be made including a Release Alert. Required external notifications and criteria must also be viewed (see DOT-REGULATED PIPELINE-RELATED SPILLS: EXTERNAL NOTIFICATIONS section) and reported accordingly.

CONDITION	WHO TO NOTIFY
1. Report of a suspected release or spill, or 2. Control Center reports an alarm condition and line shutdown, or 3. The line is shutdown under the 10 minute rule as a result of abnormal operation	Contact: Nearest verifier Alert: Crews for possible mobilization Consider contacting fire/other public officials (emergency management)
1. A release of any quantity requiring an operating change or shutdown.	Mobilize: Crews and contractors as necessary Ensure: Line is shutdown and prior communications are complete Alert: Enbridge Management Complete: Release Alert
1. A release or spill of crude oil or hazardous substance occurs that does not require an operating change /shutdown, but meets one of the following criteria: - Any NGL/natural gas release - Any release/spill/contamination meeting state or federal notification requirement (see DOT-REGULATED PIPELINE-RELATED SPILLS: EXTERNAL NOTIFICATIONS section).	Initiate: Appropriate clean-up activity Complete: Release Alert

Enbridge (U.S.) - Required Release Notifications *(cont.)*

DOT-REGULATED PIPELINE-RELATED SPILLS: EXTERNAL NOTIFICATIONS

Qualified Individual (or Designee)- Criteria for External Notifications: Federal
Procedure: Upon verification of a release, the Qualified Individual must make an initial assessment of the situation to determine whether or not the incident requires Federal Notification based on the criteria described below.

CONDITION	WHO TO NOTIFY
If a failure in the pipeline system in which there is a release of hazardous liquid or gas from its primary containment (pipe or pipe system) including a release captures in secondary containment, results in: 1. Unintentional explosion or fire OR 2.* Death of any person OR 3.* Hospitalization of any person OR 4.* Estimated property damage exceeding $50,000 (including repair, clean-up and cost of product) OR 5. Pollution of a water body (rivers/streams/wetland/reservoir) OR 6.* Any other event that the Qualified Individual deems significant for other reasons.	**Then (WITHIN 1 HOUR)** Contact: **NATIONAL RESPONSE CENTER (NRC)** - 800-424-8802 Be ready to provide the following: - Name and address of Enbridge - Your name and telephone number - Location of the failure with Legal Description - Time of the failure - Fatalities and personal injuries, if any - All other significant facts known at that time If not asked by the Operator, clarify appropriate pipeline safety regulator (e.g. OPS, Oklahoma Corporation Commission, etc.)
SIGNIFICANT CHANGES - Increase or decrease in the number of previously reported injuries or fatalities OR - Revised estimate of the product release amount that is at least 10X greater than the amount initially reported OR - Revised estimate of the property damage that is at least 10X greater than amount initially reported.	Submit a verbal supplemental report to the NRC during the emergency response phase **within 48 hours of incident.** Contact: **NATIONAL RESPONSE CENTER (NRC)** - 800-424-8802
If a failure in the pipeline system in which there is a release of hazardous liquid or gas from its primary containment (pipe or pipe system) including a release captured in secondary containment, results in 1. Any of the above, or 2. Loss of 5 gallons or more of liquid with an exception for spills under 5 barrels resulting from pipeline maintenance activities that did not result in water pollution, spill is cleaned up promptly, and spill is confined to company property or ROW, OR 3. Escape of more than 5 gallons of NGL to atmosphere.	**Then (WITHIN 30 DAYS)** The U.S. Pipeline Compliance Department in Superior, WI, will file a written Accident Report on PHMSA Form 7000-1 (liquids) or Form F7100.2 (gas) for all reportable releases. These reports are due 30 days from the date of the incident. If an internal "Release Alert" is not drafted immediately after the release, please contact the Compliance Department as soon as possible to initiate the process.

Qualified Individuals (or Designee)- Criteria for External Notifications: State (Crude Oil & NGL*)
Procedure: Upon verification of a release, Qualified Individual or designee must make an initial assessment of the situation to determine whether or not the incident requires state notification based on the criteria described below.

State	Water	Release Reporting Criteria Soil	Notification Period	24-Hour Reporting Hotline
Michigan	Visible sheen or emulsion Natural gas	≥ 1 bbls >1,000,000 scf	Within 24 hours of discovery Within 24 hours of discovery	800-292-4706 (within Michigan) 517-373-7660 (outside Michigan) 800-292-4706 (within Michigan) 517-373-7660 (outside Michigan)
Minnesota	Visible sheen or emulsion	≥ 5 gallons Any release that threatens surface water or groundwater	Immediately upon discovery	800-422-0798 (within Minnesota) 651-649-5451 (outside Minnesota)
North Dakota	Visible sheen or emulsion	No minimum. All releases are reportable that may harm human health or harm the environment.	Immediately upon discovery	800-472-2121 (within North Dakota) 701-328-8100 (outside North Dakota)
Wisconsin	Visible sheen or emulsion	≥ 5 gallons Not reportable if immediately contained and cleaned up, and spilled on competent asphalt or cement (an impervious surface)	Immediately upon discovery	800-943-0003

The state reporting requirements noted in this table were developed by U.S. LP Environment.

NOTE: - Releases should be reported if any one of the reporting criteria are triggered.
- Environment staff in the Superior Office should be contacted for releases reported to regulatory agencies.
- Local reporting requirements (police, EMS, fire department, Coast Guard, etc.) may also apply.
- For releases impacting drinking water HCAs, identify water intakes, wellhead protection areas or other identified HCA DW sources, and notify the local Public Utilities Department (or equivalent) if potential threats exist.

** Contact the Enbridge U.S. Pipeline Compliance Department in Duluth, MN (218) 464-5754 to have a DOT form 7000-1 submitted (within 30 days) to the Federal OPS & Pipeline Safety Department, OCC Jim Thorpe Building, Oklahoma City, OK 73105.

NON-PIPELINE RELATED SPILL - EXTERNAL NOTIFICATION

Non-pipeline related spills of oil/petroleum products or hazardous materials may also require external notification. Example non-pipeline spills could include the following:
- Release, failure or spill from a drum or other container of oil, solvent or hazardous material.
- Hydraulic hose or equipment failure.
- Vacuum truck hose or fittings.
- Aboveground or equipment-related fuel storage tanks and containers.

The following reporting guidelines apply:

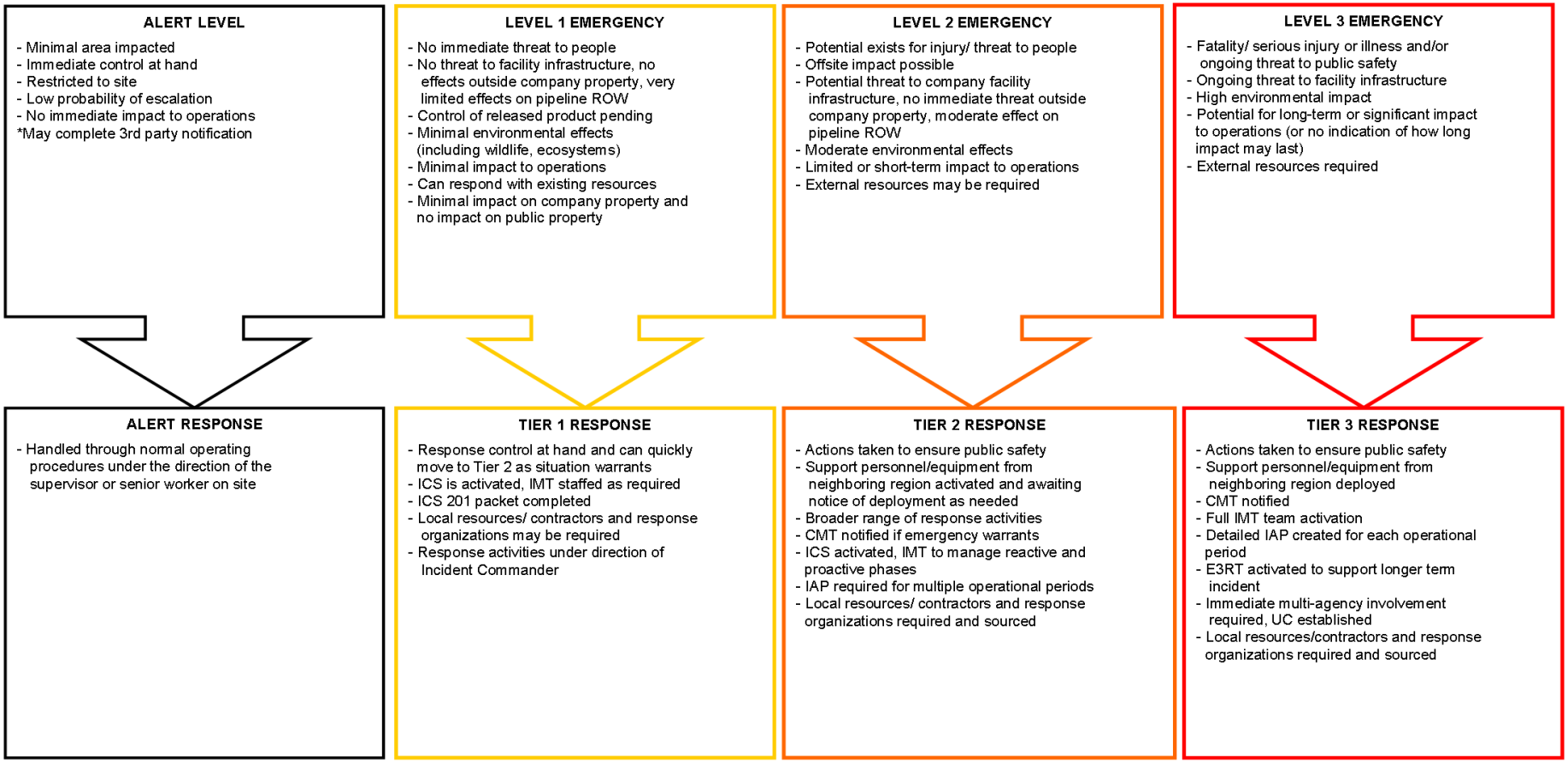
Petroleum related compounds (oils, gasoline, diesel, used oil, mineral spirits, etc.)	Reporting requirements are the same as provided in the previous tables, except for gasoline in: **Wisconsin** (>1 gallon if on pervious surface)
Non-petroleum hazardous substances (antifreeze (ethylene glycol), toluene, xylene, methanol, battery acid, etc.)	Reporting requirements vary depending on the material, spill and applicable regulations – **Contact Environment Department**

Emergency Contact Information - 6.5.5d

ENBRIDGE

6.5.6 Classification of the Incident

Figure 1



Note:
1) Regulatory classification levels may not align with Enbridge Classifications

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6.6 INITIAL RESPONSE

6.6.1 Isolation Distance

Establish initial control perimeters based on the following guidelines (see *Figure 1*):

- Hot Zone
- Warm Zone– could initially be considered containment area
- Cold Zone

The following table depicts safe distancing as recommended by the latest edition of the Emergency Response Guidebook (ERG) by the Department of Transportation and Transport Canada. Reference to the latest edition of the ERG is further recommended to confirm safe distancing relative to the site specific conditions.

Set up a Command Post, Staging Areas, and Decontamination Stations as necessary for the circumstances.

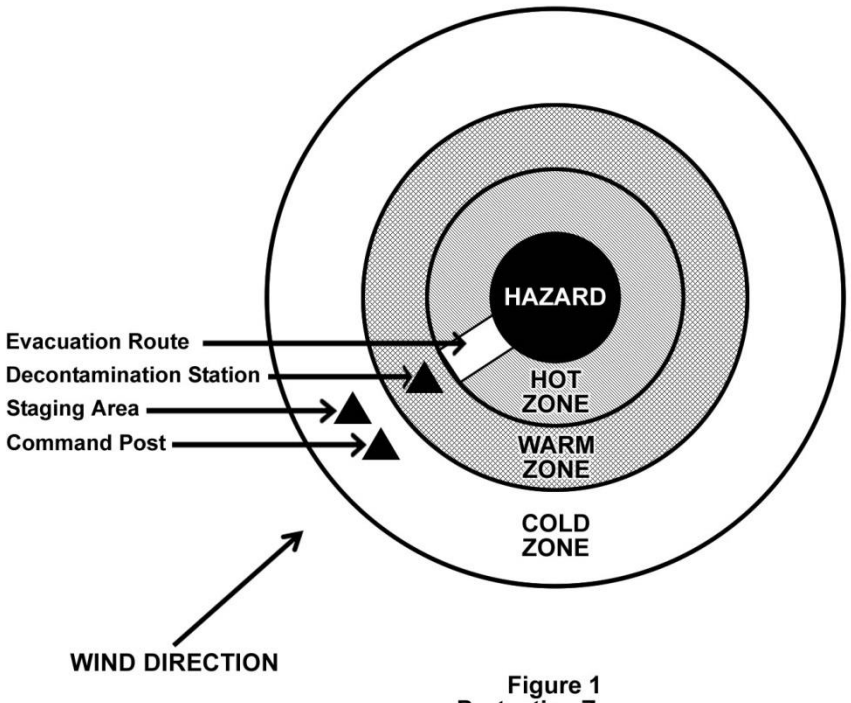


Figure 1
Protective Zones

6.6.1 Isolation Distance, continued

Isolation Distance / Emergency Response Guidebook

Product	Guide #	ID #	Immediate Precautionary Evacuation Measure	Large Spill Evacuation	Evacuation in the Event of a Fire
Condensate(Diluent), Natural Gas, Butane, Ethane, Methane, Propane	115	1971, 1011, 1075, 1035, 1078	100 meters (330 feet)	800 meters (½ mile)	1,600 meters (1 mile)
Napthalene Crude	133	1334	25 meters (75 feet)	100 meters (330 feet)	800 meters (½ mile)
Petroleum Crude Oil, Petroleum products, Pentane, Hexane, Heptane, Octane, Nonane, Decane	128	1270, 1267, 1265,1268, 1208, 1206, 1262, 1920, 2247	50 meters (150 feet)	300 meters (1,000 feet)	800 meters (½ mile)
Petroleum sour crude oil, flammable, toxic	131	3494	60 meters (200 feet)	800 meters (½ mile)	800 meters (½ mile)
Benzene, Toulene, Xylene	130	1114, 1294, 1307	50 meters (150 feet)	300 meters (1,000 feet)	800 meters (½ mile)
Hydrogen Sulfide Gas	117	1053	100 meters (330 feet)	300 meters (1,000 feet)	1,600 meters (1 mile)

***** Flash Fire and Vapor Cloud Explosion should be considered potential hazards in structurally condensed areas (heavy urban areas) especially under low wind, stable weather conditions. Pool Fires should be considered potential hazards in structurally condensed areas (heavy urban areas) especially if wind speed is high and ignition is delayed (product has pooled significantly). These hazards may result in a travelling flame front, damaging overpressure or exposure to thermal radiation, therefore responders should use the distances identified for "Evacuation in the Event of a Fire" even if no fire is present. In a full bore rupture where there is a risk of Flash Fire or Vapor Cloud Explosion, these distances should be doubled.

****** Additional conditions that should be considered when determining an evacuation zone include weather, full bore rupture, wind speed, overcast/clear sky and day/night

******* These substances may also present a Toxic Inhalation Hazard (TIH) and night time distances will defer from above

6.6.2 Setting Up Work Areas

The IC or designate will assess the accessibility of the site and will separate the site into three distinct areas to clearly identify the high risk areas and to reduce the hazards to the on-site responders. The three areas could be defined as the safe area, the hazardous area and the decontamination (or "Decon") area.

Protective Zones
To minimize spreading contamination from an emergency site to unaffected areas, the Safety Officer must record protective zones (see Figure 1) on the ICS 201-5 Site Safety and Control Form. Protective zones should identify:

- Hot Zone
- Warm Zone
- Cold Zone.

Hot Zone
The hot zone is the release site or site of clean-up operations. Any area that requires respiratory protection must be within the boundary of a designated hot zone. Access to the hot zone is restricted to trained and properly equipped emergency response personnel only. Personnel not involved in emergency operations must be prevented from entering and escorted off the site if necessary.

Warm Zone
The warm zone is a transition zone where equipment may be cleaned, and contaminated clothing removed, before leaving the site. Follow the established Decon plan. Appropriate PPE is required.

Cold Zone
The cold zone is the largest zone and includes all areas not immediately involved in the emergency. Take all possible efforts to ensure contamination does not spread to this area.
Air monitoring delineates the perimeter where air contaminants and combustible vapors cease to be detected. The cold zone must be established outside of this perimeter. Locate the Command Post and staging area (pre-deployment staging area for equipment arriving on site) in the cold zone.

6.6.3 Personnel Evacuation

Evacuation plans will be located in the applicable facility. All evacuation directives will be communicated through an audible signal, either through voice by the Designated Individual, such as PLM supervisor, Emergency Warden, Area Supervisor, Area Manager or Area Coordinator, or by the activation of an alarm system. All facility personnel are trained routinely in evacuation and emergency response procedures. The facility contains no critical equipment that requires employees to continue to operate after the evacuation notification is made.

The purpose of the evacuation plan is to provide some guidance in the event shutdown and evacuation are necessary. In the event of an incident, the facility operator will stop the flow of product by normal operating procedures. The facility supervisor/manager shall be notified immediately of the emergency. All facility personnel should evacuate with the exception of

any individuals designated to remain on site. The Fire Department will be notified if there is a fire. Arriving personnel, equipment and fire resources will be met at the main gate of the facility, unless deemed unsafe to do so. Tactical deployment of arriving resources will depend on the current situation.

Evacuating personnel shall proceed in an orderly manner. The Supervisor/Manager or Designated Individual will account for all employees and arrange for medical assistance as required. When the alarm is sounded or a signal to evacuate is given all personnel should:

Evacuation Checklist	
✓	Immediately stop work activities.
✓	Check the wind direction
✓	Move upwind or cross wind
✓	Check the wind again
✓	Conduct a head count to account for all personnel known to be at the facility
✓	Assist in alerting and escorting personnel, including visitors and contractors to the appropriate evacuation point
✓	Notify the Control Center
✓	Assist in hazard control activities as requested
✓	Assist in search and rescue of missing persons
✓	Injured personnel will be transported to the nearest emergency medical facility. All other personnel will remain at the evacuation point until the "All Clear" signal is given.
Note: Evacuation should be carried out in an orderly manner. Personnel should walk, NOT run or panic.	

Personnel evacuation direction is further defined as follows:

- **Facility Employees** - All Company employees who are not directly involved with the abatement of the emergency will immediately evacuate the area of the emergency. They will proceed via an unthreatened route to the facility main gate and remain in a "stand by" mode until instructed by the Facility Management to do otherwise. Should access to the facility main gate be threatened by the emergency, proceed to a location on the facility unthreatened by the emergency and notify the Emergency Warden and/or Area Supervisor/Manager and/or Designated Individual of your whereabouts as soon as practical.

- **Contractors, Freight Haulers, Vendors and Other Visitors** - All non-Company personnel will immediately evacuate the area when notified of an emergency. All material loading or unloading will cease. Personnel will proceed to the facility main gate via an unthreatened route. Non-Company personnel will exit immediately upon approval of the Facility Management. Should access to the facility main gate be threatened by the emergency, proceed to a location on the facility unthreatened by the emergency and notify the Emergency Warden and/or Area Supervisor/Manager and/or Designated Individual of your whereabouts as soon as practical. After personnel evacuation is initiated, emergency response agencies and teams will be notified (either from on-site or off-site immediately after the evacuation was completed), and immediate response actions will be initiated to minimize threats to human health and the environment.

6.6.4 Community Evacuation

Evacuation of the public should only proceed when it is safe to do so and ONLY in cooperation and coordination with Local Emergency Services. As identified under community emergency response plans, the responsibility and decision to evacuate is a community responsibility. The Company will support the evacuation and cover the cost of the response.

It is important to remember that evacuations beyond Company property will have to be initiated and coordinated with local emergency response/management organizations which have the legislative authority to order the movement of persons. State, Provincial, Territorial, First Nation and local authorities have primary responsibility and authority for evacuation planning and for the transportation, sheltering, public safety, and security of persons and non-Federal property within their respective jurisdictions. The unique challenges that might confront State, Provincial, Territorial, First Nation and local governments during a mass evacuation could require them to request additional assistance, of either a logistical or operational nature, from within their province, from other provinces pursuant to mutual aid and assistance compacts, or from the Federal government.

The Company:

- Should ensure that local emergency response/management organizations are provided with a clear recommendation to evacuate the public should the Company become aware of an immediate threat to life and safety that may not be under action by first responders.
- Will serve only in an advisory capacity during an evacuation order and may assist with the logistics of an evacuation.
- Must provide as much product information as possible to any emergency management organization coordinating an evacuation. The latest version of the Emergency Response Guidebook ("ERG") should be consulted in order to determine safe evacuation distances.

The priority for all Company personnel in any emergency is protecting the public and responders.

Prevent public access to the emergency site while there is any danger of explosion, fire, hazardous vapors or other hazardous conditions. For example:

- Seal off routes into the emergency site and establish a security perimeter
- Contact local police to set up road blocks at all access points, as applicable
- Employees/contractors, police and/or security personnel can be used, as well as physical barriers (e.g., barricades, reflective tape) to control access to hazardous areas.

Coordinate with external emergency response agencies (e.g., police, fire and EMS departments) to establish appropriate response measures for public protection as required, including:

- Monitoring for hazardous atmospheres;
- Evacuating people from the area (homes and businesses);
- Eliminating ignition sources near a release site;
- Preventing ignition sources from entering a release site; and
- Stopping traffic (e.g., on roads, rail lines, bridges), as required.

In the unlikely event that evacuation plans were required beyond the boundary of the facility, the designated individual would communicate further directives. These plans will include guidance of where to move potentially affected parties to minimize threats to human health and the environment. This will be accomplished in conjunction with local emergency response officials. The notification mechanisms will be based on monitored air quality and other situations that might arise during the emergency.

Evacuation is recommended for incidents in which the plume is visible and egress can occur in any direction away from the plume. A recommendation to evacuate should be made by a Qualified Individual/Incident Commander with access to LEL monitors and or air quality monitoring.

Under the direction of the IMT, community evacuation will be coordinated with the local authority. The recommendation to evacuate would be the decision of the IC. Refer to the ERG for product/evacuation guidance.

If the public must be evacuated before external response agencies arrive or if these agencies are not available, the IC must take all steps necessary to ensure public protection (e.g., assigning Company employees to begin a door to door evacuation), then turn over these duties to community agencies as soon as possible.

For long-term releases, evacuation is preferred to sheltering if public safety can be assured during the evacuation process. Evacuation is a viable public protection measure in circumstances when:

- The location of the plume is known and safe egress routes can be assured.
- The release will not likely be contained in the near future.
- Visibility and road conditions are good.
- The residents clearly understand their directions.

Residents should also be evacuated during ongoing emergency flaring or burning if their health and safety could be affected by the operation.
In planning an evacuation, the following must be considered:

- The size and expected duration of the release;
- Egress routes;
- Current and expected meteorological conditions; and
- The potential for unexpected ignition.

Sheltering is the primary public protection measure for high vapor pressure products and when the hazard is of limited duration. Sheltering within a building creates an indoor buffer to protect affected individuals from higher (more toxic) concentrations that may exist outdoors. The goal is to reduce the movement of air into and out of the building until either the hazard has passed or other appropriate emergency actions can be taken (such as evacuation).

Sheltering indoors is a viable public protection measure in circumstances when:

- There is insufficient time or warning to safely evacuate the public.
- Residents are waiting for evacuation assistance.
- The release will be of a limited size and /or duration.

- The location of the release has not been identified.
- The public would be at a higher risk if evacuated.

In conjunction with shelter-in-place and evacuation strategies, a natural gas release may be ignited at the source in order to reduce public exposure to the hazard. If an immediate threat to human life exists and there is not sufficient time to evacuate the hazard area the IC is authorized to ignite the release.

6.7 OPERATIONS

6.7.1 Enbridge Response Management System

Incident Command System

The ICS enables a well-managed response and limits the effects of an emergency through the rapid, effective, coordinated response of resources. ICS is the standard international practice for emergency management, and clarifies the roles of personnel involved in emergency response. ICS is effective for emergency response because essential information and resources are organized into a logical structure for planning and implementing the required actions. It also provides a flexible preplanned emergency response organizational structure for any type or size of incident. The structure of the ICS required depends on the nature and complexity of the emergency, and is based on need, rather than rigid organizational structure. For Level 1 emergencies, one position may assume many responsibilities, whereas in higher-level emergencies (Levels 2 and 3), several positions may be required. The IMT would be mobilized, as appropriate, to fill ICS roles. The FRT functions under the Operations section in the ICS.

The FRT consists of trained personnel that will respond to all Company emergency incidents. Trained and qualified third-party contractors will be called on to fill the Incident Command System/Unified Command (ICS/UC) roles as required, including but not limited to positions in the Operations, Planning and Logistics sections. Note as well, that if requested by the local governing emergency management agency, Enbridge may provide a technical specialist to a community's Emergency Operations Center.

Key responsibilities for the FRT are aligned with the ICS organizational structure (Refer to ICS 207 Organization Chart).

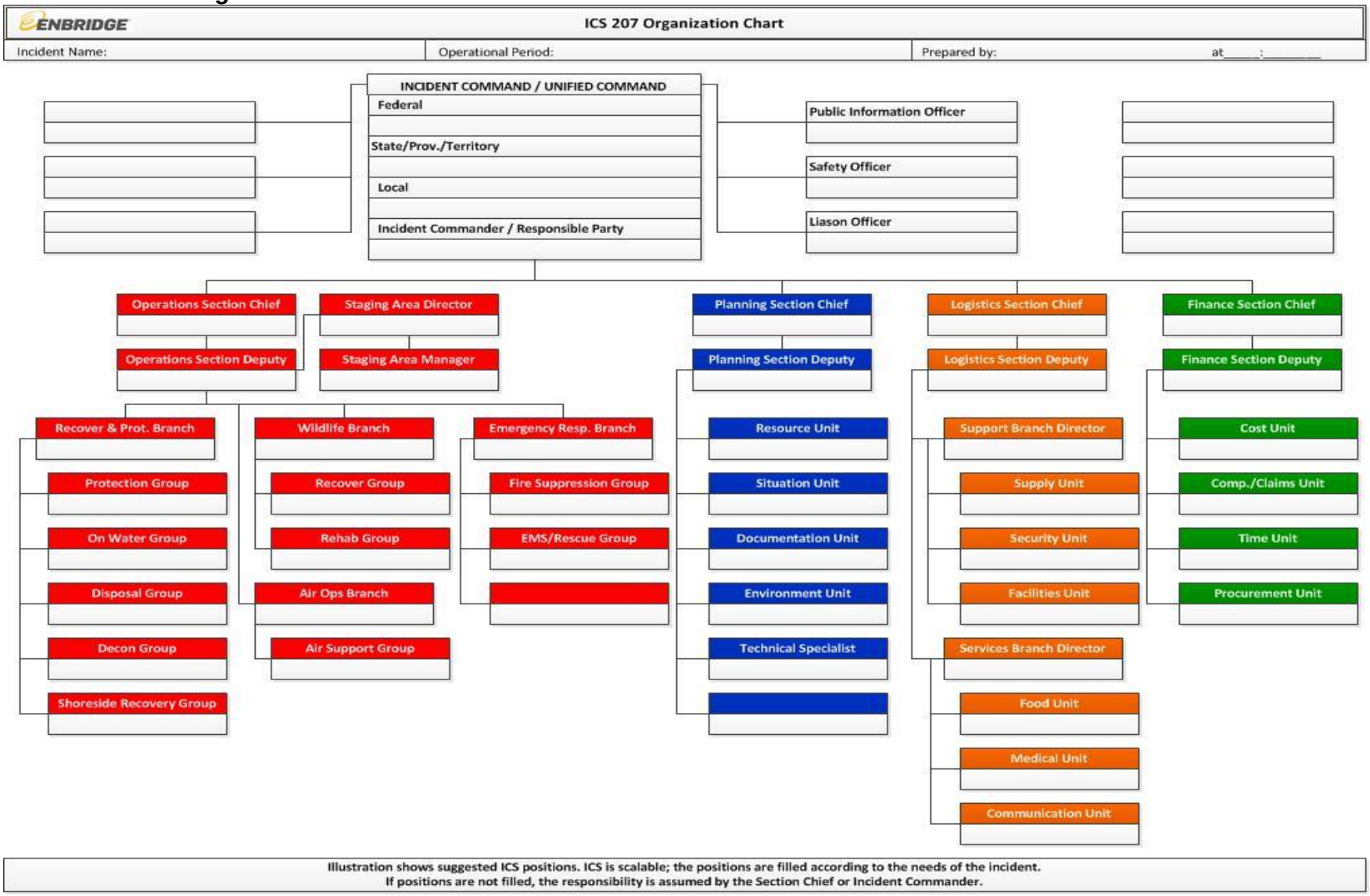
Assignment of responsibilities in the ICS starts with the top position (i.e., IC) and works down, as required. The IC role must be filled at all times during the emergency. The IC would mobilize positions directly beneath, as required. When a position is not mobilized, the position directly above would assume the responsibilities. ICS when activated requires as a minimum an IC and Safety Officer positions.

Determine the level of emergency and tier of response required to effectively manage the response. Refer to the Company Emergency Classification and Tiered Response Chart located in Section 6.5.6.

6.7.2 ICS Activation

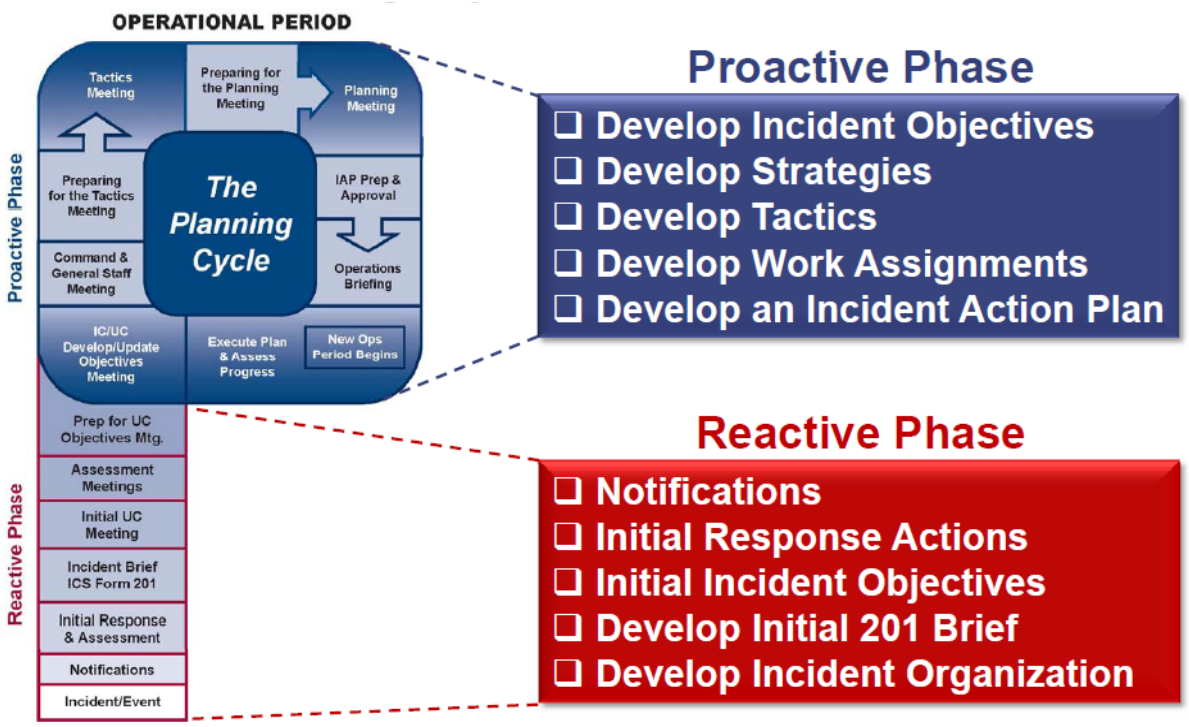
ICS Is Scalable And Will Be Activated To Meet The Needs Of An Emergency	
Level 1	ICS is activated, IMT staffed as required, at minimum I/C and Safety Officer will be staffed
Level 2	ICS is activated; IMT to manage reactive and proactive phases. Command and general staff will be required with the potential to fill additional positions. CMT will be notified based on significant incident criteria
Level 3	Full IMT will be activated, CMT is notified.

6.7.3 ICS 207 Organization Chart



6.7.4 Operational Period Planning Cycle

In more complex Level 2 or 3 emergencies, planning for the next operational period will take place in the proactive phase. The move from reactive to proactive will be situation specific and depends on the incident, skill set and staff available. Once the scale and scope of the event has been determined (a situational assessment is complete and a common operating picture has been established), the IC should discuss with the IMT and determine when a move into the proactive phase would be appropriate. A detailed IAP will be put together and the following meetings will be conducted to ensure all personnel are briefed on the objectives and have the appropriate work plan in hand.



6.7.5 ICS Common Responsibilities

Common Responsibilities Checklist	
After initial notification and receiving your assignment:	
✓	Review job assignment (e.g., Strike Team designation, position, etc.).
✓	Receive brief overview of type and magnitude of incident.
✓	Receive resource order number and request number.
✓	Receive reporting location & time.
✓	Receive travel instructions.
✓	Receive any special communications instructions (e.g., travel, radio frequency).
✓	Monitor incident related information from media, internet, etc., if available.
✓	Assess personal equipment readiness for specific incident and climate (e.g. medications, money, computer, medical record, etc.). Maintain a checklist of items and if possible a personal Go-Kit.
✓	Inform others as to where you are going and how to contact you.
✓	Review Incident Management Handbook (IMH).
✓	Take advantage of available travel to rest prior to arrival.
✓	Upon arrival at the incident, check-in at the designated check-in location. Check-in may be found at any of the following locations: • Incident Command Post, Base/Camps, Staging Areas, and Heli-bases. • If you are instructed to report directly to a line assignment, check-in with the Division/Group Supervisor.
✓	Receive briefing from immediate supervisor.
✓	Agency Representatives from assisting or cooperating agencies report to the LNO at the Incident Command Post after check-in.
✓	Acquire work materials.
✓	Abide by organizational code of ethics.
✓	Participate in IMT meetings and briefings, as appropriate.
✓	Document information and key actions.
✓	Ensure compliance with all safety practices and procedures. Report unsafe conditions to the SOFR.
✓	Supervisors shall maintain accountability for their assigned personnel with regard as to exact location(s) and personal safety and welfare at all times, especially when working in or around incident operations.
✓	Organize and brief subordinates.
✓	The Command Staff and General Staff shall ensure branches are identified, set up and allocate divisions and groups within them to stay within the recommended span of control (1 Supervisor per 4-7 people).
✓	Know your assigned communication methods and procedures for your area of responsibility and ensure that communication equipment is operating properly.

Common Responsibilities Checklist (Cont'd)	
✓	Use clear text and ICS/UC terminology (no codes) in all radio communications.
✓	Complete forms and reports required of the assigned position and ensure proper disposition of incident documentation as directed by the Documentation Unit Leader (DOCL).
✓	Ensure all equipment is operational prior to each work period.
✓	Report any signs/symptoms of extended incident stress, injury, fatigue or illness for yourself or coworkers to your supervisor.
✓	Respond to demobilization orders and brief subordinates regarding demobilization.
✓	Prepare personal belongings for demobilization.
✓	Return all assigned equipment to appropriate location.
✓	Complete Demobilization check-out process before returning to home base.
✓	Participate in After-Action activities as directed.
✓	Carry out all assignments as directed.

Initial Response

SPILL OBSERVER

- If a pressure drop is noticed or a leak is suspected, notify the Senior staff member on-site immediately and stop all product transfers.
- To minimize damage, close all automatic isolation valves, if available.
- Assist with initial response actions as directed.

AERIAL PATROL

- Report all abnormal activity and dead vegetation in the vicinity of a pipeline.
- If action requires immediate attention, report via radio.
- In the event radio contact cannot be made; the line flyer will land and report to Company management by telephone.

ENBRIDGE FIRST RESPONDER

- Determine level of response needed, hazards of product(s) involved and proper response guidelines to be followed.
- Work with local law enforcement to make sure all personnel/citizens are a safe distance away from the hazard area.
- Notify External Emergency Services as appropriate.
- Notify People Leader / Regional On-Call.
- Work with response team once they arrive on site to establish a workable Incident Command Post and Communications Center.
- Determine the extent of spill or release, verify product type(s), identify material(s), estimate quantity spilled or released, approximate rate of discharge, estimate movement of the spill/vapor cloud, estimate the wind direction.
- Instruct response team to eliminate sources of vapor cloud ignition. Shut down all engines and motors.
- Review pipeline alignment sheets to become familiar with the location of mainline valves and elevation characteristics. Review ESA maps for the location of any sensitive area that may be impacted (Annex 3).
- Advise response team on manual valves locations; order them closed if appropriate.
- Note time of spill or time of first detection, location, source and cause of spill.
- Make a note of response actions taken and by whom.
- Instruct response team to attend to injured personnel.
- Request resources for additional emergency response contractors through Logistics
- Collect information necessary to complete the Incident Report Form.
- Provide information on spill to Compliance/Liaison Officer to ensure notifications are made to appropriate local/state/provincial/territorial/ federal agencies
- Advise neighboring property owners and operators of any threat to their property or personnel.
- Direct initial response actions.

General Initial Response Procedures

This checklist is generic to all Company Plans and is included as an additional checklist to supplement facility specific checklists contained in this Plan:

- Any employee observing a spill should take emergency action to stop the release at the source in a safe manner and immediately notify the Terminal/Area Supervisor/Manager or On-Call Representative for the location.
- Upon becoming aware of a spill, the Terminal/Area Supervisor/ Manager or On-Call Representative will assess the spill in terms of the location and volume and determine if the ICS should be activated.
- Once it has been determined to activate the ICS, the IC will initiate the following actions:
  - Confirm that injured personnel have been attended to and arrange for medical assistance and transportation to hospitals, if necessary, and ensure the safety of all response personnel.
  - Confirm that personnel have been assigned to stop the release and flow of oil, and secure leaks.
  - Assess the spill; determine parameters such as spill volume, extent, speed, and direction of movement.
  - Integrate local evacuation plans into the Unified Command decision-making process.
  - Confirm that containment equipment and oil spill contractors have been deployed.
  - Notify the appropriate Company management.
  - Notify appropriate federal, state and local government agencies, including local utilities.
  - Begin development of an initial incident action plan (ICS 201 Forms).

General Initial Response Procedures Field Responders

These procedures have been designed to:

- Provide safety to the public and company personnel when threatened by the release of product from a pipeline to the environment, and
- To coordinate activities for prompt and safe repair of the pipeline and the return to normal operating conditions.

Whenever any of the above conditions occur, the following emergency shutdown procedures should be initiated:

- Shutting in the line at the nearest block valves.
- Notifying the nearest pump station and/or the appropriate Control Center.
- Maintenance crewmembers should notify their immediate supervisor who will in turn notify appropriate Company contacts.
- If the exact location of the leak is unknown, the immediate supervisor will request a line flyer, or if it is at night, manpower might be used to walk the line.
- Once a leak site has been located, the following information should be obtained:
  - Have all ignition sources been eliminated?
  - Are any schools, homes or commercial properties at risk and should they be evacuated?
  - Should access to the area be restricted (roads blocked)? If so, assistance should be requested from law enforcement agencies.
  - Have local response agencies been advised of the product's characteristics and handling precautions which are described in the SDSs?
  - Are railroads or utility companies in the area and have they been notified?
  - Will product flow into any waterways or roadways?
  - Work with Company Environmental Department to conduct a Natural Resource Damage Assessment.
- The Control Center should be notified following an assessment of the release site; an evaluation should be made regarding the effect of downtime on product scheduling. Appropriate report, logs & notifications will be made.

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EXPLORE	
	Determine the wind direction and approach cautiously from upwind.
	Explore the suspected release area only when wearing appropriate PPE, using the buddy system if possible.
	Ensure safety of personnel in the area.
	Conduct a hazard assessment to determine the potential for fire, explosion and hazardous toxic vapors.
	Eliminate or shut off all potential ignition sources in the immediate area.
	Use intrinsically safe equipment (e.g., flashlights, two-way radios, gas detectors with audible alarms).
	Maintain regular/scheduled communication with the Control Centre and Regional Management/on-call person.

APPROACH	
	Verify wind direction and stay upwind
	Are people injured or trapped?
	Are there external party people involved in rescue or evacuation
	Are there immediate signs of potential hazards such as: · Electrical lines down or overhead · Unidentified liquid or solid products visible · Vapors visible · Smells or breathing hazards evident? · Fires, sparks or ignition sources visible? · Holes, caverns, deep ditches, fast water or cliffs near? · Is local traffic a problem? · Determine ground conditions: Dry Wet Icy

CONFRIM AND CONTROL	
	Confirm identification of spilled material and check the SDS
	Assess the spill threat, site safety and parameters such as spill volume, extent and direction of movement.
	Has pipeline(s) been shut down?
	If on water, consult Control Point and High Consequence Area (HCA) maps for appropriate response strategies for incoming resources.
	Has wind direction been confirmed and windsock erected?
	Has the public been protected or evacuation considered if necessary?
	Have all ignition sources been identified and eliminated?
	Establish exclusion zone and safe work areas (hot, warm and cold).
	Have personal protection and safety requirements been established and communicated?
	Is adequate fire protection equipment available andi n place?
	Have valves been locked out if necessary?
	Are tank and VAC-truck electrical equipment properly grounded?
	Have decontamination sites and procedures been established?
	Are activities and events being logged/documented?

COMMUNICATE	
	Initiate actions to notify government agencies including local authorities of area affected or at risk areas via the Control Center, Regional Management or designate
	Complete notifications for emergency call-out, including regulatory agencies. This will be done by the Regional Management or designate
	If excavating, confirm that One-Call agency has been notified?
	Has a Preliminary Incident Report been issued?
	Has a radio channel been established for communication between the site and other personnel in field?

Considerations	
	If appropriate, request surveillance fly-over to determine: • Size and description of incident • Direction of movement • Coordinates of leading and trailing edge of oil slick if applicable • Sensitivities endangered • Areas of population that are threatened
	If possible, photograph the area for situational awareness
	Once support has arrived, conduct transfer of command and start preparing for tactical and planning meetings.

ENBRIDGE

6.7.7 Hazard-Specific Field Response Team Guides

The following Field Response Team guides are intended to provide recommendations and suggestions to assist Enbridge first responders (and also support the Incident Management Team) on a variety of hazards and threats. General procedures for response (such as Incident Command, Site Control, and PPE) should still also be applied where required.

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6.7.7.1 Medical Emergencies

The three basic steps to follow in a medical emergency are as follows:

CHECK the person

- Does the person want your help? If the person is unable to answer, assume you have consent to give first aid
- Check the person's ABCs

CALL for assistance/additional resources

- If the person responds, find out if here is a need to call for additional help (e.g. 911, EMS)
- If the person does not respond, call for help.

CARE for life-threatening conditions first

- Reduce the risk of disease transmission by using protective equipment such as disposable gloves and a barrier device

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OBJECTIVES

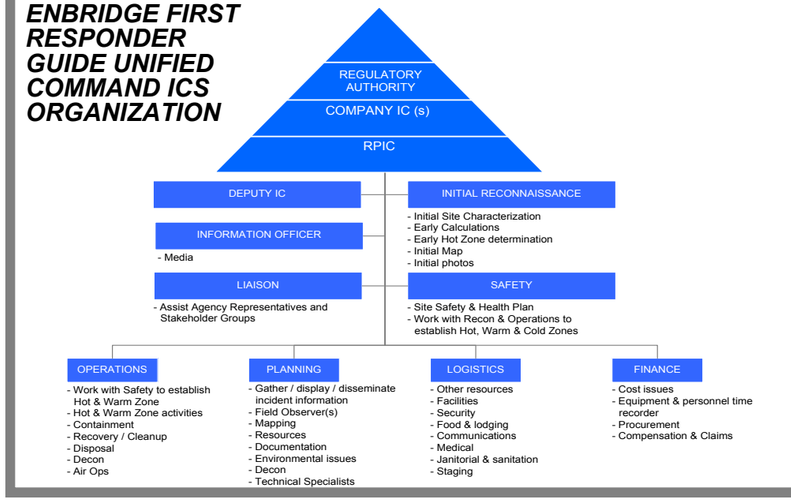
We will prudently over respond to any incident with priorities in the following order:

People
Environment
Assets
Reputation

FACILITY MITIGATION / PROTECTION ACTIONS

- Shut off flow
- Isolate leaking section of piping
- Notify Terminal Supervisor, Manager or designee
- Place a container under the leak and attempt to temporarily plug the hole
- Initiate spill containment (if outside containment area)
- Evacuate contents of line with suction pump or flush with water to remove remaining oil
- Block and purge affected equipment
- Initiate recovery/clean-up actions

ENBRIDGE FIRST RESPONDER GUIDE UNIFIED COMMAND ICS ORGANIZATION



SAFETY

- Ensure proper documentation has been completed (Safe Work Permit, Field Level Hazard Assessment, etc.)
- Your safety first and then the safety of others
- Stay out of hazard zone
- If performing Recon approach up wind, up hill, up stream
- Determine the immediate hot zone

ISOLATE AND DENY ENTRY

- Evacuate the immediate area
- Deny entry to the immediate area
- Ask others to help deny entry into the area
- If on the scene, ask agency resources to help deny entry into immediate area

NOTIFICATIONS

- Contact your supervisor
- Contact Control Centre
- Dial 911 if ambulance, police or fire dept. assistance is needed
- Request assistance from local OSRO/Spill Cooperatives though Logistics, if necessary
- (Notifications section of this plan A2)
- Follow Notification Procedures (Notification section of this plan A2)

COMMAND MANAGEMENT

- First Responders assumes the role of the Incident Commander until transfer of command occurs
- Make an announcement to everyone on scene that you have assumed Command
- Establish a Command Post up wind, up hill and upstream of the incident in the cold zone
- Establish a Staging Area up wind, up hill and upstream of the incident in the cold zone
- Begin assigning ICS positions as per Regional Incident Management Team
- Meet, greet and brief responding Agencies as they arrive at the Command Post
- Ensure Safety Officer begins and completes a Site Safety Plan

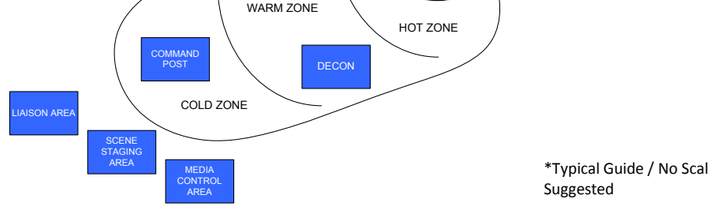
IDENTIFICATION AND ASSESSMENT

- Continue to evaluate the hot zone and adjust accordingly
- Continue to monitor evacuation activities
- Ensure safe Recon to determine extent of impact on water, air, soil, plant life and wildlife

ACTION PLANNING

- Complete an ICS Form 201 for the Incident Action Plan

TYPICAL EMERGENCY SCENE CONTROL ZONE DIAGRAM



*Typical Guide / No Scale Suggested

PROTECTIVE EQUIPMENT

- Ensure proper levels of PPE
- Ensure PPE is in line with Site Safety and Health Plans (SSHP)

CONTAINMENT AND CONTROL

- Containment and control strategies should be developed within the Incident Action Plan process / follow Area Contingency Plan
- Operations Section Chief oversees containment & controls tactical deployment
- OSRO's/Spill Cooperatives work under the Operations Section and should not freelance

PROTECTIVE ACTIONS

- Ensure safe Recon to access impact on area
- Protective action tactical deployment should be part of the Incident Action Plan

DECONTAMINATION / CLEANUP

- Decon activities take place under the ICS Ops Section
- Ensure decon capabilities are in place within the Warm Zone as soon as possible
- Ensure proper PPE for Decon Team
- Clean up strategies should be part of the Incident Action Plan
- Decon runoff needs to be contained and properly disposed of

DISPOSAL

- Ensure early notification of EH&S
- Consult Waste Management section of this plan and other company documentation

DOCUMENTATION

- Ensure proper field safety documentation has been completed (Safe Work Permit, Field Level Hazard Assessment, etc.)
- Ensure early completion of ICS Form 201 & SSHP
- Ensure proper retention of all incident related documents
- Ensure timely incident critique and record lessons learned

INITIAL ICS / NOTIFICATION FORMS THAT MAY BE UTILIZED

- Notification Fax
- ICS Form 201 (Incident Briefing, 1-5)
- ICS Form 214 (Unit Log)
- Site Safety and Health Plan (SSHP)
- ICS Form 232 (Resources at Risk Summary)

EMERGENCY RESPONSE GUIDEBOOK QUICK REFERENCE PAGES

Product	Guide #
Gasoline	128
Diesel	128
Crude Oil	128
Oil <200° FP	171
Sour crude oil	131

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Field Response Team - Pipeline Release 6.7.7.2

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Spill Surveillance Guidelines

- Spill surveillance should begin as soon as possible to aid response personnel with assessing spill size, movement and potential impact locations.
- Cloud shadows, sediment, floating organic matter, submerged sand banks, or wind-induced patterns on the water may resemble an oil slick if viewed from a distance.
- It is difficult to adequately observe oil on the water from a boat, dock or shoreline.
- Spill surveillance is best accomplished using helicopters or small planes. Helicopters are preferred due to their superior visibility and maneuverability characteristics.
- If fixed-wing planes are used, high wing types provide better visibility than low-wing types.
- Document all observations in writing and with photographs and/or videotapes.
- Describe the approximate oil slick dimensions based on available reference points (i.e. vessel, shoreline features, facilities, etc.). Use aircraft or vessel (if safe to do so) to traverse the length and width of the slick while timing each pass. Calculate the approximate size and area of the slick by multiplying speed and time.
- Record aerial observations on detailed maps.
- In the event of reduced visibility, such as dense fog or cloud cover, boats may be used for patrols and documenting the location and movements of the spill. Boats will only be used if safe conditions are present, including on-scene weather and product characteristics.
- Surveillance is also required during spill response operations in order to gauge effectiveness of response operations, to assist in locating skimmers and to continually assess size, movement and impact of spill.

Spill Volume Estimation & Methods

Early in a spill response, estimation of spill volume is required in order to:

- Report to agencies.
- Determine liquid recovery requirements.
- Assess manpower and equipment requirements.
- Determine disposal and interim storage requirements.
- In the event that actual spill volumes are not available, it may be necessary to estimate this volume (see flowchart)

Initial Estimates:
If available, information provided from the control center can be used to provide an initial estimate of the spill volume. The volume released should match the change in a cutoff inventory measurement.

Tanks:
If the leak source can be isolated to a tank, an initial leak volume estimate can be determined as:
Volume = the change in height of the tank x the volume per inch as found on the tank strapping table
Mainline Releases - An initial release volume can be calculated as:
Volume = (the mainline flow rate x the time to isolate) + the volume of drain-up from the release site to the next high point in the line

The volume release estimate can be verified by the mismatch in injection and delivery flow meters or tank volume change. In systems where ATMOS pipe is used for leak detection (i.e. gathering system), the estimated leak size is available in the user screen.

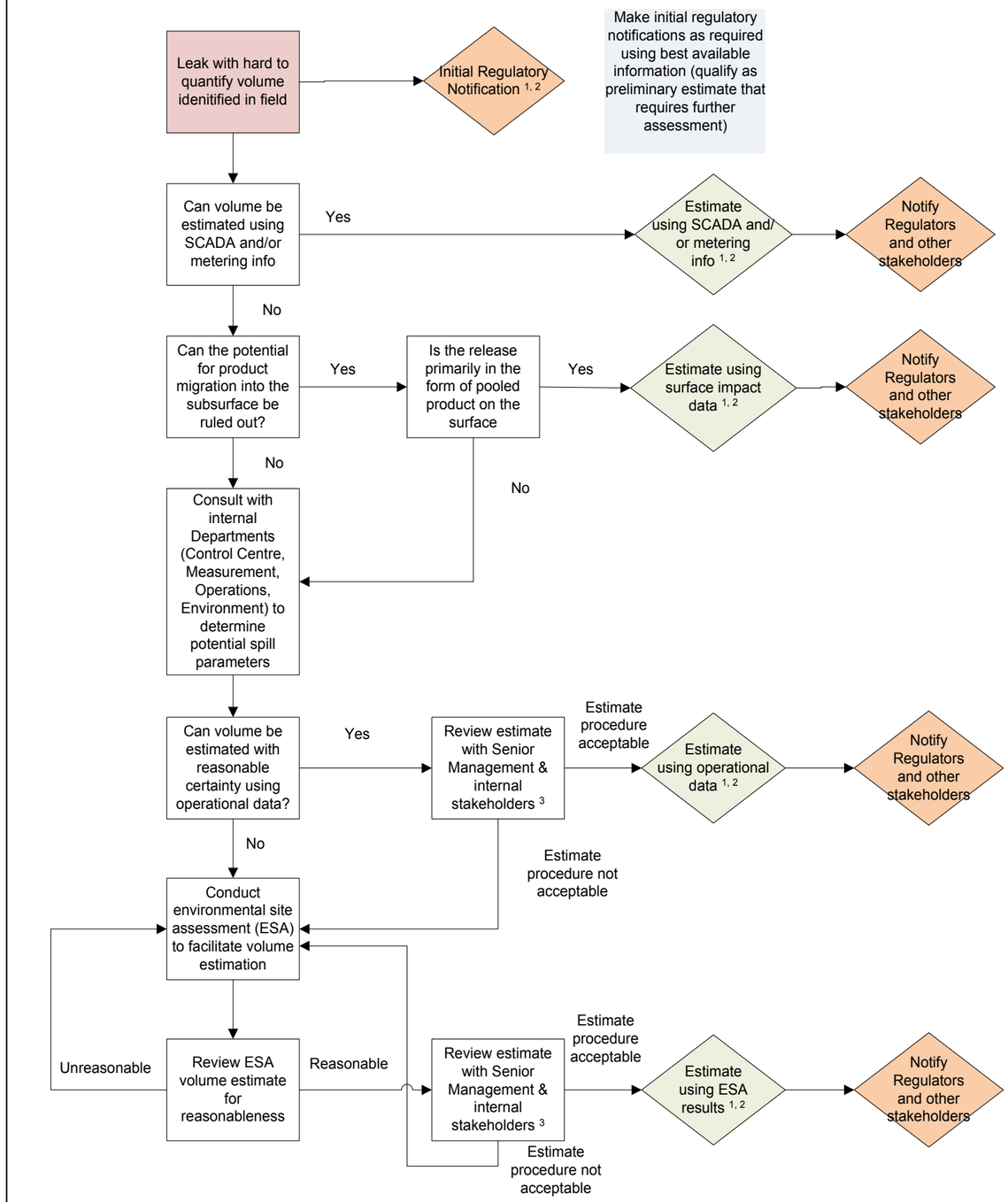
Land:
The following is a list of possible tools that can assist with determining a spill volume on land.
Transportation Spill to Land Estimation Tool
SCADA (Control Center calculation)
Tank Data Program

Leak on Land - Field Measurement:
To estimate the volume of a spill in a field location, the spill is segmented to a summation of area calculations. The volume of each area is calculated as the length x the width x the depth.
Conversions:
1 m3 = 6.29 bbls 1 ft3 = 0.178 bbls
1 in = 0.0254 meters 1inch = 0.0833 ft.

Water
Visual observation and calibration with the A.P.I. Task Force on Oil Spill Cleanup, Committee for Air and Water Conservation's Spill Size Estimation Matrix Table. Methods which can be used to determine size and volume of a spill include, but are not limited to:
Vessel / line capacity formulas
Infra-red thermal imaging

Leak on Water - Visual Observation:
Using only visual observation to obtain an accurate volume estimate for a product on water is improbable. When possible, the estimate should be based on one of the above methods (i.e. tank or mainline release calculations with Control Center input). The National Oceanic and Atmospheric Administration (NOAA) does provide a job aid to assist with visually estimating the volume of a release on water, but it is more suitably used to subjectively characterize and describe the spill. It may be found at: http://response.restoration.noaa.gov/oil-and-chemical-spills/oil-spills/resources/open-water-oil-identification-job-aid.html

Volume Estimates Flowchart



Notes:
1. Estimates must take uncertainties (such as extent of subsurface contamination, duration of leak, etc) into account.
2. In situations where there are significant uncertanties, it is preferable to estimate using a range (low case, likely case, and high case).
3. Internal stakeholders typically include Operations, Public & Government Affairs, Environment and Law.

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Estimating Spill Trajectories

Oil spill/NGL trajectories may initially be estimated in order to predict direction and speed of the slick movement. Trajectory calculations provide an estimate of where oil slicks may impact shorelines and other sensitive areas and provide an estimate of the most likely locations for protection, containment and recovery.

The following method may be used to predict spill movement:

- Computer trajectory modeling programs (including but not limited to):
  - World Oil Spill Model (WOSM)
  - OilMap
  - General NOAA Oil Modeling Environment (GNOME)

The Company will utilize internal subject matter leads (SML) with consultants as necessary to perform trajectory analysis and fate & effect modeling.

Input variables for proper modeling include, but are not limited to:

- Spill location, volume, and time of spill.
- Nature of the spill - continuous or single incident
- Wind speed & direction.
- Water movement (current) speed & direction.
- Water temperature.
- Atmospheric temperature.
- Characteristics of spilled material

This information can be obtained from many sources, including but not limited to:

- Reports from personnel at the spill site.
- Commercial weather services.
- NOAA
- Internal company databases.
- The Response Group (TRG) GIS Trajectory.

Product Volume Tracking

An estimate of the amount of product recovered. In order to provide relevant information, a uniform procedure for sampling, analyzing and calculating the amount of product recovered from remediation activities at the release location should be established for the site.

Product volume tracking requires identification of each waste stream. Examples of typical waste streams from an oil release include:

- Soil and/or sediment impacted by the hydrocarbon product (hazardous and non-hazardous)
- Debris (e.g., impacted sorbents, boom, pads, plastic, PPE, vegetation)
- Water (hazardous and non-hazardous)

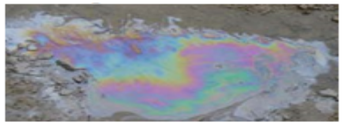
A sampling protocol will be established for each waste stream and will include:

- Number of samples required per volume of waste generated
- Laboratory analysis required
- Data reporting requirements

In the case of a crude oil release, the data provided by the waste stream disposal contractors (e.g. volumes converted to mass) and the validated analytical results (Oil and Grease in mg/kg) may be used as a basis to calculate the amount of crude oil recovered per waste load. These calculations will be maintained in a “Daily Waste Load Summary” spreadsheet.

Oil Volume Calculation Table

Visual Color

	Sheen (Silver/Gray)		Rainbow		Metallic		Transitional	
								

	Sheen (Silver/Gray)	Rainbow	Metallic	Transitional	Dark (or True) Color
Approximate Thickness	0.04 to 0.3 µm	0.3 to 5.0 µm	5.0 to 50 µm	50 to 200 µm	>200 µm
Area	**Volume (liters)**				
100 m²	0.004 to 0.03	0.03 to 0.5	0.5 to 5	5 to 20	>20
500 m²	0.02 to 0.15	0.15 to 2.5	2.5 to 25	25 to 100	>100
1,000 m²	0.04 to 0.3	0.3 to 5	5 to 50	50 to 200	>200
1,500 m²	0.06 to 0.45	0.45 to 7.5	7.5 to 75	75 to 300	>300
2,000 m²	0.08 to 0.6	0.6 to 10	10 to 100	100 to 400	>400
3,000 m²	0.12 to 0.9	0.9 to 15	15 to 150	150 to 600	>600
5,000 m²	0.2 to 1.5	1.5 to 25	25 to 250	250 to 1000	>1000
10,000 m²	0.4 to 3	3 to 50	50 to 500	500 to 2000	>2000
50,000 m²	2 to 15	15 to 250	250 to 2500	2500 to 10,000	>10,000
100,000 m²	4 to 30	30 to 500	500 to 5000	5000 to 20,000	>20,000
150,000 m²	6 to 45	45 to 750	750 to 7500	7500 to 30,000	>30,000
200,000 m²	8 to 60	60 to 1000	1000 to 10,000	10,000 to 40,000	>40,000
400,000 m²	16 to 120	120 to 2000	2000 to 20,000	20,000 to 80,000	>80,000
600,000 m²	24 to 180	180 to 3000	3000 to 30,000	30,000 to 120,000	>120,000
800,000 m²	32 to 240	240 to 4000	4000 to 40,000	40,000 to 160,000	>160,000
1,000,000 m²	40 to 300	300 to 5000	5000 to 50,000	50,000 to 200,000	>200,000

	Sheen (Silver/Gray)	Rainbow	Metallic	Transitional	Dark (or True) Color
Approximate Thickness	1.6 x 10^{-6} to 1.2 x 10^{-5} inches	1.2 x 10^{-5} to 2.0 x 10^{-4} inches	2.0 x 10^{-4} to 2.0 x 10^{-3} inches	2.0 x 10^{-3} to 8 x 10^{-3} inches	>8 x 10^{-3} inches
Area	**Volume (gallons)**				
100 yd²	0.003 to 0.007	0.007 to 0.11	0.11 to 1.1	1.1 to 4.4	>4.4
500 yd²	0.013 to 0.03	0.03 to 0.56	0.56 to 5.6	5.6 to 22	>22
1,000 yd²	0.026 to 0.07	0.07 to 1.1	1.1 to 11.1	11.1 to 44	>44
1,500 yd²	0.039 to 0.10	0.10 to 1.67	1.67 to 16.7	16.7 to 66	>66
2,000 yd²	0.052 to 0.14	0.14 to 2.2	2.2 to 22.2	22.2 to 88	>88
3,000 yd²	0.078 to 0.20	0.20 to 3.3	3.3 to 33.3	33.3 to 132	>132
5,000 yd²	0.13 to 0.34	0.34 to 5.6	5.6 to 55.5	55.5 to 220	>220
10,000 yd²	0.26 to 0.68	0.68 to 11.1	11.1 to 111	111 to 440	>440
50,000 yd²	1.3 to 3.4	3.4 to 55.5	55.5 to 555	555 to 2,200	>2,200
100,000 yd²	2.6 to 6.8	6.8 to 111	111 to 1,110	1,110 to 4,400	>4,400
150,000 yd²	3.9 to 10.2	10.2 to 167	167 to 1,665	1,665 to 6,600	>6,600
200,000 yd²	5.2 to 13.6	13.6 to 222	222 to 2,220	2,220 to 8,800	>8,800
400,000 yd²	10.4 to 27.2	27.2 to 444	444 to 4,440	4,440 to 17,600	>17,600
600,000 yd²	15.6 to 40.8	40.8 to 666	666 to 6,660	6,660 to 26,400	>26,400
800,000 yd²	20.8 to 54.4	54.4 to 888	888 to 8,880	8,880 to 35,200	>35,200
1,000,000 yd²	26 to 68	68 to 1,110	1,110 to 11,100	11,100 to 44,000	>44,000

Table is based off of information in NOAA's *Open Water Oil Identification Job Aid for Aerial Observation*.

Discovery / Investigation

The Enbridge Responder will take action to mitigate the situation and prevent escalation if safe to do so. For the initial action it is important to remember:

- Don't try to control more area than can be effectively isolated and controlled ;
- The more time, distance and shielding between the Enbridge Responder and the released product, the lower the risk;
- Designate an emergency evacuation signal and identify muster points if emergency evacuation is necessary;
- Ensure appropriate PPE;
- Ensure compliance to safety and health policies for working alone
- Never permit response personnel to perform activities in areas where un-ignited gasses or vapors may accumulate; and
- Assess the hazards posed by the release (health, physical, chemical, other).

Immediately inform the Control Center and contact the QI/IC and provide a situation report. Assess the emergency level and activate the ICS based on need.

The most qualified Enbridge Responder on scene will assume the role of IC and direct on-scene response activities until otherwise relieved.

Identifying NGL Releases

Indications of an NGL release include:

- Cloud of steam or mist (caused by condensation and freezing moisture);
- Ice buildup on exposed pipe, or frozen ground around an underground pipe;
- Brown vegetation (indicates soil saturation);
- Yellow-stained snow (may indicate NGL accumulation under the snow); and/or
- Odor (which is the condensate fraction of NGL).

Standard Safety Precautions

- Ensure proper documentation has been completed (Safe Work Permit, Field Level Hazard Assessment, etc.)

- Determine the wind direction and approach cautiously from upwind.
- Park vehicles upwind in vapor-free areas and on high ground, if possible.
- Shut down vehicles when not in use.
- Eliminate or shut off all potential ignition sources in the immediate area.
- Explore the suspected release area only when wearing appropriate PPE; explore on foot, using the buddy system if possible.
- Do not carry ignition sources.
- Do not attempt to walk in product releases or vapors.
- Maintain constant or scheduled communication "buddy" or back-up personnel.
- Use intrinsically safe equipment (e.g., flashlights, two-way radios, gas detectors with audible alarms).

Assess the site for potential impacts, for example:

- Electrical lines down or overhead.
- Unidentified visible liquid or solid products.
- Visible vapors.
- Odors or breathing hazards.
- Fire, sparks or other ignition sources.
- Holes, caverns, deep ditches, fast water or steep slopes nearby.
- Local traffic.
- Ground conditions (dry, wet or icy).

Standard Safety Precautions, cont.

There is no one single barrier that will effectively combine both chemical and thermal protection. Also any type and level of impermeable protective clothing creates the potential for heat stress injuries. Remember that PPE is the LAST line of defense. Enbridge responders have been seriously burned and injured because they did not use their protective clothing and equipment.

Flammable liquids and gases give off a tremendous amount of radiant heat. Responders need to be aware and protect exposed areas as appropriate. No attempt should be made to extinguish a flammable gas fire. Always control or isolate the source of the leak as best as possible. If the source can't be isolated, then attempt to reduce the operating pressure of the pipeline. Try and permit the fire to self-extinguish, if possible and consume any residual fuel that may remain inside or outside the pipeline.

In addition to the standard safety precautions, when exploring outdoors use a gas detector to determine the presence of vapors. Natural gas is odorless and colorless. However, even if there is no odor present or there is an odor, a dangerous concentration may be present.

A combustible gas indicator (CGI) or a gas flame ionization detector (FID) could be used to determine the flammability hazards. Most CGIs and flammable gas detectors are set to alarm at 10% of the LEL of the gas upon which the sensor is calibrated (approximately 4000 ppm). In the natural gas industry, virtually all CGIs and flammable gas sensors are calibrated on pentane.

Natural gas may follow disturbed soil and enter grade areas around the pipe or other venues. The flammability range of natural gas is 4% to 15% in air by volume. Controlling ignition sources is a priority. Some examples you may not have thought about are:

- Doorbells
- Flashlights
- Telephones
- Burglar Alarms
- Heating Systems
- Vehicles and Trucks
- Pagers
- Light Switches
- Garage Door Openers

Since natural gas is extremely flammable the following should be considered:

- With any leak, always anticipate and expect that ignition will occur;
- Natural gas released inside buildings presents one of the greatest flammable hazards to emergency responders. Buildings full of natural gas should only be approached when needed with extreme caution and with a minimum number of personnel;
- Natural Gas / Methane (UN1971) is lighter than air and will rise;
- Do not close main valves or any other large transmission or distribution valves. This can lead to serious problems elsewhere in the natural gas pipeline system;
- Upon ignition, vapors may burn back to the source of gas; therefore make sure source is controlled;
- Vapors may cause dizziness or asphyxiation;
- Establish an effective and safe perimeter;
- Position all response support out of danger zone;
- Secure the scene and deny entry;
- If necessary, evacuate the public to a safe distance;
- Monitor the atmosphere, using multiple monitors where possible;
- Monitor for gas traveling away from source toward exposures;
- Control ignition sources (smoking, open flames, vehicles, internal combustion engines and motors);
- Do not operate electric devices such as switches, etc. Sparks could cause ignition; and
- If safely possible, ventilate the area, keeping in mind that during this process, if the flammable atmosphere is above the UEL the gas may pass back through the flammable range of 4% to 15% gas to air.

Prompt and Effective Management of Release

Small Release

If the released NGL is creating a local safety hazard, the NGL may then be ignited following the procedure for igniting NGL (see below). Where available, water fog may be used to break up and disperse small vapor clouds. Air movers are also an effective method of providing air circulation in confined areas or in buildings. Ensure they are safe (intrinsically safe) to use in that environment.

Large Release

If the NGL release is large or the NGL batch cannot be pumped past the release site, ignite the NGL following the standard procedure.

If the vapor plume is moving toward a populated area the area will be evacuated. If the vapor cloud cannot be ignited and repair procedures must begin, all equipment and vehicles will be located a minimum of 0.5 mi (0.8 km) upwind of the leak site. Continuously monitor the perimeter of the vapor cloud to detect any shift in the vapor cloud.

Isolating the Pipeline Section

When NGL is escaping uncontrolled, the affected pipe section will be immediately isolated by closing the appropriate sectionalizing valves.

Relieving Pressure

Use one of the following methods to relieve pressure at a pipeline section releasing NGL:

- If NGL is present at the blowdown valve, install a pipe discharge line and flare the NGL
- Transfer the product to a properly rated pressure containment vessel
- Install a pump complete with a discharge check valve to pump across the downstream sectionalizing valve
- If elevation does not provide a standing head in the isolated section, a transfer pump connected to the blowdown valve will be needed to fill a properly rated pressure containment vessel

Evacuation/Site Security

Due to the high flammability of NGL and the possibility of a vapor plume forming, it may be necessary to evacuate workers and visitors from the area, and to secure the site to protect the public and property.

Digging out a Release Site

Repair operations involving NGL are difficult, slow and hazardous. Pockets of gas may be trapped in the ground. In addition, if NGL has been leaking for some time, the condensate portion may have saturated the soil for a considerable distance around the site. Before beginning excavation or line repairs, active NGL releases are ignited or left burning.

When digging out an NGL release site, the following methods will be used:

- Ensure liquid has replaced the NGL at the release site;
- Follow appropriate Company standards on pipeline excavation;
- Ensure fire extinguishing equipment is immediately at hand;
- Consider obtaining external firefighting services and equipment;
- If no wind is blowing, use air movers to keep air moving across the worksite and away from workers;
- Continuously monitor air using a gas detector; and
- Constantly monitor wind direction

Igniting an NGL Plume

Before ignition of an NGL plume:

- Ensure the area where people are congregating is and remains a Cold Zone by the use of gas detectors;
- Ensure proper permits for firearm and ignition if applicable;
- The area of the vapor plume is maintained clear of people and vehicles and people are prevented from going near the area;
- The potential impact on adjacent facilities is evaluated;
- Every attempt to obtain clearance from Regional Management and the municipal fire chief has been made;
- Review flare pistol safe handling procedures (jurisdictional firearm rules apply); and
- Confirm that the available pistol is in working order, verify the number of flares available and ensure that they are the correct type for the firearm.

If contact with the QI/IC cannot be obtained quickly (e.g. no cell phone communication in area or no definite answer given) and there is an immediate risk to the public, the Enbridge Responder or a designee trained in NGL ignition may proceed with ignition.

If applicable have local fire department on-scene prior to any attempt at ignition. Review the Ignition Decision Flowchart on the next page.

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Ignition Decision Flowchart

Consider the Impact of Ignition on People, the Environment and Property.

Assess as follows:

If the plume remains un-ignited or the wind direction changes:

- Are responders or the public at risk?
- Is there a greater potential for property and/or environmental damage due to accidental ignition or explosion?

No → **Continuously review:**

- Employee and public safety considerations.
- Existing site conditions and changes.
- Site control procedures.
- Monitoring of the Emergency Hazard Area.

Yes ↓

Review pre-ignition considerations:

- Consider safer alternatives (i.e. close valves, ventilate, etc.)
- Assess the area/perimeter of impact
- Proximity to residences, public facilities, towns or urban centers.
- Status of evacuations.
- Wind conditions and general topography.
- The potential for changes in weather and its implications.
- Transition from daylight to night darkness.
- Fire hazard after ignition in relation to adjacent area.
- Safety of all personnel in the Hazard Area.
- The presence of other underground or overhead utilities.De-energize if possible
- Will the situation worsen by burning seals out of adjacent valves or by starting pumps on fire?
- Controlled depressurization at other locations in the damaged section will reduce down time.

IS IGNITION THE MOST FAVORABLE CONTROL OPTION TO MINIMIZE THE HAZARDS?

No →

- Continue with release control procedures onsite.
- Review alternative control procedures.

Yes ↓

- Is there time to discuss the ignition decision with Regional QI/IC, Regional On-Call or People Leader?

No → Go to Ignition Procedures Flowchart.

Yes ↓

- Review decision to Ignite with Regional QI/IC, On Call or People Leader
- Determine post-ignition emergency service requirements.
- Assemble and brief Ignition Team.
- Go to Figure 2: Ignition Procedure Flowchart.

Ignition Procedure Flowchart

Onsite personnel will coordinate and lead the safe ignition of gas release.

PREPLANNING

Prior to ignition the Enbridge Responder will:

- Consider the path of the flair projectable
- Confirm that the area has been checked for habitation and that a complete evacuation of non-essential personnel has been completed.
- Isolate the Warm Zone / Hot Zone using manned roadblocks.
- Assemble ignition Team (2 people when possible).
- Ensure Ignition Team is protected with appropriate personal protective equipment.
- Review wind conditions (direction and speed), and erect windsock and streamer (if time permits).
- Monitor the area for combustible gas.
- Fully discuss ignition procedures.
- Check radio communications.
- Confirm whether overhead wires and electrical sub-stations have been de-energized.

APPROACH

Select position to attempt safe ignition that will:

- Allow for safe retreat.
- Provide cover from the initial flash.
- Be upwind of the gas leak 250m (820 ft) minimum from the edge of identified vapor plume for first attempt – this may be reduced in subsequent attempts as long as it is safe to move forward).
- Be in an area where no combustible gas is detected.
- Shoot for the outer edge of the cloud

ATTEMPT IGNITION

- Aim for the outer edge of plume. The center of the plume is too rich to ignite. Arcing shots or bounce shots can be used.
- Turn away from target to avoid heat flash.

Is the Plume ignited?

No → **REPEAT IGNITION**

- Continue approaching inwards using short distances and repeat (as long as safe to do so) until successful. Do not go closer than 100m (330 ft) from plume.

Yes → **POST IGNITION**

- Advise Regional Management.
- Continue to monitor downwind for gas accumulations.
- Maintain security around immediate area.
- Assist emergency service crews with any fire control measures needed.

OBJECTIVES

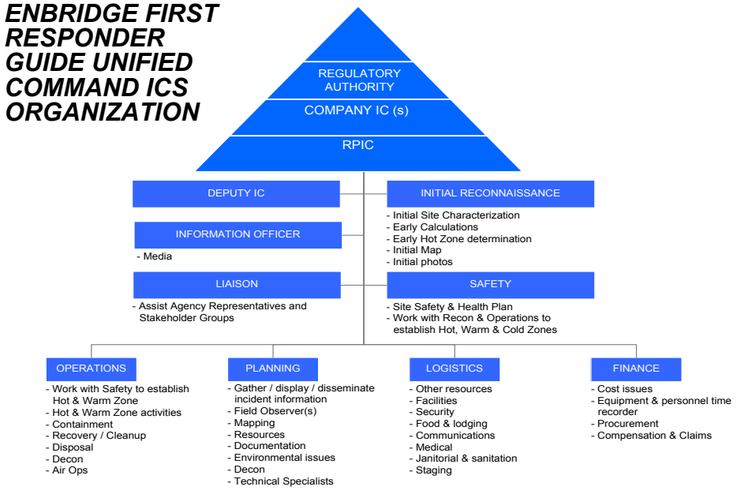
We will prudently over respond to any incident with priorities in the following order:

People
Environment
Assets
Reputation

FACILITY MITIGATION / PROTECTION ACTIONS

- Immediately stop work activity
- If safe, ensure dike drains are closed
- Notify Terminal Supervisor, Manager or designee
- Secure area
- Initiate response actions
- Shut off flow to tank
- Begin transfer of contents to other tankage

ENBRIDGE FIRST RESPONDER GUIDE UNIFIED COMMAND ICS ORGANIZATION



SAFETY

- Ensure proper documentation has been completed (Safe Work Permit, Field Level Hazard Assessment, etc.)
- Your safety first and then the safety of others
- Stay out of hazard zone
- If performing Recon approach up wind, up hill, up stream
- Determine the immediate hot zone

ISOLATE AND DENY ENTRY

- Evacuate the immediate area
- Deny entry to the immediate area
- Ask others to help deny entry into the area
- If on the scene, ask agency resources to help deny entry into immediate area

NOTIFICATIONS

- Contact your supervisor and the Control Centre
- Dial 911 if ambulance, police or fire dept. assistance is needed
- Request assistance from local OSRO/Spill Cooperatives though Logistics, if necessary
- (Notifications section of this plan A2)
- Follow Notification Procedures (Notification section of this plan A2)

COMMAND MANAGEMENT

- First Responders assume the role of the Incident Commander until transfer of command occurs
- Make an announcement to all on scene that you have assumed Command
- Establish a Command Post up wind, up hill and upstream of the incident in the cold zone
- Establish a Staging Area up wind, up hill and upstream of the incident in the cold zone
- Begin assigning ICS positions as per Regional Incident Management Team
- Meet, greet and brief responding Agencies as they arrive at the Command Post
- Ensure Safety Officer begins and completes a Site Safety Plan

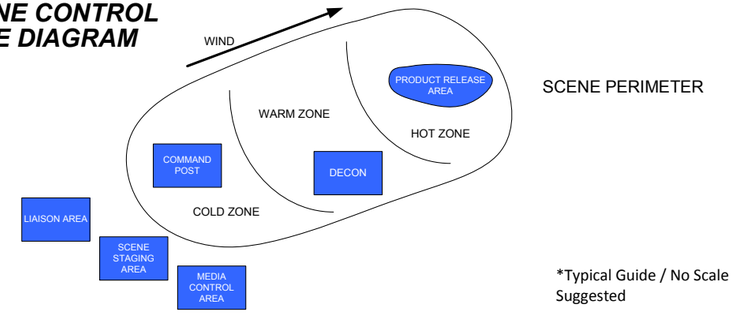
IDENTIFICATION AND ASSESSMENT

- Continue to evaluate the hot zone and adjust accordingly
- Continue to monitor evacuation activities
- Ensure safe Recon to determine extent of impact on water, air, soil, plant life and wildlife

ACTION PLANNING

- Complete an ICS Form 201 for the Incident Action Plan

TYPICAL EMERGENCY SCENE CONTROL ZONE DIAGRAM



PROTECTIVE EQUIPMENT

- Ensure proper levels of PPE
- Ensure PPE is in line with Site Safety and Health Plans (SSHP)

CONTAINMENT AND CONTROL

- Containment and control strategies should be developed within the Incident Action Plan process / follow Area Contingency Plan
- Operations Section Chief oversees strategies
- OSRO's / Spill Cooperatives work under the Operations section and should not freelance

PROTECTIVE ACTIONS

- Ensure safe Recon to assess impact on area
- Protective action tactical deployment should be part of the Incident Action Plan

DECONTAMINATION / CLEANUP

- Decon activities take place under the ICS Ops Section
- Ensure decon capabilities are in place within the Warm Zone as soon as possible
- Ensure proper PPE for Decon Team
- Clean up strategies should be part of the Incident Action Plan
- Decon runoff needs to be contained and properly disposed of

DISPOSAL

- Ensure early notification of EH&S
- Consult Waste Management section of this plan

DOCUMENTATION

- Ensure proper field safety documentation has been completed (Safe Work Permit, Field Level Hazard Assessment, etc.)
- Ensure early completion of ICS Form 201 & SSHP
- Ensure proper retention of all incident related documents
- Ensure timely incident critique and record lessons learned

INITIAL ICS / NOTIFICATION FORMS THAT MAY BE UTILIZED

- Incident Report Form and Notifications
- ICS Form 201 (Incident Briefing, 1-5)
- ICS Form 214 (Unit Log)
- Site Safety and Health Plan (SSHP)
- ICS Form 232 (Resources at Risk Summary)

EMERGENCY RESPONSE GUIDEBOOK QUICK REFERENCE PAGES

Product	Guide #
Gasoline, Diesel & Crude Oil	128
Oil < 200°FP	171
LPG	119
Natural Gas	115
Sour Crude Oil	131

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Field Response Team - Tank Failure 6.7.7.5

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OBJECTIVES

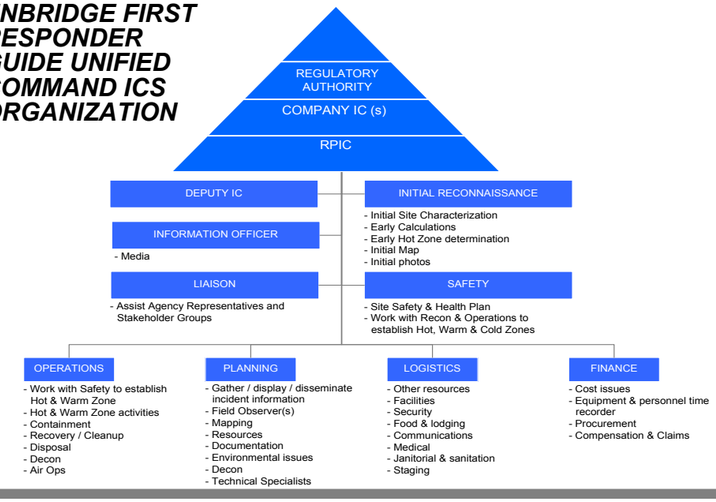
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People
Environment
Assets
Reputation

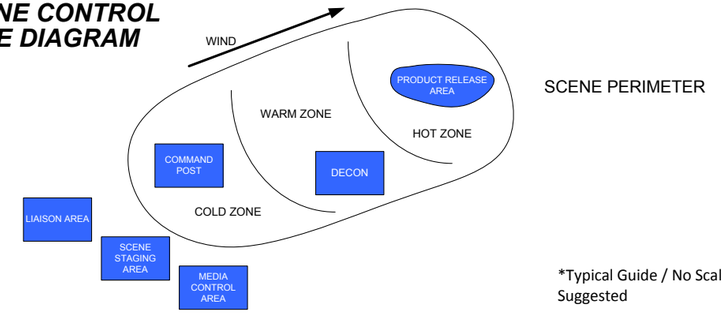
FACILITY MITIGATION / PROTECTION ACTIONS

- Immediately stop work activities
- Shut off flow to tank
- If safe, ensure dike drains are closed
- Begin transfer of contents to other tankage
- Notify Terminal Supervisor or Manager
- Secure area
- Initiate response actions

ENBRIDGE FIRST RESPONDER GUIDE UNIFIED COMMAND ICS ORGANIZATION



TYPICAL EMERGENCY SCENE CONTROL ZONE DIAGRAM



SAFETY

- Your safety first and then the safety of others
- Ensure proper field safety documentation has been completed (Safe Work Permit, Field Level Hazard Assessment, etc.)
- Stay out of hazard zone
- If performing Recon approach up wind, up hill, up stream
- Determine the immediate hot zone

ISOLATE AND DENY ENTRY

- Evacuate the immediate area
- Deny entry to the immediate area
- Ask others to help deny entry into the area
- If on the scene, ask agency resources to help deny entry into immediate area

NOTIFICATIONS

- Contact your supervisor and the Control Centre
- Dial 911 if ambulance, police or fire dept. assistance is needed
- Request assistance from local OSRO/Spill Cooperatives though Logistics, if necessary
- (Notifications section of this plan A2)
- Follow Notification Procedures (Notification section of this plan A2)

COMMAND MANAGEMENT

- First Responders assume the role of the Incident Commander until transfer of command occurs
- Make an announcement to all on scene that you have assumed Command
- Establish a Command Post up wind, up hill and upstream of the incident in the cold zone
- Establish a Staging Area up wind, up hill and upstream of the incident in the cold zone
- Begin assigning ICS positions as per Regional Incident Management Team
- Meet, greet and brief responding Agencies as they arrive at the Command Post
- Ensure Safety Officer begins and completes a Site Safety Plan

IDENTIFICATION AND ASSESSMENT

- Continue to evaluate the hot zone and adjust accordingly
- Continue to monitor evacuation activities
- Ensure safe Recon to determine extent of impact on water, air, soil, plant life and wildlife

ACTION PLANNING

- Complete an ICS Form 201 for the Incident Action Plan

INITIAL ICS / NOTIFICATION FORMS THAT MAY BE UTILIZED

- Incident Report Form and Notifications
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EMERGENCY RESPONSE GUIDEBOOK QUICK REFERENCE PAGES

Product	Guide #
Gasoline, Diesel & Crude Oil	128
Oil < 200°FP	171
LPG	119
Natural Gas	115
Sour Crude Oil	131

PROTECTIVE EQUIPMENT

- Ensure proper levels of PPE
- Ensure PPE is in line with Site Safety and Health Plans (SSHP)

CONTAINMENT AND CONTROL

- Containment and control strategies should be developed within the Incident Action Plan process / follow Area Contingency Plan
- Operations Section Chief oversees strategies
- OSRO's / Spill Cooperatives work under the Operations section and should not freelance

PROTECTIVE ACTIONS

- Ensure safe Recon to assess impact on area
- Protective action tactical deployment should be part of the Incident Action Plan

DECONTAMINATION / CLEANUP

- Decon activities take place under the ICS Ops Section
- Ensure decon capabilities are in place within the Warm Zone as soon as possible
- Ensure proper PPE for Decon Team
- Clean up strategies should be part of the Incident Action Plan
- Decon runoff needs to be contained and properly disposed of

DISPOSAL

- Ensure early notification of Environmental Health & Safety
- Consult Waste Management section of this plan

DOCUMENTATION

- Ensure proper field safety documentation has been completed (Safe Work Permit, Field Level Hazard Assessment, etc.)
- Ensure early completion of ICS Form 201 & SSHP
- Ensure proper retention of all incident related documents
- Ensure timely incident critique and record lessons learned

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Field Response Team - Tank Overfill 6.7.7.6

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OBJECTIVES

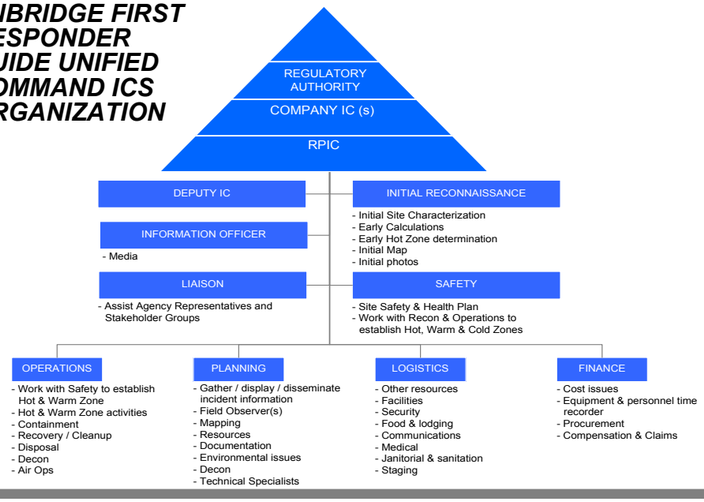
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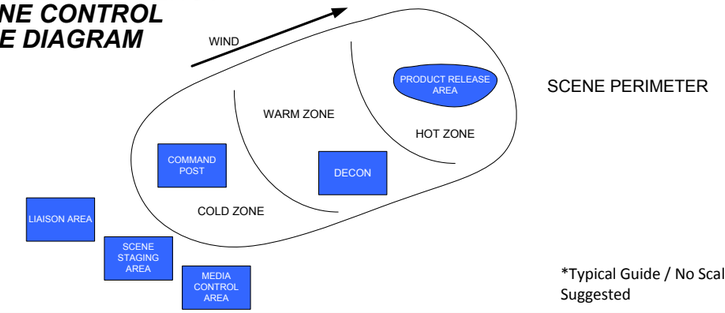
FACILITY MITIGATION / PROTECTION ACTIONS

- Shut off transfer pumps. Close header & tank valves
- Notify Terminal Operations/Manager
- Drain remaining contents to containment tanks
- Secure area
- Initiate response actions

ENBRIDGE FIRST RESPONDER GUIDE UNIFIED COMMAND ICS ORGANIZATION



TYPICAL EMERGENCY SCENE CONTROL ZONE DIAGRAM



*Typical Guide / No Scale Suggested

SAFETY

- Ensure proper documentation has been completed (Safe Work Permit, Field Level Hazard Assessment, etc.)
- Your safety first and then the safety of others
- Stay out of hazard zone
- If performing Recon approach up wind, up hill, up stream
- Determine the immediate hot zone

ISOLATE AND DENY ENTRY

- Evacuate the immediate area
- Deny entry to the immediate area
- Ask others to help deny entry into the area
- If on the scene, ask agency resources to help deny entry into immediate area

NOTIFICATIONS

- Contact your supervisor and the Control Centre
- Dial 911 if ambulance, police or fire dept. assistance is needed
- Request assistance from local OSRO/Spill Cooperatives though Logistics, if necessary
- (Notifications section of this plan A2)
- Follow Notification Procedures (Notification section of this plan A2)

COMMAND MANAGEMENT

- First Responders assumes the role of the Incident Commander until transfer of command occurs
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- Begin assigning ICS positions as per the Regional Incident Management Team
- Meet, greet and brief responding Agencies as they arrive at the Command Post
- Ensure Safety Officer begins and completes a Site Safety Plan

IDENTIFICATION AND ASSESSMENT

- Continue to evaluate the hot zone and adjust accordingly
- Continue to monitor evacuation activities
- Ensure safe Recon to determine extent of impact on water, air, soil, plant life and wildlife

ACTION PLANNING

- Complete an ICS Form 201 for the Incident Action Plan

PROTECTIVE EQUIPMENT

- Ensure proper levels of PPE
- Ensure PPE is in line with Site Safety and Health Plans (SSHP)

CONTAINMENT AND CONTROL

- Containment and control strategies should be developed within the Incident Action Plan process / follow Area Contingency Plan
- Operations Section Chief oversees containment & controls tactical deployment

PROTECTIVE ACTIONS

- Ensure safe Recon to assess impact on water intakes, adjoining properties, public recreation sites & sensitive sites
- Protective action tactical deployment should be part of the Incident Action Plan

DECONTAMINATION / CLEANUP

- Decon activities take place under the ICS Ops Section
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- Ensure proper PPE for Decon Team
- Clean up strategies should be part of the Incident Action Plan
- Decon runoff needs to be contained and properly disposed of

DISPOSAL

- Ensure early notification of EH&S
- Consult Waste Management section of this plan and other company documentation

DOCUMENTATION

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Field Response Team - Failure of Transfer Equip. 6.7.7.7

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Field Response Team - Equipment Failure 6.7.7.8

OBJECTIVES

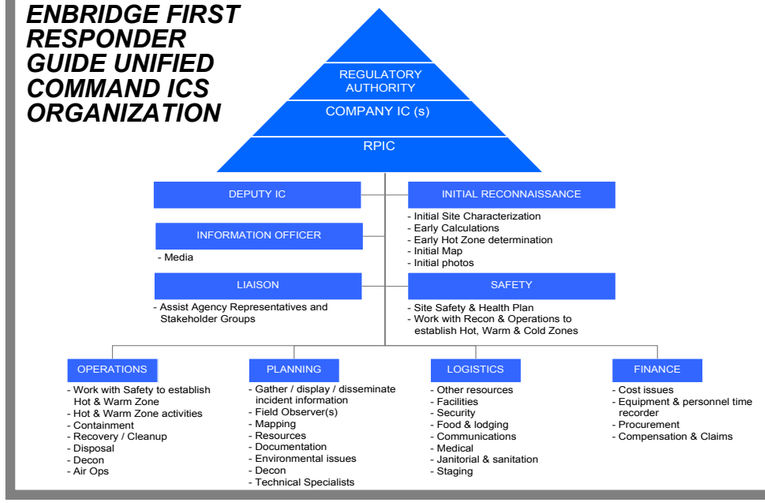
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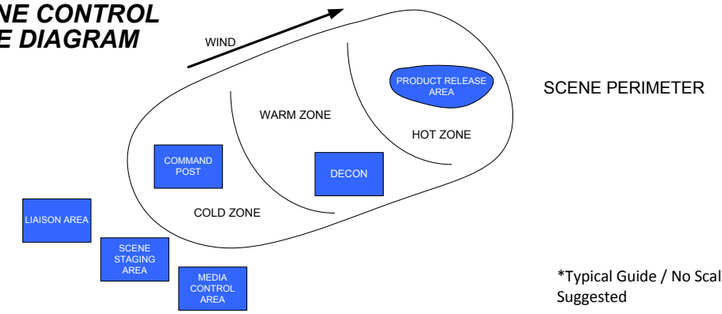
FACILITY MITIGATION / PROTECTION ACTIONS

- Shut off flow
- Notify Terminal Supervisor, Manager or designee
- Evacuate area as necessary
- Secure area if safe to do so
- Tighten leaky valve or fitting, if safe
- Transfer tank contents to available tankage

ENBRIDGE FIRST RESPONDER GUIDE UNIFIED COMMAND ICS ORGANIZATION



TYPICAL EMERGENCY SCENE CONTROL ZONE DIAGRAM



*Typical Guide / No Scale Suggested

SAFETY

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- Determine the immediate hot zone

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NOTIFICATIONS

- Contact your supervisor and the Control Centre
- Dial 911 if ambulance, police or fire dept. assistance is needed
- Request assistance from local OSRO/Spill Cooperatives though Logistics, if necessary
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- Continue to monitor evacuation activities
- Ensure safe Recon to determine extent of impact on water, air, soil, plant life and wildlife

ACTION PLANNING

- Complete an ICS Form 201 for the Incident Action Plan

PROTECTIVE EQUIPMENT

- Ensure proper levels of PPE
- Ensure PPE is in line with Site Safety and Health Plans (SSHP)

CONTAINMENT AND CONTROL

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- OSRO's/Spill Cooperatives work under the Operations Section and should not freelance

PROTECTIVE ACTIONS

- Ensure safe Recon to access impact on area
- Protective action tactical deployment should be part of the Incident Action Plan

DECONTAMINATION / CLEANUP

- Decon activities take place under the ICS Ops Section
- Ensure decon capabilities are in place within the Warm Zone as soon as possible
- Ensure proper PPE for Decon Team
- Clean up strategies should be part of the Incident Action Plan
- Decon runoff needs to be contained and properly disposed of

DISPOSAL

- Ensure early notification of EH&S
- Consult Waste Management section of this plan and other company documentation

DOCUMENTATION

- Ensure proper field safety documentation has been completed (Safe Work Permit, Field Level Hazard Assessment, etc.)
- Ensure early completion of ICS Form 201 & SSHP
- Ensure proper retention of all incident related documents
- Ensure timely incident critique and record lessons learned

INITIAL ICS / NOTIFICATION FORMS THAT MAY BE UTILIZED

- Notification Fax
- ICS Form 201 (Incident Briefing, 1-5)
- ICS Form 214 (Unit Log)
- Site Safety and Health Plan (SSHP)
- ICS Form 232 (Resources at Risk Summary)

EMERGENCY RESPONSE GUIDEBOOK QUICK REFERENCE PAGES

Product	Guide #
Gasoline	128
Diesel	128
Crude Oil	128
Oil <200° FP	171
Sour crude oil	131

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6.7.7.9 Radioactive Source Emergencies

In the event of an accident (e.g. fire, explosion), damage or any other incident that may affect the integrity of a radiation source (e.g. nuclear densitometers, either portable or fixed):

- Stop all activity in the immediate area and clear personnel within a 6 meter radius perimeter around the source head.
- Notify local Operations personnel and/or call the 24-hour emergency number shown on the warning sign.
- Do not allow workers to re-enter the area until a radiation survey is completed by a radiation specialist.
- If the device has sustained physical damage, contact a radiation specialist to leak test the device (see below for list of qualified contractors).
- follow company procedures for required initial notifications and reporting of nuclear densitometer incidents.

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***Under no circumstances are Enbridge employees to engage in offensive fire-fighting tactics unless they are trained, certified, and have the correct PPE and firefighting equipment and it is safe to do so**

OBJECTIVES

We will prudently over respond to any incident with priorities in the following order:

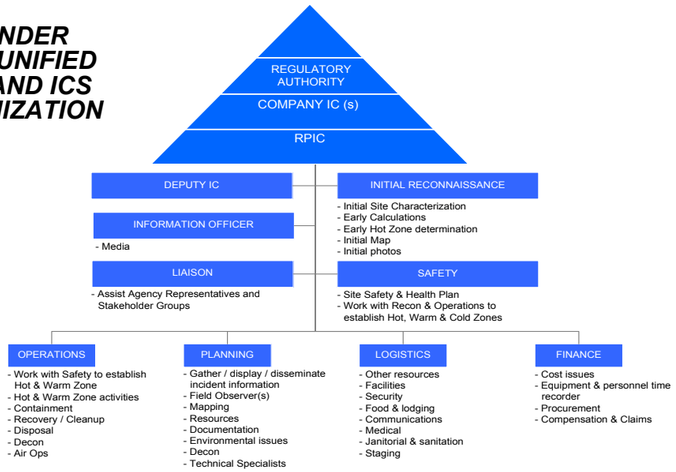
People
Environment
Assets
Reputation

FACILITY MITIGATION / PROTECTION ACTIONS

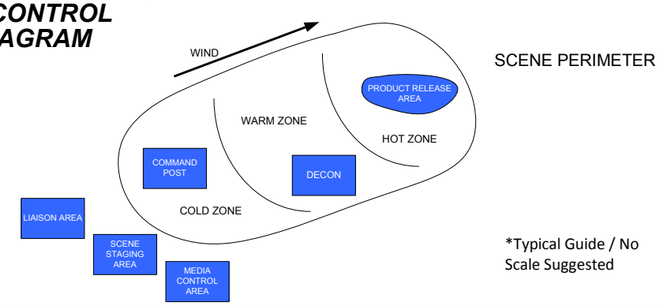
Refer to the next page for actions related to:

- Foam systems Compressor Buildings
- Fire Response Standard Fires
- Facilities with CO2 Fixed Systems
- Mainline Fires
- Station Yard Piping or Manifold Fires
- Sump Fires
- Natural Gas Fires
- PCB Fires
- Diesel Storage Tank Fires
- Tank Fires

FIRST RESPONDER GUIDE UNIFIED COMMAND ICS ORGANIZATION



TYPICAL EMERGENCY SCENE CONTROL ZONE DIAGRAM



SAFETY

- Your safety first and then the safety of others
- Ensure proper documentation has been completed (Safe Work Permit, Field Level Hazard Assessment, etc.)
- Stay out of hazard zone
- If performing Recon approach up wind, up hill, up stream
- Determine the immediate hot zone

ISOLATE AND DENY ENTRY

- Evacuate the immediate area
- Deny entry to the immediate area
- Ask others to help deny entry into the area
- If on the scene, ask agency resources to help deny entry into immediate area

NOTIFICATIONS

- Contact your supervisor and the Control Centre
- Dial 911 if ambulance, police or fire dept. assistance is needed
- Request assistance from contract response organizations though Logistics, if necessary
- (Notifications section of this plan A2)
- Follow Notification Procedures (Notification section of this plan A2)

COMMAND MANAGEMENT

- First Responders assume the role of the Incident Commander until transfer of command occurs
- Make an announcement to all on scene that you have assumed Command
- Establish a Command Post up wind, up hill and upstream of the incident in the cold zone
- Establish a Staging Area up wind, up hill and upstream of the incident in the cold zone
- Begin assigning ICS positions as per Regional Incident Management Team
- Meet, greet and brief responding Agencies as they arrive at the Command Post
- Ensure Safety Officer begins and completes a Site Safety Plan

IDENTIFICATION AND ASSESSMENT

- Continue to evaluate the hot zone and adjust accordingly
- Continue to monitor evacuation activities
- Ensure safe Recon to determine extent of impact on water, air, soil, plant life and wildlife

ACTION PLANNING

- Complete an ICS Form 201 for the Incident Action Plan

PROTECTIVE EQUIPMENT

- Ensure proper levels of PPE
- Ensure PPE is in line with Site Safety and Health Plans (SSHP)

CONTAINMENT AND CONTROL

- Containment and control strategies should be developed within the Incident Action Plan process / follow Area Contingency Plan
- Operations Section Chief oversees strategies

PROTECTIVE ACTIONS

- Ensure safe Recon to assess impact on area
- Protective action tactical deployment should be part if the Incident Action Plan

DECONTAMINATION / CLEANUP

- Decon activities take place under the ICS Ops Section
- Ensure decon capabilities are in place within the Warm Zone as soon as possible
- Ensure proper PPE for Decon Team
- Clean up strategies should be part of the Incident Action Plan
- Decon runoff needs to be contained and properly disposed of

DISPOSAL

- Ensure early notification of EH&S
- Consult Waste Management section of this plan

DOCUMENTATION

- Ensure proper field safety documentation has been completed (Safe Work Permit, Field Level Hazard Assessment, etc.)
- Ensure early completion of ICS Form 201 & SSHP
- Ensure proper retention of all incident related documents
- Ensure timely incident critique and record lessons learned

INITIAL ICS / NOTIFICATION FORMS THAT MAY BE UTILIZED

- Incident Report Form and Notifications
- ICS Form 201 (Incident Briefing, 1-5)
- ICS Form 214 (Unit Log)
- Site Safety and Health Plan (SSHP)
- ICS Form 232 (Resources at Risk Summary)

EMERGENCY RESPONSE GUIDEBOOK QUICK REFERENCE PAGES

Product	Guide #
Gasoline, Diesel & Crude Oil	128
Oil < 200°FP	171
LPG	119
Natural Gas	115
Sour Crude Oil	131

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Field Response Team - Fire or Explosion 6.7.7.10

6.7.7.10 Enbridge Field Response Team Guide - Fire and Explosion

***Under no circumstances are Enbridge employees to engage in offensive fire-fighting tactics unless they are trained, certified, and have the correct PPE and firefighting equipment**

FIRE RESPONSE STANDARD FIRES

1. Look or call for help.
2. Notify fire department.
3. Activate fire alarm, if one is available.
4. Implement Emergency Procedures and Evacuation Plan.
5. If safe to do so, shut off sources of fuel to fire and facility electricity and eliminate ignition sources.
6. Shut down pumping only if essential to fight or control the fire to stop a leak.
7. Report fire to the control center and initiate reporting.

FOAM SYSTEMS COMPRESSOR BUILDINGS

If one of the UV/IR fire detection sensors in the compressor building detects a fire:

1. An emergency shutdown (ESD) condition is triggered, which automatically shuts down any operating units, isolates the station from the mainline, and vents all gas from the station.
2. A warning horn sounds.
3. The fire pump starts, drawing water from the concrete tanks and mixing it with the liquid foaming agent.
4. Foam is pumped from the control building to the compressor building, where it is ejected through the foam heads in the ceiling, and continues until it runs out or the foam system is deactivated. Do not use water to extinguish fires in or close to

FACILITIES WITH CO2 FIXED SYSTEMS

When a fixed system is triggered, an audible pre-discharge signal sounds as a warning that the system will activate within 30 seconds. In compressor unit enclosures, where there is no delay or audible alarm, there is a visual indication that the CO2 system is
activated.

1. As soon as fire is detected or audible pre-discharge signal sounds, evacuate protected area.
2. If extinguishing system does not trigger automatically, manually activate

MAINLINE FIRES

1. Assess fire.
2. Initiate fire response:
   - if fire is small and in early stages, and it is safe to do so, attempt to extinguish it using multiple portable extinguishers simultaneously, including 150lb or 350lb wheeled unit.
   - if fire is large or fully involved:
     - follow standard fire response procedure
     - notify nearby tenants, landowners and businesses
     - build a fire break around perimeter of fire if possible
   - if fire is beside a pipeline and pipeline is not leaking, continue pumping to keep pipeline cool.

STATION YARD PIPING OR MANIFOLD FIRES

1. Follow standard fire response procedure.
2. Attempt to contain fire with earth dikes, water fog or foam blanket.
3. Ensure all ignition sources (e.g., electrical short circuits) have been isolated or
   eliminated.
4. Extinguish fire with foam or dry chemical extinguishers.
5. Cool hot pipes and tanks with water, if possible.

SUMP FIRES

1. Assess fire.
2. Initiate fire response:
   - if fire is small and in early stages, and it is safe to do so, attempt to extinguish it using dry chemical extinguishers
   - to keep fire from spreading or reigniting, use available water to cool adjacent facilities or sump metal
   - if fire is large or fully involved, follow standard fire response procedure
3. Isolate sump and close lid if possible.

NATURAL GAS FIRES

1. Follow standard fire response procedure.
2. Close appropriate valves to isolate pipe section.
3. Consider blowing down pressure at a safe location.
4. Let fire burn down.
5. Do not extinguish a fire involving natural gas until fire burns down, flow of gas can be stopped and there is no chance of re-ignition.

PCB FIRES

1. Evacuate and secure area.
2. Call fire department or HAZMAT representative.
3. Ensure power is off to equipment containing PCB (e.g., transformer or capacitor).
4. If fire is within an enclosed building, close air inlets/outlets and access to building ventilation system.
5. Assist fire fighters and/or HAZMAT officials in extinguishing fire.

DIESEL STORAGE TANK FIRES

1. If possible and safe to do so, isolate diesel tank by closing remote or manually operated valves.
2. Remove any combustible materials (e.g., timber, rags) located near fire.
3. Allow tank to burn itself out.
4. Keep other installations in the vicinity cool with water spray if possible.

TANK FIRES

1. Activate Alarm
2. Evacuate area.
3. Notify the control center.
4. Notify fire department, if applicable.
5. From a safe distance, assess type of fire.
6. Implement emergency procedures and evacuation plan.
7. Activate terminal Pre-Fire Plan for:
   - First Responder actions
   - local fire department contacts and equipment list
   - Safety Data Sheets (SDS)
   - tank fire and tank datasheets

VEHICLE FIRES

1. Sound facility alarm (if applicable).
2. Assess situation.
3. If fire is small and in early stages, and it is safe to do so, attempt to extinguish using dry chemical extinguishers. Otherwise, withdraw and secure area.
4. Call emergency services.

Flash Fire, Vapour Cloud Explosion, Pool Fire

HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient. For mixtures containing alcohol or polar solvent, alcohol- resistant foam may be more effective

1. Do not extinguish fire unless flow can be stopped and it is safe to do so
2. Keep unauthorized personnel away.
3. Use water in flooding quantities as fog. Solid streams of water may spread fire.
4. Cool all affected containers with flooding quantities of water.
5. Apply water from as far a distance as possible.
6. If fire becomes uncontrollable or container is exposed to direct flame - consider evacuation

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Security Classification

Security information is received from multiple sources. They include employees, industry, public, local policing, provincial/state, federal organizations or Enterprise Security. This intelligence, normally delivered via phone, email, mail and/or media channels is to be assessed by the LP Security. Once information is examined, subsequent advisories or notifications are issued globally or to the regions affected.

Level 1 Security provides guidelines on minimum requirements for facilities. These include access control, fencing, gates, security guards, employee awareness, communications, facility lighting, intrusion detection, closed-circuit video and general policies/ practices.

Level 2 Security provides direction in the event security measures require elevating. Changes typically include tighter perimeter control, visitor restrictions and increased perimeter checks.

Level 3 Security provides direction in the event that security measures require elevation based on a credible, imminent threat. Changes typically include Level 2 Security plus further personnel and vehicle restrictions, the use of security guards, more frequent and random perimeter checks, work restrictions and potentially operational restrictions.

Although most anonymous security threats are hoaxes intended to create an atmosphere of anxiety and panic in order to interrupt normal operational activities, all threats must be taken seriously.

Suspicious Package

If a threat is received in the mail, (a) place all letters and envelopes associated with the mail in a bag or large envelope, and (b) immediately notify the management/on-call person and local law enforcement.

Indicators of suspicious mail/packages might include:

- No return address, or a return address that does not make sense;
- Unusual rigidity, bulk, or irregularity;
- Handwritten or poorly typed addresses or labels;
- Peculiar odors, especially sweet smells;
- Excessive binding, taping, or tying material;
- Excess postage, lack of postage, or un-canceled postage;
- Mismatching postmark and return address;
- Foreign writing, address, or postage;
- Incorrect spelling of common names, titles, or places;
- Leaks or stains; and/or
- Protruding wires, string, or tape.

If suspicious mail/package is received in the mail or observed at company facilities:

- Immediately notify management/on-call person who in turn should notify local law enforcement.
- Leave the suspicious package in its present location.
- Do not open or physically handle the package, or allow anyone to touch or move the package.
- Do not use two-way radios and cellular telephones within 300 feet of the package.
- Do not cover the package.

Suspicious Activities

If any of the following are observed at company facilities, immediately notify the regional management/on-call person:

- Unknown personnel;
- Unidentified vehicles or vehicles operated out of the ordinary;
- Abandoned parcels or packages; and/or
- Suspicious activities (e.g., loitering).

Protestors

Protestors
Do not approach protestors if they seem angry or violent in any way. When dealing with protestors:

- Show concern for their cause.
- Be cordial.
- Be empathetic.
- Advise them they will receive a quick response.

Maintain crowd control using either onsite security officers, or if necessary, police intervention. If safe, speak to the group leader to gather information about the protestors. Share information with police as appropriate. Before issuing an initial response statement, wait for direction from Public Affairs.

Threat Assessment

Upon notification of a bomb threat or other security threat, the Regional Management/on-call person is responsible for:

- Assessing the seriousness of the threat;
- Determining the appropriate level of response;
- Ensuring the police have been alerted;
- To assess the seriousness of a threat, consider**:**
  - Is the information credible (e.g., identity of the caller, likelihood of facility access to place the explosive device)?
  - Is the information corroborated (e.g., were suspicious activities or personnel observed)?
  - Is the threat specific (e.g., detonation time, location, type of explosive device, intended target)?
  - What are the potential consequences?

Initial Response

Based on the threat assessment, consider the following initial response options:

- General facility evacuation (i.e., if the threat is confirmed or is considered credible and serious).
- Do not evacuate (i.e., if the threat is considered a hoax and not credible).

Bomb Explosion, Confirmed or Credible Threat

If (a) there is a bomb explosion, or (b) a security threat is confirmed or considered credible and serious, the regional management/on-call person is responsible to:

- Be pro-active and activate ICS.
- Evacuate workers and visitors from the area according to the regional Emergency Procedures and Evacuation Plan.
- Secure the area to ensure the safety of workers, visitors, and the public.
- If firefighting or other medical response becomes necessary, activate the ICS and mobilize response personnel and equipment.

The Company has developed procedures to be used in responding to bomb threats, identifying strangers in the work place, or other suspicious communications, some of which may be related to acts of terrorism or abductions.

Bomb Threat Call Procedures
Bomb threats or warnings will usually be given by telephone; anyone on site could receive such a call. The individual receiving the bomb threat should obtain as much information as possible. The use of the Bomb Threat Information Form is highly recommended. (See Section 4 – Forms)

- The person receiving the call should, if possible, attempt to have someone else notify a supervisor while the bomb threat call is in progress.
- Remain calm; Keep the caller on the line for as long as possible. Try to keep the caller talking to learn more information. DO NOT HANG UP, even if the caller does.
- Listen carefully, be polite, and show interest.
- If your phone has a display, copy the number and/or letters from the display.
- Once the caller has terminated the call; DO NOT HANG UP, but from a different phone contact the supervisor immediately with information and await instructions.
- The supervisor will notify local authorities and company management. Police will want to speak with the person who received the call directly, thus should remain available to provide details to police.
- Secure access and evacuate the facility until the local authorities have cleared the facility for re-entry.
- A complete written record of each incident shall be retained by the supervisor and any photographs or physical evidence shall be preserved until further disposition of the incident by the company.
- The supervisor should ensure that a follow up investigation into the incident has been conducted and appropriate additional security measures, if any, have been established and any identified issues have been resolved.

Bomb Explosion, Confirmed or Credible Threat cont.

Bomb Threat Received by Hand Written Note (In addition to above procedures)

- Contact Supervisor immediately
- Handle note as minimally as possible.

Bomb Threat Received by E-Mail (In addition to above procedures)

- Contact Supervisor immediately
- Do not delete the message.

Unconfirmed Threat

If unable to confirm a security threat, the Regional Management/on-call person is responsible to advise employees, the police and the Control Center, and return to normal operations.

Procedures

- Person in Charge – Call 911 and activate fire alarm.
- Eliminate all ignition sources.
- Begin Emergency Shut-Down if necessary.
- If person(s) down, refer to Medical Emergency Checklist.
- When fire is noticed at any facility, secure the source if safe to do so.
- Account for all personnel in the unit or area where the fire occurred.
- Evacuate all non-essential personnel, if necessary.
- Establish communications. Contact PIC.
- Search for and rescue missing or injured personnel as directed by appropriate authority.
- Use the buddy system.
- Ensure the Facility Operators control the process.
- Conduct air monitoring to ensure safety of personnel and appropriate PPE is required to respond. (For additional information, see the Site Safety and Health Plan and/or the Safety Coordinator.)
- Conduct initial firefighting by personnel (trained in the use of firefighting equipment and PPE), which may include use of monitors, deluge systems, and portable fire extinguishers.
- Coordinate evacuation of nearby residents with local responders.

6.7.7.11 Bomb and Security Threats

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Objectives

We will prudently over respond to any incident with priorities in the following order:

People
- Ensure safety of employees & contractors located in the field
- Ensure safety of staff located inside regional buildings

Environment
- Take mitigative action to prevent a release

Assets
- Where possible protect company assets located on regional property; tanks, pipelines, equipment, vehicles, etc.

Reputation

Notifications

Notifications in addition to standard emergency notification procedure:
- Safety Coordinator/Officer

Personnel Protective Actions

Actions to Consider Before and During a Wildfire:
- Continuously manage vegetation around facilities
- Identify evacuation staging areas in evacuation plans for use during a wildfire event
- Ensure personnel are aware of evacuation alerts, evacuation routes and evacuation staging areas away from the wildfire.
- Identify methods of transportation for evacuation (air, ground, water)
- Obtain and maintain emergency contact lists
- Decrease the number of personnel onsite during a wildfire event
- Stay tuned to local media for updates on the wildfire conditions

Site Control & Safety

SAFETY
- Your safety first and then the safety of others
- Ensure proper documentation has been completed (Safe Work Permit, Field Level Hazard Assessment, etc.)
- Locate safe zone
- Stay out of hazard area

ACCESS CONTROL
- Establish a perimeter to control access to area
- A list of authorized personnel should be issued to the group leader responsible for implementing the access control
- Employees & Contractors who are not part of the response will require approval to access the area
- A log must be kept for personnel accessing the area

Asset Mitigation Actions

Actions that can be taken during a wild fire to mitigate a release include:
- Shutting down the lines, etc.
- Isolation of energized systems

Additional References

www.ready.gov/wildfires
www.firewise.org/wildfire-preparedness.aspx
www.redcross.org/prepare/disaster/wildfire
www.wildfire.alberta.ca/fire-smart-industry (see oil and gas)

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Field Response Team – Earthquake 6.7.7.13

Objectives

We will prudently over respond to any incident with priorities in the following order:

People
- Ensure safety of Employees & Contractors located in the field
- Ensure safety of staff located inside buildings

Environment
- Take mitigative action to prevent a release

Assets
- Protect and prevent damage to company assets (tanks, pipelines, equipment, vehicles, etc.)
- Isolate energized systems of any suspected damaged assets

Reputation

Notifications

Notifications in addition to standard emergency notification procedure:
- Enbridge Geohazard Department
- Safety Coordinator/Officer

Personnel Protective Actions

If outside:
- Stay outside, do not enter a building
- Stay away from buildings, utility wires and fuel and gas lines
- If outside, stay away from the exterior walls of a building
- Once on the open, get down low (to avoid being knocked down by strong shaking) and stay there until the shaking stops

If in an vehicle:
- Stop as quickly and safely as possible
- Move your vehicle to the shoulder or curb, away from utility wires and under or overpasses
- Stay in the car and set the parking brake
- Turn on the radio for emergency broadcast information
- Watch for hazards created by the earthquake

If inside:
- Do not evacuate outside, stay where you are until the shaking stops
- “Drop, Cover and Hold On”
    * DROP down onto your hands and knees
    * COVER your head and neck
    * HOLD ON to your shelter
- Do not get in a doorway as this doesn’t provide protection from falling debris
- Stay away from glass and windows

Site Control & Safety

SAFETY
- Your safety first and then the safety of others
- Ensure proper documentation has been completed (Safe Work Permit, Field Level Hazard Assessment, etc.)
- Locate safe zone
- Stay out of hazard area

ACCESS CONTROL
- Establish a perimeter to control access to area
- Access to buildings that have sustained structural damage should be prohibited until they can be assessed by a structural engineer
- A list of authorized personnel should be issued to the group leader responsible for implementing the access control
- Employees & Contractors who are not part of the response will require approval to access the area
- A log must be kept for personnel accessing the area

Asset Mitigation Actions

The following actions could be taken during an earthquake to mitigate further damage:
- Isolate and/or shut down energized systems to anticipate aftershock and/or additional tremors

Additional References

- Earthquake Monitoring System, USGS: www.earthquake.usgs.gov/monitoring/
- www.getprepared.gc.ca/cnt/hzd/rthqks-en.aspx
- www.fema.gov/earthquake-safety-home

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Objectives

We will prudently over respond to any incident with priorities in the following order:

People
- Ensure safety of employees & contractors located in the field
- Ensure safety of staff located inside regional buildings

Environment
- Take mitigative action to prevent a release

Assets
- Where possible protect company assets located on regional property; tanks, pipelines, equipment, vehicles, etc.

Reputation

Notifications

Notifications in addition to standard emergency notification procedure:
- Safety Coordinator/Officer
- GeoHazards Program representative

Personnel Protective Actions

Actions to Consider Before and During a Flood:
- Evaluate accessibility of pipes, valves, etc.
- Extend regulator vents and relief stacks above predicted flood levels
- Preposition personnel and equipment in the event that emergency action is required including, shutdown, isolations or containment
- Determine the location of critical asset and mark with Coast Guard approved buoy if assets are predicted to be flooded
- Perform frequent patrols, including over flights to evaluate right of way conditions
- Locate locations where underground pipe may have been exposed and damaged as a result of erosion during flooding

Site Control & Safety

SAFETY
- Your safety first and then the safety of others
- Ensure proper documentation has been completed (Safe Work Permit, Field Level Hazard Assessment, etc.)
- Locate safe zone
- Stay out of hazard area

ACCESS CONTROL
- Establish a perimeter to control access to area
- A list of authorized personnel should be issued to the group leader responsible for implementing the access control
- Employees & Contractors who are not part of the response will require approval to access the area
- A log must be kept for personnel accessing the area

Asset Mitigation Actions

Actions that can be taken during a flooding event to mitigate a release include:
- Shutting down the lines, etc.
- Isolation of energized systems

Additional References

www.getprepared.gc.ca/cnt/hzd/flds-en.aspx
www.ready.gov/floods

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Field Response Team – Flooding 6.7.7.14

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Field Response Team – Tornado 6.7.7.15

Objectives

We will prudently over respond to any incident with priorities in the following order:

People
- Ensure safety of employees & contractors located in the field
- Ensure safety of staff located inside regional buildings

Environment
- Take mitigative action to prevent a release

Assets
- Where possible protect company assets located on regional property; tanks, pipelines, equipment, vehicles, etc.

Reputation

Personnel Protective Actions

- All employees must proceed immediately to the closest storm shelter. See building sit maps and terminal evacuation map for shelter locations.
- If you are accompanied by visitors, bring them to your designated shelter.
- If you are caught outside with no shelter:
  - * Lie flat in a nearby ditch or depression and cover your head with your hands. Be aware of the potential for flooding.
  - * Do not get under an overpass or bridge. You are safer in a low, flat location.
  - * Never try to outrun a tornado in urban or congested areas in a car or truck. Instead, leave the vehicle immediately for safe shelter.
  - * Watch out for flying debris. Flying debris from tornados cause most fatalities and injuries.

Site Control & Safety

SAFETY
- Your safety first and then the safety of others
- Ensure proper documentation has been completed (Safe Work Permit, Field Level Hazard Assessment, etc.)
- Locate safe zone
- Stay out of hazard area

ACCESS CONTROL
- Establish a perimeter to control access to area
- A list of authorized personnel should be issued to the group leader responsible for implementing the access control
- Employees & Contractors who are not part of the response will require approval to access the area
- A log must be kept for personnel accessing the area

Asset Mitigation Actions

Actions that can be taken during a tornado to mitigate a release include:
- Shutting down the lines, etc.
- Isolation of energized systems

Notifications

Notifications in addition to standard emergency notification procedure:
- Enbridge Geohazard Department
- Safety Coordinator/Officer

Additional References

www.ready.gov/tornados
www.redcross.org/prepare/disaster/tornado
www.getprepared.gc.ca/cnt/hzd/trnfs-en.aspx

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6.8 COMMUNICATIONS

All Public statements and notification must be pre-approved by the Public Information Officer (PIO), if appointed, or the Incident Commander (IC). Notify Public & Government Affairs of any confirmed emergency situation. Refer all media and public inquiries to the PIO, if appointed, or to the IC.

External Communications should:

1. Focus on Priorities

   The company's priority in an emergency is to protect the public, limit environmental impact and resolve the problem calmly, professionally and safely.

2. Use Local Resources

   Local fire, police and emergency medical service (EMS) officials will be requested to communicate the emergency situation to those in proximity to the incident. Community Relations, Stakeholder Relations and Aboriginal Relations representatives or Land Agents for the area will also contact/follow up with local landowners, municipal representatives, Aboriginal and Native Americans and other stakeholders.

Enbridge First Responder should use the following to respond to the Media until a Public Information officer is available:

- Communicate with the public and media in a calm, professional and respectful manner, showing concern for their safety.
- State that you are not an official spokesperson for the company but a representative will respond to their inquiry as quickly as possible.
- Provide media members with the toll free media line (1-888-992-0997)

6.9 RESPONSE EQUIPMENT

It is the responsibility of each Area Supervisor/ Maintenance Team Leader to ensure that the spill response equipment is inventoried annually and restocked as resources are expended.

The following table lists the Enbridge owned primary spill recovery equipment and its capabilities. Emergency response trailers contain hard boom, sorbent boom, skimmers, and porta-tanks as well as various tools for initial emergency response to both land and water releases.

The locations of these facilities are noted on emergency response maps within this Annex under *Section 6.9.3*.

Enbridge has an OSRO Master Service Agreement with Marine Pollution Control Corp. (MPC). The agreement and list of OSRO Equipment can be found in *Annex 2*.

6.9.1 Spill Response Organizations – Internal & External Locations

Equipment Locations	Emergency Phone Number	Address	Coordinates
Enbridge Region Response Units			
Thief River Falls, MN (PLM)	218-681-7195	1125 Hwy 59 N Thief River Falls, MN 56701	*48.119599 -96.166889*
Clearbrook Terminal	218-776-6100	17816 470th St. Clearbrook, MN 56634	*47.689663 -95.412104*
Bemidji, MN (PLM)	218-755-6635	1129 Industrial Park SE Bemidji, MN 56601	*47.443089 -94.852656*
Superior Terminal	715-398-8323	2800 East 21st, St. Superior, WI 54880	*46.688839 -92.059634*
Ironwood, MI (PLM)	906-932-3190	501 Easy St., Ironwood, MI 49938	*46.463839 -90.137021*
Escanaba, MI (PLM)	906-789-1221	2811 27th Avenue North, Escanaba, MI 49829	*45.780155 -87.088077*
Manistique, MI	906-341-2730	587 N State Hwy M94 Manistique, MI 49854	*45.975330 -86.267854*
Gould City, MI	906-477-6722	N6355 North Gould City Rd. Gould City, MI 49838	*46.103128 -85.698844*
Mackinaw, MI	231-436-5760	16309 Headland Rd. Mackinaw City, MI 49701	*45.786362 -84.774463*
Indian River, MI	231-525-8861	9671 Afton Rd. Wolverine, MI 49799	*45.322670 -84.553668*
St. Ignace, MI	906-643-8212	W706 Boulevard Dr. St. Ignace, MI 49781	TRAILER ONLY
External Response Agencies			
Twin Ports Fire Department	715-395-1371		
Marine Pollution Control Corp. (MPC)	313-849-2333	8631 W. Jefferson Ave. Detroit, MI 48209	

6.9.2 Local Response Equipment

Thursday, July 10, 2014
5:04:40 PM

ENBRIDGE ICP Report

Superior Region

Bemidji PLM

Boom

Resource Name	Total
Airmax River Boom, 8" x 8" x 50' with accessories	30 each
Back Pack Unit, blower high volume gasoline	3 each
Boom Reel with Cover (holds 500 to 1500 Airmax River Boom)	3 each
Containment Boom	1630 feet
Containment Boom - Long Skirt	450 feet
Mini Boom	300 feet
River Boom	250 feet
Sorbent Boom	560 feet
Tow Bridle with Bullet Float for airmax boom	3 each

Shallow Water Equipment

Resource Name	Total
Diaphragm Pump	2 each
Portable Dam Seacor System, 25' sections	2 each
Trash Pump	1 each

Skimmers

Resource Name	Total
Grooved Drum Skimmer System with air motor and blade kit	2 each
Skim Pak 43"	1 each
Skimmer	2 each
Skimmer - Drum 48"	5 each
Skimmer - Manta Ray	2 each
Skimmer - Mini Max	1 each
Skimmer - Mini Max 48"	1 each
Skimmer - Skim Pack	1 each
Skimmer 48"	1 each
Skimmer 96"	3 each

Sorbents

Resource Name	Total
Sorbent Boom	104 each

Enbridge Pipelines Inc. 10201 Jasper Avenue, Edmonton AB T5J 3N7 Page 1 of 10

Sorbent Boom	640	feet
Sorbent Pad	24	bale(s)
Sorbent Roll - Sweep	2	roll(s)
Sorbent Roll 38"x144'	2	roll(s)

Specialized Equipment

Resource Name	Total	
Boom Trailer 220	1	each
Fastank Model 2000 - Full kit	2	each
Generator	1	each
Generator - Portable	2	each
Hydraulic Power Unit with accessories	2	each
LeakTrailer	2	each
LeakTrailer Unit 109	1	each
LeakTrailer Unit 292	1	each
Port -a - Tank & Liner	1	each
Response Trailer - includes Wildlife Deterrence Kit and Water Response Safety Kits	1	each
Storage - Portable Tank	1	each
Trailer, deck over, 16'	1	each
Trailer, deck over, 30'	1	each
Vaccum Truck	1	each

Clearbrook Terminal

Boats & Response Vessels

Resource Name	Total	
Jon Boat	1	each
Small Boat - Lund w/motor - OWE 109	1	each

Boom

Resource Name	Total	
Boom - Containment	300	feet

Shallow Water Equipment

Resource Name	Total	
Diaphragm Pump	2	each
Electric Pump	2	each
Self-Priming 6'' Trash Pump with accessories (male adapter, cold weather suction hose, trash strainer, quick couplers)	4	each

Skimmers

Resource Name	Total	
Skimmer - ACME Floating Saucer- OWE-245	1	each

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Skimmer - Floating - OWE-158	1 each

Sorbents

Resource Name	Total
Sorbant Boom 8"	160 feet
Sorbent Boom 3"	224 feet
Sorbent Boom 8"x10'	200 feet
Sorbent Pad	7 bag(s)
Sorbent Roll 38"x144'	1 roll(s)

Specialized Equipment

Resource Name	Total
EquipmentTrailer OWE 245	1 each
Fire Suppression System	1 each
Foam Trailer	1 each
Storage - Portable Tank	1 each

Escanaba PLM

Boats & Response Vessels

Resource Name	Total
Landing Craft Style Boom Deployment Boat, 26', with commissioning kit	1 each
Lund Boat	1 each

Boom

Resource Name	Total
Airmax River Boom, 8" x 8" x 50' with accessories	30 each
Back Pack Unit, blower high volume gasoline	3 each
Boom Reel with Cover (holds 500 to 1500 Airmax River Boom)	3 each
Containment Boom	300 feet
Mini Boom	400 feet
River Boom	500 feet
Tow Bridle with Bullet Float for airmax boom	3 each

Shallow Water Equipment

Resource Name	Total
Portable Dam Seacor System, 25' sections	2 each
Power Unit for Skimmers	1 each

Skimmers

Resource Name	Total
Skimmer - Drum	2 each
Skimmer - Drum 48"	1 each
Skimmer - Manta Ray	1 each

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Skimmer - Power Pack	1 each
Skimmer - Weir	1 each

Sorbents

Resource Name	Total
Sorbent Boom	40 inch(es)
Sorbent Boom	2 bale(s)
Sorbent Boom 6"	240 feet
Sorbent Boom 8"x10'	280 feet
Sorbent Roll - Sweep	2 each
Sorbent Roll - Sweep	6 bale(s)

Specialized Equipment

Resource Name	Total
Boom Trailer	1 each
Decon Trailer	1 each
Fastank Model 2000 - Full kit	2 each
Generator	1 each
Ice Slotting Trailer	1 each
LeakTrailer	1 each
Port-a-Tank and Liner	1 each
Response Trailer - includes Wildlife Deterrence Kit and Water Response Safety Kits	1 each
Single Drop Trailer	2 each
Storage - Portable Tank	1 each
Trailer	1 each

Gould City Station

Boom

Resource Name	Total
Boom	300 feet

Sorbents

Resource Name	Total
Sorbent Boom	400 feet
Sorbent Pad	300 each

Specialized Equipment

Resource Name	Total
Boom Trailer	1 each
Tank Storage	1 each

Indian River Station

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Boom	
Resource Name	Total
Boom w/Quick Latch Coupling	400 feet
Sorbents	
Resource Name	Total
Sorbent Boom 5"x10''	200 feet
Sorbent Boom 8"x10'	200 feet
Sorbent Pad 17"x19"	300 each
Specialized Equipment	
Resource Name	Total
Boom Trailer	1 each

Ironwood PLM

Boats & Response Vessels	
Resource Name	Total
Aqua Deck Boat, 23', 330 HP	1 each
Boom	
Resource Name	Total
Airmax River Boom, 8" x 8" x 50' with accessories	30 each
Back Pack Unit, blower high volume gasoline	3 each
Boom - Containment	500 feet
Boom - River	500 feet
Boom Reel with Cover (holds 500 to 1500 Airmax River Boom)	3 each
Mini Boom 50' Sections	300 feet
Tow Bridle with Bullet Float for airmax boom	3 each
Shallow Water Equipment	
Resource Name	Total
Portable Dam Seacor System, 25' sections	2 each
Skimmers	
Resource Name	Total
Drum Skimmer - Elastec	2 each
Skimmer-Grooved Drum	1 each
Sorbents	
Resource Name	Total
Sorbent Boom	280 feet
Sorbent Boom 6"x10"	200 feet
Sorbent Roll 38"x144'	144 feet
Sorbent Sweep/Roll	200 feet
Specialized Equipment	
Resource Name	Total

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Boom Trailer	1 each
Fastank Model 2000 - Full kit	2 each
Generator - Honda	1 each
Ironwood PLM Boom	1 each
Port-a-Tank and Liner	1 each
Response Trailer - includes Wildlife Deterrence Kit and Water Response Safety Kits	1 each
Storage Tank - Portable	1 each

Mackinaw Station

Boom

Resource Name	Total
Anchor w/Chain & Rope	5 each
Boom w/Quick Latch Coupling	1000 feet

Shallow Water Equipment

Resource Name	Total
Diaphragm Pump - Air Operated	1 each

Sorbents

Resource Name	Total
Sorbent Boom	4 bale(s)
Sorbent Pad	3 bale(s)
Sorbent Roll - Sweep	2 bale(s)
Sorbent Roll 38"x144'	2 roll(s)

Specialized Equipment

Resource Name	Total
Boom Trailer	1 each
Fast Tank Saddle Assembly	1 each
Generator	1 each

Manistique Station

Boom

Resource Name	Total
Boom w/Quick Latch Coupling	400 feet

Sorbents

Resource Name	Total
Sorbent Boom 5"x10'	5 bale(s)
Sorbent Boom 8"x10'	5 bale(s)
Sorbent Pads 17"x19"	300 each

Specialized Equipment

Resource Name	Total

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Boom Trailer	1 each

St. Ignace Station

Boom

Resource Name	Total
Boom Anchor w/ Chains & Rope	5 each
Boom w/Quick Latch Couplings & 16" skirt	1000 feet
Buoy - Markers w/Lights	5 each

Shallow Water Equipment

Resource Name	Total
Diaphragm Pump - Air Operated	1 each

Sorbents

Resource Name	Total
Sorbent Boom 6"x10'	2 bale(s)
Sorbent Boom 8"x10'	2 bale(s)
Sorbent Pads 17"x18"	1.5 bale(s)
Sorbent Roll - Sweep	1 bale(s)
Sorbent Roll 38"x144'	1 bale(s)

Specialized Equipment

Resource Name	Total
Boom Trailer	1 each
Fast Tank & Saddle Assembly	1 each
Generator	1 each

Straits of Mackinac, MI

Boom

Resource Name	Total
Containment Boom	2000 feet
River Boom	1000 feet

Sorbents

Resource Name	Total
Sorbent Boom	160 feet
Sorbent Pad	300 each
Sorbent Roll - Sweep	8 bale(s)

Specialized Equipment

Resource Name	Total
Boom Trailer	1 each

Superior PLM

Boats & Response Vessels

Resource Name	Total

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Landing Craft Style Boom Deployment Boat, 26', with commissioning kit	1 each

Boom

Resource Name	Total
Airmax River Boom, 8" x 8" x 50' with accessories	30 each
Back Pack Unit, blower high volume gasoline	3 each
Boom - Small	150 feet
Boom Reel with Cover (holds 500 to 1500 Airmax River Boom)	3 each
Containment Boom	700 feet
Containment Boom w/ Quick Latch Couplings	700 feet
Mini Boom	150 feet
Open Water Boom	4200 feet
River Boom	850 feet
Tow Bridle with Bullet Float for airmax boom	3 each

Shallow Water Equipment

Resource Name	Total
Air Diaphragm Pump	2 each
Air Operated Pump w/Hose	1 each
Hydraulic Pump	1 each
Portable Dam Seacor System, 25' sections	2 each
Pump - Air Operated	2 each

Skimmers

Resource Name	Total
Grooved Drum Skimmer System with power unit and shut down valve	2 each
Sea Skater Weir Skimmer System	1 each
Skimmer - Oil	2 each

Sorbents

Resource Name	Total
Absorbent Cellulose Bag	5 each
Sorbent Boom (10) Bags x 40'	400 feet
Sorbent Boom (100/bundle)	6 each
Sorbent Boom Bundle	1 each
Sorbent Pad	7 each
Sorbent Roll - Sweep	1 roll(s)
Sorbent Roll 38"x144'	1 roll(s)

Specialized Equipment

Resource Name	Total

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Boom Trailer	1 each
Fastank Model 2000 - Full kit	2 each
PLM Leak Trailer	1 each
Response Trailer - includes Wildlife Deterrence Kit and Water Response Safety Kits	1 each
Safety Trailer, upgraded	1 each
Submerged Oil Trailer, 14'	1 each
Trailer, stationary deck, 18', for Skid Steer	1 each

Superior Terminal

Sorbents

Resource Name	Total
Sorbent Boom 8"x10'	25 bag(s)
Sorbent Boom 8"x10'	25 each

Specialized Equipment

Resource Name	Total
Canvass Hose 2 - 25' Sections	50 feet
Fire Hose 21/2" x 50'	45 each
Fire Suppression System	1 each
Foam Trailer	2 each
LeakTrailer	1 each
Tank Storage	1 each

Thief River Falls PLM

Boom

Resource Name	Total
Airmax River Boom, 8" x 8" x 50' with accessories	30 each
Anchor systems	4 each
Back Pack Unit, blower high volume gasoline	3 each
Boom	3000 feet
Boom - Containment	2 feet
Boom Reel with Cover (holds 500 to 1500 Airmax River Boom)	3 each
Containment Boom, 13", 50' (15M sections), Optimax 1	20 each
Mini Boom	150 feet
Tow Bridle with Bullet Float for airmax boom	3 each
Tow Bridle with Bullet Float for Optimax	2 each

Shallow Water Equipment

Resource Name	Total
Portable Dam Seacor System, 25' sections	2 each

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Skimmers	
Resource Name	Total
Skimmer	2 each
Skimmer - Drum	1 each
Specialized Equipment	
Resource Name	Total
Boom Trailer	1 each
Boom Trailer for TRF	1 each
Command Trailer	1 each
Fastank Model 2000 - Full kit	2 each
LeakTrailer	1 each
Lowboy Trailer 30'	1 each
Response Trailer - includes Wildlife Deterrence Kit and Water Response Safety Kits	1 each

Twin Ports

Boats & Response Vessels	
Resource Name	Total
Alumaweld Boat	1 each
Boom	
Resource Name	Total
Anchors - 43#	2 each
Containment Boom	275 feet
Sorbents	
Resource Name	Total
Rolls Absorbent	2 each
Sorbent	3 box(es)
Tharco Absorbent Pellets	4 box(es)

Emergency response trailers contain hard boom, sorbent boom, skimmers, and porta-tanks as well as various tools for initial emergency response to both land and water releases.

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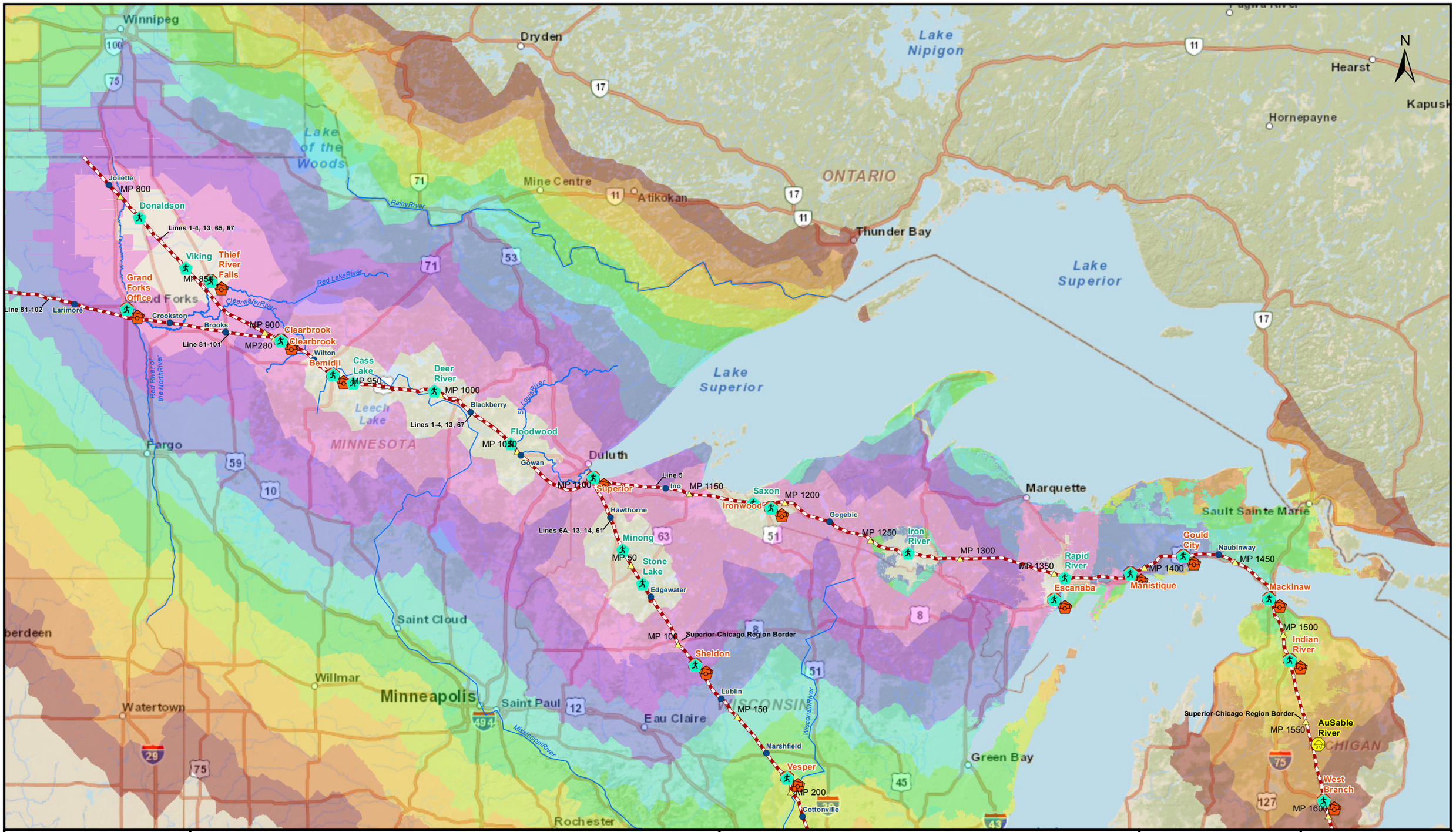
6.9.3 Emergency Response Time Maps

Superior Region Response Zone

Regional Emergency Response Time Maps were created utilizing ESRI® (Environmental Systems Research Institute) ArcMap. Times were calculated from actual street speed limits based on a network dataset built from ESRI's World Routing Service dataset which contains street information from 2013. Peak travel time conditions were used in this analysis. Actual time is subject to change based on local road, traffic and weather conditions.

These response time maps are considered a conservative timeframe for travel to site and include time to deployment. In the event of an incident, reference to individual maps will be necessary.

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ENBRIDGE

Legend

- Manned Facility
- Enbridge Trailer
- Milepost
- Enbridge Unmanned Facility
- Pipeline

30 Minutes	2 Hours 30 Min	4 Hours 30 Min
1 Hour	3 Hours	5 Hours
1 Hour 30 Min	3 Hours 30 Min	
2 Hours	4 Hours	

Actual time may vary based on local conditions.

Manned Facilities Overview

Regional Travel Time Per 30 Minutes Based on Ideal Road and Traffic Conditions

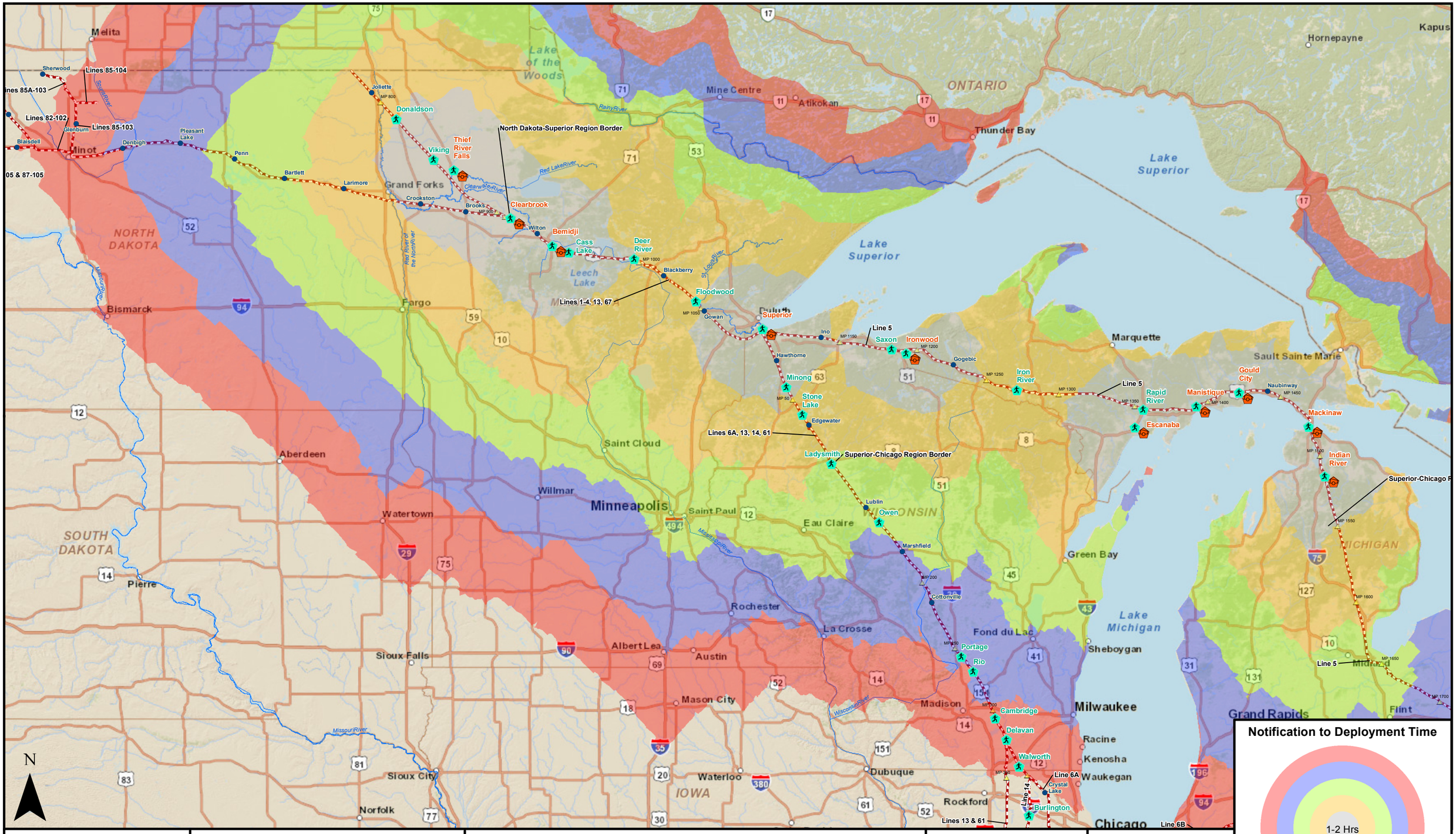
Superior Region

0 35 70 140 Miles

Date Issued:	12/17/2013
Date Revised:	8/5/2014
Drawn By:	AWC
Scale:	1:4,200,000
Map Series	1 of 11

Natural Resources Engineering Co.
715-395-5680

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ENBRIDGE

Manned Facility
Milepost
Enbridge Trailer
Pipeline
Enbridge Unmanned Facility

Manned Facility & ER Trailer Overview

Regional Travel Time Per Hour Based on Ideal Road and Traffic Conditions

Superior Region

0 40 80 160 Miles

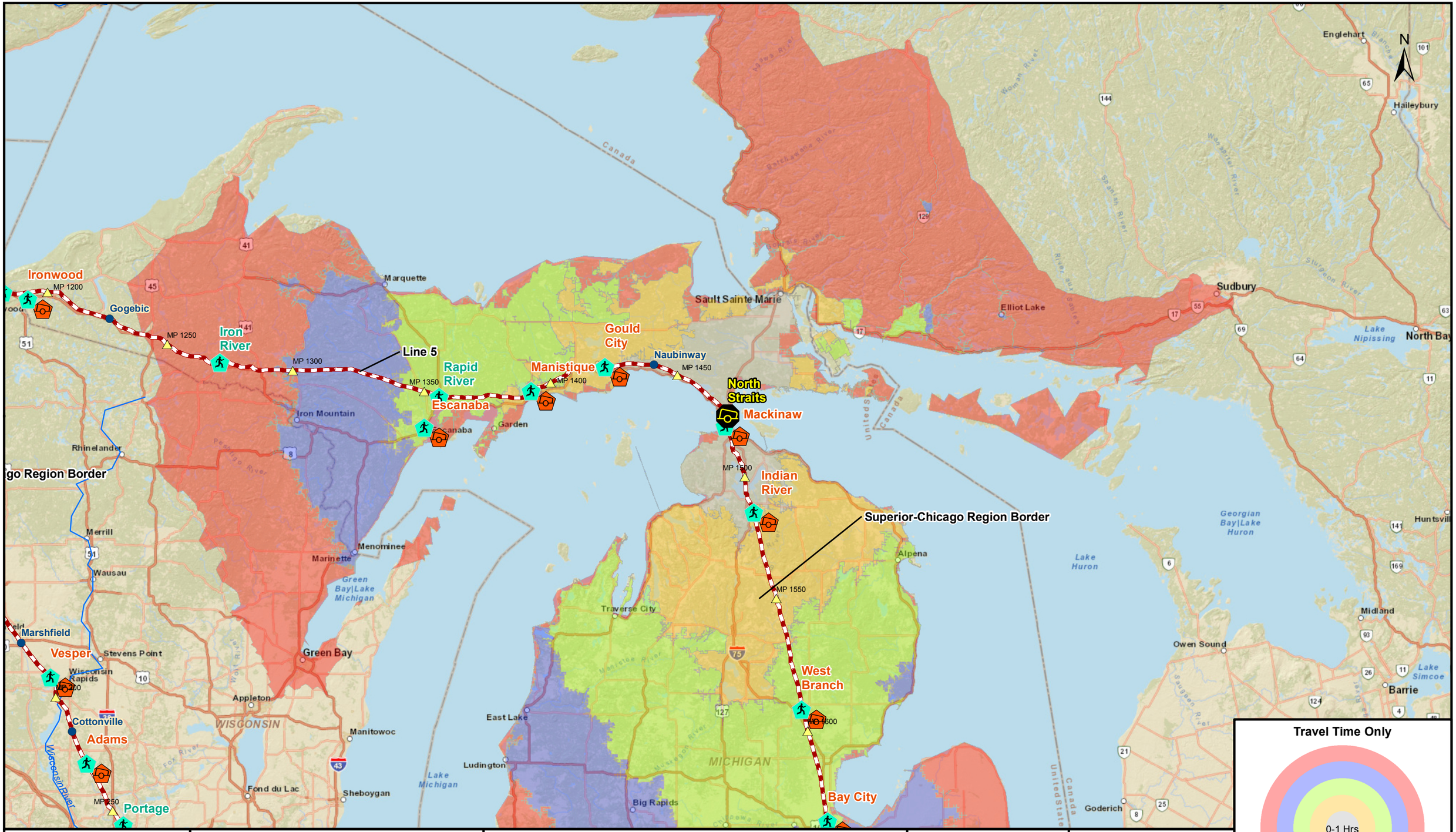
Date Issued: 12/17/2013
Date Revised: 8/1/2014
Drawn By: AWC
Scale: 1:5,200,000
Map Series 1 of 11

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Notification to Deployment Time

1-2 Hrs
2-3 Hrs
3-4 Hrs
4-5 Hrs
5-6 Hrs

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ENBRIDGE

Manned Facility
Enbridge Trailer
Enbridge Unmanned Facility
Milepost
Pipeline

North Straits (St. Ignace) Emergency Response Trailer Only

Regional Travel Time Per Hour Based on Ideal Road and Traffic Conditions

Superior Region

0 25 50 100 Miles

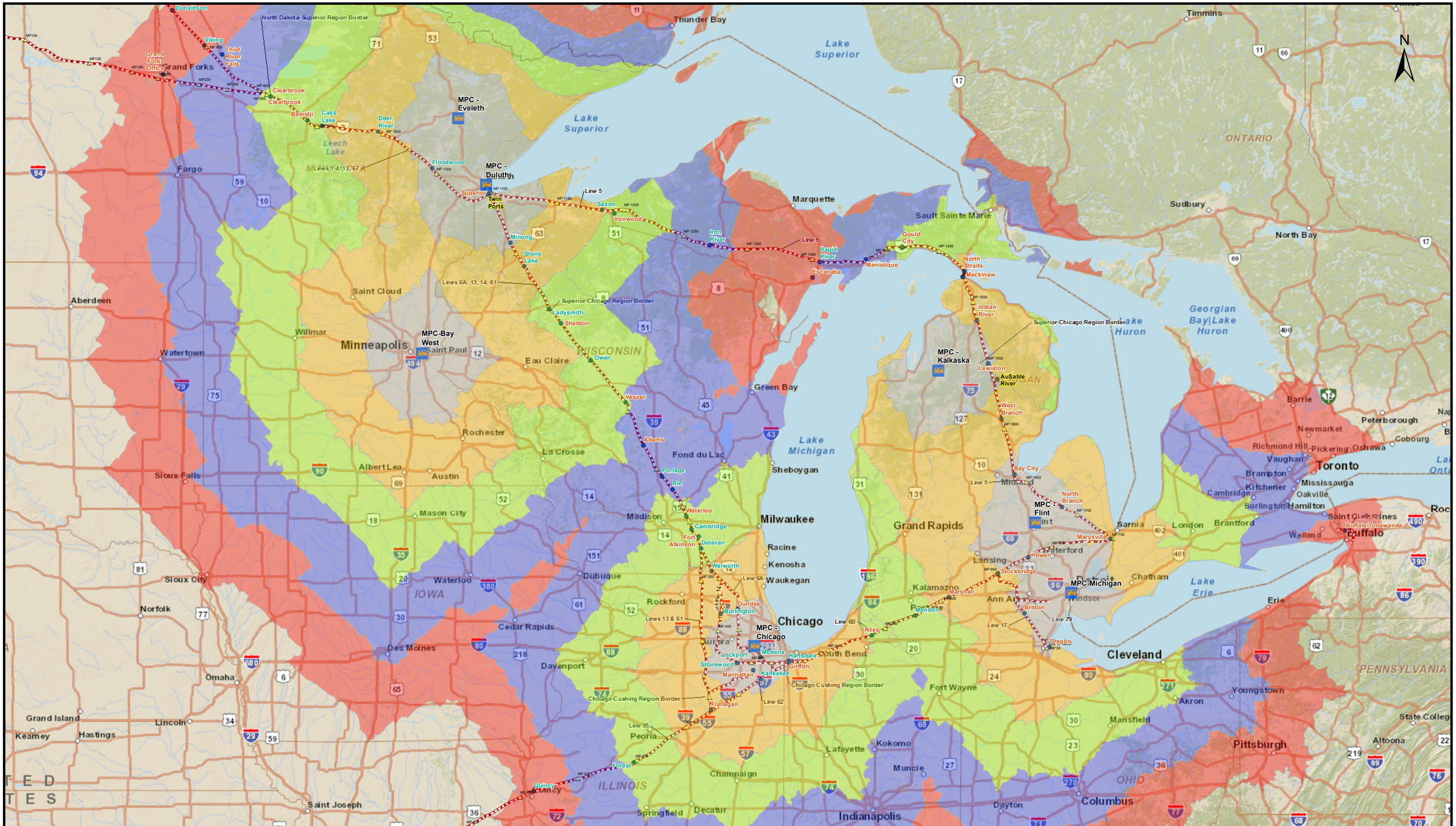
Date Issued:	12/17/2013
Date Revised:	9/16/2014
Drawn By:	AWC
Scale:	1:3,000,000
Map Series	1 of 1

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715-395-5680

Travel Time Only

0-1 Hrs
1-2 Hrs
2-3 Hrs
3-4 Hrs
4-5 Hrs

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ENBRIDGE

Legend

0-1 Hour	3-4 Hours	Enbridge Facility	Milepost
1-2 Hours	4-5 Hours	Contractor Trailer	Pipeline
2-3 Hours			

Actual time may vary based on local conditions.

Marine Pollution Control Corp. Overview
OSRO
Regional Travel Time Per Hour Based on Ideal Road and Traffic Conditions
Superior Region
0 45 90 180 Miles

Date Issued:	12/17/2013
Date Revised:	8/18/2014
Drawn By:	AWC
Scale:	1:6,000,000
Map Series	1 of 8

Natural Resources Engineering Co.
715-395-5680

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6.10 ENVIRONMENTAL RESPONSE

This section provides key information related to environmental response activities associated with an emergency response to a release. The discovery of a historical release (i.e. a release that occurred in the past that is not considered to be a new or ongoing release) may result in the need to initiate some or all of the activities described in the following sections of this Environmental Response section.

As a precaution, the Company's Environment Unit should ensure the Federal and Provincial/State Environmental Regulatory Agencies have been contacted.

In the event of a release that requires an environmental response, the Environment Unit Leader ("ENVL") will immediately mobilize a preferred environmental consultant or consultants if necessary. The Company's Environment Department will staff the Environment Unit within the ICS organizational structure and at a minimum manage the following environmental related response activities:

- Spills to ground water
- Monitoring / sampling activities
- Wildlife management
- Natural Resource Damage Assessment
- Environmental compliance
- Environmental documentation
- Site investigation and remediation
- Waste management.

6.10.1 Spills to Groundwater

Spills to bare ground may initially spread laterally on the surface and then begin migrating downward through the soil and, depending on a variety of factors and circumstances, could reach groundwater. During vertical migration the spill may spread laterally to some degree and a portion of the oil may be absorbed by the soil particles or become trapped in small pores eventually immobilizing the spill.

In general, oil may continue migrating downward until:	
✓	Residual saturation is reached (all of the oil is absorbed by the soil)
✓	Impenetrable layer (silt, clay, sandstone, rock) is encountered
✓	Groundwater is reached.

If a spill does reach groundwater, the oil may begin to spread radially but preferentially in the direction of groundwater flow. In general the following behaviors may occur:

- For higher groundwater velocities, a narrow plume elongated in the direction of groundwater flow may form; and/or
- For lower groundwater velocities the plume may broaden and assume a more circular pattern.

The timeline for this process may be days to months to years, depending on the circumstances of the spill, site specific hydrogeology, and remedial action taken.

The thickness of the plume or layer of oil may decrease with distance from the source. As with vertical migration, a portion of the oil may adhere to soil particles and become trapped in small or water filled pores eventually becoming immobilized.

Response Actions

In the event of a spill to bare ground, there are a number of actions that should be taken to assess the spill and, if groundwater is impacted, initiate recovery and limit the extent of impact.

Containment and Recovery

Rapid and efficient containment and recovery of free product reduces the potential for impacts to groundwater or other environmental receptors.

Initial Assessment

As for any spill, the initial response actions for spills to bare ground should include the assessment of health and safety hazards. See the SSHP as well as the following parameters.

Initial Assessment :	
✓	Spill Size and Product Accumulation (pooled oil) Depth
✓	Product Type (viscosity)
✓	Soil Type / Permeability
✓	Depth to Groundwater
✓	Estimated Response Time to Initiation of Recovery Actions.

Groundwater Impact Potential

Once the initial assessment is completed, the potential for the spill to impact underlying groundwater should be determined and generally requires some knowledge of the local hydrogeology including soil type/permeability and depth to groundwater, and groundwater flow direction. The common factors, along with selected examples, that contribute to a spill having a higher potential to impact groundwater are:

Higher Potential	
✓	Shallow Groundwater (generally <20 ft/6 m)
✓	Low Viscosity Oil (gasoline)
✓	Dry Soil with Low Oil Retention Capacity
✓	Highly Permeable Soils (sand, gravel, coarse grained mixed sediment)
✓	Large Volume of Groundwater
✓	Pooled Oil (creates hydraulic head that enhances penetration)
✓	Response Time (several hours before pooled oil recovery begins).

Supplemental Assessment

If the potential exists for a spill to reach groundwater, additional assessment activities should be conducted to confirm if groundwater has been impacted and, if so, assess the extent of impacts. The Company's Environment Unit will work with third party Environmental Consultants to conduct subsequent assessment activities and characterize any impacts.

These activities commonly include:	
✓	**Backhoes or Excavators** – excavate pits/trenches to determine penetration depth/groundwater impacts (limited to depths of 10–20 ft / 36 m)
✓	**Hand or Power Augers** – install borings to collect soil/water samples and which can also be used to install temporary wells (often limited to 15-30 ft / 4-9 m)
✓	**Direct Push Drilling Rigs –** install borings to collect soil/water samples and which can also be used to install temporary wells (often limited to 50-100 ft / 15-30 m)
✓	**Hollow Stem Auger ("HAS") or rotary drill rigs -** install borings to collect soil samples and wells for groundwater samples (limited to 100-500 ft / 30-150 m .).

The method used often depends on equipment availability, depth to groundwater and access to the spill area. For areas with shallow groundwater and good access, backhoes or excavators are often the most expedient means of determining penetration depth and groundwater impacts. If access is limited, such as in many tank farms, hand or power augers can be used to advance borings and collect samples. Direct push (Geo-probe) rigs can get into many areas but are generally truck mounted and will need road access. For areas with good access and where groundwater is deeper, hollow stem augers or rotary drill rigs are often the best equipment for subsequent assessment.

If groundwater impacts are confirmed or expected, additional sample points or wells should be installed by stepping out laterally from the spill area until the groundwater impact area is delineated.

It is important to note that if intrusive activities (excavation, drilling, hand augers, etc.) are necessary, additional air monitoring of the excavation and breathing zone around the activities should be conducted to ensure additional hazards are not created by the activities. In addition, if excavation activities are conducted and it is necessary for workers to enter the excavation, confined space permitting and/or shoring regulations may apply.

Care must be taken during the groundwater assessment not to create additional pathways for impact movement. The Environment Unit and third party Environmental Consultants will determine appropriate assessment methods and locations.

Recovery/Remediation

In the event a spill does reach groundwater, recovery or remediation activities may need to be conducted to mitigate the impacts. The impacts could be limited to low concentrations of hydrocarbons that have dissolved into the groundwater or, for larger spills, involve a layer of oil/product floating (separate, or non-aqueous, phase hydrocarbons) on the groundwater surface accompanied by elevated concentrations of dissolved (aqueous phase) hydrocarbons in the groundwater.

Common groundwater remediation techniques include:	
✓	Pump and Treat
✓	Excavation
✓	Bio-remediation
✓	Air Sparging/Vapor Extraction
✓	In-Situ Oxidation
✓	Monitoring Natural Attenuation

Selection of the most appropriate remediation technique will depend on a number of factors including product type, soil type, depth to groundwater, access, extent of impacts, current groundwater use, etc. The Company will utilize experienced remediation contractors to select and implement the most appropriate remediation technique(s)

6.10.2 Monitoring/Sampling Activities

Air Monitoring & Groundwater

In defining an acceptable response to a spill incident, it is necessary to know certain physical and chemical characteristics of the spill material. If positive identification of the spilled material can be made without testing, product data may be obtained from a SDS found in Section 2.11.10, product specification information, and/or records of product physical and chemical properties.

Occasionally a spill may occur in which the spilled material is not readily identifiable. Typically, laboratory analytical data for spill event samples will not be instantaneously available during an emergency. Therefore, it is necessary and desirable to field-categorize oils as the product reacts and changes in the environment. Although varying widely in physical and chemical properties, oil products have common basic features that permit their grouping for predictive evaluation of environmental effects and determination of control actions. In addition, as petroleum products react and change (e.g., weather) when exposed to the environment, the laboratory data may not be representative of "real-time" conditions; rather the data may instead reflect the chemical characteristics of the spilled material(s) at the time of sample collection.

Monitoring of the following media may be required, depending on the nature and location of the release:

- Air
- Surface water
- Groundwater
- Sediment
- Soil.

Air Monitoring

Air monitoring will assess real-time hydrocarbon related compound concentrations and background air quality conditions as needed.

- A site action level will trigger the collection of confirmation analytical testing.
- Grab analytical air samples will determine air quality for general public and site workers

Groundwater

Groundwater samples will be collected as necessary from onsite public and private wells (residential, public utility, commercial and industrial) within a specified potential receptor zone around the site.

- State, province or county databases will be used to identify wells.
- Ground survey may also be conducted to ensure all area wells are identified.
- Groundwater samples will be analyzed for laboratory and field parameters that will be determined on a site specific basis.

Surface Water and Sediment

Surface Water

Surface water sampling and monitoring procedures will be utilized to assess visible product and/or hydrocarbon sheen that may affect navigable waterways as well as to document background conditions within the waterways.

- Surface water samples will be collected periodically at each sample location to establish concentration changes over time.
- Surface water samples will be collected at various depths within the water column periodically at each sample location to establish concentration changes over time.
- GPS coordinates will be collected for sample locations to assist in re-sampling.
- Location and frequency of the sample collection activities will be determined on a site-specific basis.
- Surface water samples will be analyzed for laboratory and field parameters that will be determined on a site specific basis.

Sediment

Sediment samples will be collected periodically to provide a baseline evaluation of current conditions and confirm the presence or absence of hydrocarbon impacts.

- Sample locations will be selected in the field based on topography, erosion features, water depth, water velocity and other indicators of sediment deposition.
- GPS coordinates will be collected for sample locations to assist in re-sampling.
- Shallow sediment samples (e.g. 0 to 2", approximately 50-mm depth) will generally be collected from areas of low potential for sediment deposition (i.e. straight, narrow and/or swiftly moving waterways).
- Deeper sediment samples (e.g. 0 to 6", approximately 150 mm depth) would generally be collected at locations with a high potential for sediment deposition (i.e. meandering, broad, and/or slowly moving waterways).
- Sediment samples will be analyzed for laboratory and field parameters that will be determined on a site specific basis.

Oil Sampling Procedures

Oil Sampling Procedures

The following is a list of procedures to follow when obtaining an oil sample:

- Always wear latex or rubber gloves when taking samples. This protects the sample from your hands and your hands from the sample.
- Use a laboratory supplied clear glass jar for sampling. Four or six-ounce jars are sufficient. Dip or lower the jar (using string if necessary) into the oil or oily water at about a 30° angle. This may allow more oil and less water to flow over the lip of the jar. Do not fill the jar more than 2/3 full.
- If sampling a small amount of light oil, such as a sheen, the oil can be collected more easily using a Teflon strip or sorbent pad that is transferred to a sample jar. Do not use anything containing organic fibers such as rag, cotton, cheesecloth, etc.; these may contaminate the sample, thus, giving improper analysis results.
- Decanting the water may be necessary to get enough oil for analysis. To decant, fasten the lid on securely and turn the jar over allowing the water to settle towards the lid. Then unscrew the lid just enough to allow the excess water to slowly escape.
- Fasten the lid after lining it with aluminum foil or Teflon to obtain a good seal.
- Affix the documentation label to the jar after wiping it clean and dry for the label to adhere. The label should identify the following information:
  - Date and time of sampling
  - Source/location of sample (be specific and include GPS coordinates)
  - Name of person who took the sample
  - Sample designation using a sequential numbering or lettering system
  - Samples should be delivered to a laboratory immediately for analysis. If samples cannot be delivered immediately, they should be temporarily stored in a refrigerator or a cool dark place since exposure to heat and light could affect the analysis. Samples should be transported in waterproof containers or wrapped in enough sorbent material to soak up the entire contents of the jar in case of leakage or breakage.

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6.10.3 Wildlife Management

In the event of a release where impacts to wildlife are present or expected, the Environment Unit will immediately mobilize a preferred wildlife response consultant or consultants.

The following actions should be taken to minimize or prevent additional damages to wildlife:

- Immediately secure the release area and install appropriate wildlife deterrence measures to discourage wildlife access to the site;
- Conduct an initial assessment of wildlife and wildlife habitat in the area of the release to establish the potential for wildlife impacts;
- Avoid collecting any dead or injured wildlife in the impacted (oiled) areas until the wildlife response team arrives unless it impedes operations or is a threat to human health and safety. However, if there is concern that injured or deceased wildlife might attract scavenging or predatory wildlife to the impacted areas, consult with the Environmental Unit for a proper and authorized course of action.; and
- Contact the appropriate regulating authority. Wildlife rescue and rehabilitation can only be conducted with appropriate permits and under the direction of the ENVL.

A site specific wildlife management and response plan may be developed for the site. The plan may include, but is not limited to:

- Additional wildlife deterrence strategies.
- Wildlife response permitting and approval requirements.
- Wildlife assessment procedures.
- Wildlife capture and collection procedures.
- Wildlife cleaning and rehabilitation procedures.
- Documentation protocols.

Dead and injured wildlife found during response operations must be collected by trained and authorized personnel and properly documented. An inventory of dead, injured, rehabilitated and released wildlife needs to be maintained as a component of the Natural Resources Damage Assessment in the U.S.

6.10.4 Environmental Compliance

Environmental compliance includes, but is not limited to, preparing and submitting permit applications and completing associated field inspections. Permits and other compliance requirements that may be required during a release response may include but are not limited to:

- Permit applications to discharge treated water, trench dewatering, stormwater impacted by construction activities in some states, and/or hydro-test water.
- Applicable Wetland plans and permits.
- Joint Permit Application for wetland disturbances.
- Air Emissions Inventory and Air Permit.
- Local Authority Soil Erosion and Sediment Control Permit and associated inspections.
- Local Authority - Road and Drain Permits.
- Wildlife Research and Collection Permit.
- Wildlife Rehabilitation Permit.

- Application of the "Recovered Oil" vs. "Recovered Fuel" exemptions or exclusions.
- Clean Water Act emergency response actions.
- Permits for disturbance of areas outside of existing ROW.
- Other permits or approvals as necessary based on event circumstances.

Additional permitting or regulatory compliance requirements will be determined based on the regulatory jurisdiction and specific circumstances of the release.

6.10.5 Environmental Documentation

In addition to the general documentation activities listed in the ICP Core Section 2.0, Environmental documentation activities also include: collecting and retaining site records; initial site survey; preparation of site figures; and preliminary reporting. Site Records include:

- Field notebooks;
- Daily weather conditions (include wind direction and speed); and
- Initial release information:
    - Incident characteristics, product properties, extent of impacts, and site conditions
    - Product recovery/containment operations, including: amount of product recovered; recovery techniques (e.g., booms, vacuum recovery, etc.), and their locations
    - Areas affected by the release and threatened natural resources; and
    - Wildlife injury and impacts.

Regulatory Communication

- Records of all notifications should include: time, date, agency, telephone number, individual contacted, and a summary of the conversation.
- Establish and distribute a general Enbridge email account to be copied on all emails to Federal, State/provincial and local regulators.
- Maintain a log of on-site agency personnel.

Photos

- Include a description of the site and the cardinal direction the photographer is facing when the photograph was taken. Photographs taken with a camera equipped with or synchronized to a GPS are preferred.

Laboratory Data

- Establish a standard protocol for sample naming at the onset of the response (e.g. Sampling and Analysis Plan).
- Establish quality assurance ("QA") and quality control ("QC") objectives.
- Includes Chain of Custody and laboratory reports.
- Collect and maintain post-processed GPS data of sample locations.

Other Documentation

- An initial site survey may include an aerial or ground survey of the area affected by the release and adjacent areas with video and photographs to document:

    - Extent and movement of the product
    - Protection priorities for natural resources

- Natural resources that are affected and threatened by the release
- Sample locations and access areas
- Areas not affected by the release (e.g. background conditions, access and staging).

Site information to produce early in the project may include:

- Site/Release Location and Site Access (i.e. release location, extent of visual impacts, access roads, boat launches, boom deployment areas, safety zones, sign-in and security gates).
- Receptor Survey (may include: residential, commercial and industrial wells, residences, surface water intakes, and threatened and endangered species).

Preliminary reporting activities may include:

- Estimated volume of release
- Response activities
- Data presentation.

6.10.6 Site Investigation and Remediation

Site investigations will generally include determining the horizontal and vertical extent of the impacts. Equipment used to complete site investigation activities may include hand tools, drilling equipment and earth-moving equipment. Soil sampling for field screening and laboratory analysis may also be required.

Based on the results of the site investigation, a site specific remedial action plan may be prepared to address the impacts. The remedial action plan may include:

- Description of impacted areas
- Remediation criteria and end points
- Remediation methodology
- Approvals and permits required for remediation
- Site reclamation methodology.

6.11 PROTECTION, CONTAINMENT AND RECOVERY

6.11.1 Isolation Protection Technique Selection

Containment and recovery refers to the techniques or methods that can be employed to contain and recover petroleum spills on water or the containment of petroleum spills flowing overland. Recovery of terrestrial spills is often very similar, or uses the same techniques as shoreline clean-up.

The following considerations should be taken into account when planning or implementing containment and recovery operations:	
✓	Containment is most effective when conducted near the source of the spill where the oil has not spread over a large area and the contained oil is of sufficient thickness to allow effective recovery and/or clean-up
✓	Feasibility of containment is generally dependent on the size of the spill, available logistical resources, implementation time, environmental conditions and the nature of the terrain in the spill area
✓	Aquatic (water) containment is primarily conducted through the use of oil spill containment booms
✓	Skimmers are usually the most efficient means of recovery of aquatic spills, although pumps, vacuum systems, and sorbents can also be effective, particularly in smaller waterways
✓	Terrestrial (land) containment typically involves berms or other physical barriers
✓	Recovery of free petroleum from the ground surface is best achieved by using pumps, vacuum sources, and/or sorbents.

The *Inland Spill Response Tactics Guide* is a Company document that can be used as a quick reference by Enbridge first-on-scene responders to select and implement containment and recovery tactics with Enbridge-owned oil spill response equipment during the first 72 hours of the response. It illustrates a collection of inland spill tactics that can be applied using obtainable resources to a liquid products release until additional resources and personnel arrive on site.

Isolation Protection Technique Selection *(Conversion table located in Section 1: Plan Introduction Elements)*

Technique	Description	Logistical Requirement Examples	Use Limitations[1]	Potential Environmental Effects
Techniques on Land				
A. Containment / Diversion Berms (3.1.1 in Tactics Guide)	Construct berm (clay, bales, rocks, logs, etc.) ahead of advancing surface spill to contain spill or divert it to a containment area.	Typical Equipment Backhoe, bulldozer, front- end loader, or set of hand tools, plastic sheeting	• Steep Slopes • Porous substrate	• Disturbance to environmental sensitivities, surface soils and vegetation • Increased oil penetration
B. Interceptor Trench (3.1.2 in Tactics Guide)	Excavate ahead of advancing surface/ near-surface spill to contain product. Cover bottom and down gradient side with plastic.	Typical Equipment* Backhoe or set of hand, tools, misc. plastic sheeting	• Slope • Depth to near-surface flow	• Increased oil penetration • Disturbance to environmental sensitivities, surface soils and vegetation • Potential to impact groundwater
C. Trench and Berm (3.1.3 in Tactics Guide)	Construct berm with soil from the trench to stop the advancing surface spill and allow for recovery.	Typical Equipment* Backhoe, bulldozer, front- end loader, or set of hand tools, plastic sheeting	• Steep Slopes • Porous substrate	• Increased oil penetration • Disturbance to environmental sensitivities, surface soils and vegetation • Potential to impact groundwater
Techniques on Small Watercourses				
D. Stream Dam, Board Weir, Siphon Dam (3.2.1, 3.2.2 and 3.2.5 in Tactics Guide)	Construct dam in drainage course/stream bed to block and contain flowing oil. Cover with plastic sheeting. If water is flowing, install inclined pipes during dam construction to pass water underneath.	Typical Equipment* Backhoe, bulldozer, front- end loader, or set of hand tools, plastic sheeting roll, Aqua Dam, PVC Pipe, Water Gate, Tiger Dam, Water Bag	• Upstream storage capacity	• Increased oil penetration • May increase suspended sediment • Downstream water flow may be restricted

Isolation Protection Technique Selection *(See Conversion table located in Section 1: Plan Introduction Elements)*

Technique	Description	Logistical Requirement Examples	Use Limitations[1]	Potential Environmental Effects
E. Culvert Block (3.2.3 in Tactics Guide)	Block culvert opening with plywood, sediments, sandbags, etc. to prevent oil from entering culvert	Typical Equipment* Misc. hand tools, misc. plywood, sandbags, etc.	• Upstream storage capacity	• Increased oil penetration • Downstream water flow may be restricted
F. Filter Fence - Debris Exclusion (3.2.4 in Tactics Guide)	Install fence barrier upstream of containment site to exclude debris/ice	Typical Equipment* Misc. hand tool, fence posts, fence, fasteners, chicken wire, support lines, bales, sorbent materials etc.	• Soft substrate	• Minor substrate disturbance at post an anchor points
G. Sorbent Barriers / Filter Fence (3.2.4 in Tactics Guide)	A barrier is constructed by installing two parallel lines of stakes across a channel, fastening wire mesh to the stakes, and filling the space between stakes with sorbents.	Typical Equipment* Misc. hand tools, boats, fence posts, wire mesh, sorbents, misc. fasteners, support lines, stakes, etc.	• Soft substrate	• Minor substrate disturbance at post and shoreline anchor points • High substrate disturbance if boat is not used

Isolation Protection Technique Selection *(See Conversion table located in Section 1: Plan Introduction Elements)*

Technique	Description	Logistical Requirement Examples	Use Limitations[1]	Potential Environmental Effects
Techniques on Larger Watercourses				
H. Diversion Booming (3.3.3.3 in Tactics Guide)	Boom is deployed from the shoreline at an angle towards the approaching slick and anchored or held in place with a work boat. Oil is diverted towards the shoreline for recovery.	Typical Equipment* Hard boom, ground tackle, rope, shoreline anchors, boats, winches.	• Sensitive shorelines	• Minor substrate disturbance at anchor points • Heavy oiling at shoreline anchor point
I. Narrow Channel Containment Booming (3.3.3.3 in Tactics Guide)	Boom is deployed across entire river channel at an angle to contain floating oil passing through channel.	Typical Equipment* Hard boom, ground tackle, rope, shoreline anchors, boats, winches.	• Sensitive shorelines	• Minor substrate disturbance at anchor points • Heavy shoreline oiling at downstream anchor point
J. Exclusion Booming (3.3.3.1 and 3.3.3.2 in Tactics Guide)	Boom is deployed across or around sensitive areas and anchored in place. Approaching oil is excluded from area.	Typical Equipment* Hard boom, ground tackle, rope, shoreline anchors, boats, winches.		• Minor substrate disturbance at anchor points

Isolation Protection Technique Selection *(See Conversion table located in Section 1: Plan Introduction Elements)*

Technique	Description	Logistical Requirement Examples	Use Limitations[1]	Potential Environmental Effects
Spills on Water (Cont'd)				
K. Deflection Booming (3.3.3.1 and 3.3.3.2 in Tactics Guide)	Boom is deployed from the shoreline away from the approaching slick and anchored or held in place with a work boat. Oil is deflected away from shoreline.	Typical Equipment* Hard boom, ground tackle, rope, shoreline anchors, boats, winches.	• Onshore winds	• Minor substrate disturbance at anchor points • Oil is not contained and may contact other shorelines
L. Boomvane Deploying Containment / Recovery / Deflection modes (3.3.3.4 in Tactics Guide	BoomVanes can be used in place of ground tackle when deploying deflection and diversion booms.	Typical Equipment* Hard boom, BoomVane(s), control line, mooring line,boom/shore anchor line, tow bridles, shore anchor pins.	• Requires access to multiple shoreline locations (if mooring line is to be used) • Requires a current (not for still water use)	• Minor disturbance of trees if using as an anchor point.

[1] In addition to implementation and accessibility.
* Need to establish a safe perimeter and follow safety precautions as appropriate before work begins.

6.11.2 Imperial/Metric Conversion Table

English to Metric		Metric to English	
Length			
1 inch (in)	2.54 centimetres (cm)	1 cm	0.393 in
1 foot (ft)	0.3048 metres (m)	1 m	3.28 ft
1 mile (mi)	1.609 kilometres (km)	1 km	0.621 mi
1 nautical mile (nm)	1.852 kilometres (km)	1 km	0.540 nm
Area			
1 square foot (ft^2)	929 square centimetres (cm^2)	1 cm^2	0.0129 ft^2
1 square foot (ft^2)	0.0929 square metres (m^2)	1 m^2	10.76 ft^2
1 acre (ac)	4,047 square metres (m^2)	1000 m^2	0.247 ac
1 square mile (mi^2)	2.59 square kilometres (km^2)	1 km^2	0.386 mi^2
Volume			
1 US Gallon (US gal)	3.785 litres (l)	1 l	0.264 U.S. gal
1 Imperial Gallon (Imp gal)	4.546 litres (l)	1 l	0.220 Imp gal
1 Barrel (bbl)	159 litres (l)	1 l	0.00629 bbl
Velocity			
1 mile per hour (mph)	1.609 kilometres/hr (kph)	1 kph	0.621 mph
1 nautical mile per hour (knot)	1.852 kilometres/hr (kph)	1 kph	0.54 knot
1 foot per second (fps)	0.3048 metre/second (m/sec)	1 m/sec	3.28 fps
1 foot per second (fps)	1.097 kilometres/hr (kph)	1 kph	0.911 fps
Weight			
1 pound (lb)	0.454 kilograms (kg)	1 kg	2.205 lb
1 short ton (st)	0.907 tonne (mt)	1 mt	1.102 st
1 long ton (lt)	1.016 tonne (mt)	1 mt	0.984 lt
Temperature			
F° = (C° (9) ÷ 5) + 32			
Pressure			
1 pound per square inch (psi)	0.0689 bar	1 bar	14.504 psi
1 pound per square inch (psi)	6.89 kilopascals (kPa)	1 kPa	0.145 psi
1 pound per square inch (psi)	0.704 metre (water column) (mwc)	1 mwc	1.42 psi
1 inch mercury (in Hg)	25.4 mm mercury (mm Hg)	1 mm Hg	0.0394 in Hg
1 atmosphere (atm)	1.033 kg/cm^2	1 kg/cm^2	0.968 atm
1 atmosphere (atm)	760 mm mercury (mm Hg)	1 mm Hg	0.00132 atm
Flow			
1 gallon per minute (gpm)	0.227 $metre^3$ per hour (m^3/hr)	1 m^3/hr	4.403 gpm
1 cubic foot per minute (cfm)	1.699 cubic metres per hour (m^3/hr)	1 m^3/hr	0.5886 cfm
1 barrel per day (bpd)	0.1104 litres per minute (lpm)	1 lpm	9.057 bpd
Power			
1 horsepower (hp)	0.746 kilowatt (kw)	1 kw	1.341 hp

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Biological Disinfection

Biological disinfection is the systematic reduction in the probability of spreading invasive biological organisms between freshwater environments.

Applying the practices in the procedure will reduce the probability of spreading invasive biological organisms between freshwater environments by way of Enbridge Pipelines Inc., Enbridge Energy Partners, L.P. (Enbridge) or contractor equipment, material or operations used during a response or exercise. The procedure incorporates the requirements of the jurisdictions (state, province, territory and country) in which Enbridge operates.

The disinfection procedures included in this document may not be suitable in all situations or for all potential biological organisms. If more information is required regarding which disinfection procedure should be used, an appropriate environmental professional or environmental regulator should be contacted.

If required, the ENVL is responsible for development of the detailed Biological Disinfection Plan.

The following should be considered when setting up disinfection stations:

- Weather conditions.
- Proximity to water bodies or means by which water and cleaning solutions could enter water bodies.
- Disinfection stations will be constructed with secondary containment to collect wash water. Wash water will be collected and disposed of as per the site-specific waste management plan.
- Wherever possible, draining water from equipment (e.g. bilge water) should be done in the waterbody in which work was conducted.
- Type and quantity of PPE, clothing, heavy equipment and vehicles to be disinfected.

General Guidelines

General guidelines that will assist in implementation of this SOP follow:

- Use a tagging system to identify infected from disinfected equipment.
- Look in cracks/crevices that may otherwise go unnoticed and hide unwanted organisms.
- Use rubber waders, gloves and boots where possible, as neoprene waders and gloves as well as felt soled boots retain moisture and organism such as Rock Snot and whirling disease. Neoprene and felt soles are also harder to disinfect.
- Allow equipment to dry completely and for the recommended times between uses.
- To help prevent transfer of aquatic invasive species, in addition to the above mentioned disinfection methods, where possible efforts should be made to designate equipment and personal gear to a single waterbody

Equipment

WORKERS AND PERSONAL PROTECTIVE EQUIPMENT

When using chemicals, the appropriate PPE is to be used (e.g., appropriate gloves, safety glasses and clothing) and the MSDS are to be reviewed and available.

Recommended cleaning supplies and equipment for disinfecting workers and their PPE will depend on the method of disinfection that is determined to be appropriate and may include:

- Heavy gauge plastic drop cloths for larger pieces of equipment, personal clothing/ technical equipment (i.e., waders, wader boots, rubber boots, motors, etc.).
- Assorted long and short handles soft bristled brushes to scrub equipment, parts and boots.
- Buckets for wash and rinse solutions.
- Tubs, stock tanks, or containers large enough and sturdy enough to contain water above 60ºC (140ºF).
- Plastic tubs for workers to submerge equipment and clothing.
- Methods for containing waste water.
- Methods for disposing of waste water (e.g. bilge water etc.).
- Bleach solutions:
  - 2% bleach solution (200 mL and water added to make 10 liters) for general disinfection
  - if targeting whirling disease specifically, a 10% solution should be used
  - if Viral Hemorrhagic Septicemia (VHS) is targeted a 20% chlorine bleach solution should be used.

Bleach can be corrosive to aluminum and hot water can delaminate Gore-Tex® fabric and other sensitive clothing or fabrics.

- 5% salt solution.
- 5% antiseptic hand solution.
- Full strength cleaning agents with quaternary ammonium compound alkyl dimethyl benzyl ammonium chloride (ex Parvasol ® and Kennelsol ® or Formula 409® and Fantastic ®).
- A 5% Household detergent (dishwashing detergent) solution.

Disinfection of workers and PPE must be completed in one of the on-site disinfection stations. These stations are to be separate from the on-site decontamination stations.

The following is recommended for disinfecting heavy equipment and vehicles. These should be used in addition to the previously listed materials and solutions.

- Pressure washer with at least 250 psi strength.
- Pumps for collecting wash solutions and emptying boats and other vessels
- Brooms and brushes for cleaning operator areas inside vehicles and equipment.
- Disposal receptacles for disposable cleaning materials and for any biological materials removed from equipment (e.g., plants, bait fish, paper towels or other disposable cleaning materials used).
- Methods for containing waste water.
- Methods for disposing of waste water (e.g. bilge water etc.).

Disinfection of heavy equipment and vehicles must be completed in one of the on-site disinfection stations. These stations are to be separate from the on-site decontamination stations. Decontamination is to occur prior to disinfection. If heavy equipment and vehicles require disinfection following decontamination, the equipment is to be brought directly from the decontamination station and is not to be re-used until disinfection has been completed.

Where possible, potentially infected equipment should be disinfected in one of the on-site disinfection station, rather than transported off-site for disinfection.

If on-site disinfection is not feasible, PPE and clothing should be removed as per the site-specific decontamination plan, bagged and not used on other sites before being disinfected off-site.

Disinfection Procedures

Disinfection methods should be matched to best suit the type of equipment being used. Refer to Spill Response Freshwater Biological Disinfection Procedures for detailed disinfection procedures.

It is illegal to transport live fish, bait or other organisms from one body of water to another. If none of the disinfection procedures are plausible for certain equipment, restrict use of equipment to a single water body.

INSPECTION

- Inspect all potentially infected PPE, clothing, heavy equipment and vehicles. Remove all mud, plants and other organisms that might be attached. Pay particular attention to cracks and crevices which may not be immediately visible and may house plants, mud and other organisms.
- Drain standing water from boats or equipment at the waterbody where it came from, or at a designated Disinfection Station.
- Drain motors in operating position then pull the motor up and tip it from side to side. If motor is being removed from the boat, stand it upright and allow all water to drain completely.
- Drain bilge and boat hull, live wells, compartments, boots, jet drives, bait buckets.

DISINFECTION

Disinfection procedures may vary depending on whether particular organisms are being targeted, as well as what may be most suitable, based on what the equipment is made of, how readily some supplies are, and the feasibility of obtaining large enough quantities of cleaning solutions in the field.

DRYING

Drying can be used as a disinfection process if the following procedure can be followed:

- Some aquatic invasive species can survive out of water for more than two weeks. It is important to know potential species to which equipment may have been exposed. Equipment should be dried before transporting to another body of water, according to the site-specific species of concern.
- If targeting adult zebra mussels, 10 days may be required to kill organisms in cool or humid weather.
- If targeting *Didymosphenia geminate* (commonly referred to as Didymo or Rock Snot), equipment must be dried completely inside and out, and then for an additional 48 hours. Freezing items solid will also kill Didymo cells. Freezing overnight should work in most instances.
- Porous materials should be soaked in cleaning solutions for longer than non-porous materials and dried for longer periods of time than non-porous materials. Materials should be dry to the touch both inside and out, and allowed to dry for at least an additional 48 hours prior to entering a different waterway.

ACTIVE CLEANING

If drying cannot be implemented, an active cleaning method of disinfection will be required to limit the potential of transporting biological organisms from one fresh water environment to another.

Non Absorbent Items

Soak and scrub non-absorbent items for at least one minute (unless otherwise specified below) in one of the following solutions:

- 5% solution of dishwashing liquid (500 mL or 2 cups and water added to make 10 liters).
- 2% solution of bleach (200 mL and water added to make 10 liters).
- 5% solution of salt (500 ml or 2 cups and water added to make 10 liters).
- 5% antiseptic hand cleaner (500 mL or 2 cups and water added to make 10 liters).
- A dilute solution of 7% hydrogen peroxide mixed in a 64 ml (hydrogen peroxide):1litre (water) ratio. Can be applied using spray equipment. Infected equipment should be completely covered with the solution and allowed to sit for approximately 60 minutes before rinsing with clean water.
- Iodophor solution of 100 mg/L for moving equipment out of Viral Hemorrhagic Septicemia (VHS) management zones.
- Vinegar Dip (100% vinegar for 20 minutes).
- 1% salt solution in place of the vinegar dip for 24 hours.
- Full strength cleaning agents with quaternary ammonium compound alkyl dimethyl benzyl ammonium chloride (ex Parvasol ®and Kennelsol ®or Formula 409® and Fantastic ®)
- These can also be used in a 2:1 water to disinfectant ratio
- Soak all equipment for a minimum of 10 minutes

When deciding on the appropriate active cleaning methodology for non-absorbent items, the following should be considered:

- Disinfection with chemicals is not effective against killing spiny water fleas resting eggs.
- Disinfection with chlorine or iodophor must be used if fieldwork is conducted within and outside of the VHS management zones.
- Water-based solutions should be at least 60ºC (140ºF) and soaked for at least 20 minutes in hot water kept above 45ºC (113ºF).
- For equipment that cannot be submerged, solutions may be applied by either washing with a pressure washer, or with a pressurized garden hose. Pressure washers should reach at least 250 pounds per square inch (psi). Pressure washers may not be appropriate for all equipment and may damage some equipment.

ABSORBENT ITEMS

Absorbent items (e.g. felt-soled waders and diving suits) will require longer soaking times than non-absorbent items, to allow thorough saturation.

Soak absorbent items in the following solutions:

- At least 40 minutes in hot water kept above 45ºC
- At least 30 minutes in hot water kept above 45ºC containing a 5% dishwashing detergent solution
- For SCUBA gear, the following solution and soak times may also be used:
- Submerge and wash the suit and equipment (including inside of buoyancy compensator with hot water that is at least 40ºC (or 104ºF);
- Submerge/wash suit and equipment in a tub/tote with a salt solution (1/2 cup salt dissolved in 3.4 liters of water), then rinse with clean water

DISPOSAL

- Materials and solutions used in the disinfection process will be contained, and managed as outlined in the site-specific Waste Management Plan.

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6.12 SAFETY DATA SHEETS ("SDS")

Table of Contents

AMH_Albian Muskeg River Heavy

ARB_Albian Residual Blend

ASH_Albian Synthetic Heavy

AVB_ Albian Vacuum Blend

AWB_Access Western Blend

BHB_Borealis Heavy Blend Suncor

BR_CL_CLB_CDB_CSB_WH_WCS_Bow River

BSO_BP Sour Crude

CRW_ENB Condensate

Gasoline

KDB_Kearl Lake Dilbit

MSB_CAL1_PLS1_GLS1_PLO1_MGS2_KHE2_PHO2_SPR2_RSO2_GHE2_MBL3_MM4_MSM4_MLS_MJT_ENB Crude Oil Sour

MSW_MGL_MLN_PSB_RSW_RA_FD_MSY_MST Crude Oil-Sweet

NGL Natural Gas Liquids

NSA_Husky Synthetic Crude Oil

OSC_Suncor C

OSH_Suncor H

OSJ Suncor J

PBS_Crude Oil Canada

PCH_CHV_ENB Crude Oil Heavy

PSY_SYN_HSC_ENB Crude Oil Synthetic

SCB_Statoil Cheecham Blend

SCS_SHB_CSB_MKH_PSH_ENB Synbit

SH_Crude Oil Sour

SPX_Shell Upgraded Crude

SSX_Shell Synthetic Light

UHC_US Sweet- Clearbrook; NSW_North Dakota Sweet

WCS_ENB Heavy Crude

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Material Safety Data Sheet

1. MATERIAL AND COMPANY IDENTIFICATION

Material Name : **Albian Residual Blend**
Product Code : 001D1781
Uses : Refinery Feedstock.

Manufacturer/Supplier : **Motiva Enterprises LLC**
PO BOX 4540
Houston TX 77210-4540
USA
SDS Request : (+1) 8772767285

Emergency Telephone Number
Spill Information : +1- 877-242-7400
Health Information : +1- 877-504-9351

2. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Identity	CAS No.	Concentration
Petroleum, Crude Oil	8002-05-9	100.00 %

Contains Benzene, CAS # 71-43-2.
Contains Ethylbenzene, CAS # 100-41-4.
Contains n-Hexane, CAS # 110-54-3.
Contains Naphthalene, CAS # 91-20-3.
Contains hydrogen sulphide, CAS # 7783-06-4.
Hydrogen sulphide may be present both in the liquid and the vapour. Composition is complex and varies with the source of the crude oil.
Raw petroleum extracted in its natural state from the ground (excluding hydrocarbons from shale) and containing predominantly aliphatic, alicyclic and aromatic hydrocarbons. It may also contain small amounts of nitrogen, oxygen and sulphur compounds.

3. HAZARDS IDENTIFICATION

Emergency Overview

Appearance and Odour : Brown to black. Viscous liquid. Potential smell of rotten eggs and sulphur..

Health Hazards : Harmful: may cause lung damage if swallowed. Vapours may cause drowsiness and dizziness. A component or components of this material may cause cancer. This product contains benzene which may cause leukaemia (AML - acute myelogenous leukaemia). May cause MDS (Myelodysplastic Syndrome). Hydrogen sulphide is highly toxic and may be fatal if inhaled. Repeated exposure may cause skin dryness or cracking.

Safety Hazards : Flammable liquid. The vapour is heavier than air, spreads along the ground and distant ignition is possible. Electrostatic

		charges may be generated during handling. Electrostatic discharge may cause fire. Hydrogen sulphide (H2S), an extremely flammable and toxic gas, and potentially toxic sulphur oxides may be present.
Environmental Hazards	:	Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Health Hazards

Inhalation	:	Vapours may cause drowsiness and dizziness. Hydrogen sulphide is highly toxic and may be fatal if inhaled. Hydrogen sulphide (H2S), an extremely flammable and toxic gas, and other hazardous vapours may evolve and collect in the headspace of storage tanks, transport vessels and other enclosed containers.
Eye Contact	:	Moderately irritating to eyes.
Ingestion	:	Harmful: danger of serious damage to health by prolonged exposure in contact with skin and if swallowed.Harmful: may cause lung damage if swallowed.
Other Information	:	A component or components of this material may cause cancer. This product contains benzene which may cause leukaemia (AML - acute myelogenous leukaemia). May cause MDS (Myelodysplastic Syndrome).
Signs and Symptoms	:	Defatting dermatitis signs and symptoms may include a burning sensation and/or a dried/cracked appearance. Eye irritation signs and symptoms may include a burning sensation, redness, swelling, and/or blurred vision. If material enters lungs, signs and symptoms may include coughing, choking, wheezing, difficulty in breathing, chest congestion, shortness of breath, and/or fever. The onset of respiratory symptoms may be delayed for several hours after exposure. Breathing of high vapour concentrations may cause central nervous system (CNS) depression resulting in dizziness, light-headedness, headache, nausea and loss of coordination. Continued inhalation may result in unconsciousness and death. H2S has a broad range of effects dependent on the airborne concentration and length of exposure: 0.02 ppm odour threshold, smell of rotten eggs; 10 ppm eye and respiratory tract irritation; 100 ppm coughing, headache, dizziness, nausea, eye irritation, loss of sense of smell in minutes; 200 ppm potential for pulmonary oedema after >20-30 minutes; 500 ppm loss of consciousness after short exposures, potential for respiratory arrest; >1000ppm immediate loss of consciousness, may lead rapidly to death, prompt cardiopulmonary resuscitation may be required. Do not depend on sense of smell for warning. H2S causes rapid olfactory fatigue (deadens sense of smell). There is no evidence that H2S will accumulate in the body tissue after repeated exposure.
Environmental Hazards	:	Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Additional Information	:	This product is intended for use in closed systems only.

4. FIRST-AID MEASURES

General Information	:	Vaporisation of H2S that has been trapped in clothing can be dangerous to rescuers. Maintain respiratory protection to avoid contamination from the victim to rescuer. Mechanical ventilation should be used to resuscitate if at all possible.
Inhalation	:	Remove to fresh air. If rapid recovery does not occur, transport to nearest medical facility for additional treatment.
Skin Contact	:	Remove contaminated clothing. Immediately flush skin with large amounts of water for at least 15 minutes, and follow by washing with soap and water if available. If redness, swelling, pain and/or blisters occur, transport to the nearest medical facility for additional treatment.
Eye Contact	:	Flush eyes with water while holding eyelids open. Rest eyes for 30 minutes. If redness, burning, blurred vision, or swelling persist transport to the nearest medical facility for additional treatment.
Ingestion	:	If swallowed, do not induce vomiting: transport to nearest medical facility for additional treatment. If vomiting occurs spontaneously, keep head below hips to prevent aspiration. Give nothing by mouth. Do not induce vomiting. If any of the following delayed signs and symptoms appear within the next 6 hours, transport to the nearest medical facility: fever greater than 101° F (38.3°C), shortness of breath, chest congestion or continued coughing or wheezing.
Advice to Physician	:	Hydrogen sulphide (H2S) - CNS asphyxiant. May cause rhinitis, bronchitis and occasionally pulmonary oedema after severe exposure. CONSIDER: Oxygen therapy. Consult a Poison Control Center for guidance. Exposure to hydrogen sulphide at concentrations above the recommended occupational exposure standard may cause headache, dizziness, irritation of the eyes, upper respiratory tract, mouth and digestive tract, convulsions, respiratory paralysis, unconsciousness and even death. Call a doctor or poison control center for guidance. Potential for chemical pneumonitis.

5. FIRE-FIGHTING MEASURES

Clear fire area of all non-emergency personnel.

Flash point	:	< 23 °C / 73 °F
Upper / lower Flammability or Explosion limits	:	0.6 - 8 %(V)
Auto ignition temperature	:	> 220 °C / 428 °F
Specific Hazards	:	Hazardous combustion products may include: A complex mixture of airborne solid and liquid particulates and gases (smoke). Oxides of nitrogen. Oxides of sulphur. Unidentified organic and inorganic compounds. Flammable vapours may be present even at temperatures below the flash point. The

vapour is heavier than air, spreads along the ground and distant ignition is possible. Carbon monoxide may be evolved if incomplete combustion occurs. Hydrogen sulphide (H2S) and toxic sulphur oxides may be given off when this material is heated. Do not depend on sense of smell for warning.

Suitable Extinguishing Media	:	Foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only.
Unsuitable Extinguishing Media	:	Do not use direct water jets on the burning product as they could cause a steam explosion and spread of the fire. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam.
Protective Equipment for Firefighters	:	Proper protective equipment including chemical resistant gloves are to be worn; chemical resistant suit is indicated if large contact with spilled product is expected. Self-Contained Breathing Apparatus must be worn when approaching a fire in a confined space. Select fire fighter's clothing approved to relevant Standards (e.g. Europe: EN469).
Additional Advice	:	Keep adjacent containers cool by spraying with water. If possible remove containers from the danger zone. If the fire cannot be extinguished the only course of action is to evacuate immediately.

6. ACCIDENTAL RELEASE MEASURES

Observe the relevant local and international regulations. Remove contaminated clothing. Evacuate the area of all non-essential personnel. Avoid contact with skin, eyes and clothing. Ventilate contaminated area thoroughly. Avoid contact with spilled or released material. For guidance on selection of personal protective equipment see Chapter 8 of this Material Safety Data Sheet. See Chapter 13 for information on disposal.

Protective measures	:	May ignite on surfaces at temperatures above auto-ignition temperature. Do not breathe fumes, vapour. Do not operate electrical equipment. Shut off leaks, if possible without personal risks. Remove all possible sources of ignition in the surrounding area. Use appropriate containment (of product and fire fighting water) to avoid environmental contamination. Prevent from spreading or entering drains, ditches or rivers by using sand, earth, or other appropriate barriers. Attempt to disperse the vapour or to direct its flow to a safe location for example by using fog sprays. Take precautionary measures against static discharge. Ensure electrical continuity by bonding and grounding (earthing) all equipment.
Clean Up Methods	:	For large liquid spills (> 1 drum), transfer by mechanical means such as vacuum truck to a salvage tank for recovery or safe disposal. Do not flush away residues with water. Retain as contaminated waste. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely. For small liquid spills (< 1 drum), transfer by mechanical means to a labelled, sealable container for product recovery or safe disposal. Allow residues to evaporate or soak up with an

appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely.

Additional Advice : Notify authorities if any exposure to the general public or the environment occurs or is likely to occur. Local authorities should be advised if significant spillages cannot be contained. Maritime spillages should be dealt with using a Shipboard Oil Pollution Emergency Plan (SOPEP), as required by MARPOL Annex 1 Regulation 26. U.S. regulations may require reporting releases of this material to the environment which exceed the reportable quantity (refer to Chapter 15) to the National Response Center at (800) 424-8802. Under Section 311 of the Clean Water Act (CWA) this material is considered an oil. As such, spills into surface waters must be reported to the National Response Center at (800) 424-8802. This material is covered by EPA's Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Petroleum Exclusion. Therefore, releases to the environment may not be reportable under CERCLA. For guidance on selection of personal protective equipment see Chapter 8 of this Material Safety Data Sheet. For guidance on disposal of spilled material see Chapter 13 of this Material Safety Data Sheet.

7. HANDLING AND STORAGE

General Precautions : Avoid breathing vapours or contact with material. Only use in well ventilated areas. Wash thoroughly after handling. For guidance on selection of personal protective equipment see Chapter 8 of this Material Safety Data Sheet. Use the information in this data sheet as input to a risk assessment of local circumstances to help determine appropriate controls for safe handling, storage and disposal of this material. Properly dispose of any contaminated rags or cleaning materials in order to prevent fires. Prevent spillages. Use local exhaust ventilation if there is risk of inhalation of vapours, mists or aerosols.

Handling : When using do not eat or drink. Extinguish any naked flames. Do not smoke. Remove ignition sources. Avoid sparks. Never siphon by mouth. The vapour is heavier than air, spreads along the ground and distant ignition is possible. Avoid exposure. Use only non-sparking tools. Use local exhaust ventilation if there is risk of inhalation of vapours, mists or aerosols. Bulk storage tanks should be diked (bunded). Even with proper grounding and bonding, this material can still accumulate an electrostatic charge. If sufficient charge is allowed to accumulate, electrostatic discharge and ignition of flammable air-vapour mixtures can occur. Be aware of handling operations that may give rise to additional hazards that result from the accumulation of static charges. These include but are not limited to pumping (especially turbulent flow), mixing, filtering, splash filling, cleaning and filling of tanks and containers, sampling, switch loading, gauging, vacuum truck

operations, and mechanical movements. These activities may lead to static discharge e.g. spark formation. Restrict line velocity during pumping in order to avoid generation of electrostatic discharge (<= 1 m/s until fill pipe submerged to twice its diameter, then <= 7 m/s). Avoid splash filling. Do NOT use compressed air for filling, discharging, or handling operations.

Storage : Drum and small container storage: Keep containers closed when not in use. Drums should be stacked to a maximum of 3 high. Use properly labelled and closeable containers.
Packaged product must be kept tightly closed and stored in a diked (bunded) well-ventilated area, away from, ignition sources and other sources of heat. Take suitable precautions when opening sealed containers, as pressure can build up during storage. Tank storage: Tanks must be specifically designed for use with this product. Bulk storage tanks should be diked (bunded). Locate tanks away from heat and other sources of ignition. Cleaning, inspection and maintenance of storage tanks is a specialist operation, which requires the implementation of strict procedures and precautions.
Electrostatic charges will be generated during pumping. Electrostatic discharge may cause fire. Ensure electrical continuity by bonding and grounding (earthing) all equipment to reduce the risk. The vapours in the head space of the storage vessel may lie in the flammable/explosive range and hence may be flammable. Refer to section 15 for any additional specific legislation covering the packaging and storage of this product.

Product Transfer : Wait 2 minutes after tank filling (for tanks such as those on road tanker vehicles) before opening hatches or manholes.
Wait 30 minutes after tank filling (for large storage tanks) before opening hatches or manholes.
Avoid splash filling. Keep containers closed when not in use.
Do not use compressed air for filling, discharging or handling.
Contamination resulting from product transfer may give rise to light hydrocarbon vapour in the headspace of tanks that have previously contained gasoline. This vapour may explode if there is a source of ignition. Partly filled containers present a greater hazard than those that are full, therefore handling, transfer and sampling activities need special care.
Refer to guidance under Handling section.

Recommended Materials : For containers, or container linings use mild steel, stainless steel. Aluminium may also be used for applications where it does not present an unnecessary fire hazard. Examples of suitable materials are: high density polyethylene (HDPE), polypropylene (PP), polyvinyl chloride (PVC), polyvinyl fluoride (PVDF), and fluoroelastomers (FKM), e.g. Viton, which have been specifically tested for compatibility with this product. For container linings, or coatings, use Epoxy (amine-cured), or Epoxy Novolac, or Phenolic Epoxy. For seals and gaskets use: fluoroelastomers (FKM), e.g. Viton A, B, or F, or Neoprene

(CR), or nitrile (NBR, HNBR), or graphite, or expanded PTFE (e.g. Gore-Tex).

Unsuitable Materials : Some synthetic materials may be unsuitable for containers or container linings depending on the material specification and intended use. Examples of materials to avoid are: natural rubber (NR), ethylene propylene rubber (EPDM), polymethyl methacrylate (PMMA), polystyrene, polyisobutylene. However, some may be suitable for glove materials.

Container Advice : Do not cut, drill, grind, weld or perform similar operations on or near containers. Containers, even those that have been emptied, can contain explosive vapours.

Additional Information : Ensure that all local regulations regarding handling and storage facilities are followed. Hydrogen sulphide (H2S) and toxic sulphur oxides may be given off when this material is heated. Do not depend on sense of smell for warning. Hydrogen sulphide (H2S or Sour Gas) may be present when loading and unloading transport vessels. Stay upwind and away from newly opened hatches and allow to vent thoroughly before handling material. Steam may be used to vent hatches. Keep all sources of ignition away from loading area.
Use hydrogen sulphide monitors for detection.
See additional references that provide safe handling practices for liquids that are determined to be static accumulators: American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practices on Static Electricity). CENELEC CLC/TR 50404 (Electrostatics – Code of practice for the avoidance of hazards due to static electricity).

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Occupational Exposure Limits

Material	Source	Type	ppm	mg/m3	Notation
n-hexane	ACGIH	TWA	50 ppm		
n-hexane	ACGIH	SKIN_DES			Can be absorbed through the skin.
n-hexane	OSHA Z1	PEL	500 ppm	1,800 mg/m3	
Benzene	ACGIH	TWA	0.5 ppm		
Benzene	ACGIH	STEL	2.5 ppm		
Benzene	ACGIH	SKIN_DES			Can be absorbed through the skin.

Benzene	OSHA	TWA	1 ppm		
Benzene	OSHA	STEL	5 ppm		
Benzene	OSHA	OSHA_ACT	0.5 ppm		
Benzene	SHELL IS	TWA	0.5 ppm	1.6 mg/m3	
Benzene	SHELL IS	STEL	2.5 ppm	8 mg/m3	
Benzene	OSHA Z2	TWA	10 ppm		
Benzene	OSHA Z2	Ceiling	25 ppm		
Benzene	OSHA Z2	MAX. CONC	50 ppm		
Naphthalene	ACGIH	TWA	10 ppm		
Naphthalene	ACGIH	STEL	15 ppm		
Naphthalene	ACGIH	SKIN_DES			Can be absorbed through the skin.
Naphthalene	OSHA Z1	PEL	10 ppm	50 mg/m3	
Ethylbenzene	ACGIH	TWA	20 ppm		
Ethylbenzene	OSHA Z1	PEL	100 ppm	435 mg/m3	
Ethylbenzene	OSHA Z1				Listed.
Hydrogen Sulphide	ACGIH	TWA	1 ppm		
Hydrogen Sulphide	ACGIH	STEL	5 ppm		
Hydrogen Sulphide	OSHA Z2	Ceiling	20 ppm		
Hydrogen Sulphide	OSHA Z2	MAX. CONC	50 ppm		

Additional Information : Skin notation means that significant exposure can also occur by absorption of liquid through the skin and of vapour through the eyes or mucous membranes.
SHELL IS is the Shell Internal Standard. Skin notation means that significant exposure can also occur by absorption of liquid through the skin and of vapour through the eyes or mucous membranes.

Biological Exposure Index (BEI)

Material	Determinant	Sampling Time	BEI	Reference
Benzene	t,t-Muconic acid in Creatinine in urine	Sampling time: End of shift.	500 µg/g	ACGIH BEL (2011)
Benzene	S-Phenylmercapturic acid in Creatinine in urine	Sampling time: End of shift.	25 µg/g	ACGIH BEL (2011)
Ethylbenzene	Sum of mandelic acid and phenylglyoxylic acid in Creatinine in urine	Sampling time: End of shift at end of work week.	0.7 g/g	ACGIH BEL (2011)
Ethylbenzene	Ethyl benzene in End-exhaled air	Sampling time: Not critical.		ACGIH BEL (2011)
n-hexane	2,5-Hexanedion, without hydrolysis in Urine	Sampling time: End of shift at end of work week.	0.4 mg/l	ACGIH BEL (2011)

Exposure Controls : The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include: Use sealed systems as far as possible. Adequate explosion-proof ventilation to control airborne concentrations below the exposure guidelines/limits. Local exhaust ventilation is recommended. Eye washes and showers for emergency use. Firewater monitors and deluge systems are recommended. Always observe good personal hygiene measures, such as washing hands after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping. Define procedures for safe handling and maintenance of controls. Educate and train workers in the hazards and control measures relevant to normal activities associated with this product. Ensure appropriate selection, testing and maintenance of equipment used to control exposure, e.g.

		personal protective equipment, local exhaust ventilation. Drain down system prior to equipment break-in or maintenance. Retain drain downs in sealed storage pending disposal or for subsequent recycle.
Personal Protective Equipment	:	Personal protective equipment (PPE) should meet recommended national standards. Check with PPE suppliers.
Respiratory Protection	:	Respirator selection, use and maintenance should be in accordance with the requirements of the OSHA Respiratory Protection Standard, 29 CFR 1910.134.
Hand Protection	:	Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739) made from the following materials may provide suitable chemical protection: PVC. Longer term protection: Nitrile rubber. Incidental contact/Splash protection: Neoprene rubber. For continuous contact we recommend gloves with breakthrough time of more than 240 minutes with preference for > 480 minutes where suitable gloves can be identified. For short-term/splash protection we recommend the same, but recognise that suitable gloves offering this level of protection may not be available and in this case a lower breakthrough time may be acceptable so long as appropriate maintenance and replacement regimes are followed. Glove thickness is not a good predictor of glove resistance to a chemical as it is dependent on the exact composition of the glove material. Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced.
Eye Protection	:	Chemical splash goggles (chemical monogoggles).
Protective Clothing	:	Chemical resistant gloves/gauntlets, boots, and apron.
Monitoring Methods	:	Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate. Validated exposure measurement methods should be applied by a competent person and samples analysed by an accredited laboratory. Examples of sources of recommended exposure measurement methods are given below or contact the supplier. Further national methods may be available. National Institute of Occupational Safety and Health (NIOSH), USA: Manual of Analytical Methods http://www.cdc.gov/niosh/ Occupational Safety and Health Administration (OSHA), USA: Sampling and Analytical Methods http://www.osha.gov/
Environmental Exposure Controls	:	Local guidelines on emission limits for volatile substances must be observed for the discharge of exhaust air containing vapour. Take appropriate measures to fulfil the requirements of relevant environmental protection legislation. Avoid contamination of the environment by following advice given in Chapter 6. If necessary, prevent undissolved material from

being discharged to waste water. Waste water should be treated in a municipal or industrial waste water treatment plant before discharge to surface water.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	Brown to black. Viscous liquid.
Odour	:	Potential smell of rotten eggs and sulphur..
pH	:	Not applicable
Initial Boiling Point and Boiling Range	:	10 - 400 °C / 50 - 752 °F
Freezing Point	:	Data not available
Flash point	:	< 23 °C / 73 °F
Upper / lower Flammability or Explosion limits	:	0.6 - 8 %(V)
Auto-ignition temperature	:	> 220 °C / 428 °F
Vapour pressure	:	Typical 10 - 70 kPa
Specific gravity	:	Data not available
Water solubility	:	Insoluble.
Solubility in other solvents	:	Data not available
Kinematic viscosity	:	3 - 1,000 mm2/s at 40 °C / 104 °F
Vapour density (air=1)	:	Data not available
Electrical conductivity	:	Low conductivity: < 100 pS/m, The conductivity of this material makes it a static accumulator., A liquid is typically considered nonconductive if its conductivity is below 100 pS/m and is considered semi-conductive if its conductivity is below 10 000 pS/m., Whether a liquid is nonconductive or semi-conductive, the precautions are the same., A number of factors, for example liquid temperature, presence of contaminants, and anti-static additives can greatly influence the conductivity of a liquid.
Other Information	:	Not applicable.
Molecular weight	:	Data not available

10. STABILITY AND REACTIVITY

Stability	:	Stable under normal conditions of use.
Conditions to Avoid	:	Avoid heat, sparks, open flames and other ignition sources.
Materials to Avoid	:	Strong oxidising agents.
Hazardous Decomposition Products	:	Hazardous decomposition products are not expected to form during normal storage. Thermal decomposition is highly dependent on conditions. A complex mixture of airborne solids, liquids and gases including carbon monoxide, carbon dioxide, sulphur oxides and unidentified organic compounds will be evolved when this material undergoes combustion or thermal or oxidative degradation.

11. TOXICOLOGICAL INFORMATION

Basis for Assessment	:	Information given is based on data on the components and the toxicology of similar products.

Unless indicated otherwise, the data presented is representative of the product as a whole, rather than for individual component(s).

Acute Oral Toxicity : Low toxicity: LD50 > 5000 mg/kg , Rat

Acute Dermal Toxicity : Low toxicity: LD50 >2000 mg/kg , Rabbit

Acute Inhalation Toxicity : Extremely toxic: LC100 = 600ppm(v) / 30 min, Man (Hydrogen Sulphide)
Low toxicity by inhalation. (Petroleum, Crude Oil)

Skin Irritation : Not irritating to skin. Prolonged/repeated contact may cause defatting of the skin which can lead to dermatitis.

Eye Irritation : Expected to be moderately irritating to eyes (but insufficient to classify).

Respiratory Irritation : Not expected to be a respiratory irritant.

Sensitisation : Not expected to be a sensitiser.

Repeated Dose Toxicity : Harmful: danger of serious damage to health by prolonged exposure in contact with skin and if swallowed.

Mutagenicity : Not expected to be mutagenic.

Carcinogenicity : Causes cancer in laboratory animals.
Known human carcinogen. May cause leukaemia (AML - acute myelogenous leukemia).

Material	:	**Carcinogenicity Classification**
Crude Oil	:	IARC 3: Not classifiable as to carcinogenicity to humans.
Crude Oil	:	GHS / CLP: No carcinogenicity classification
Hydrogen Sulphide	:	GHS / CLP: No carcinogenicity classification
n-hexane	:	GHS / CLP: No carcinogenicity classification
Benzene	:	ACGIH Group A1: Confirmed human carcinogen.
Benzene	:	NTP: Known To Be Human Carcinogen.
Benzene	:	IARC 1: Carcinogenic to humans.
Benzene	:	GHS / CLP: Carcinogenicity Category 1A
Naphthalene	:	ACGIH Group A4: Not classifiable as a human carcinogen.
Naphthalene	:	NTP: Reasonably Anticipated to be a Human Carcinogen.
Naphthalene	:	IARC 2B: Possibly carcinogenic to humans.
Naphthalene	:	GHS / CLP: Carcinogenicity Category 2
Ethylbenzene	:	ACGIH Group A3: Confirmed animal carcinogen with unknown relevance to humans.
Ethylbenzene	:	IARC 2B: Possibly carcinogenic to humans.
Ethylbenzene	:	GHS / CLP: No carcinogenicity classification

Reproductive and Developmental Toxicity : Not expected to impair fertility. Not expected to be a developmental toxicant.

Additional Information : Classifications by other authorities under varying regulatory frameworks may exist.
Can cause liver damage. (Hydrogen Sulphide)
H2S has a broad range of effects dependent on the airborne concentration and length of exposure: 0.02 ppm odour threshold, smell of rotten eggs; 10 ppm eye and respiratory tract irritation; 100 ppm coughing, headache, dizziness, nausea, eye irritation, loss of sense of smell in minutes; 200

ppm potential for pulmonary oedema after >20-30 minutes; 500 ppm loss of consciousness after short exposures, potential for respiratory arrest; >1000ppm immediate loss of consciousness, may lead rapidly to death, prompt cardiopulmonary resuscitation may be required. Do not depend on sense of smell for warning. H2S causes rapid olfactory fatigue (deadens sense of smell). There is no evidence that H2S will accumulate in the body tissue after repeated exposure.
May cause MDS (Myelodysplastic Syndrome). (Benzene)

12. ECOLOGICAL INFORMATION

Ecotoxicological data have not been determined specifically for this product. Information given is based on a knowledge of the components and the ecotoxicology of similar products. Unless indicated otherwise, the data presented is representative of the product as a whole, rather than for individual component(s).

Acute Toxicity	:	Expected to be harmful: LL/EL/IL50 1-10 mg/l (to aquatic organisms) LL/EL50 expressed as the nominal amount of product required to prepare aqueous test extract.
Chronic Toxicity		
Fish	:	Data not available
Aquatic crustacea	:	Data not available
Mobility	:	If the product enters soil, one or more constituents will or may be mobile and may contaminate groundwater. Contains volatile constituents. Partly evaporates from water or soil surfaces, but a significant proportion will remain after one day. Floats on water and forms a slick.
Persistence/degradability	:	Major constituents are inherently biodegradable, but contains components that may persist in the environment.
Bioaccumulation	:	Contains constituents with the potential to bioaccumulate.
Other Adverse Effects	:	Films formed on water may affect oxygen transfer and damage organisms.

13. DISPOSAL CONSIDERATIONS

Material Disposal	:	Recover or recycle if possible. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations. Do not dispose into the environment, in drains or in water courses. Do not dispose of tank water bottoms by allowing them to drain into the ground. This will result in soil and groundwater contamination. Waste arising from a spillage or tank cleaning should be disposed of in accordance with prevailing regulations, preferably to a recognised collector or contractor. The competence of the collector or contractor should be established beforehand.
Container Disposal	:	Send to drum recoverer or metal reclaimer. Drain container

thoroughly. After draining, vent in a safe place away from sparks and fire. Residues may cause an explosion hazard if heated above the flash point. Do not puncture, cut or weld uncleaned drums. Do not pollute the soil, water or environment with the waste container. Comply with any local recovery or waste disposal regulations.

Local Legislation : Disposal should be in accordance with applicable regional, national, and local laws and regulations. Local regulations may be more stringent than regional or national requirements and must be in compliance.

14. TRANSPORT INFORMATION

US Department of Transportation Classification (49CFR)

Identification number	UN 1267
Proper shipping name	Petroleum crude oil
Class / Division	3
Packing group	I
Emergency Response Guide No .	128

IMDG

Identification number	UN 3494
Proper shipping name	PETROLEUM SOUR CRUDE OIL, FLAMMABLE, TOXIC
Class / Division	3
Subsidiary class/Division	6.1
Packing group	I
Marine Pollutant:	Yes

IATA (Country variations may apply)

Identification number	UN 3494
Proper shipping name	Petroleum sour crude oil, flammable, toxic
Class / Division	3
Subsidiary class/Division	6.1
Packing group	I

15. REGULATORY INFORMATION

The regulatory information is not intended to be comprehensive. Other regulations may apply to this material.

Federal Regulatory Status

Notification Status

EINECS	All components listed or polymer exempt.
DSL	All components listed.
TSCA	All components listed.

Comprehensive Environmental Release, Compensation & Liability Act (CERCLA)

Albian Residual Blend (8002-05-9)	Reportable quantity: 1 lbs
Crude Oil (8002-05-9)	Reportable quantity: 100 lbs
Hydrogen Sulphide (7783-06-4)	Reportable quantity: 100 lbs
n-hexane (110-54-3)	Reportable quantity: 5000 lbs
Benzene (71-43-2)	Reportable quantity: 10 lbs
Naphthalene (91-20-3)	Reportable quantity: 100 lbs
Ethylbenzene (100-41-4)	Reportable quantity: 1000 lbs

Shell classifies this material as an "oil" under the CERCLA Petroleum Exclusion, therefore releases to the environment are not reportable under CERCLA.
The components with RQs are given for information.

Clean Water Act (CWA) Section 311

Hydrogen Sulphide (7783-06-4)	Reportable quantity: 100 lbs
Benzene (71-43-2)	Reportable quantity: 10 lbs
Naphthalene (91-20-3)	Reportable quantity: 100 lbs
Ethylbenzene (100-41-4)	Reportable quantity: 1000 lbs

SARA Toxic Release Inventory (TRI) (313)

Crude Oil (8002-05-9)	100.00%
Hydrogen Sulphide (7783-06-4)	10.00%
n-hexane (110-54-3)	9.99%
Benzene (71-43-2)	8.99%
Naphthalene (91-20-3)	0.99%

Ethylbenzene (100-41-4) 0.99%

SARA Extremely Hazardous Substances (302/304)

Hydrogen Sulphide (7783-06-4)	Reportable quantity: 100 lbs
Hydrogen Sulphide (7783-06-4)	Threshold Planning Quantity: 500 lbs

State Regulatory Status

California Safe Drinking Water and Toxic Enforcement Act (Proposition 65)

This product contains a chemical known to the State of California to cause cancer.
Known to the State of California to cause birth defects or other reproductive harm.

New Jersey Right-To-Know Chemical List

Crude Oil (8002-05-9) 100.00%	Listed.
Hydrogen Sulphide (7783-06-4) 10.00%	Listed.
n-hexane (110-54-3) 9.99%	Listed.
Benzene (71-43-2) 8.99%	Listed.
Naphthalene (91-20-3) 0.99%	Listed.
Ethylbenzene (100-41-4) 0.99%	Listed.

Pennsylvania Right-To-Know Chemical List

Crude Oil (8002-05-9) 100.00%	Listed. Environmental hazard.
Hydrogen Sulphide (7783-06-4) 10.00%	Environmental hazard. Listed.
n-hexane (110-54-3) 9.99%	Listed.
Benzene (71-43-2) 8.99%	Environmental hazard. Listed. Special hazard.
Naphthalene (91-20-3) 0.99%	Environmental hazard. Listed.
Ethylbenzene (100-41-4) 0.99%	Environmental hazard. Listed.

16. OTHER INFORMATION

NFPA Rating (Health, Fire, Reactivity) : 1, 3, 0

Material Safety Data Sheet

SDS Version Number	:	1.1
SDS Effective Date	:	02/13/2014
SDS Revisions	:	A vertical bar (|) in the left margin indicates an amendment from the previous version.
SDS Regulation	:	The content and format of this MSDS is in accordance with the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
SDS Distribution	:	The information in this document should be made available to all who may handle the product.
Disclaimer	:	The information contained herein is based on our current knowledge of the underlying data and is intended to describe the product for the purpose of health, safety and environmental requirements only. No warranty or guarantee is expressed or implied regarding the accuracy of these data or the results to be obtained from the use of the product.

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Albian Heavy Synthetic

Product code : 001B3607
Chemical nature : Crude oil produced by an upgrading process and containing predominantly aliphatic, alicyclic and aromatic hydrocarbons. It may also contain small amounts of nitrogen, oxygen and sulphur compounds.

Manufacturer or supplier's details

Manufacturer/Supplier : **Motiva Enterprises LLC**
PO BOX 4540
Houston TX 77210-4540
USA
SDS Request : (+1) 8772767285
Customer Service :

Emergency telephone number
Spill Information : +1-877-504-9351
Health Information : +1-877-242-7400

Recommended use of the chemical and restrictions on use
Recommended use : Refinery Feedstock.

Restrictions on use : This product must not be used in applications other than those listed in Section 1 without first seeking the advice of the supplier.

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Appearance	liquid
Colour	Brown to black
Odour	Potential smell of rotten eggs and sulphur.
Health Hazards	Harmful: May cause lung damage if swallowed. Vapours may cause drowsiness and dizziness. A component or components of this material may cause cancer. This product contains benzene which may cause leukaemia (AML - acute myelogenous leukaemia). Highly toxic and may be fatal if inhaled. (Hydrogen Sulfide) Repeated exposure may cause skin dryness or cracking May cause MDS (Myelodysplastic Syndrome).
Safety Hazards	Flammable liquid. The vapour is heavier than air, spreads along the ground and distant ignition is possible.Electrostatic charges may be generated during pumping. Electrostatic discharge may cause fire.Hydrogen sulphide (H2S), an extremely flammable and toxic gas, and potentially toxic sulphur oxides may be present.

Environmental Hazards	Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Other Hazards
Flammable liquid
Carcinogen

Other hazards which do not result in classification
None known.

Additional Information
The vapour is heavier than air, spreads along the ground and distant ignition is possible. Electrostatic charges may be generated during pumping. Electrostatic discharge may cause fire. Hydrogen sulphide (H2S), an extremely flammable and toxic gas, and potentially toxic sulphur oxides may be present.

The following percentage of the mixture consists of ingredient(s) with unknown acute oral toxicity:
< 5 %

Potential Health Effects

Inhalation	:	Highly toxic and may be fatal if inhaled. (Hydrogen Sulfide) Vapours may cause drowsiness and dizziness.
Skin	:	Repeated exposure may cause skin dryness or cracking
Eyes	:	Moderately irritating to eyes.
Ingestion	:	Harmful: May cause lung damage if swallowed.
Chronic Exposure	:	A component or components of this material may cause cancer. This product contains benzene which may cause leukaemia (AML - acute myelogenous leukaemia).
Symptoms of Overexposure	:	Defatting dermatitis signs and symptoms may include a burning sensation and/or a dried/cracked appearance. Eye irritation signs and symptoms may include a burning sensation, redness, swelling, and/or blurred vision. If material enters lungs, signs and symptoms may include coughing, choking, wheezing, difficulty in breathing, chest congestion, shortness of breath, and/or fever. The onset of respiratory symptoms may be delayed for several hours after exposure. Breathing of high vapour concentrations may cause central nervous system (CNS) depression resulting in dizziness, light-headedness, headache and nausea. H2S has a broad range of effects dependent on the airborne concentration and length of exposure: 0.02 ppm odour threshold, smell of rotten eggs; 10 ppm eye and respiratory tract irritation; 100 ppm coughing, headache, dizziness, nausea, eye irritation, loss of sense of smell in minutes; 200 ppm potential for pulmonary oedema after >20-30 minutes; 500 ppm loss of consciousness after short exposures, potential for respiratory arrest; >1000ppm immediate loss of

consciousness, may lead rapidly to death, prompt cardiopulmonary resuscitation may be required. Do not depend on sense of smell for warning. H2S causes rapid olfactory fatigue (deadens sense of smell). There is no evidence that H2S will accumulate in the body tissue after repeated exposure.

Environmental Effects

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

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical nature : Crude oil produced by an upgrading process and containing predominantly aliphatic, alicyclic and aromatic hydrocarbons. It may also contain small amounts of nitrogen, oxygen and sulphur compounds.

Hazardous components

Chemical Name	CAS-No.	Concentration [%]
crude oil	8002-05-9	0 - 100
	Not Assigned	0 - 100

Hydrogen sulphide may be present both in the liquid and the vapour. Composition is complex and varies with the source of the crude oil and the contributing process plants at that time., Refer to Chapter 8 for Occupational Exposure Guidelines.

Further information

Contains:

Chemical Name	Identification number	Classification	Concentration [%]
n-Hexane	110-54-3, 203-777-6	Flammable liquids: Category 2, H225 Skin corrosion/irritation: Category 2, H315 Aspiration hazard: Category 1, H304 Specific target organ toxicity - repeated exposure: Category 1 Specific target organ toxicity - single exposure: Category 3, H336 Reproductive toxicity: Category 2, H361 Hazardous to the aquatic environment: Category 2, H411	0 < 2

Ethylbenzene	100-41-4, 202-849-4	Flammable liquids: Category 2, H225 Acute toxicity: Category 4, H332 Skin corrosion/irritation: Category 2, H315 Serious eye damage/eye irritation: Category 2, H319 Aspiration hazard: Category 1, H304 Specific target organ toxicity - single exposure: Category 3, H335 Specific target organ toxicity - repeated exposure: Category 2, H373	0 < 0.5
benzene	71-43-2, 200-753-7	Flammable liquids: Category 2, H225 Skin corrosion/irritation: Category 2, H315 Serious eye damage/eye irritation: Category 2, H319 Germ cell mutagenicity: Category 1B, H340 Specific target organ toxicity - repeated exposure: Category 1, H372 Aspiration hazard: Category 1, H304	0 < 0.5
Cumene	98-82-8, 202-704-5		0 < 0.5
Naphthalene	91-20-3, 202-049-5		0 < 0.5
Hydrogen Sulphide	7783-06-4, 231-977-3	Flammable gas.: Category 1, H220 Acute toxicity: Category 1, H330 Chronic aquatic toxicity: Category 1, H400	0 < 0.01

Further information

NFPA Rating (Health, Fire, Reactivity) 1, 3, 0

SECTION 4. FIRST AID MEASURES

General advice : Vaporisation of H2S that has been trapped in clothing can be

		dangerous to rescuers. Maintain respiratory protection to avoid contamination from the victim to rescuer. Mechanical ventilation should be used to resuscitate if at all possible.
If inhaled	:	Remove to fresh air. If rapid recovery does not occur, transport to nearest medical facility for additional treatment.
In case of skin contact	:	Remove contaminated clothing. Immediately flush skin with large amounts of water for at least 15 minutes, and follow by washing with soap and water if available. If redness, swelling, pain and/or blisters occur, transport to the nearest medical facility for additional treatment.
In case of eye contact	:	Flush eyes with water while holding eyelids open. Rest eyes for 30 minutes. If redness, burning, blurred vision, or swelling persist transport to the nearest medical facility for additional treatment.
If swallowed	:	If swallowed, do not induce vomiting: transport to nearest medical facility for additional treatment. If vomiting occurs spontaneously, keep head below hips to prevent aspiration. Give nothing by mouth. Do NOT induce vomiting. If any of the following delayed signs and symptoms appear within the next 6 hours, transport to the nearest medical facility: fever greater than 101° F (38.3°C), shortness of breath, chest congestion or continued coughing or wheezing.
Most important symptoms and effects, both acute and delayed	:	Defatting dermatitis signs and symptoms may include a burning sensation and/or a dried/cracked appearance. Eye irritation signs and symptoms may include a burning sensation, redness, swelling, and/or blurred vision. If material enters lungs, signs and symptoms may include coughing, choking, wheezing, difficulty in breathing, chest congestion, shortness of breath, and/or fever. The onset of respiratory symptoms may be delayed for several hours after exposure. Breathing of high vapour concentrations may cause central nervous system (CNS) depression resulting in dizziness, light-headedness, headache and nausea. H2S has a broad range of effects dependent on the airborne concentration and length of exposure: 0.02 ppm odour threshold, smell of rotten eggs; 10 ppm eye and respiratory tract irritation; 100 ppm coughing, headache, dizziness, nausea, eye irritation, loss of sense of smell in minutes; 200 ppm potential for pulmonary oedema after >20-30 minutes; 500 ppm loss of consciousness after short exposures, potential for respiratory arrest; >1000ppm immediate loss of consciousness, may lead rapidly to death, prompt cardiopulmonary resuscitation may be required. Do not depend on sense of smell for warning. H2S causes rapid olfactory fatigue (deadens sense of smell). There is no evidence that H2S will accumulate in the body tissue after repeated exposure.
Protection of first-aiders	:	When administering first aid, ensure that you are wearing the

appropriate personal protective equipment according to the incident, injury and surroundings.

Immediate medical attention, special treatment	:	Hydrogen sulphide (H2S) - CNS asphyxiant. May cause rhinitis, bronchitis and occasionally pulmonary oedema after severe exposure. CONSIDER: Oxygen therapy. Consult a Poison Control Center for guidance. Exposure to hydrogen sulphide at concentrations above the recommended oc cupational exposure standard may cause headache, dizziness, irritation of the eyes, upper respiratory tract, mouth and digestive tract, convulsions, respiratory paralysis, unconsciousness and even death. Call a doctor or poison control center for guidance. Potential for chemical pneumonitis.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only.
Unsuitable extinguishing media	:	Do not use direct water jets on the burning product as they could cause a steam explosion and spread of the fire. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam.
Specific hazards during firefighting	:	Hazardous combustion products may include: A complex mixture of airborne solid and liquid particulates and gases (smoke). Oxides of nitrogen Oxides of sulphur. Unidentified organic and inorganic compounds. Flammable vapours may be present even at temperatures below the flash point. The vapour is heavier than air, spreads along the ground and distant ignition is possible. Carbon monoxide may be evolved if incomplete combustion occurs. Hydrogen sulphide (H2S) and other toxic sulphur oxides may be given off when this material is heated. Do not depend on sense of smell for warning.
Specific extinguishing methods	:	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Further information	:	Keep adjacent containers cool by spraying with water. If possible remove containers from the danger zone. If the fire cannot be extinguished the only course of action is to evacuate immediately.
Special protective equipment	:	Proper protective equipment including chemical resistant

for firefighters	gloves are to be worn; chemical resistant suit is indicated if large contact with spilled product is expected. Self-Contained Breathing Apparatus must be worn when approaching a fire in a confined space. Select fire fighter's clothing approved to relevant Standards (e.g. Europe: EN469).

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Notify authorities if any exposure to the general public or the environment occurs or is likely to occur. Local authorities should be advised if significant spillages cannot be contained.
Environmental precautions	:	Shut off leaks, if possible without personal risks. Remove all possible sources of ignition in the surrounding area. Use appropriate containment to avoid environmental contamination. Prevent from spreading or entering drains, ditches or rivers by using sand, earth, or other appropriate barriers. Attempt to disperse the vapor or to direct its flow to a safe location for example by using fog sprays. Take precautionary measures against static discharge. Ensure electrical continuity by bonding and grounding (earthing) all equipment.
Methods and materials for containment and cleaning up	:	For large liquid spills (> 1 drum), transfer by mechanical means such as vacuum truck to a salvage tank for recovery or safe disposal. Do not flush away residues with water. Retain as contaminated waste. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely For small liquid spills (< 1 drum), transfer by mechanical means to a labeled, sealable container for product recovery or safe disposal. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely Remove contaminated soil and dispose of safely.

Observe all relevant local and international regulations.

Additional advice	:	For guidance on selection of personal protective equipment see Chapter 8 of this Material Safety Data Sheet. Notify authorities if any exposure to the general public or the environment occurs or is likely to occur. For guidance on disposal of spilled material see Chapter 13 of this Material Safety Data Sheet. Local authorities should be advised if significant spillages cannot be contained. Maritime spillages should be dealt with using a Shipboard Oil Pollution Emergency Plan (SOPEP), as required by MARPOL Annex 1 Regulation 26. U.S. regulations may require reporting releases of this material to the environment which exceed the reportable quantity (refer to Chapter 15) to the National Response Center at (800) 424-8802. Under Section 311 of the Clean Water Act (CWA) this material

is considered an oil. As such, spills into surface waters must be reported to the National Response Center at (800) 424-8802.
This material is covered by EPA's Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Petroleum Exclusion. Therefore, releases to the environment may not be reportable under CERCLA.

SECTION 7. HANDLING AND STORAGE

General Precautions	:	Avoid breathing of or direct contact with material. Only use in well ventilated areas. Wash thoroughly after handling. For guidance on selection of personal protective equipment see Chapter 8 of this Material Safety Data Sheet. Use the information in this data sheet as input to a risk assessment of local circumstances to help determine appropriate controls for safe handling, storage and disposal of this material. Properly dispose of any contaminated rags or cleaning materials in order to prevent fires. Prevent spillages. Use local exhaust ventilation if there is risk of inhalation of vapours, mists or aerosols.
Precautions for safe handling	:	When using do not eat or drink. Extinguish any naked flames. Do not smoke. Remove ignition sources. Avoid sparks. Never siphon by mouth. The vapour is heavier than air, spreads along the ground and distant ignition is possible. Avoid exposure. Use only non-sparking tools. Use local exhaust ventilation if there is risk of inhalation of vapours, mists or aerosols. Bulk storage tanks should be diked (bunded).
Avoidance of contact	:	Strong oxidising agents.
Product Transfer	:	Wait 2 minutes after tank filling (for tanks such as those on road tanker vehicles) before opening hatches or manholes. Wait 30 minutes after tank filling (for large storage tanks) before opening hatches or manholes. Avoid splash filling Keep containers closed when not in use. Do not use compressed air for filling discharge or handling. Contamination resulting from product transfer may give rise to light hydrocarbon vapour in the headspace of tanks that have previously contained gasoline. This vapour may explode if there is a source of ignition. Partly filled containers present a greater hazard than those that are full, therefore handling, transfer and sampling activities need special care.

Storage

Other data	:	Drum and small container storage:

Keep containers closed when not in use.
Drums should be stacked to a maximum of 3 high.
Use properly labeled and closable containers.
Packaged product must be kept tightly closed and stored in a diked (bunded) well-ventilated area, away from, ignition sources and other sources of heat.
Take suitable precautions when opening sealed containers, as pressure can build up during storage.
Tank storage:
Tanks must be specifically designed for use with this product.
Bulk storage tanks should be diked (bunded).
Locate tanks away from heat and other sources of ignition.
Cleaning, inspection and maintenance of storage tanks is a specialist operation, which requires the implementation of strict procedures and precautions.
Electrostatic charges will be generated during pumping.
Electrostatic discharge may cause fire. Ensure electrical continuity by bonding and grounding (earthing) all equipment to reduce the risk.
The vapours in the head space of the storage vessel may lie in the flammable/explosive range and hence may be flammable.
Refer to section 15 for any additional specific legislation covering the packaging and storage of this product.

Packaging material : Suitable material: For containers, or container linings use mild steel, stainless steel.
Unsuitable material: Some synthetic materials may be unsuitable for containers or container linings depending on the material specification and intended use. Examples of materials to avoid are: natural rubber (NR), nitrile rubber (NBR), ethylene propylene rubber (EPDM), polymethyl methacrylate (PMMA), polystyrene, polyvinyl chloride (PVC), polyisobutylene.

Container Advice : Do not cut, drill, grind, weld or perform similar operations on or near containers.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
n-Hexane	110-54-3	TWA	50 ppm	ACGIH
benzene	71-43-2	TWA	0.5 ppm	ACGIH
		STEL	2.5 ppm	ACGIH
		TWA	10 ppm	OSHA Z-2
		CEIL	25 ppm	OSHA Z-2
		Peak	50 ppm	OSHA Z-2
		PEL	1 ppm	OSHA CARC
		STEL	5 ppm	OSHA CARC

Biological occupational exposure limits

Component	CAS-No.	Control parameters	Biological specimen	Sampling time	Permissible concentration	Basis
n-Hexane	110-54-3	2,5-Hexanedione	Urine	End of shift at end of workweek	0.4 mg/l	ACGIH BEI
benzene	71-43-2	S-Phenylmercapturic acid	Urine	End of shift (As soon as possible after exposure ceases)	0.025 mg/g	ACGIH BEI
Remarks: Creatinine						
benzene		t,t-Muconic acid	Urine	End of shift (As soon as possible after exposure ceases)	0.5 mg/g	ACGIH BEI
Remarks: Creatinine						
Ethylbenzene	100-41-4	Sum of mandelic acid and phenyl glyoxylic acid	Urine	End of shift at end of workweek	700 mg/g	ACGIH BEI
Remarks: Creatinine						
Ethylbenzene		Ethylbenzene	In end-exhaled air	Not critical		ACGIH BEI

Monitoring Methods

Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate.
Validated exposure measurement methods should be applied by a competent person and samples analysed by an accredited laboratory.
Examples of sources of recommended exposure measurement methods are given below or contact the supplier. Further national methods may be available.

National Institute of Occupational Safety and Health (NIOSH), USA: Manual of Analytical Methods http://www.cdc.gov/niosh/
Occupational Safety and Health Administration (OSHA), USA: Sampling and Analytical Methods http://www.osha.gov/

Appropriate engineering controls : The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include:

Use sealed systems as far as possible.
Adequate explosion-proof ventilation to control airborne concentrations below the exposure guidelines/limits.
Local exhaust ventilation is recommended.
Eye washes and showers for emergency use.
Firewater monitors and deluge systems are recommended.
Always observe good personal hygiene measures, such as washing hands after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned.
Practice good housekeeping.
Define procedures for safe handling and maintenance of controls.
Educate and train workers in the hazards and control measures relevant to normal activities associated with this product.
Ensure appropriate selection, testing and maintenance of equipment used to control exposure, e.g. personal protective equipment, local exhaust ventilation.
Drain down system prior to equipment break-in or maintenance.
Retain drain downs in sealed storage pending disposal or for subsequent recycle.

Personal protective equipment

Protective measures

Personal protective equipment (PPE) should meet recommended national standards. Check with PPE suppliers.

Respiratory protection : Respirator selection, use and maintenance should be in accordance with the requirements of the OSHA Respiratory Protection Standard, 29 CFR 1910.134.

Hand protection
Remarks : Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739) made from the following materials may provide suitable chemical protection. PVC. Longer term protection: Nitrile rubber. Incidental contact/Splash protection: Neoprene rubber. For continuous contact we recommend gloves with breakthrough time of more than 240 minutes with preference for > 480 minutes where suitable gloves can be identified. For short-term/splash protection we recommend the same, but recognize that suitable gloves offering this level of protection may not be available and in this case a lower breakthrough time maybe acceptable so long as appropriate maintenance and replacement regimes are followed. Glove thickness is not a good predictor of glove resistance to a chemical as it is dependent on the exact composition of the glove material. Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced.

Eye protection	:	Wear goggles for use against liquids and gas.
Skin and body protection	:	Wear chemical resistant gloves/gauntlets, boots, and apron.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	liquid
Colour	:	Brown to black
Odour	:	Potential smell of rotten eggs and sulphur.
Flash point	:	<= 23 °C / <= 73 °F Method: Unspecified
Flammability (solid, gas)	:	Not applicable
Vapour pressure	:	Data not available
Density	:	888.9 kg/m3 (15.0 °C / 59.0 °F) Method: Unspecified
Auto-ignition temperature	:	> 220 °C / 428 °F
Viscosity		
Viscosity, kinematic	:	3 - 1,000 mm2/s (40 °C / 104 °F) Method: Unspecified
Explosive properties	:	Classification Code: NOT CLASS: Not classified
Oxidizing properties	:	Not applicable
Conductivity	:	Low conductivity: < 100 pS/m, The conductivity of this material makes it a static accumulator., A liquid is typically considered nonconductive if its conductivity is below 100 pS/m and is considered semi-conductive if its conductivity is below 10 000 pS/m., Whether a liquid is nonconductive or semiconductive, the precautions are the same., A number of factors, for example liquid temperature, presence of contaminants, and anti-static additives can greatly influence the conductivity of a liquid.

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	Oxidises on contact with air.
Chemical stability	:	Stable under normal conditions of use.

Conditions to avoid	:	Avoid heat, sparks, open flames and other ignition sources.
Incompatible materials	:	Strong oxidising agents.
Hazardous decomposition products	:	Hazardous decomposition products are not expected to form during normal storage. Thermal decomposition is highly dependent on conditions. A complex mixture of airborne solids, liquids and gases including carbon monoxide, carbon dioxide, sulphur oxides and unidentified organic compounds will be evolved when this material undergoes combustion or thermal or oxidative degradation.

SECTION 11. TOXICOLOGICAL INFORMATION

Basis for assessment	:	Information given is based on data on the components and the toxicology of similar products.Unless indicated otherwise, the data presented is representative of the product as a whole, rather than for individual component(s).

Acute toxicity

Product:

Acute oral toxicity	:	LD 50 rat: > 5,000 mg/kg Remarks: Low toxicity:
Acute inhalation toxicity	:	Remarks: Expected to be of low toxicity if inhaled. Man: Exposure time: 30 min Remarks: Contains hydrogen sulphide. Extremely toxic: LC100 = 600ppm(v)
Acute dermal toxicity	:	LD 50 Rabbit: > 2,000 mg/kg Remarks: Low toxicity:
Acute toxicity (other routes of administration)	:	Remarks: Not expected to be a respiratory irritant.

Skin corrosion/irritation

no data available

Serious eye damage/eye irritation

no data available

Respiratory or skin sensitisation

Product:

Test Method: Skin sensitisation

Remarks: Not expected to be a sensitiser.

Test Method: Respiratory sensitisation
Remarks: Not expected to be a sensitiser.

Germ cell mutagenicity

Product:

Remarks: Not expected to be mutagenic.

Carcinogenicity

Product:

Remarks: Causes cancer in laboratory animals.

Remarks: Known human carcinogen., May cause leukaemia (AML - acute myelogenous leukaemia).

Other Carcinogenicity Classification:

IARC	Group 2B: Possibly carcinogenic to humans	
	Ethylbenzene	100-41-4
	Naphthalene	91-20-3
	Group 1: Carcinogenic to humans	
	benzene	71-43-2
	Group 3: Not classifiable as to its carcinogenicity to humans	
	crude oil	8002-05-9
ACGIH	Confirmed human carcinogen	
	benzene	71-43-2
	Confirmed animal carcinogen with unknown relevance to humans.	
	Ethylbenzene	100-41-4
	Not classifiable as a human carcinogen.	
	Naphthalene	91-20-3
OSHA	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.	
NTP	Reasonably anticipated to be a human carcinogen	
	Naphthalene	91-20-3

Reproductive toxicity

Product:

Remarks: Not expected to impair fertility., Not expected to be a developmental toxicant.

STOT - single exposure

Product:

Remarks: High concentrations may cause central nervous system depression resulting in headaches, dizziness and nausea; continued inhalation may result in unconsciousness and/or death.

STOT - repeated exposure

no data available

Aspiration toxicity

no data available

Further information

Product:

Remarks: Classifications by other authorities under varying regulatory frameworks may exist.

Remarks: H2S has a broad range of effects dependent on the airborne concentration and length of exposure: 0.02 ppm odour threshold, smell of rotten eggs; 10 ppm eye and respiratory tract irritation; 100 ppm coughing, headache, dizziness, nausea, eye irritation, loss of sense of smell in minutes; 200 ppm potential for pulmonary oedema after >20-30 minutes; 500 ppm loss of consciousness after short exposures, potential for respiratory arrest; >1000ppm immediate loss of consciousness, may lead rapidly to death, prompt cardiopulmonary resuscitation may be required. Do not depend on sense of smell for warning. H2S causes rapid olfactory fatigue (deadens sense of smell). There is no evidence that H2S will accumulate in the body tissue after repeated exposure.

Remarks: Contains Benzene, CAS # 71-43-2., May cause MDS (Myelodysplastic Syndrome).

SECTION 12. ECOLOGICAL INFORMATION

Basis for assessment	:	Ecotoxicological data have not been determined specifically for this product. Information given is based on a knowledge of the components and the ecotoxicology of similar products. Unless indicated otherwise, the data presented is representative of the product as a whole, rather than for individual component(s).

Ecotoxicity

Product:

Toxicity to fish (Chronic toxicity)	:	Remarks: NOEC/NOEL expected to be > 0.1 - <= 1.0 mg/l (based on modeled data)
Toxicity to crustacean (Chronic toxicity)	:	Remarks: NOEC/NOEL expected to be > 0.1 - <= 1.0 mg/l (based on modeled data)

Persistence and degradability

Product:

Biodegradability	:	Remarks: Major constituents are inherently biodegradable, but

contains components that may persist in the environment., The volatile constituents will oxidize rapidly by photochemical reactions in air.

Bioaccumulative potential

Product:

Bioaccumulation : Remarks: Contains constituents with the potential to bioaccumulate.

Mobility in soil

Product:

Mobility : Remarks: If the product enters soil, one or more constituents will or may be mobile and may contaminate groundwater., Contains volatile components., Partly evaporates from water or soil surfaces, but a significant proportion will remain after one day., Floats on water and forms a slick.

Other adverse effects

no data available

Product:

Additional ecological information : Films formed on water may affect oxygen transfer and damage organisms.

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues : Recover or recycle if possible.
It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations.
Do not dispose into the environment, in drains or in water courses
Do not dispose of tank water bottoms by allowing them to drain into the ground.
Waste arising from a spillage or tank cleaning should be disposed of in accordance with prevailing regulations, preferably to a recognised collector or contractor. The competence of the collector or contractor should be established beforehand.

Contaminated packaging : Send to drum recoverer or metal reclaimer.
Drain container thoroughly.
After draining, vent in a safe place away from sparks and fire.
Residues may cause an explosion hazard if heated above the flash point. Do not puncture, cut or weld uncleaned drums.
Do not pollute the soil, water or environment with the waste container.
Comply with any local recovery or waste disposal regulations.

Local legislation
Remarks : Disposal should be in accordance with applicable regional, national, and local laws and regulations.
Local regulations may be more stringent than regional or national requirements and must be complied with.

SECTION 14. TRANSPORT INFORMATION

National Regulations

49 CFR

UN/ID/NA number	:	UN 1267
Proper shipping name	:	PETROLEUM CRUDE OIL
Class	:	3
Packing group	:	I
Labels	:	3
Marine pollutant	:	no
Remarks	:	This material is an 'OIL' under 49 CFR Part 130 when transported in a container of 3500 gallon capacity or greater.

International regulation

IATA-DGR

UN/ID No.	:	UN 3494
Proper shipping name	:	PETROLEUM SOUR CRUDE OIL, FLAMMABLE, TOXIC
Class	:	3
Subsidiary risk	:	6.1
Packing group	:	I
Labels	:	3 (6.1)

IMDG-Code

UN number	:	UN 3494
Proper shipping name	:	PETROLEUM SOUR CRUDE OIL, FLAMMABLE, TOXIC
Class	:	3
Subsidiary risk	:	6.1
Packing group	:	I
Labels	:	3 (6.1)
Marine pollutant	:	yes

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied.

Special precautions for user

Remarks : Special Precautions: Refer to Chapter 7, Handling & Storage, for special precautions which a user needs to be aware of or needs to comply with in connection with transport.

Additional Information **:** MARPOL Annex 1 rules apply for bulk shipments by sea.

SECTION 15. REGULATORY INFORMATION

OSHA Hazards : Flammable liquid, Carcinogen

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

CERCLA Reportable Quantity

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
Benzene	71-43-2	10	*
Hydrogen Sulfide	7783-06-4	100	*
Naphthalene	91-20-3	100	*
Ethylbenzene	100-41-4	1000	*
n-Hexane	110-54-3	5000	*

*: Calculated RQ exceeds reasonably attainable upper limit.

CERCLA Reportable Quantity

Calculated RQ exceeds reasonably attainable upper limit.

CERCLA Reportable Quantity

Shell classifies this material as an "oil" under the CERCLA Petroleum Exclusion, therefore releases to the environment are not reportable under CERCLA.

CERCLA Reportable Quantity

The components with RQs are given for information.

SARA 304 Extremely Hazardous Substances Reportable Quantity

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
Hydrogen Sulphide	7783-06-4	100	*

*: Calculated RQ exceeds reasonably attainable upper limit.

SARA 311/312 Hazards : Fire Hazard

SARA 302 : SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

Hydrogen Sulphide	7783-06-4	0.01 %

SARA 313 : The following components are subject to reporting levels established by SARA Title III, Section 313:

n-Hexane	110-54-3	2 %
benzene	71-43-2	0.5 %
Naphthalene	91-20-3	0.5 %
crude oil	8002-05-9	100 %
Hydrogen Sulphide	7783-06-4	0.01 %

Clean Water Act

The following Hazardous Substances are listed under the U.S. CleanWater Act, Section 311, Table 116.4A:

Hydrogen Sulphide	7783-06-4	0.01 %

benzene	71-43-2	0.5 %
Toluene	108-88-3	1 %

The following Hazardous Chemicals are listed under the U.S. CleanWater Act, Section 311, Table 117.3:

Toluene	108-88-3	1 %
benzene	71-43-2	0.5 %
Hydrogen Sulphide	7783-06-4	0.01 %

This product does not contain any toxic pollutants listed under the U.S. Clean Water Act Section 307

US State Regulations

Pennsylvania Right To Know

crude oil	8002-05-9	90 - 100 %
	Not Assigned	90 - 100 %
n-Hexane	110-54-3	1 - 5 %
benzene	71-43-2	0.1 - 1 %
Hydrogen Sulphide	7783-06-4	0 - 0.1 %

New Jersey Right To Know

crude oil	8002-05-9	90 - 100 %
	Not Assigned	90 - 100 %
n-Hexane	110-54-3	1 - 5 %
benzene	71-43-2	0.1 - 1 %
Hydrogen Sulphide	7783-06-4	0 - 0.1 %

California Prop 65 WARNING! This product contains a chemical known to the State of California to cause cancer.

benzene 71-43-2

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

benzene 71-43-2

The components of this product are reported in the following inventories:

TSCA All components are listed on the TSCA Inventory.

SECTION 16. OTHER INFORMATION

Abbreviations and Acronyms : The quoted data are from, but not limited to, one or more sources of information (e.g. toxicological data from Shell Health Services, material suppliers' data, CONCAWE, EU IUCLID date base, EC 1272 regulation, etc).

Further information

NFPA Rating (Health, Fire, Reactivity) 1, 3, 0

This product is intended for use in closed systems only.

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

Shell Canada Limited
Material Safety Data Sheet

Effective Date: 2010-02-15
Supersedes: 2007-02-23


Class B2 Flammable Liquid


Class D2B Skin Irritation


Class D2A Carcinogenicity

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT:	**ALBIAN VACUUM GASOIL BLEND**
SYNONYMS:	AVB Synthetic crude oil is a mixture of paraffins, naphthenes, aromatics and sulphur compounds
PRODUCT USE:	Base product for Petroleum Refining.
PRODUCT CODE:	**873-331**

SUPPLIER
Shell Canada Limited (SCL)
P.O. Box 100, Station M
400-4th Ave. S.W.
Calgary, AB Canada
T2P 2H5

TELEPHONE NUMBERS

Shell Emergency Number	1-800-661-7378
CANUTEC 24 HOUR EMERGENCY NUMBER	1-613-996-6666
For general information:	1-800-661-1600
	www.shell.ca

This MSDS was prepared by the Toxicology and Product Stewardship Section of Shell Canada Limited.
*An asterisk in the product name designates a trade-mark of Shell Brands International AG. Used under license.

2. COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	CAS Number	% Range	WHMIS Controlled
Distillates (petroleum), petroleum residues vacuum	68955-27-1	80 - 90	Yes
Naphtha (Petroleum), Hydrotreated Light	64742-49-0	10 - 20	Yes

See Section 8 for Occupational Exposure Guidelines.

3. HAZARDS IDENTIFICATION

Physical Description: Viscous Liquid Dark Hydrocarbon Odour
Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.
Hazards:

Flammable Liquid.
Irritating to skin.
May cause cancer.

	Exposure to vapours may cause irritation of the eyes. Inhalation of oil mist or vapours from hot oil may cause irritation of the upper respiratory tract.
Handling:	Eliminate all ignition sources. Avoid inhalation of vapours. Wear suitable gloves and eye protection. Bond and ground transfer containers and equipment to avoid static accumulation. Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.

For further information on health effects, see Section 11.

4. FIRST AID MEASURES

Eyes:	Flush eyes with water for at least 15 minutes while holding eyelids open. If irritation occurs and persists, obtain medical attention.
Skin:	Wash contaminated skin with mild soap and water for at least 15 minutes. If irritation occurs and persists, obtain medical attention.
Ingestion:	Do not induce vomiting; get medical help immediately.
Inhalation:	Remove victim from further exposure and restore breathing, if required. Obtain medical attention.
Notes to Physician:	Treatment of exposure should be directed at the control of symptoms and the clinical condition.

5. FIRE FIGHTING MEASURES

Extinguishing Media:	Dry Chemical Carbon Dioxide Foam Water Fog
Firefighting Instructions:	Flammable. Do not use a direct stream of water as it may spread fire. Clear area of unprotected personnel. Vapours may travel along ground and flashback along vapour trail may occur. Containers exposed to intense heat from fires should be cooled with water to prevent vapour pressure buildup, which could result in container rupture. Delayed lung damage can be experienced after exposure to combustion products, sometimes hours after the exposure. Do not enter confined fire space without adequate protective clothing and an approved positive pressure self-contained breathing apparatus. Fight fire from maximum distance.
Hazardous Combustion Products:	A complex mixture of airborne solid, liquid, particulates and gases will evolve when this material undergoes pyrolysis or combustion. Carbon monoxide, carbon dioxide, oxides of nitrogen and oxides of sulphur may be formed on combustion.

6. ACCIDENTAL RELEASE MEASURES

Issue warning "Flammable". See Section 8 for advice on personal protective equipment. Eliminate all ignition sources. Isolate hazard area and restrict access. Stop leak only if safe to do so. Notify appropriate environmental agency(ies). Work upwind of spill if it is safe to do so. Dike and contain land spills; contain

spills to water by booming. Do not wash spills into sewers or other public water systems. For large spills remove by mechanical means and place in containers. Adsorb residue or small spills with adsorbent material and remove to non-leaking containers for disposal. After area has been cleaned up to the satisfaction of regulatory authorities, flush area with water to remove trace residue. Dispose of recovered material as noted under Disposal Considerations.

7. HANDLING AND STORAGE

Handling: Flammable. Fixed equipment as well as transfer containers and equipment should be grounded to prevent accumulation of static charge. Avoid breathing vapours and prolonged or repeated contact with skin. Do not cut, drill, grind, weld or perform similar operations on or near containers. Empty containers are hazardous, may contain flammable/explosive dusts, residues or vapours. Launder contaminated clothing prior to reuse. Wash with soap and water prior to eating, drinking, smoking, applying cosmetics or using toilet facilities. Use good personal hygiene.

Storage: Tank storage should be done according to NFPA Code 30 for crude oils.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

The following, while appropriate for this product, is general in nature. The selection of personal protective equipment will vary depending on the conditions of use.

OCCUPATIONAL EXPOSURE LIMITS (Current ACGIH TLV/TWA unless otherwise noted):
North American exposure limits have not been established for the product. Consult local and provincial authorities for acceptable values.
Polycyclic Aromatic Hydrocarbons (PAH): Shell Canada's internal guideline is 0.02 mg/m3 as an OEL (8-hour TWA).
Petroleum Distillates (Carbon range C9 to C20): Shell Canada's internal guideline is 100 mg/m3 total hydrocarbon as an OEL (8-hour TWA).
Naphtha (Carbon range C3 to C11): Shell Canada's internal guideline is 900 mg/m3 total hydrocarbon as an OEL (8-hour TWA).

Mechanical Ventilation: Use explosion-proof ventilation as required to control vapour concentrations. Concentrations in air should be maintained below the occupational exposure limit if unprotected personnel are involved. Make up air should always be supplied to balance air exhausted (either generally or locally). Local ventilation recommended where general ventilation is ineffective in controlling airborne concentrations below the recommended occupational exposure limit. For personnel entry into confined spaces (i.e. bulk storage tanks) a proper confined space entry procedure must be followed including ventilation and testing of tank atmosphere.

PERSONAL PROTECTIVE EQUIPMENT:

Eye Protection: Chemical safety goggles and/or full face shield to protect eyes and face, if product is handled such that it could be splashed into eyes.

Skin Protection: Avoid contact with skin. Impervious gloves should be worn at all times when handling this product. In confined spaces or where the risk of skin exposure is much higher, impervious clothing should be worn. Use protective clothing and gloves manufactured from nitrile.

Respiratory Avoid breathing vapour or mists. If exposure exceeds occupational exposure limits, use

Protection: an appropriate NIOSH-approved respirator. Depending on airborne concentration, use either a NIOSH-approved chemical cartridge respirator with organic vapour cartridges in combination with a P95 particulate filter or use a NIOSH-approved supplied-air respirator, either self-contained or airline, operated in positive pressure mode.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Viscous Liquid
Appearance:	Dark
Odour:	Hydrocarbon Odour
Odour Threshold:	Not available
Boiling Point:	-25 - 600 °C
Density:	940 kg/m3 @ 15 °C
Specific Gravity (Water = 1):	0.94
pH:	Not available
Flash Point:	< 0 °C
Lower Flammable Limit:	Not available
Upper Flammable Limit:	Not available
Auto-ignition Temperature:	Not available
Viscosity:	350 cSt @ 6 °C
Evaporation Rate (n-BuAc = 1):	Not available
Partition Coefficient (log K_{OW}):	Not available
Water Solubility:	Insoluble
Other Solvents:	Hydrocarbon Solvents

10. STABILITY AND REACTIVITY

Chemically Stable:	Yes
Hazardous Polymerization:	No
Sensitive to Mechanical Impact:	No
Sensitive to Static Discharge:	Yes
Hazardous Decomposition Products:	When heated to decomposition, may emit toxic and corrosive fumes of sulphur oxides, as well as CO, CO2, uncombusted hydrocarbons and soot.
Incompatible Materials:	Avoid strong oxidizing agents.
Conditions of Reactivity:	Avoid excessive heat, formation of vapours or mists.

11. TOXICOLOGICAL INFORMATION

Ingredient (or Product if not specified)	Toxicological Data
Distillates (petroleum), petroleum residues vacuum	LD50 Oral Rat = 4320 mg/kg LD50 Dermal Rat > 2000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Naphtha (Petroleum), Hydrotreated Light	LD50 Oral Rat > 5000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg

Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.
Irritancy: Based on the ingredients, this product is expected to be irritating to skin.

Chronic Effects: Prolonged or repeated contact may cause various forms of dermatitis including folliculitis and oil acne. Prolonged exposure to high vapour concentration can cause headache, dizziness, nausea, blurred vision and central nervous system depression. Long term intensive exposure to oil mist may cause benign lung fibrosis.

Pre-existing Conditions: Pre-existing skin disorders may be aggravated by exposure to components of this product.

Carcinogenicity and Mutagenicity: Carcinogenic hazard. According to the International Agency for Research on Cancer (IARC) this product is considered to be possibly carcinogenic to humans. This product may contain a variety of polycyclic aromatic hydrocarbons (PAH), some of which are associated with the potential of inducing skin cancer. Increasing amounts of PAH may be released if this product is heated above 200 C. A component of this product has produced mutagenic effects.

12. ECOLOGICAL INFORMATION

Environmental Effects: The immediate effect of a release is the physical impairment of the environment from the coating of surfaces, resulting in the disruption of oxygen, water and light to flora and fauna. May cause physical fouling of aquatic and avian organisms. Prolonged exposure may result in the partitioning of light-end hydrocarbon fractions into the water and gas phases of the subsurface soil environment with potential to adversely affect soil and groundwater quality.

Biodegradability: Not readily biodegradable.

13. DISPOSAL CONSIDERATIONS

Waste management priorities (depending on volumes and concentration of waste) are: 1. recycle (reprocess), 2. energy recovery 3. incineration, 4. disposal at a licenced waste disposal facility. Do not attempt to combust waste on-site. Incinerate at a licenced waste disposal site with approval of environmental authority. Landfill adsorbed material in a government approved site.

14. TRANSPORT INFORMATION

Canadian Road and Rail Shipping Classification:

UN Number	UN1268
Proper Shipping Name	PETROLEUM DISTILLATES, N.O.S.
Hazard Class	Class 3 Flammable Liquids
Packing Group	PG I
Shipping Description	PETROLEUM DISTILLATES, N.O.S. Class 3 UN1268 PG I

15. REGULATORY INFORMATION

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

WHMIS Class: Class B2 Flammable Liquid
Class D2B Skin Irritation

Class D2A Carcinogenicity

DSL/NDSL Status: This product, or all components, are listed on the Domestic Substances List, as required under the Canadian Environmental Protection Act.

Other Regulatory Status: The regulatory information is not intended to be comprehensive. Other regulations may apply to this material. For purposes of TSCA, the product is a mixture of certain blending components, all of which are on the TSCA Inventory. Individual shipments of this product will not necessarily contain all of the blending components listed in Section 2 above.

16. OTHER INFORMATION

LABEL STATEMENTS

Hazard Statement : Flammable Liquid.
Irritating to skin.
May cause cancer.

Handling Statement: Eliminate all ignition sources.
Avoid inhalation of vapours.
Wear suitable gloves and eye protection.
Bond and ground transfer containers and equipment to avoid static accumulation.
Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.

First Aid Statement : Wash contaminated skin with soap and water.
Flush eyes with water.
If overcome by vapours remove to fresh air.
Do not induce vomiting.
Obtain medical attention.

Revisions: This MSDS has been reviewed and updated. Changes have been made to: Section 11 Section 15

Section 1: IDENTIFICATION

Product Name:	Access Western Blend
Synonyms:	AWB.
Product Use:	Refinery feedstock.
Restrictions on Use:	Not available.
Manufacturer/Supplier:	Access Pipeline Inc. Suite 1510, 540 – 5th Avenue S.W. Calgary, AB T2P 0M2
Emergency Phone:	1-866-987-3899; Canutec: (613) 996-6666 or Cellular *666
Date of Preparation of SDS:	February 24, 2014

Section 2: HAZARD(S) IDENTIFICATION

GHS INFORMATION

Classification:
Flammable Liquids, Category 2
Skin Irritation, Category 2
Germ Cell Mutagenicity, Category 1B
Carcinogenicity, Category 1A
Toxic to Reproduction, Category 2
Specific Target Organ Toxicity (Single Exposure), Category 3 - Narcotic Effects
Specific Target Organ Toxicity (Repeated Exposure), Category 1

LABEL ELEMENTS

Hazard Pictogram(s):



Signal Word: Danger

Hazard Statements:
Highly flammable liquid and vapor.
Causes skin irritation.
May cause genetic defects.
May cause cancer.
Suspected of damaging fertility or the unborn child.
May cause drowsiness or dizziness.
Causes damage to organs through prolonged or repeated exposure.

Precautionary Statements

Prevention:
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Keep away from heat, sparks, open flames, and hot surfaces. – No smoking.
Keep container tightly closed.
Ground/bond container and receiving equipment.
Use explosion-proof electrical, ventilating, and lighting equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Do not breathe mist, vapors, or spray.

Wash thoroughly after handling.
Do not eat, drink or smoke when using this product.
Use only outdoors or in a well-ventilated area.
Wear protective gloves, protective clothing and eye protection.

Response: If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
If inhaled: Remove person to fresh air and keep comfortable for breathing.
Call a poison center or doctor if you feel unwell.
If skin irritation occurs: Get medical advice/attention.
Wash contaminated clothing before reuse.
In case of fire: Use dry chemical, CO2, water spray or regular foam to extinguish.

Storage: Store in a well-ventilated place. Keep container tightly closed.
Keep cool.
Store locked up.

Disposal: Dispose of contents/container in accordance with applicable regional, national and local laws and regulations.

Hazards Not Otherwise Classified: Not applicable.

Ingredients with Unknown Toxicity: None.

This material is considered hazardous by the OSHA Hazard Communication Standard, (29 CFR 1910.1200).

Section 3: COMPOSITION / INFORMATION ON INGREDIENTS

Hazardous Ingredient(s)	Common name / Synonyms	CAS No.	% wt./wt.
Petroleum	Not available.	8002-05-9	100
Sulfur	Not available.	7704-34-9	1 - 5

Section 4: FIRST-AID MEASURES

Inhalation: If inhaled: Remove person to fresh air and keep comfortable for breathing. Call a poison center or doctor if you feel unwell. If breathing or the heart stops, trained personnel should immediately begin artificial respiration (AR) or cardiopulmonary resuscitation (CPR) respectively. Get medical attention immediately.

Acute and delayed symptoms and effects: May cause drowsiness or dizziness. May cause respiratory irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. Excessive inhalation may cause headache, dizziness, confusion, loss of appetite and/or loss of consciousness. This product contains small amounts of Hydrogen sulphide which may accumulate in confined spaces. Inhalation of Hydrogen sulphide may cause loss of sense of smell, major irritation of the respiratory tract, headache, nausea, vomiting, dizziness, and fluid buildup in the lungs (pulmonary edema), which can be fatal. At 300 ppm unconsciousness may occur after 20

minutes. From 300 to 500 ppm, death can occur within 1 to 4 hours of continuous exposure. At 500 ppm the respiratory system is paralyzed, the victim collapses almost instantaneously, and death can occur after exposure of only 30 to 60 minutes. Above 500 ppm Hydrogen sulphide may cause immediate loss of consciousness; death is rapid, and possibly immediate.

Eye Contact: If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Call a poison center or doctor if you feel unwell.

Acute and delayed symptoms and effects: May cause eye irritation. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision.

Skin Contact: If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. Call a poison center or doctor if you feel unwell. If skin irritation occurs: Get medical advice/attention. Wash contaminated clothing before reuse.

Acute and delayed symptoms and effects: Causes skin irritation. Signs/symptoms may include localized redness, swelling, and itching.

Ingestion: If swallowed: Call a poison center or doctor if you feel unwell. If vomiting occurs naturally, have victim lean forward to reduce the risk of aspiration. Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If breathing or the heart stops, trained personnel should immediately begin artificial respiration (AR) or cardiopulmonary resuscitation (CPR) respectively. Get medical attention immediately.

Acute and delayed symptoms and effects: May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

General Advice: In case of accident or if you feel unwell, seek medical advice immediately (show the label or SDS where possible).

Note to Physicians: Symptoms may not appear immediately. For inhalation of Hydrogen Sulphide, consider oxygen.

Section 5: FIRE-FIGHTING MEASURES

FLAMMABILITY AND EXPLOSION INFORMATION

Highly flammable liquid and vapor. Will be easily ignited by heat, sparks or flames. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks). Vapor explosion hazard indoors, outdoors or in sewers. Runoff to sewer may create fire or explosion hazard. Containers may explode when heated. Many liquids are lighter than water. When heated, this material may evolve toxic and flammable Hydrogen sulphide.

If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

Fire involving Tanks or Car/Trailer Loads: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

Sensitivity to Mechanical Impact: This material is not sensitive to mechanical impact.
Sensitivity to Static Discharge: This material is sensitive to static discharge.

MEANS OF EXTINCTION

Suitable Extinguishing Media: Small Fire: Dry chemical, CO2, water spray or regular foam.

Large Fire: Water spray, fog or regular foam. Move containers from fire area if you can do it without risk.

Unsuitable Extinguishing Media: Do not use straight streams. CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient.

Products of Combustion: Oxides of carbon. Oxides of sulphur. Aldehydes.

Protection of Firefighters: Fire may produce irritating, corrosive and/or toxic gases. Vapors may cause dizziness or suffocation. Runoff from fire control or dilution water may cause pollution. Hydrogen sulphide is heavier than air and may collect in low lying areas and confined spaces. Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters' protective clothing will only provide limited protection.

Section 6: ACCIDENTAL RELEASE MEASURES

Emergency Procedures: As an immediate precautionary measure, isolate spill or leak area for at least 50 meters (150 feet) in all directions. Keep unauthorized personnel away. Stay upwind. Keep out of low areas. Ventilate closed spaces before entering. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). All equipment used when handling the product must be grounded.

Personal Precautions: Do not touch or walk through spilled material. Use personal protection recommended in Section 8. Don full-face, positive pressure, self-contained breathing apparatus.

Environmental Precautions: Prevent entry into waterways, sewers, basements or confined areas.

Methods for Containment: Stop leak if you can do it without risk. A vapor suppressing foam may be used to reduce vapors.

Methods for Clean-Up: Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean non-sparking tools to collect absorbed material.

Other Information: See Section 13 for disposal considerations.

Section 7: HANDLING AND STORAGE

Handling:

Do not swallow. Do not breathe mist, vapors, or spray. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Keep away from heat, sparks, open flames, and hot surfaces. – No smoking. Keep container tightly closed. Ground/bond container and receiving equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Use only outdoors or in a well-ventilated area. Harmful concentrations of hydrogen sulfide (H2S) gas can accumulate in excavations and low-lying areas as well as the vapour space of storage and bulk transport compartments. See Section 8 for information on Personal Protective Equipment.

Storage:

Store in a well-ventilated place. Keep container tightly closed. Store locked up. Store away from incompatible materials. See Section 10 for information on Incompatible Materials. Keep out of the reach of children. Head spaces in storage containers may contain toxic Hydrogen sulphide gas. Structural materials and lighting and ventilation systems should be corrosion resistant.

Section 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines
Component

Petroleum [CAS No. 8002-05-9]

ACGIH: A2; Exposure by all routes should be carefully controlled to levels as low as possible (2009); For Mineral oil, excluding metal working fluids; Poorly and mildly refined

OSHA: 500 ppm (TWA), 2000 mg/m³ (TWA);
400 ppm (TWA) [Vacated];

Sulfur [CAS No. 7704-34-9]

ACGIH: 10 mg/m³ (TWA); Inhalable. 3 mg/m³ (Respirable.); For Particles (Insoluble or Poorly Soluble) Not Otherwise Specified

OSHA: 15 mg/m³ (Total dust) (TWA), 5 mg/m³ (Respirable fraction) (TWA); For Particulates Not Otherwise Regulated (PNOR).

Hexane [CAS No. 110-54-3]

ACGIH: 50 ppm (TWA); Skin, BEI (1996)

OSHA: 500 ppm (TWA), 1800 mg/m³ (TWA); Skin.
50 ppm (TWA) [Vacated];

Benzene [CAS No. 71-43-2]

ACGIH: 0.5 ppm (TWA); 2.5 ppm (STEL); Skin; A1; BEI (1996)

OSHA: 1 ppm (TWA); 5 ppm (STEL);

Toluene [CAS No. 108-88-3]

ACGIH: 20 ppm (TWA); A4; BEI (2006)

OSHA: 200 ppm (TWA); 300 ppm (C); 500 ppm (Peak) (Maximum duration: 10 minutes.)
100 ppm (TWA); 150 ppm (STEL) [Vacated];

Ethylbenzene [CAS No. 100-41-4]

ACGIH: 20 ppm (TWA); A3; BEI (2010)
OSHA: 100 ppm (TWA), 435 mg/m³ (TWA);
125 ppm (STEL) [Vacated];

Xylene [CAS No. 1330-20-7]

ACGIH: 100 ppm (TWA); 150 ppm (STEL); A4; BEI (1992)
OSHA: 100 ppm (TWA), 435 mg/m³ (TWA);
150 ppm (STEL) [Vacated]; For Xylenes.

Hydrogen sulphide [CAS No. 7783-06-4]

ACGIH: 1 ppm (TWA); 5 ppm (STEL); (2009);
OSHA: 20 ppm (C); 50 ppm (Peak) (Maximum duration: 10 mins. once only if no other meas. exp. occurs.)
10 ppm (TWA); 15 ppm (STEL) [Vacated];

TLV: Threshold Limit Value
TWA: Time-Weighted Average
STEL: Short-Term Exposure Limit
C: Ceiling

Engineering Controls: Use ventilation adequate to keep exposures (airborne levels of dust, fume, vapour, gas, etc.) below recommended exposure limits. Use explosion-proof electrical, ventilating, and lighting equipment.

PERSONAL PROTECTIVE EQUIPMENT (PPE)



Eye/Face Protection: Wear safety glasses. Use equipment for eye protection that meets the standards referenced by CSA Standard CAN/CSA-Z94.3-92 and OSHA regulations in 29 CFR 1910.133 for Personal Protective Equipment.

Hand Protection: Wear protective gloves. Consult manufacturer specifications for further information.

Skin and Body Protection: Wear protective clothing. Flame resistant clothing that meets the NFPA 2112 and CAN/CGSB 155.20 standards is recommended in areas where material is stored or handled.

Respiratory Protection: If engineering controls and ventilation are not sufficient to control exposure to below the allowable limits then an appropriate NIOSH/MSHA approved air-purifying respirator that meets the requirements of CSA Standard CAN/CSA-Z94.4-11, with organic vapor cartridge, or self-contained breathing apparatus must be used. Supplied air breathing apparatus must be used when oxygen concentrations are

	low or if airborne concentrations exceed the limits of the air-purifying respirators.
General Hygiene Considerations:	Handle according to established industrial hygiene and safety practices.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Brown liquid.
Colour:	Brown.
Odour:	Petroleum.
Odour Threshold:	0.0047 ppm, (Hydrogen sulphide)
Physical State:	Liquid.
pH:	Not available.
Melting Point / Freezing Point:	Not available.
Initial Boiling Point:	36.4 °C (97.5 °F)
Boiling Range:	36.4 to 288.4 °C (97.5 to 551.1 °F)
Flash Point:	< -15 °C (5 °F) (PMCC)
Evaporation Rate:	Not available.
Flammability (solid, gas):	Not applicable.
Lower Flammability Limit:	1.1 % (Hexane)
Upper Flammability Limit:	7.5 % (Hexane)
Vapor Pressure:	61.5 kPa at 37.8 °C (100 °F) (Reid Vapour Pressure)
Vapor Density:	Not available.
Relative Density:	0.9 to 1 (Water = 1) at 15 °C (59 °F)
Solubilities:	Insoluble in water.
Partition Coefficient: n-Octanol/Water:	Not available.
Auto-ignition Temperature:	Not available.
Decomposition Temperature:	Not available.
Viscosity:	90 to 100 cSt at 30 °C (86 °F)
Percent Volatile, wt. %:	Not available.
VOC content, wt. %:	Not available.
Density:	900 to 1000 kg/m³
Coefficient of Water/Oil Distribution:	Not available.

Section 10: STABILITY AND REACTIVITY

Reactivity: Contact with incompatible materials. Sources of ignition. Exposure to heat.

Chemical Stability: Stable under normal storage conditions.

Possibility of Hazardous Reactions: None known.

Conditions to Avoid: Contact with incompatible materials. Sources of ignition. Exposure to heat.

Incompatible Materials: Strong acids. Strong oxidizers. Halogens.

Hazardous Decomposition Products: Hazardous sulphur dioxide, and related oxides of sulphur may be generated upon combustion.

Section 11: TOXICOLOGICAL INFORMATION

EFFECTS OF ACUTE EXPOSURE

Product Toxicity

Oral: Not available.

Dermal: Not available.

Inhalation: Not available.

Component Toxicity

Component	CAS No.	LD_{50} oral	LD_{50} dermal	LC_{50}
Petroleum	8002-05-9	4300 mg/kg (rat)	Not available.	Not available.
Sulfur	7704-34-9	> 8437 mg/kg (rat)	Not available.	Not available.
Hexane	110-54-3	25000 mg/kg (rat)	Not available.	48000 ppm (rat); 4H
Benzene	71-43-2	930 mg/kg (rat)	> 9400 µl/kg (rabbit)	10000 ppm (rat); 7H
Toluene	108-88-3	600 mg/kg (rat)	14.1 mL/kg (rabbit)	49000 mg/m³ (rat); 4H
Ethylbenzene	100-41-4	3500 mg/kg (rat)	17800 µl/kg (rabbit)	Not available.
Xylene	1330-20-7	4300 mg/kg (rat)	> 1700 mg/kg (rabbit)	5000 ppm (rat); 4H
Hydrogen sulphide	7783-06-4	Not available.	Not available.	444 ppm (rat); 4H

Likely Routes of Exposure: Eye contact. Skin contact. Inhalation. Ingestion. Skin absorption.

Target Organs: Skin. Eyes. Gastrointestinal tract. Respiratory system. Lungs. Blood. Cardiovascular system. Bone marrow. Liver. Reproductive system. Nervous system.

Symptoms (including delayed and immediate effects)

Inhalation: May cause drowsiness or dizziness. May cause respiratory irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. Excessive inhalation may cause headache, dizziness, confusion, loss of appetite and/or loss of consciousness. This product

contains small amounts of Hydrogen sulphide which may accumulate in confined spaces. Inhalation of Hydrogen sulphide may cause loss of sense of smell, major irritation of the respiratory tract, headache, nausea, vomiting, dizziness, and fluid buildup in the lungs (pulmonary edema), which can be fatal. At 300 ppm unconsciousness may occur after 20 minutes. From 300 to 500 ppm, death can occur within 1 to 4 hours of continuous exposure. At 500 ppm the respiratory system is paralyzed, the victim collapses almost instantaneously, and death can occur after exposure of only 30 to 60 minutes. Above 500 ppm Hydrogen sulphide may cause immediate loss of consciousness; death is rapid, and possibly immediate.

Eye: May cause eye irritation. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision.

Skin: Causes skin irritation. Signs/symptoms may include localized redness, swelling, and itching.

Ingestion: May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

Skin Sensitization: Not available.

Respiratory Sensitization: Not available.

Medical Conditions Aggravated By Exposure: Not available.

EFFECTS OF CHRONIC EXPOSURE (from short and long-term exposure)

Target Organs: Skin. Eyes. Gastrointestinal tract. Respiratory system. Lungs. Blood. Cardiovascular system. Bone marrow. Liver. Kidneys. Reproductive system. Nervous system.

Chronic Effects: Hazardous by OSHA/WHMIS criteria. May cause chronic effects. Prolonged or repeated contact may dry skin and cause irritation. High vapour concentrations, generally greater than 10% by volume, may sensitize the heart and lead to lethal cardiac arrhythmias. Repeated dermal application of crude oils in rats produced systemic toxicity in blood, liver, thymus and bone marrow. Chronic inhalation of n-Hexane may cause peripheral nerve disorders and central nervous system effectsReports of chronic poisoning with Benzene, Toluene, Ethylbenzene or Xylene describe anemia, decreased blood cell count and bone marrow hypoplasia. Liver and kidney damage may occur. Repeated exposure of the eyes to high concentrations of Xylenes vapour may cause reversible eye damage. Chronic inhalation exposure to xylene causes mid-frequency hearing loss in laboratory animals. Xylene reacts synergistically with n-hexane to enhance hearing loss. Hydrogen sulphide may reduce lung function; cause neurological effects such as headaches, nausea, depression and personality changes; eye and mucous membrane irritation: damage to cardiovascular system.

Carcinogenicity: May cause cancer. Lifetime skin painting studies in animals with whole crude oils and crude oil fractions have produced tumours in animals following prolonged and repeated skin contact. Chronic exposure to

benzene has been associated with an increased incidence of leukemia and multiple myeloma (tumour composed of cells of the type normally found in the bone marrow).

Component Carcinogenicity

Component	ACGIH	IARC	NTP	OSHA	Prop 65
Petroleum	A2	Group 3	List 1	OSHA Carcinogen.	Listed.
Benzene	A1	Group 1	List 1	OSHA Carcinogen.	Listed.
Toluene	A4	Group 3	Not listed.	Not listed.	Not listed.
Ethylbenzene	A3	Group 2B	Not listed.	OSHA Carcinogen.	Listed.
Xylene	A4	Group 3	Not listed.	Not listed.	Not listed.

Mutagenicity: May cause genetic defects.

Reproductive Effects: Suspected of damaging fertility or the unborn child. Studies exist which report a link to crude oil and reproductive effects including menstrual disorders.

Developmental Effects

Teratogenicity: Not available.

Embryotoxicity: Possible risk of harm to the unborn child. Repeated dermal application of crude oils to pregnant rats produced maternal toxicity and fetal developmental toxicity and fetal tumours. Benzene and Xylene have caused adverse fetal effects in laboratory animals. Exposure to Toluene may affect the developing fetus.

Toxicologically Synergistic Materials: Xylene reacts synergistically with n-hexane to enhance hearing loss.

Section 12: ECOLOGICAL INFORMATION

Ecotoxicity: Petroleum: 21 and 41 mg/l, 96 hr., Rainbow trout;

Petroleum: 2.7 and 4.1 mg/l, 96 hr., Mysid;

Petroleum: 122 and 528 ml/kg, 96 hr., Algae.

Persistence / Degradability: Not available.

Bioaccumulation / Accumulation: Not available.

Mobility in Environment: Not available.

Other Adverse Effects: Not available.

Section 13: DISPOSAL CONSIDERATIONS

Disposal Instructions: Disposal should be in accordance with applicable regional, national and local laws and regulations. Local regulations may be more stringent than regional or national requirements.

Section 14: TRANSPORT INFORMATION

U.S. Department of Transportation (DOT)

Proper Shipping Name: UN1267, PETROLEUM CRUDE OIL, 3, PG I

Class: 3

UN Number: UN1267

Packing Group: I

Label Code:



Canada Transportation of Dangerous Goods (TDG)

Proper Shipping Name: UN1267, PETROLEUM CRUDE OIL, 3, PG I

Class: 3

UN Number: UN1267

Packing Group: I

Label Code:



Section 15: REGULATORY INFORMATION

Chemical Inventories

US (TSCA)
The components of this product are in compliance with the chemical notification requirements of TSCA.

Canada (DSL)
The components of this product are in compliance with the chemical notification requirements of the NSN Regulations under CEPA, 1999.

Federal Regulations

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

WHMIS Classification:
Class B2 - Flammable Liquids.
Class D2A - Carcinogenicity.
Class D2A - Embryotoxicity.
Class D2A - Mutagenicity.
Class D2A - Chronic toxic effects.
Class D2B - Skin irritant.

Hazard Symbols:



United States

This SDS has been prepared to meet the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200.

SARA Title III

Component	Section 302 (EHS) TPQ (lbs.)	Section 304 EHS RQ (lbs.)	CERCLA RQ (lbs.)	Section 313	RCRA CODE	CAA 112(r) TQ (lbs.)
Hexane	Not listed.	Not listed.	5000	313	Not listed.	Not listed.
Benzene	Not listed.	Not listed.	10	313	U019	Not listed.
Toluene	Not listed.	Not listed.	1000	313	U220	Not listed.
Ethylbenzene	Not listed.	Not listed.	1000	313	Not listed.	Not listed.
Xylene	Not listed.	Not listed.	100	313	U239	Not listed.
Hydrogen sulphide	500	100	100	313s	U135	10000

State Regulations

Massachusetts

US Massachusetts Commonwealth's Right-to-Know Law (Appendix A to 105 Code of Massachusetts Regulations Section 670.000)

Component	CAS No.	RTK List
Petroleum	8002-05-9	Listed.
Sulfur	7704-34-9	Listed.
Hexane	110-54-3	Listed.
Benzene	71-43-2	E
Toluene	108-88-3	Listed.
Ethylbenzene	100-41-4	Listed.
Xylene	1330-20-7	Listed.
Hydrogen sulphide	7783-06-4	E

Note: E = Extraordinarily Hazardous Substance

New Jersey

US New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)

Component	CAS No.	RTK List
Petroleum	8002-05-9	SHHS
Sulfur	7704-34-9	Listed.
Hexane	110-54-3	SHHS
Benzene	71-43-2	SHHS
Toluene	108-88-3	SHHS
Ethylbenzene	100-41-4	SHHS
Xylene	1330-20-7	SHHS
Hydrogen sulphide	7783-06-4	SHHS

Note: SHHS = Special Health Hazard Substance

Pennsylvania

US Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)

Component	CAS No.	RTK List
Petroleum	8002-05-9	Listed.
Sulfur	7704-34-9	Listed.
Hexane	110-54-3	Listed.

Benzene	71-43-2	ES
Toluene	108-88-3	E
Ethylbenzene	100-41-4	E
Xylene	1330-20-7	E
Hydrogen sulphide	7783-06-4	E

Note: E = Environmental Hazard; S = Special Hazardous Substance

California

California Prop 65: WARNING: This product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

Component	**Type of Toxicity**
Petroleum	cancer
Benzene	cancer; developmental, male
Toluene	developmental; female
Ethylbenzene	cancer

Section 16: OTHER INFORMATION

Disclaimer:
The information contained in this document applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to satisfy oneself as to the suitability and completeness of this information for his own particular use.

Date of Preparation of SDS: February 24, 2014

SDS Expiry Date (Canada): February 23, 2017

Version: 1.0

GHS SDS Prepared by: **Deerfoot Consulting Inc.**
Phone: (403) 720-3700

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : SUNCOR BHB

Manufacturer or supplier's details

SUNCOR ENERGY INC.
P.O. Box 2844, 150 - 6th Avenue South-West
Calgary Alberta T2P 3E3
Canada

Emergency telephone number

Suncor Energy: +1 403-296-3000;
Poison Control Centre: Consult local telephone directory for emergency number(s).

Recommended use of the chemical and restrictions on use

Recommended use : Refinery Feedstock

Prepared by : Product Safety: +1 905-804-4752

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Form	liquid
Colour	black
Odour	hydrocarbon-like
Hazard Summary	Flammable liquid Irritating to eyes and skin. May cause sensitisation by skin contact. Contains material that may adversely affect the developing foetus. Contains material that may cause adverse reproductive effects. Contains material which may cause cancer based on animal data.

Potential Health Effects

Primary Routes of Entry : Inhalation
Eye contact
Skin Absorption
Skin contact
Ingestion

Target Organs : Respiratory system
Central nervous system
Eyes
Skin

Inhalation : Inhalation of high vapour concentrations may cause

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symptoms like headache, dizziness, tiredness, nausea and vomiting.
Inhalation may cause central nervous system effects.

Skin : May cause allergic skin reaction.
May cause skin irritation.

Eyes : May cause eye irritation.

Ingestion : Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea.
Aspiration hazard if swallowed - can enter lungs and cause damage.

Aggravated Medical Condition : None known.

Carcinogenicity:

IARC Group 1: Carcinogenic to humans

Benzene	71-43-2
1,3-BUTADIENE	106-99-0

Group 2B: Possibly carcinogenic to humans

Ethylbenzene	100-41-4

OSHA OSHA specifically regulated carcinogen

Benzene	71-43-2
1,3-BUTADIENE	106-99-0

NTP Known to be human carcinogen

Benzene	71-43-2
1,3-BUTADIENE	106-99-0

ACGIH Confirmed human carcinogen

Benzene	71-43-2

Suspected human carcinogen

1,3-BUTADIENE	106-99-0

Confirmed animal carcinogen with unknown relevance to humans

Ethylbenzene	100-41-4

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Hazardous components

Chemical Name	CAS-No.	Concentration (%)
Bitumens	128683-24-9	60 - 80 %
Natural gas condensates	68919-39-1	0 - 40 %
Naphtha (oil sand), hydrotreated	128683-33-0	0 - 40 %
pentane	109-66-0	10 - 15 %
2-methylbutane	78-78-4	10 - 15 %
n-hexane	110-54-3	5 - 10 %

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n-heptane	142-82-5	5 - 10 %
n-octane	111-65-9	5 - 10 %
butane	106-97-8	3 - 7 %
isobutane	75-28-5	1 - 5 %
sulfur	7704-34-9	<= 3.5 %
xylene	1330-20-7	0.5 - 1.5 %
benzene	71-43-2	0.5 - 1.5 %
1,3-butadiene	106-99-0	0.1 - 1 %
methylcyclohexane	108-87-2	1 - 5 %
cyclohexane	110-82-7	1 - 5 %
cyclopentane	287-92-3	1 - 5 %
methylcyclopentane	96-37-7	1 - 5 %
trimethylbenzene	25551-13-7	1 - 5 %
toluene	108-88-3	1 - 5 %
ethylbenzene	100-41-4	0.1 - 1 %

Contains trace amounts of Polycyclic aromatic hydrocarbons, some of which are suspected carcinogens., Product may contain trace amounts of hydrogen sulphide

SECTION 4. FIRST AID MEASURES

If inhaled : Move to fresh air.
Artificial respiration and/or oxygen may be necessary.
Seek medical advice.

In case of skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Wash skin thoroughly with soap and water or use recognized skin cleanser.
Wash contaminated clothing before reuse.
Seek medical advice.

In case of eye contact : Remove contact lenses.
Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
Obtain medical attention.

If swallowed : Rinse mouth with water.
Never give anything by mouth to an unconscious person.
DO NOT induce vomiting unless directed to do so by a physician or poison control center.
Seek medical advice.

Most important symptoms and effects, both acute and delayed : First aider needs to protect himself.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media : Carbon dioxide (CO2)
Foam
Dry chemical

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Unsuitable extinguishing media	:	No information available.
Specific hazards during firefighting	:	Cool closed containers exposed to fire with water spray.
Hazardous combustion products	:	Carbon oxides (CO, CO2), sulphur oxides (SOx), sulphur compounds (H2S), hydrocarbons, smoke and irritating vapours as products of incomplete combustion.
Specific extinguishing methods	:	Prevent fire extinguishing water from contaminating surface water or the ground water system.
Special protective equipment for firefighters	:	Wear self-contained breathing apparatus for firefighting if necessary.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Use personal protective equipment. Ensure adequate ventilation. Evacuate personnel to safe areas. Material can create slippery conditions.
Environmental precautions	:	If the product contaminates rivers and lakes or drains inform respective authorities.
Methods and materials for containment and cleaning up	:	Prevent further leakage or spillage if safe to do so. Remove all sources of ignition. Soak up with inert absorbent material. Non-sparking tools should be used. Ensure adequate ventilation. Contact the proper local authorities.

SECTION 7. HANDLING AND STORAGE

Advice on safe handling	:	For personal protection see section 8. Persons with a history of skin sensitisation problems or asthma, allergies, chronic or recurrent respiratory disease should not be employed in any process in which this mixture is being used. Smoking, eating and drinking should be prohibited in the application area. In case of insufficient ventilation, wear suitable respiratory equipment. Avoid contact with skin, eyes and clothing. Do not ingest. Keep away from heat and sources of ignition. Keep container closed when not in use.
Conditions for safe storage	:	Store in original container. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Keep in a dry, cool and well-ventilated place. Keep in properly labelled containers. To maintain product quality, do not store in heat or direct

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sunlight.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
xylene	1330-20-7	TWA	100 ppm	ACGIH
		STEL	150 ppm	ACGIH
		TWA	100 ppm	ACGIH
		STEL	150 ppm	ACGIH
benzene	71-43-2	TWA	0.5 ppm 1.6 mg/m3	CA AB OEL
		STEL	2.5 ppm 8 mg/m3	CA AB OEL
		TWA	0.5 ppm	CA BC OEL
		STEL	2.5 ppm	CA BC OEL
		TWA	0.5 ppm	CA ON OEL
		STEL	2.5 ppm	CA ON OEL
		TWAEV	1 ppm 3 mg/m3	CA QC OEL
		STEV	5 ppm 15.5 mg/m3	CA QC OEL
		TWA	0.5 ppm	ACGIH
		STEL	2.5 ppm	ACGIH
		TWA	0.1 ppm	NIOSH REL
		ST	1 ppm	NIOSH REL
		TWA	10 ppm	OSHA Z-2
		CEIL	25 ppm	OSHA Z-2
		Peak	50 ppm	OSHA Z-2
		PEL	1 ppm	OSHA CARC
		STEL	5 ppm	OSHA CARC
		TWA	0.5 ppm	ACGIH
		STEL	2.5 ppm	ACGIH
		TWA	0.1 ppm	NIOSH REL
		ST	1 ppm	NIOSH REL
		TWA	10 ppm	OSHA Z-2
		CEIL	25 ppm	OSHA Z-2
		Peak	50 ppm	OSHA Z-2
		PEL	1 ppm	OSHA CARC
		STEL	5 ppm	OSHA CARC
butane	106-97-8	TWA	1,000 ppm	CA AB OEL
		TWA	600 ppm	CA BC OEL
		STEL	750 ppm	CA BC OEL
		TWAEV	800 ppm 1,900 mg/m3	CA QC OEL
		TWA	800 ppm 1,900 mg/m3	NIOSH REL
		TWA	800 ppm 1,900 mg/m3	OSHA P0

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		TWA	800 ppm 1,900 mg/m3	NIOSH REL
		TWA	800 ppm 1,900 mg/m3	OSHA P0
Bitumens	128683-24-9	TWA	5 mg/m3	
pentane	109-66-0	TWAEV	120 ppm 350 mg/m3	CA QC OEL
		TWA	120 ppm 350 mg/m3	NIOSH REL
		C	610 ppm 1,800 mg/m3	NIOSH REL
		TWA	1,000 ppm 2,950 mg/m3	OSHA Z-1
		TWA	600 ppm 1,800 mg/m3	OSHA P0
		STEL	750 ppm 2,250 mg/m3	OSHA P0
		TWA	120 ppm 350 mg/m3	NIOSH REL
		C	610 ppm 1,800 mg/m3	NIOSH REL
		TWA	1,000 ppm 2,950 mg/m3	OSHA Z-1
		TWA	600 ppm 1,800 mg/m3	OSHA P0
		STEL	750 ppm 2,250 mg/m3	OSHA P0
isobutane	75-28-5	TWA	800 ppm 1,900 mg/m3	NIOSH REL
		TWA	800 ppm 1,900 mg/m3	NIOSH REL
2-methylbutane	78-78-4	TWA	600 ppm 1,770 mg/m3	CA AB OEL
n-hexane	110-54-3	TWA	50 ppm 176 mg/m3	CA AB OEL
		TWA	20 ppm	CA BC OEL
		TWAEV	50 ppm 176 mg/m3	CA QC OEL
		TWA	50 ppm	ACGIH
		TWA	50 ppm 180 mg/m3	NIOSH REL
		TWA	500 ppm 1,800 mg/m3	OSHA Z-1
		TWA	50 ppm 180 mg/m3	OSHA P0
		TWA	50 ppm	ACGIH
		TWA	50 ppm 180 mg/m3	NIOSH REL
		TWA	500 ppm 1,800 mg/m3	OSHA Z-1
		TWA	50 ppm 180 mg/m3	OSHA P0
1,3-butadiene	106-99-0	TWA	2 ppm 4.4 mg/m3	CA AB OEL
		TWA	2 ppm	CA BC OEL

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		TWAEV	2 ppm 4.4 mg/m3	CA QC OEL
		TWA	2 ppm	ACGIH
		TWA	1 ppm	OSHA Z-1
		STEL	5 ppm	OSHA Z-1
		PEL	1 ppm	OSHA CARC
		STEL	5 ppm	OSHA CARC
		TWA	2 ppm	ACGIH
		TWA	1 ppm	OSHA Z-1
		STEL	5 ppm	OSHA Z-1
		PEL	1 ppm	OSHA CARC
		STEL	5 ppm	OSHA CARC
n-heptane	142-82-5	TWA	400 ppm	CA BC OEL
		STEL	500 ppm	CA BC OEL
		TWAEV	400 ppm 1,640 mg/m3	CA QC OEL
		STEV	500 ppm 2,050 mg/m3	CA QC OEL
		TWA	85 ppm 350 mg/m3	NIOSH REL
		C	440 ppm 1,800 mg/m3	NIOSH REL
		TWA	500 ppm 2,000 mg/m3	OSHA Z-1
		TWA	400 ppm 1,600 mg/m3	OSHA P0
		STEL	500 ppm 2,000 mg/m3	OSHA P0
		TWA	85 ppm 350 mg/m3	NIOSH REL
		C	440 ppm 1,800 mg/m3	NIOSH REL
		TWA	500 ppm 2,000 mg/m3	OSHA Z-1
		TWA	400 ppm 1,600 mg/m3	OSHA P0
		STEL	500 ppm 2,000 mg/m3	OSHA P0
n-octane	111-65-9	TWA	300 ppm 1,400 mg/m3	CA AB OEL
		TWAEV	300 ppm 1,400 mg/m3	CA QC OEL
		STEV	375 ppm 1,750 mg/m3	CA QC OEL
		TWA	300 ppm	ACGIH
		TWA	75 ppm 350 mg/m3	NIOSH REL
		C	385 ppm 1,800 mg/m3	NIOSH REL
		TWA	500 ppm 2,350 mg/m3	OSHA Z-1
		TWA	300 ppm 1,450 mg/m3	OSHA P0
		STEL	375 ppm 1,800 mg/m3	OSHA P0

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		TWA	300 ppm	ACGIH
		TWA	75 ppm 350 mg/m3	NIOSH REL
		C	385 ppm 1,800 mg/m3	NIOSH REL
		TWA	500 ppm 2,350 mg/m3	OSHA Z-1
		TWA	300 ppm 1,450 mg/m3	OSHA P0
		STEL	375 ppm 1,800 mg/m3	OSHA P0
methylcyclohexane	108-87-2	TWA	400 ppm 1,610 mg/m3	CA AB OEL
		TWA	400 ppm	CA BC OEL
		TWAEV	400 ppm 1,610 mg/m3	CA QC OEL
		TWA	400 ppm	ACGIH
		TWA	400 ppm 1,600 mg/m3	NIOSH REL
		TWA	500 ppm 2,000 mg/m3	OSHA Z-1
		TWA	400 ppm 1,600 mg/m3	OSHA P0
		TWA	400 ppm	ACGIH
		TWA	400 ppm 1,600 mg/m3	NIOSH REL
		TWA	500 ppm 2,000 mg/m3	OSHA Z-1
		TWA	400 ppm 1,600 mg/m3	OSHA P0
cyclohexane	110-82-7	TWA	100 ppm 344 mg/m3	CA AB OEL
		TWA	100 ppm	CA BC OEL
		TWAEV	300 ppm 1,030 mg/m3	CA QC OEL
		TWA	100 ppm	ACGIH
		TWA	300 ppm 1,050 mg/m3	NIOSH REL
		TWA	300 ppm 1,050 mg/m3	OSHA Z-1
		TWA	300 ppm 1,050 mg/m3	OSHA P0
		TWA	100 ppm	ACGIH
		TWA	300 ppm 1,050 mg/m3	NIOSH REL
		TWA	300 ppm 1,050 mg/m3	OSHA Z-1
		TWA	300 ppm 1,050 mg/m3	OSHA P0
cyclopentane	287-92-3	TWA	600 ppm 1,720 mg/m3	CA AB OEL
		TWA	600 ppm	CA BC OEL
		TWAEV	600 ppm 1,720 mg/m3	CA QC OEL
		TWA	600 ppm	ACGIH

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		TWA	600 ppm 1,720 mg/m3	NIOSH REL
		TWA	600 ppm 1,720 mg/m3	OSHA P0
		TWA	600 ppm	ACGIH
		TWA	600 ppm 1,720 mg/m3	NIOSH REL
		TWA	600 ppm 1,720 mg/m3	OSHA P0
trimethylbenzene	25551-13-7	TWA	25 ppm 123 mg/m3	CA AB OEL
		TWAEV	25 ppm 123 mg/m3	CA QC OEL
		TWA	25 ppm	ACGIH
		TWA	25 ppm 125 mg/m3	OSHA P0
		TWA	25 ppm	ACGIH
		TWA	25 ppm 125 mg/m3	OSHA P0
toluene	108-88-3	TWA	50 ppm 188 mg/m3	CA AB OEL
		TWA	20 ppm	CA BC OEL
		TWAEV	50 ppm 188 mg/m3	CA QC OEL
		TWA	20 ppm	ACGIH
		TWA	100 ppm 375 mg/m3	NIOSH REL
		ST	150 ppm 560 mg/m3	NIOSH REL
		TWA	200 ppm	OSHA Z-2
		CEIL	300 ppm	OSHA Z-2
		Peak	500 ppm	OSHA Z-2
		TWA	100 ppm 375 mg/m3	OSHA P0
		STEL	150 ppm 560 mg/m3	OSHA P0
		TWA	20 ppm	ACGIH
		TWA	100 ppm 375 mg/m3	NIOSH REL
		ST	150 ppm 560 mg/m3	NIOSH REL
		TWA	200 ppm	OSHA Z-2
		CEIL	300 ppm	OSHA Z-2
		Peak	500 ppm	OSHA Z-2
		TWA	100 ppm 375 mg/m3	OSHA P0
		STEL	150 ppm 560 mg/m3	OSHA P0
ethylbenzene	100-41-4	TWA	100 ppm 434 mg/m3	CA AB OEL
		STEL	125 ppm 543 mg/m3	CA AB OEL
		TWA	20 ppm	CA BC OEL
		STEV	125 ppm 543 mg/m3	CA QC OEL

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		TWAEV	100 ppm 434 mg/m3	CA QC OEL
		TWA	100 ppm	ACGIH
		STEL	125 ppm	ACGIH
		TWA	100 ppm 435 mg/m3	NIOSH REL
		ST	125 ppm 545 mg/m3	NIOSH REL
		TWA	100 ppm 435 mg/m3	OSHA Z-1
		TWA	100 ppm 435 mg/m3	OSHA P0
		STEL	125 ppm 545 mg/m3	OSHA P0
		TWA	100 ppm	ACGIH
		STEL	125 ppm	ACGIH
		TWA	100 ppm 435 mg/m3	NIOSH REL
		ST	125 ppm 545 mg/m3	NIOSH REL
		TWA	100 ppm 435 mg/m3	OSHA Z-1
		TWA	100 ppm 435 mg/m3	OSHA P0
		STEL	125 ppm 545 mg/m3	OSHA P0
hydrogen sulphide	7783-06-4	TWA	10 ppm 14 mg/m3	CA AB OEL
		(c)	15 ppm 21 mg/m3	CA AB OEL
		C	10 ppm	CA BC OEL
		TWA	10 ppm	CA ON OEL
		STEL	15 ppm	CA ON OEL
		TWAEV	10 ppm 14 mg/m3	CA QC OEL
		STEV	15 ppm 21 mg/m3	CA QC OEL
		TWA	1 ppm	ACGIH
		STEL	5 ppm	ACGIH
		C	10 ppm 15 mg/m3	NIOSH REL
		CEIL	20 ppm	OSHA Z-2
		Peak	50 ppm	OSHA Z-2
		TWA	10 ppm 14 mg/m3	OSHA P0
		STEL	15 ppm 21 mg/m3	OSHA P0
		TWA	1 ppm	ACGIH
		STEL	5 ppm	ACGIH
		C	10 ppm 15 mg/m3	NIOSH REL
		CEIL	20 ppm	OSHA Z-2
		Peak	50 ppm	OSHA Z-2
		TWA	10 ppm 14 mg/m3	OSHA P0

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		STEL	15 ppm 21 mg/m3	OSHA P0

Biological occupational exposure limits

Component	CAS-No.	Control parameters	Biological specimen	Sampling time	Permissible concentration	Basis
Toluene	108-88-3	Toluene	In blood	Prior to last shift of workweek	0.02 mg/l	ACGIH BEI
Toluene		Toluene	Urine	End of shift (As soon as possible after exposure ceases)	0.03 mg/l	ACGIH BEI
Toluene	108-88-3	Toluene	In blood	Prior to last shift of workweek	0.02 mg/l	ACGIH BEI
		Toluene	Urine	End of shift (As soon as possible after exposure ceases)	0.03 mg/l	ACGIH BEI

Engineering measures : Ensure adequate ventilation, especially in confined areas.

Personal protective equipment

Respiratory protection : Use respiratory protection unless adequate local exhaust ventilation is provided or exposure assessment demonstrates that exposures are within recommended exposure guidelines. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Filter type : Wear a NIOSH-approved respirator/breathing apparatus in situations where there may be potential for airborne exposure.

Hand protection
Material : neoprene, nitrile.
Remarks : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Eye protection : Wear face-shield and protective suit for abnormal processing problems.
Ensure that eyewash stations and safety showers are close to

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the workstation location.

Skin and body protection	:	Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place.
Protective measures	:	Wash contaminated clothing before re-use. No special protective equipment required.
Hygiene measures	:	Remove and wash contaminated clothing and gloves, including the inside, before re-use. Wash face, hands and any exposed skin thoroughly after handling.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	liquid
Colour	:	black
Odour	:	hydrocarbon-like
Odour Threshold	:	No data available
pH	:	No data available
Melting point/range	:	No data available
Initial boiling point and boiling range	:	> 31 °C (88 °F) Method: ASTM D-86
Flash point	:	< -35 °C (-31 °F) Method: ASTM D 93, closed cup
Fire Point	:	No data available
Auto-Ignition Temperature	:	No data available
Evaporation rate	:	No data available
Flammability	:	Easily ignites under almost all normal temperature conditions. Extremely flammable in presence of open flames, sparks, shocks, heat, oxidizing materials. Vapours are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks), and may travel considerable distance to sources of ignition and flash back.
Upper explosion limit	:	No data available
Lower explosion limit	:	No data available
Vapour pressure	:	40 - 50 kPa (37.8 °C / 100.0 °F) Method: ASTM D6377
Relative vapour density	:	No data available
Density	:	915 - 940 kg/m3 (15.56 °C / 60.01 °F)
Solubility(ies)		

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Water solubility	:	insoluble
Partition coefficient: n-octanol/water	:	Pow: estimated < 1
Viscosity		
Viscosity, kinematic	:	estimated 63.5 mm2/s (40 °C / 104 °F)
		estimated 268.5 mm2/s (15.5 °C / 59.9 °F) Method: ASTM D 445
Explosive properties	:	Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Vapours may form explosive mixtures with air. Runoff to sewer may create fire or explosion hazard. Liquid may accumulate static charge.

SECTION 10. STABILITY AND REACTIVITY

Possibility of hazardous reactions	:	Hazardous polymerisation does not occur. Stable under normal conditions.
Conditions to avoid	:	Extremes of temperature and direct sunlight.
Incompatible materials	:	Reactive with oxidising agents.
Hazardous decomposition products	:	May release COx, SOx, H2S, hydrocarbons, smoke and irritating vapours when heated to decomposition.

SECTION 11. TOXICOLOGICAL INFORMATION

Acute toxicity

Product:

Acute oral toxicity	:	Remarks: No data available
Acute inhalation toxicity	:	Remarks: No data available
Acute dermal toxicity	:	Remarks: No data available

Components:

Natural gas condensates:

Acute oral toxicity	:	LD50 Rat: 14,000 mg/kg,
Acute inhalation toxicity	:	LC50 Rat: > 5.2 mg/l Exposure time: 4 h

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pentane:

Acute oral toxicity	:	LD50 Rat: > 2,000 mg/kg,
Acute inhalation toxicity	:	LC50 Rat: 364 mg/l Exposure time: 4 h

2-methylbutane:

Acute inhalation toxicity	:	LC50 Rat: 280 mg/l Exposure time: 4 h

n-hexane:

Acute oral toxicity	:	LD50 Rat: 15,840 mg/kg,
Acute inhalation toxicity	:	LC50 Rat: 48000 ppm Exposure time: 4 h
Acute dermal toxicity	:	LD50 Rabbit: > 3,295 mg/kg,

butane:

Acute inhalation toxicity	:	LC50 Rat: 658 mg/l Exposure time: 4 h Test atmosphere: gas

isobutane:

Acute inhalation toxicity	:	LC50 Rat: 658,000 mg/m3 Exposure time: 4 h Test atmosphere: gas

xylene:

Acute oral toxicity	:	LD50 Rat: 4,300 mg/kg,
Acute inhalation toxicity	:	LC50 Rat: 5000 ppm Exposure time: 4 h Test atmosphere: vapour
Acute dermal toxicity	:	LD50 Rabbit: > 1,700 mg/kg,

benzene:

Acute oral toxicity	:	LD50 Rat: 930 mg/kg,
Acute inhalation toxicity	:	LC50 Rat: 13700 ppm Exposure time: 4 h Test atmosphere: vapour
Acute dermal toxicity	:	LD50 Rabbit: > 8,240 mg/kg,

toluene:

Acute oral toxicity	:	LD50 Rat: 636 mg/kg,

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Acute inhalation toxicity	:	LC50 Rat: 7585 ppm Exposure time: 4 h Test atmosphere: vapour
Acute dermal toxicity	:	LD50 Rabbit: 12,125 mg/kg,

ethylbenzene:

Acute oral toxicity	:	LD50 Rat: 3,500 mg/kg,
Acute inhalation toxicity	:	LC50 Rat: 4000 ppm Exposure time: 4 h Test atmosphere: vapour
Acute dermal toxicity	:	LD50 Rabbit: 15,380 mg/kg,

Skin corrosion/irritation

Product:

Remarks: No data available

Components:

2-methylbutane:
Result: Mild skin irritation

sulfur:
Result: Moderate skin irritant

xylene:
Result: Skin irritation

benzene:
Result: Moderate skin irritant

toluene:
Result: Moderate skin irritant

ethylbenzene:
Result: Moderate skin irritant

Serious eye damage/eye irritation

Product:

Remarks: No data available

Components:

2-methylbutane:
Result: Mild eye irritation

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sulfur:
Result: Moderate eye irritation

benzene:
Result: Moderate eye irritation

toluene:
Result: Mild eye irritation

ethylbenzene:
Result: Mild eye irritation

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

No data available

Reproductive toxicity

No data available

Bitumens:
Natural gas condensates:
Naphtha (oil sand), hydrotreated:
pentane:
2-methylbutane:
n-hexane:
n-heptane:
n-octane:
butane:
isobutane:
sulfur:
xylene:
benzene:
1,3-butadiene:
methylcyclohexane:
cyclohexane:
cyclopentane:
methylcyclopentane:
trimethylbenzene:
toluene:
ethylbenzene:

STOT - single exposure

No data available

STOT - repeated exposure

No data available

Aspiration toxicity

No data available

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SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Product:

Toxicity to fish	:	Remarks: No data available
Toxicity to daphnia and other aquatic invertebrates	:	Remarks: No data available
Toxicity to algae	:	Remarks: No data available
Toxicity to bacteria	:	Remarks: No data available

Components:

n-hexane :

Toxicity to fish	:	LC50 (Fish): 4.12 mg/l Exposure time: 96 h
Toxicity to daphnia and other aquatic invertebrates	:	EC50 (Daphnia (water flea)): 3.87 mg/l Exposure time: 48 h

Persistence and degradability

Product:

Biodegradability	:	Remarks: No data available

No data available

Bioaccumulative potential

Product:

Partition coefficient: n-octanol/water	:	Pow: estimated < 1

Components:

pentane :

Partition coefficient: n-octanol/water	:	log Pow: 3.39

butane :

Partition coefficient: n-octanol/water	:	log Pow: 2.89

isobutane :

Partition coefficient: n-octanol/water	:	log Pow: 2.76

Mobility in soil

No data available

Other adverse effects

No data available

SECTION 13. DISPOSAL CONSIDERATIONS

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Disposal methods

Waste from residues	:	The product should not be allowed to enter drains, water courses or the soil. Offer surplus and non-recyclable solutions to a licensed disposal company. Waste must be classified and labelled prior to recycling or disposal. Send to a licensed waste management company. Dispose of as hazardous waste in compliance with local and national regulations. Dispose of product residue in accordance with the instructions of the person responsible for waste disposal.

SECTION 14. TRANSPORT INFORMATION

International Regulation

IATA-DGR

UN/ID No.	:	1993
Proper shipping name	:	Flammable liquid, n.o.s. (Naphtha)
Class	:	3
Packing group	:	I
Labels	:	3
Packing instruction (cargo aircraft)	:	361

IMDG-Code

UN number	:	1993
Proper shipping name	:	FLAMMABLE LIQUID, N.O.S. (Naphtha)
Class	:	3
Packing group	:	I
Labels	:	3
EmS Code	:	F-E, S-E
Marine pollutant	:	no

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied.

49 CFR

UN/ID/NA number	:	1993
Proper shipping name	:	Flammable liquids, n.o.s. (Naphtha)
Class	:	3
Packing group	:	I
Labels	:	3
ERG Code	:	128
Marine pollutant	:	no

TDG

UN number	:	1993

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Proper shipping name	:	FLAMMABLE LIQUID, N.O.S. (Naphtha)
Class	:	3
Packing group	:	I
Labels	:	3
ERG Code	:	128
Marine pollutant	:	no

Special precautions for user

Not applicable

SECTION 15. REGULATORY INFORMATION

OSHA Hazards	:	Flammable liquid, Skin sensitiser, Moderate eye irritant, Carcinogen, Moderate skin irritant
WHMIS Classification	:	B2: Flammable liquid D2A: Very Toxic Material Causing Other Toxic Effects D2B: Toxic Material Causing Other Toxic Effects Flammable liquid Teratogen Carcinogen Moderate eye irritant Skin sensitiser Mutagen Moderate skin irritant

The components of this product are reported in the following inventories:

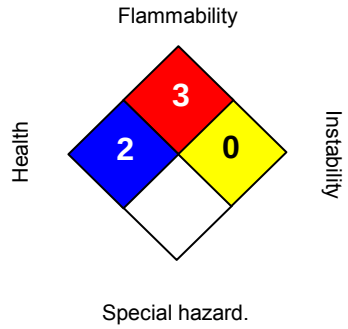
DSL	All components of this product are on the Canadian DSL.

SECTION 16. OTHER INFORMATION

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Further information

NFPA:



HMIS III:

HEALTH	2*
FLAMMABILITY	3
PHYSICAL HAZARD	0
PERSONAL PROTECTION	H

0 = not significant, 1 =Slight,
2 = Moderate, 3 = High
4 = Extreme, * = Chronic

For Copy of (M)SDS : Internet: www.petro-canada.ca/msds
Canada-wide: telephone: 1-800-668-0220; fax: 1-800-837-1228
For Product Safety Information: 1 905-804-4752

Prepared by : Product Safety: +1 905-804-4752

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

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SECTION 1 – MATERIAL IDENTIFICATION

Material Name: HEAVY CRUDE OIL/DILUENT MIX
Synonyms: Bow River (BR); Cold Lake Blend (CLB); Christina Lake Dil-bit Blend (CDB), Christina Lake Blend (CSB); Western Canadian Blend (WCB); Western Canadian Select (WCS); Wabasca Heavy (WH)
Use: Process stream, fuels and lubricants production
WHMIS Classification: Class B, Div. 2, Class D, Div. 2, Sub-Div. A and B
NFPA: **Fire**: 2 **Reactivity**: 0 **Health**: 3
TDG Shipping Name: Petroleum Crude Oil
TDG Class: 3 **UN**: 1267
TDG Packing Group: II (boiling point 35 deg. C or above, and flash point less than 23 deg. C)
Manufacturer/Supplier: CENOVUS ENERGY INC.
500 Centre Street SE, PO Box 766
Calgary, AB T2P 0M5
Emergency Telephone: 1-877-458-8080, CANUTEC 1-613-996-6666 (Canada)
Chemical Description: A naturally occurring mixture of paraffins, naphthalenes, aromatic hydrocarbons and small amounts of sulphur and nitrogen compounds mixed with condensate

SECTION 2 – HAZARDOUS INGREDIENTS OF MATERIAL

Hazardous Ingredients	Approximate Concentrations (%)	C.A.S. Nos.	LD50/LC50 Specify Species & Route	Exposure Limits
Bitumen	50 – 90	8052-42-4		5 mg/m^3 (OEL, PEL oil mist)
Hydrocarbon Diluent	10 – 50	N.Av.	N.Av.	900 mg/m^3 (OEL)*
Benzene	0.03 - 0.3	71-43-2	LD50, rat, oral, 930 mg/kg LC50, rat, 4 hr, 13200 ppm	0.5 ppm (OEL, TLV) 10 ppm (PEL)
Hydrogen Sulphide§	<0.1	7783-06-04	LC50, rat, 4 hrs, 444 ppm	10 ppm (OEL), 1 ppm (TLV), 20 ppm (PEL-C)

OEL = AB Occupational Exposure Limit; TLV = ACGIH Threshold Limit Value; PEL = OSHA Permissible Exposure Limit; C = Ceiling; *OEL for gasoline; §Hydrogen Sulfide in liquid, vapour phase may contain higher concentrations

SECTION 3 – PHYSICAL DATA FOR MATERIAL

Physical State: Liquid
Specific Gravity: 0.91 – 0.94
Vapour Density (air=1): 2.5 -5.0 (estimated)
Percent Volatiles, (v/v): 15 - 30 (estimated)
pH: N.Av.
Vapour Pressure, Reid (kPa): 76 @ 38ºC
Odour Threshold (ppm): N.Av.
Evaporation Rate: N.Av.
Boiling Pt. (deg.C): 35 – 180ºC
Freezing Pt. (deg.C): <20
Coefficient of Water/Oil Distribution: <0.1
Odour & Appearance: Brown/black liquid, hydrocarbon odour
(N.Av. = not available N.App. = not applicable)

SECTION 4 – FIRE AND EXPLOSION

Flammability: Yes **Conditions**: Material will ignite at normal temperatures.
Means of Extinction: Foam, CO_2, dry chemical. Explosive accumulations can build up in areas of poor ventilation.
Special Procedures: Use water spray to cool fire-exposed containers, and to disperse vapors if spill has not ignited. Cut off fuel and allow flame to burn out.
Flash Point (deg.C) & Method: <-35 (PMCC)
Upper Explosive Limit (% by vol.): 8 (estimated)
Lower Explosive Limit (% by vol.): 0.8 (estimated)
Auto-Ignition Temp. (deg.C): 250 (estimated)
Sensitivity to Impact: No
Sensitivity to Static Discharge: Yes, at normal temperatures
TDG Flammability Classification: 3
Hazardous Combustion Products: Carbon monoxide, carbon dioxide, sulphur oxides

SECTION 5 – REACTIVITY DATA

Chemical Stability: Stable **Conditions**: Heat
Incompatibility: Yes **Substances**: Oxidizing agents (e.g. chlorine)
Reactivity: Yes **Conditions**: Heat, strong sunlight
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide, sulphur oxides

SECTION 6 – TOXICOLOGICAL PROPERTIES OF PRODUCT

Routes of Entry:
Skin Absorption : Yes **Skin Contact**: Yes **Eye Contact**: Yes
Inhalation: **Acute**: Yes **Chronic**: Yes **Ingestion**: Yes
Effects of Acute Exposure: Vapour may cause irritation of eyes, nose and throat, dizziness and drowsiness. Contact with skin may cause irritation and possibly dermatitis. Contact of liquid with eyes may cause severe irritation/burns.
Effects of Chronic Exposure: Due to presence of benzene, long term exposure may increase the risk of anemia and leukemia. Repeated skin contact may increase the risk of skin cancer.
Sensitization to Product: No.
Exposure Limits of Product: 0.5 ppm (OEL for benzene)
Irritancy: Yes
Synergistic Materials: None reported
Carcinogenicity: Yes **Reproductive Effects**: Possibly **Teratogenicity**: Possibly **Mutagenicity**: Possibly

SECTION 7 – PREVENTIVE MEASURES

Personal Protective Equipment: Use positive pressure self-contained breathing apparatus, supplied air breathing apparatus or cartridge air purifying respirator approved for organic vapours where concentrations may exceed exposure limits (note: cartridge respirator not suitable for hydrogen sulfide, oxygen deficiency or IDLH situations) – see also Storage below).
Gloves: Viton (nitrile adequate for short exposure to liquid)
Eye: Chemical splash goggles. **Footwear**: As per safety policy **Clothing**: As per fire protection policy
Engineering Controls: Use only in well ventilated areas. Mechanical ventilation required in confined areas. Equipment must be explosion proof.
Leaks & Spills: Stop leak if safe to do so. Use personal protective equipment. Use water spray to cool containers. Remove all ignition sources. Provide explosion-proof clearing ventilation, if possible. Prevent from entering confined spaces. Dyke and pump into containers for recycling or disposal. Notify appropriate regulatory authorities.
Waste Disposal: Contact appropriate regulatory authorities for disposal requirements.
Handling Procedures & Equipment: Avoid contact with liquid. Avoid inhalation. Bond and ground all transfers. Avoid sparking conditions.
Storage Requirements: Store in a cool, dry, well ventilated area away from heat, strong sunlight, and ignition sources.
Special Shipping Provisions: N.App.

Caution: Hydrogen sulfide may accumulate in headspaces of tanks and other equipment, even when concentrations in the liquid product are low. Overexposure to hydrogen sulphide may cause dizziness, headache, nausea and possibly unconsciousness and death. Factors increasing this risk include heating, agitation and contact of the liquid with acids or acid salts. Assess the exposure risk by gas monitoring. Wear air supplying breathing apparatus if necessary.

SECTION 8 – FIRST AID MEASURES

Skin: Flush skin with water, removing contaminated clothing. Get medical attention if irritation persists or large area of contact. Decontaminate clothing before re-use.

Eye: Immediately flush with large amounts of lukewarm water for 15 minutes, lifting upper and lower lids at intervals. Seek medical attention if irritation persists.

Inhalation: Ensure own safety. Remove victim to fresh air. Give oxygen, artificial respiration, or CPR if needed. Seek medical attention immediately.

Ingestion: Give 2-3 glasses of milk or water to drink. DO NOT INDUCE VOMITING. Keep warm and at rest. Get immediate medical attention.

SECTION 9 – PREPARATION DATE OF MSDS

Prepared By: Cenovus Energy Inc. Health and Safety
Phone Number: 1-403-766-2000
Preparation Date: April 10, 2013

Material Safety Data Sheet

1. Product and company identification

Product name

Canadian Heavy Oil

This material can contain hydrogen sulfide (H_2S), a very toxic and extremely flammable gas.

Note: Released levels of hydrogen sulfide (H2S) are dependent on a variety of factors and cannot be fully predicted based on dissolved H2S levels.

Crude oil is a naturally occurring complex mixture of hydrocarbons whose exact composition and physical properties can vary widely depending upon its source.

MSDS #

0000003736

Code

0000003736

Product use

Refinery feedstock
For specific application advice see appropriate Technical Data Sheet or consult our company representative.

Synonyms

Crude oil; Petroleum distillate; PETROLEUM OIL, Canadian Heavy Oil, Dilbit, Dilsynbit

Supplier

BP Canada Energy Trading Company
240 - 4th Avenue S.W.
P.O. Box 200
Calgary, Alberta
T2P 2H8
Canada

EMERGENCY HEALTH INFORMATION:

1 (800) 447-8735
Outside the US: + 1 703 527 3887(CHEMTREC)

EMERGENCY SPILL INFORMATION:

1 (613) 996-6666 CANUTEC (Canada)

OTHER PRODUCT INFORMATION

1 (866) 4 BP - MSDS
(866-427-6737 Toll Free - North America)
email: bpcares@bp.com

2. Hazards identification

Physical state

Viscous liquid.

Color

Brown.

Emergency overview

DANGER !

FLAMMABLE LIQUID AND VAPOR.
HARMFUL IF ABSORBED THROUGH SKIN.
INHALATION CAUSES HEADACHES, DIZZINESS, DROWSINESS AND NAUSEA AND MAY LEAD TO UNCONSCIOUSNESS.
CAUSES EYE AND SKIN IRRITATION.
MAY CAUSE RESPIRATORY TRACT IRRITATION.
HARMFUL OR FATAL IF SWALLOWED.
CAN ENTER LUNGS AND CAUSE DAMAGE.
CONTAINS MATERIAL THAT CAN CAUSE TARGET ORGAN DAMAGE.
CANCER HAZARD - CONTAINS MATERIAL WHICH CAN CAUSE CANCER.
CONTAINS MATERIAL WHICH MAY CAUSE HERITABLE GENETIC EFFECTS.
ASPIRATION HAZARD.
BIRTH HAZARD - CONTAINS MATERIAL WHICH MAY CAUSE BIRTH DEFECTS

Flammable liquid. Harmful in contact with skin and if swallowed. Prolonged or repeated contact can defat the skin and lead to irritation and/or dermatitis. Aspiration hazard if swallowed. Can enter lungs and cause damage. Keep away from heat, sparks and flame. Avoid exposure - obtain special instructions before use. Do not breathe vapor or mist. Do not ingest. If ingested, do not induce vomiting. Do not get in eyes. Avoid contact with skin and clothing. Contains material which can cause cancer. Risk of cancer depends on duration and level of exposure. Contains material which may cause heritable genetic effects. Contains material which can cause birth defects. Use only with adequate ventilation. Keep container tightly closed and sealed until ready

for use. Wash thoroughly after handling.

Routes of entry Dermal contact. Eye contact. Inhalation. Ingestion.

Potential health effects

Eyes Causes eye irritation.

Skin Causes skin irritation. Prolonged or repeated contact can defat the skin and lead to irritation and/or dermatitis. See toxicological information (Section 11) .

Inhalation Vapors may cause drowsiness and dizziness. Can cause central nervous system (CNS) depression. May cause respiratory tract irritation.

Ingestion Harmful if swallowed. Aspiration hazard if swallowed. Can enter lungs and cause damage.

See toxicological information (Section 11)

3. Composition/information on ingredients

Contains 20-30% Diluent. (typical value)

Ingredient name	CAS #	%
Crude Oil: complex hydrocarbon mixture comprising mainly of aliphatic, naphthenic and aromatic hydrocarbons.	8002-05-9	60 - 80
.		
Natural gas condensates (petroleum)	64741-47-5	0 - 30
Naphtha (petroleum), light straight-run.	64741-46-4	0 - 20
Naphtha (petroleum), heavy straight-run.	64741-41-9	0 - 20
Naphtha (petroleum), hydrotreated light	64742-49-0	0 - 20
naphtha (petroleum), hydrotreated heavy	64742-48-9	0 - 20
Distillates (petroleum), hydrotreated middle	64742-46-7	0 - 10
Pentane	109-66-0	0 - 10
Butane	106-97-8	0 - 5
Hexane, other isomers	None assigned.	0 - 5
n-hexane	110-54-3	0 - 5
Heptane	142-82-5	0 - 5
methylcyclohexane	108-87-2	0 - 5
Benzene	71-43-2	0 - 1
Toluene	108-88-3	0 - 1
xylene	1330-20-7	0 - 1
Ethylbenzene	100-41-4	0 - 1
2-methylbutane	78-78-4	0 - 1
Cyclohexane	110-82-7	0 - 1
Octane	111-65-9	0 - 1
Polycyclic aromatic hydrocarbons (PAHs)	mixture	0 - 0.1
Hydrogen Sulfide	7783-06-4	0 - 0.1

4. First aid measures

Eye contact In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.

Skin contact Immediately wash exposed skin with soap and water. Remove contaminated clothing and shoes. Clean shoes thoroughly before reuse. Wash contaminated clothing before reuse. Get medical attention.

Inhalation If inhaled, remove to fresh air. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Ingestion Aspiration hazard if swallowed. Can enter lungs and cause damage. Do not induce vomiting. Never give anything by mouth to an unconscious person. Get medical attention immediately.

5. Fire-fighting measures

Flammability of the product Flammable liquid.

Flash point Closed cup: -50 to 100°C (-58 to 212°F) [Pensky-Martens.]

Explosion limits Lower: 0.6%
Upper: 8%

Fire/explosion hazards In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. Runoff to sewer may create fire or explosion hazard.

Unusual fire/explosion hazards

Explosive in the presence of the following materials or conditions: open flames, sparks and static discharge and heat.

Extinguishing media

Suitable

Use dry chemical, CO_2, water spray (fog) or foam.

Not suitable

Do not use water jet.

Fire-fighting procedures

Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Hazardous combustion products

Combustion products may include the following:
carbon oxides (CO, CO_2) (carbon monoxide, carbon dioxide)
sulfur oxides (SO_2, SO_3 etc.)
Hydrogen Sulfide (H2S)

Protective clothing (fire)

Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6. Accidental release measures

Personal precautions

No action shall be taken involving any personal risk or without suitable training. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Do not breathe vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions

Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities.

Methods for cleaning up

Large spill

Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

Small spill

Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

7. Handling and storage

Handling

Put on appropriate personal protective equipment (see Section 8). Workers should wash hands and face before eating, drinking and smoking. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. Avoid release to the environment. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material.

Storage

Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10). Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

Other information

Do not enter storage tanks without breathing apparatus unless the tank has been well ventilated and the tank atmosphere has been shown to contain hydrocarbon vapor concentrations of less than 1% of the lower flammability limit and an oxygen concentration of at least 20% volume.

Light hydrocarbon vapors can build up in the headspace of tanks. These can cause flammability/explosion hazards even at temperatures below the normal flash point (note: flash point must not be regarded as a reliable indicator of the potential flammability of vapor in tank headspaces). Tank headspaces should always be regarded as potentially flammable and care should be taken to avoid static electrical discharge and all ignition sources during filling, ullaging and sampling from storage tanks.

This material can contain hydrogen sulphide (H_2S), an extremely toxic and flammable gas. Vapors containing hydrogen sulfide may accumulate during storage or transport and may also be vented during filling of tanks. Hydrogen sulfide has a typical "bad egg" smell but at high concentrations the sense of smell is rapidly lost, therefore do not rely on sense of smell for detecting hydrogen sulfide. Use specially designed measuring instruments for determining its concentration.

8. Exposure controls/personal protection

Occupational exposure limits

Ingredient name	Occupational exposure limits
Crude oil	**CA Alberta Provincial (Canada).** OEL: 5 mg/m³ 8 hour(s). Form: Oil mist, mineral STEL: 10 mg/m³ 15 minute(s). Form: Oil mist, mineral
Natural gas condensates (petroleum)	**Alberta OH&S (Canada).** OEL: 5 mg/m³ STEL: 10 mg/m³ 15 minute(s). **British Columbia OH&S (Canada).** EL: 5 mg/m³ STEL: 10 mg/m³ 15 minute(s).
Naphtha (petroleum), light straight-run.	**ACGIH TLV (United States).** STEL: 1480 mg/m³ 15 minute(s). Form: Gasoline (Recommended) STEL: 500 ppm 15 minute(s). Form: Gasoline (Recommended) TWA: 890 mg/m³ 8 hour(s). Form: Gasoline (Recommended) TWA: 300 ppm 8 hour(s). Form: Gasoline (Recommended) TWA: 100 ppm 8 hour(s). Form: Stoddard Solvent (Recommended) TWA: 525 mg/m³ 8 hour(s). Form: Stoddard Solvent (Recommended) **OSHA PEL (United States).** TWA: 2900 mg/m³ 8 hour(s). Form: Stoddard Solvent (Recommended)
naphtha (petroleum), hydrotreated heavy	**ACGIH TLV (United States).** TWA: 300 ppm
Distillates (petroleum), hydrotreated middle	**ACGIH (United States).** TWA: 5 mg/m³ 8 hour(s). Form: Oil mist, mineral **OSHA (United States).** TWA: 5 mg/m³ 8 hour(s). Form: Oil mist, mineral
Pentane	**ACGIH TLV (Canada).** TWA: 600 ppm 8 hour(s). **CA British Columbia Provincial (Canada).** TWA: 600 ppm 8 hour(s). Issued/Revised: 8/2004 **CA Ontario Provincial (Canada).** TWA: 600 ppm 8 hour(s). Issued/Revised: 9/1998 STEL: 2210 mg/m³ 15 minute(s). Issued/Revised: 7/2010 TWA: 1770 mg/m³ 8 hour(s). Issued/Revised: 7/2010 STEL: 750 ppm 15 minute(s). Issued/Revised: 7/2010 **CA Quebec Provincial (Canada).** TWAEV: 350 mg/m³ 8 hour(s). Issued/Revised: 1/2000 TWAEV: 120 ppm 8 hour(s). Issued/Revised: 1/2000 **CA Alberta Provincial (Canada).** 8 hrs OEL: 600 ppm 8 hour(s). Issued/Revised: 4/2004 8 hrs OEL: 1770 mg/m³ 8 hour(s). Issued/Revised: 4/2004
Hydrogen Sulfide	**Alberta OH&S (Canada).** CEIL: 15 ppm OEL: 10 ppm 8 hour(s). **British Columbia OH&S (Canada).** CEIL: 10 ppm **CA Alberta Provincial (Canada).** C: 21 mg/m³ 15 minute(s). Issued/Revised: 7/2009 C: 15 ppm 15 minute(s). Issued/Revised: 7/2009 8 hrs OEL: 10 ppm 8 hour(s). Issued/Revised: 4/2004

	8 hrs OEL: 14 mg/m³ 8 hour(s). Issued/Revised: 4/2004 **CA British Columbia Provincial (Canada).** C: 10 ppm 15 minute(s). Issued/Revised: 8/2004 **CA Ontario Provincial (Canada).** TWA: 10 ppm 8 hour(s). Issued/Revised: 1/1990 STEL: 15 ppm 15 minute(s). Issued/Revised: 1/1990 **CA Quebec Provincial (Canada).** TWAEV: 10 ppm 8 hour(s). Issued/Revised: 1/2000 TWAEV: 14 mg/m³ 8 hour(s). Issued/Revised: 1/2000 STEV: 15 ppm 15 minute(s). Issued/Revised: 1/2000 STEV: 21 mg/m³ 15 minute(s). Issued/Revised: 1/2000
Hexane, other isomers	**ACGIH TLV (United States).** TWA: 500 ppm 8 hour(s). STEL: 1000 ppm 15 minute(s).
n-hexane	**CA Alberta Provincial (Canada). Absorbed through skin.** 8 hrs OEL: 176 mg/m³ 8 hour(s). Issued/Revised: 4/2004 8 hrs OEL: 50 ppm 8 hour(s). Issued/Revised: 4/2004 **CA British Columbia Provincial (Canada). Absorbed through skin.** TWA: 20 ppm 8 hour(s). Issued/Revised: 8/2004 **CA Ontario Provincial (Canada). Absorbed through skin.** TWA: 50 ppm 8 hour(s). Issued/Revised: 9/1998 **CA Quebec Provincial (Canada). Absorbed through skin.** TWAEV: 176 mg/m³ 8 hour(s). Issued/Revised: 1/2000 TWAEV: 50 ppm 8 hour(s). Issued/Revised: 1/2000
Heptane	**CA Alberta Provincial (Canada).** 15 min OEL: 2050 mg/m³ 15 minute(s). Issued/Revised: 7/2009 15 min OEL: 500 ppm 15 minute(s). Issued/Revised: 7/2009 8 hrs OEL: 1640 mg/m³ 8 hour(s). Issued/Revised: 4/2004 8 hrs OEL: 400 ppm 8 hour(s). Issued/Revised: 4/2004 **CA British Columbia Provincial (Canada).** STEL: 500 ppm 15 minute(s). Issued/Revised: 8/2004 TWA: 400 ppm 8 hour(s). Issued/Revised: 8/2004 **CA Ontario Provincial (Canada).** STEL: 2050 mg/m³ 15 minute(s). Issued/Revised: 9/1994 STEL: 500 ppm 15 minute(s). Issued/Revised: 9/1994 TWA: 1640 mg/m³ 8 hour(s). Issued/Revised: 9/1994 TWA: 400 ppm 8 hour(s). Issued/Revised: 9/1994 **CA Quebec Provincial (Canada).** STEV: 2050 mg/m³ 15 minute(s). Issued/Revised: 1/2000 STEV: 500 ppm 15 minute(s). Issued/Revised: 1/2000 TWAEV: 1640 mg/m³ 8 hour(s). Issued/Revised: 1/2000 TWAEV: 400 ppm 8 hour(s). Issued/Revised: 1/2000
methylcyclohexane	**CA Alberta Provincial (Canada).** 8 hrs OEL: 1610 mg/m³ 8 hour(s). Issued/Revised: 4/2004 8 hrs OEL: 400 ppm 8 hour(s). Issued/Revised: 4/2004 **CA British Columbia Provincial (Canada).** TWA: 400 ppm 8 hour(s). Issued/Revised: 8/2004 **CA Ontario Provincial (Canada).** TWA: 1610 mg/m³ 8 hour(s). Issued/Revised: 9/1994 TWA: 400 ppm 8 hour(s). Issued/Revised: 9/1994 **CA Quebec Provincial (Canada).** TWAEV: 1610 mg/m³ 8 hour(s). Issued/Revised: 1/2000 TWAEV: 400 ppm 8 hour(s). Issued/Revised: 1/2000
Butane	**CA Alberta Provincial (Canada).** 8 hrs OEL: 1000 ppm 8 hour(s). Issued/Revised: 7/2009 **CA British Columbia Provincial (Canada).** STEL: 750 ppm 15 minute(s). Issued/Revised: 7/2005 TWA: 600 ppm 8 hour(s). Issued/Revised: 7/2005 **CA Quebec Provincial (Canada).** TWAEV: 1900 mg/m³ 8 hour(s). Issued/Revised: 1/2000 TWAEV: 800 ppm 8 hour(s). Issued/Revised: 1/2000 **CA Ontario Provincial (Canada).** TWA: 800 ppm 8 hour(s). Issued/Revised: 7/2010
Benzene	**CA Alberta Provincial (Canada). Absorbed through skin.** 15 min OEL: 8 mg/m³ 15 minute(s). Issued/Revised: 7/2009 15 min OEL: 2.5 ppm 15 minute(s). Issued/Revised: 7/2009 8 hrs OEL: 1.6 mg/m³ 8 hour(s). Issued/Revised: 7/2009 8 hrs OEL: 0.5 ppm 8 hour(s). Issued/Revised: 7/2009 **CA British Columbia Provincial (Canada). Absorbed through skin.** STEL: 2.5 ppm 15 minute(s). Issued/Revised: 8/2004 TWA: 0.5 ppm 8 hour(s). Issued/Revised: 8/2004

	CA Ontario Provincial (Canada). Absorbed through skin. STEL: 2.5 ppm 15 minute(s). Issued/Revised: 7/2010 TWA: 0.5 ppm 8 hour(s). Issued/Revised: 7/2010 **CA Quebec Provincial (Canada).** STEV: 15.5 mg/m³ 15 minute(s). Issued/Revised: 1/2000 STEV: 5 ppm 15 minute(s). Issued/Revised: 1/2000 TWAEV: 3 mg/m³ 8 hour(s). Issued/Revised: 1/2000 TWAEV: 1 ppm 8 hour(s). Issued/Revised: 1/2000
Toluene	**CA Alberta Provincial (Canada). Absorbed through skin.** 8 hrs OEL: 188 mg/m³ 8 hour(s). Issued/Revised: 4/2004 8 hrs OEL: 50 ppm 8 hour(s). Issued/Revised: 4/2004 **CA British Columbia Provincial (Canada).** TWA: 20 ppm 8 hour(s). Issued/Revised: 5/2007 **CA Ontario Provincial (Canada).** TWA: 20 ppm 8 hour(s). Issued/Revised: 11/2006 **CA Quebec Provincial (Canada). Absorbed through skin.** TWAEV: 188 mg/m³ 8 hour(s). Issued/Revised: 1/2000 TWAEV: 50 ppm 8 hour(s). Issued/Revised: 1/2000
xylene	**CA Alberta Provincial (Canada).** 15 min OEL: 651 mg/m³ 15 minute(s). Issued/Revised: 7/2009 15 min OEL: 150 ppm 15 minute(s). Issued/Revised: 7/2009 8 hrs OEL: 434 mg/m³ 8 hour(s). Issued/Revised: 4/2004 8 hrs OEL: 100 ppm 8 hour(s). Issued/Revised: 4/2004 **CA British Columbia Provincial (Canada).** STEL: 150 ppm 15 minute(s). Issued/Revised: 8/2004 TWA: 100 ppm 8 hour(s). Issued/Revised: 8/2004 **CA Quebec Provincial (Canada).** STEV: 651 mg/m³ 15 minute(s). Issued/Revised: 1/2000 STEV: 150 ppm 15 minute(s). Issued/Revised: 1/2000 TWAEV: 434 mg/m³ 8 hour(s). Issued/Revised: 1/2000 TWAEV: 100 ppm 8 hour(s). Issued/Revised: 1/2000 **CA Ontario Provincial (Canada).** STEL: 651 mg/m³ 15 minute(s). Issued/Revised: 5/1996 STEL: 150 ppm 15 minute(s). Issued/Revised: 5/1996 TWA: 434 mg/m³ 8 hour(s). Issued/Revised: 5/1996 TWA: 100 ppm 8 hour(s). Issued/Revised: 5/1996
Ethylbenzene	**CA Alberta Provincial (Canada).** 8 hrs OEL: 100 ppm 8 hour(s). Issued/Revised: 4/2004 8 hrs OEL: 434 mg/m³ 8 hour(s). Issued/Revised: 4/2004 15 min OEL: 543 mg/m³ 15 minute(s). Issued/Revised: 7/2009 15 min OEL: 125 ppm 15 minute(s). Issued/Revised: 7/2009 **CA British Columbia Provincial (Canada).** TWA: 100 ppm 8 hour(s). Issued/Revised: 8/2004 STEL: 125 ppm 15 minute(s). Issued/Revised: 8/2004 **CA Ontario Provincial (Canada).** TWA: 100 ppm 8 hour(s). Issued/Revised: 1/2002 STEL: 125 ppm 15 minute(s). Issued/Revised: 1/2002 **CA Quebec Provincial (Canada).** TWAEV: 100 ppm 8 hour(s). Issued/Revised: 1/2000 TWAEV: 434 mg/m³ 8 hour(s). Issued/Revised: 1/2000 STEV: 125 ppm 15 minute(s). Issued/Revised: 1/2000 STEV: 543 mg/m³ 15 minute(s). Issued/Revised: 1/2000
2-methylbutane	**CA British Columbia Provincial (Canada).** TWA: 600 ppm 8 hour(s). Issued/Revised: 8/2004 **CA Ontario Provincial (Canada).** TWA: 600 ppm 8 hour(s). Issued/Revised: 9/1998 STEL: 2210 mg/m³ 15 minute(s). Issued/Revised: 7/2010 TWA: 1770 mg/m³ 8 hour(s). Issued/Revised: 7/2010 STEL: 750 ppm 15 minute(s). Issued/Revised: 7/2010 **CA Alberta Provincial (Canada).** 8 hrs OEL: 600 ppm 8 hour(s). Issued/Revised: 4/2004 8 hrs OEL: 1770 mg/m³ 8 hour(s). Issued/Revised: 4/2004
Cyclohexane	**Alberta OH&S (Canada).** TWA: 300 ppm 8 hour(s). **British Columbia OH&S (Canada).** TWA: 100 ppm 8 hour(s). **CA Alberta Provincial (Canada).** 8 hrs OEL: 344 mg/m³ 8 hour(s). Issued/Revised: 7/2009 8 hrs OEL: 100 ppm 8 hour(s). Issued/Revised: 7/2009 **CA British Columbia Provincial (Canada).**

	TWA: 100 ppm 8 hour(s). Issued/Revised: 8/2004 **CA Ontario Provincial (Canada).** TWA: 100 ppm 8 hour(s). Issued/Revised: 1/2002 **CA Quebec Provincial (Canada).** TWAEV: 1030 mg/m³ 8 hour(s). Issued/Revised: 1/2000 TWAEV: 300 ppm 8 hour(s). Issued/Revised: 1/2000
Octane	**CA Alberta Provincial (Canada). Skin sensitizer.** 8 hrs OEL: 1400 mg/m³ 8 hour(s). Issued/Revised: 7/2009 8 hrs OEL: 300 ppm 8 hour(s). Issued/Revised: 4/2004 **CA British Columbia Provincial (Canada).** TWA: 300 ppm 8 hour(s). Issued/Revised: 8/2004 **CA Ontario Provincial (Canada).** TWA: 300 ppm 8 hour(s). Issued/Revised: 3/1999 **CA Quebec Provincial (Canada).** STEV: 1750 mg/m³ 15 minute(s). Issued/Revised: 1/2000 STEV: 375 ppm 15 minute(s). Issued/Revised: 1/2000 TWAEV: 1400 mg/m³ 8 hour(s). Issued/Revised: 1/2000 TWAEV: 300 ppm 8 hour(s). Issued/Revised: 1/2000
Polycyclic aromatic hydrocarbons (PAHs)	**ACGIH TLV (United States).** TWA: 0.2 mg/m³ 8 hour(s). Form: Benzene-soluble **OSHA PEL (United States).** TWA: 0.2 mg/m³ 8 hour(s). Form: Benzene-soluble

While specific OELs for certain components may be shown in this section, other components may be present in any mist, vapor or dust produced. Therefore, the specific OELs may not be applicable to the product as a whole and are provided for guidance only.

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

Hygiene measures Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing.

Personal protection

Eyes Avoid contact with eyes. Safety glasses with side shields or chemical goggles.

Skin and body Do not get on skin or clothing. Wear clothing and footwear that cannot be penetrated by chemicals or oil.

Respiratory Use adequate ventilation. Do not breathe vapor or mist. If ventilation is inadequate, use a NIOSH-certified respirator with an organic vapor cartridge and P95 particulate filter. If operating conditions cause high vapor concentrations or the TLV is exceeded, use NIOSH-certified, supplied-air respirator.

Hands Wear chemical resistant gloves.

The correct choice of protective gloves depends upon the chemicals being handled, the conditions of work and use, and the condition of the gloves (even the best chemically resistant glove will break down after repeated chemical exposures). Most gloves provide only a short time of protection before they must be discarded and replaced. Because specific work environments and material handling practices vary, safety procedures should be developed for each intended application. Gloves should therefore be chosen in consultation with the supplier/manufacturer and with a full assessment of the working conditions.

Consult your supervisor or Standard Operating Procedure (S.O.P) for special handling instructions.

9. Physical and chemical properties

Physical state Viscous liquid.

Color Brown.

Odor Pungent.

Odor threshold Not available.

Flash point Closed cup: -50 to 100°C (-58 to 212°F) [Pensky-Martens.]

Explosion limits Lower: 0.6%
Upper: 8%

Specific gravity	Not available.
Density	750 to 1000 kg/m^3 (0.75 to 1 g/cm^3) at 15°C
pH	Not available.
Viscosity	Kinematic: <7 mm^2/s (<7 cSt) at 40°C
Boiling point / Range	-10 to 800°C (14 to 1472°F)
Melting point / Range	Not available.
Vapor pressure	39.894 to 698.138 kPa (300 to 5250 mm Hg)
Vapor density	Not available.
Evaporation rate	Not available.
Solubility	insoluble in water.
$LogK_{ow}$	>3

10. Stability and reactivity

Stability and reactivity	The product is stable.
Possibility of hazardous reactions	Under normal conditions of storage and use, hazardous reactions will not occur.
Conditions to avoid	Not available.
Incompatibility with various substances	Reactive or incompatible with the following materials: oxidizing materials.
Hazardous decomposition products	Under normal conditions of storage and use, hazardous decomposition products should not be produced. Decomposition products may include the following materials: carbon oxides (CO, CO_2) (carbon monoxide, carbon dioxide) sulfur oxides (SO_2, SO_3 etc.) Hydrogen Sulfide (H2S)
Hazardous polymerization	Under normal conditions of storage and use, hazardous polymerization will not occur.

11. Toxicological information

Classification

Product/ingredient name	IARC	NTP	OSHA
Ethylbenzene	2B	-	-
xylene	3	-	-
Toluene	3	-	-
Benzene	1	Proven.	+
Polycyclic aromatic hydrocarbons (PAHs)	-	Possible	-

IARC :
1 - Carcinogenic to human.
2B - Possible carcinogen to human.
3 - Not classifiable as a human carcinogen.

NTP :
Proven - Known to be human carcinogens.
Possible - Reasonably anticipated to be human carcinogens.

OSHA :
+ Potential occupational carcinogen

Other information

Aspiration of this material into the lungs can cause chemical pneumonia and can be fatal. Aspiration into the lungs can occur while vomiting after ingestion of this material.

From skin-painting studies in laboratory animals, it has been concluded that most, if not all, petroleum crudes, regardless of source, possess carcinogenic activity to some degree. This means that workers who practice poor personal hygiene and who are repeatedly exposed by direct skin contact to crude oil over many years may potentially be at risk of developing skin cancer. However, intermittent or occasional skin contact with petroleum crude oils is not expected to have serious health effects as long as good personal hygiene measures such as those outlined in this material safety data sheet are followed. Crude oil has not been identified as a carcinogen by NTP, IARC or OSHA.

Exposure to sunlight may increase the degree of skin irritation.
Crude oil administered orally or dermally to pregnant rats during gestation produced increased numbers of resorptions and decreases in fetal weight at maternally toxic doses. Repeated exposures to some crude oils in rats have produced effects on the blood, liver and thymus.

Hydrogen sulfide (H2S) gas may accumulate in storage tanks of bulk transport compartments containing this material. Contact with eyes causes painful conjunctivitis, sensitivity to light, tearing and clouding of vision. Inhalation of low concentrations causes a runny nose with a loss of sense of smell, labored breathing and shortness of breath. Direct contact with skin causes pain and redness. Other symptoms of exposure include profuse salivation, nausea, vomiting, diarrhea, giddiness, headache, dizziness, confusion, rapid breathing, rapid heart rate, sweating, weakness, sudden collapse, unconsciousness and death due to respiratory paralysis.

Cardiac neurological effects have also been reported. Prolonged breathing (greater than one hour) of concentrations of H2S around 50 ppm can produce eye and respiratory tract irritation. Levels of 250 to 600 ppm will result in fluid in the lungs, and concentrations around 1,000 ppm will cause unconsciousness and death in a short period of time. Since the sense of smell rapidly becomes insensitive to this toxic, colorless gas, odor cannot be relied upon as an indicator of concentrations of the gas. Always exercise caution when working around closed containers.

Benzene: Acute toxicity of benzene results primarily from depression of the central nervous system (CNS). Inhalation of concentrations over 50 ppm can produce headache, lassitude, weariness, dizziness, drowsiness, or excitation. Exposure to very high levels can result in unconsciousness and death.

Benzene: Long-term overexposure to benzene has been associated with certain types of leukemia in humans. In addition, the International Agency for Research on Cancer (IARC), the National Toxicology Program, and OSHA consider benzene to be a human carcinogen. Chronic exposures to high levels of benzene have been reported to cause adverse blood effects including anemia. Benzene exposure can occur by inhalation and absorption through the skin.
Inhalation and forced feeding studies of benzene in laboratory animals have produced a carcinogenic response in a variety of organs, including possibly leukemia, other adverse effects on the blood, chromosomal changes and some effects on the immune system. Exposure to benzene at levels up to 300 ppm did not produce birth defects in animal studies; however, exposure to higher dosage levels resulted in a reduction of body weight of the rat pups (fetotoxicity). Changes in the testes have been observed in mice exposed to benzene at 300 ppm, but reproductive performance was not altered in rats exposed to benzene at the same level. Aspiration of this material into the lungs can cause chemical pneumonia and can be fatal. Aspiration into the lungs can occur while vomiting after ingestion of this material.

Toluene: Aspiration of this material into the lungs can cause chemical pneumonia and can be fatal. Aspiration into the lungs can occur while vomiting after ingestion of this material. Deliberate inhalation of high concentrations of toluene has been linked to damage of the brain, liver and kidney. Inhalation of very high concentrations of toluene, such as in cases of solvent abuse, has resulted in sudden death which may be a result of cardiac arrhythmia or central nervous system depression. Mental and/or growth retardation has been reported in children of women who deliberately inhale toluene during pregnancy (usually at thousands of ppm). Fetal developmental toxicity was observed when pregnant rats were exposed to toluene at levels of 1500 ppm. Maternal toxicity was also observed at this concentration. Prolonged, high level exposure to toluene in laboratory animals has resulted in hearing loss. Exposure studies in rats have resulted in adverse effects on the kidney, liver and central nervous system. Studies in occupationally exposed individuals indicate that toluene exposure has been associated with impaired color vision and decreased performance in some neurobehavioral tests. There are occupational studies which report an association between inhalation exposure to toluene and adverse effects on reproduction including spontaneous abortion. The methodology of these studies and the reliability of the results have been questioned. In a two-generation study in rats, inhalation of toluene at levels up to 2000 ppm did not produce adverse effects on fertility or reproductive performance.

Xylenes: Xylene has been reported to cause central nervous system effects at concentrations above the recommended exposure limit. Xylene vapor becomes irritating at relatively high levels. In one study, eye irritation was reported at exposures of 460 ppm and in one person at 230 ppm after 15 minutes. In another study, no one reported eyes, nose and throat irritation at mixed xylene exposures up to 230 ppm for 30 minutes. Dermal LD50 is expected to be greater than 10g/kg in rabbits, based on test results from similar materials.

Mixed xylenes caused slight hearing loss in rats exposed to 800 ppm in the air for 14 hours/day for six weeks. There is no information available for lower concentrations; however, similar chemicals that have caused these hearing effects at similar concentrations have not caused effects at lower concentrations.

Pregnant animals exposed to xylene or its isomers have been reported to cause development toxicity in rodents when exposed by inhalation. The developmental effects observed consisted of delayed development and minor skeletal variations, but no malformations. Because of the high exposure levels used in these studies, we do not believe that these results imply an increased risk of reproductive toxicity to workers exposed to xylene levels at or below the exposure limits.

Xylene and its isomers are not genotoxic.

Technical grade xylene has been tested in a National Toxicology Program carcinogenicity study in rats and mice dosed orally for two years. There was no evidence of carcinogenicity.
NTP also exposed male and female rats and mice by inhalation to 0, 75, 250, or 750 ppm ethylbenzene for 2 years. There was a statistically significant increase in the number of kidney tumors in male and female rats at 750 ppm. There were also increased incidences of lung tumors in male mice and liver tumors in female mice that were statistically significant at 750 ppm. Except for the male rat kidney tumors, the incidence of the tumors were within the range observed for non-exposed animals from other studies conducted by NTP. The significance of these findings to humans is unknown. Ethylbenzene produced mixed results in in vitro genotoxicity studies, which were not confirmed when tested in vivo. The International Agency for Research on Cancer (IARC) has evaluated ethylbenzene and found it to be possibly carcinogenic to humans (Group 2B).

This product contains n-hexane. Overexposure to n-hexane may cause progressive and potentially irreversible damage to the peripheral nervous system, particularly in the arms and legs. Animal studies have also shown that n-hexane overexposure may cause testicular injury. However, animal studies conducted with commercial hexane, containing 53% n-hexane, showed neither peripheral nervous system damage nor testicular injury at inhalation exposures up to 9000 ppm.

This material may contain significant quantities of polycyclic aromatic hydrocarbons (PCAs), some of which have been shown by experimental studies to induce skin cancer.

Potential chronic health effects

Carcinogenicity Contains material which can cause cancer. Risk of cancer depends on duration and level of exposure.

Mutagenicity Contains material which may cause heritable genetic effects.

Teratogenicity Contains material which can cause birth defects.

Fertility effects No known significant effects or critical hazards.

Reproductive effects No known significant effects or critical hazards.

Medical conditions aggravated by over-exposure Pre-existing disorders involving any target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

12. Ecological information

Ecotoxicity

No testing has been performed by the manufacturer.

Persistence/degradability Inherently biodegradable

Mobility Spillages may penetrate the soil causing ground water contamination. This material may accumulate in sediments.

Bioaccumulative potential This product is not expected to bioaccumulate through food chains in the environment.

Other ecological information Spills may form a film on water surfaces causing physical damage to organisms. Oxygen transfer could also be impaired.

13. Disposal considerations

Waste information The generation of waste should be avoided or minimized wherever possible. Significant quantities of waste product residues should not be disposed of via the foul sewer but processed in a suitable effluent treatment plant. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Vapor

from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

NOTE: The generator of waste has the responsibility for proper waste identification (based on characteristic(s) or listing), transportation and disposal

14. Transport information

International transport regulations

Regulatory information	UN number	Proper shipping name	Class	Packing group	Additional information
DOT Classification	UN 1267	PETROLEUM CRUDE OIL	3	I	-
TDG Classification	UN 1267	PETROLEUM CRUDE OIL	3	I	-
IMDG Classification	UN 1267	PETROLEUM CRUDE OIL. Marine pollutant	3	I	**Emergency schedules (EmS)** F-E, S-E
IATA/ICAO Classification	UN 1267	PETROLEUM CRUDE OIL	3	I	-

15. Regulatory information

WHMIS (Canada)

Class B-2: Flammable liquid
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

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

Other regulations

Canada inventory: All components are listed or exempted.

United States inventory (TSCA 8b): All components are listed or exempted.

REACH Status: For the REACH status of this product please consult your company contact, as identified in Section 1.

Australia inventory (AICS): Not determined.

China inventory (IECSC): Not determined.

Japan inventory (ENCS): Not determined.

Korea inventory (KECI): Not determined.

Philippines inventory (PICCS): At least one component is not listed.

16. Other information

Label requirements

DANGER !

FLAMMABLE LIQUID AND VAPOR.
HARMFUL IF ABSORBED THROUGH SKIN.
INHALATION CAUSES HEADACHES, DIZZINESS, DROWSINESS AND NAUSEA AND MAY LEAD TO UNCONSCIOUSNESS.
CAUSES EYE AND SKIN IRRITATION.
MAY CAUSE RESPIRATORY TRACT IRRITATION.
HARMFUL OR FATAL IF SWALLOWED.
CAN ENTER LUNGS AND CAUSE DAMAGE.
CONTAINS MATERIAL THAT CAN CAUSE TARGET ORGAN DAMAGE.
CANCER HAZARD - CONTAINS MATERIAL WHICH CAN CAUSE CANCER.

CONTAINS MATERIAL WHICH MAY CAUSE HERITABLE GENETIC EFFECTS.
ASPIRATION HAZARD.
BIRTH HAZARD - CONTAINS MATERIAL WHICH MAY CAUSE BIRTH DEFECTS

History

Date of issue 12/14/2011.

Date of previous issue No previous validation.

Prepared by Product Stewardship

Indicates information that has changed from previously issued version.

Notice to reader

All reasonably practicable steps have been taken to ensure this data sheet and the health, safety and environmental information contained in it is accurate as of the date specified below. No warranty or representation, express or implied is made as to the accuracy or completeness of the data and information in this data sheet.

The data and advice given apply when the product is sold for the stated application or applications. You should not use the product other than for the stated application or applications without seeking advice from BP Group.

It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations. The BP Group shall not be responsible for any damage or injury resulting from use, other than the stated product use of the material, from any failure to adhere to recommendations, or from any hazards inherent in the nature of the material. Purchasers of the product for supply to a third party for use at work, have a duty to take all necessary steps to ensure that any person handling or using the product is provided with the information in this sheet. Employers have a duty to tell employees and others who may be affected of any hazards described in this sheet and of any precautions that should be taken. You can contact the BP Group to ensure that this document is the most current available. Alteration of this document is strictly prohibited.

ENBRIDGE

Safety Data Sheet

Section 1: Identification

PRODUCT IDENTIFIER	Petroleum Crude Oil - Condensate	
OTHER MEANS OF IDENTIFICATION	**UN-Number**	UN1268
	Synonyms	Condensate Blend (CRW), Pembina Condensate (CPM), Southern Lights Diluent (SLD), Fort Saskatchewan Condensate (CFT), Gibson Condensate (CGB), Condensate Gibsons Light Density (CGL), Plains Marketing Condensate (CLN), Pembina Nexus Condensate (CPN), Rangeland Condensate (CRL), Rimbey Condensate (CRM), Petrocanada Condensate (CPC), Suncor N (OSN), Federated Condensate (CFD), Gibson Condensate Hardisty (CGY)
	Chemical Category	Crude oils—extremely flammable Petroleum Distillate
RECOMMENDED USE	Refinery feedstock	
RESTRICTIONS OF USE	No information available	
SUPPLIER INFORMATION	Enbridge Pipelines Inc. 10201 Jasper Avenue Edmonton, Alberta T5J 3N7 Canada TEL: 1-780-420-5210	
EMERGENCY CONTACT INFORMATION	**CHEMTREC**	1-800-424-9300 for US 703- 527- 3887 outside US
	CANUTEC (Canadian Transportation)	613-996-6666

Section 2: Hazards Identification

CLASSIFICATION

Skin Irritation	Category 2
Eye Irritation	Category 2
Germ Cell Mutagenicity	Category 1B
Carcinogenicity	Category 1A
Reproductive Toxicity	Category 2
Specific Target Organ Systemic Toxicity (Single Exposure)	Category 3
Specific Target Organ Toxicity (Repeated Exposure)	Category 1
Aspiration Toxicity	Category 1
Flammable liquids	Category 1

LABEL ELEMENTS

Signal Word

Danger

Hazard Pictograms



Hazard Statements

- Causes skin irritation.
- Causes serious eye irritation.
- May cause genetic defects.
- May cause cancer.
- Suspected of damaging fertility or the unborn child.
- May cause respiratory irritation.
- Causes damage to organs through prolonged or repeated exposure.
- May be fatal if swallowed and enters airways.
- Extremely flammable liquid and vapor.
- May cause drowsiness or dizziness.

PRECAUTIONARY STATEMENTS

Prevention

- Wash face, hands and any exposed skin thoroughly after handling.
- Wear protective gloves/protective clothing/eye protection/face protection.
- Obtain special instructions before use.
- Do not handle until all safety precautions have been read and understood.
- Use personal protective equipment as required.
- Do not breathe dust/fume/gas/mist/vapors/spray.
- Use only outdoors or in a well-ventilated area.
- Do not eat, drink or smoke when using this product.
- Keep away from heat/sparks/open flames/hot surfaces.
- Keep container tightly closed.
- No smoking.
- Ground/bond container and receiving equipment.
- Use explosion-proof electrical/ventilating/lighting/equipment.
- Use only non-sparking tools.
- Take precautionary measures against static discharge.
- In case of inadequate ventilation wear respiratory protection.

Response

- IF EXPOSED or concerned: Get medical advice/attention.
- IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
- Call a POISON CENTER or doctor/physician if you feel unwell.
- IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
- Do NOT induce vomiting.
- IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower and soap.
- In case of fire: Use CO_2, dry chemical, or foam for extinction.
- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- If SKIN irritation occurs: Get medical advice/attention.
- If EYE irritation persists: Get medical advice/attention.

Storage/Disposal

- Store locked up and keep cool.
- Store in a well-ventilated place. Keep container tightly closed.
- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

OTHER INFORMATION

- Under United States Regulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered hazardous.
- Very toxic to aquatic life with long lasting effects.

Section 3: Composition/Information on Ingredients

COMPONENT NAME	CAS NUMBER	PERCENTAGE (%)*	NOTES
1,2,4-Trimethylbenzene	95-63-6	0-5	
2-Methylbutane (In Liquid form)	78-78-4	0-10	
Benzene	71-43-2	0-10	
Benzene, trimethyl-	25551-13-7	0-1	
Butane	106-97-8	0-7	
Cyclohexane	110-82-7	0-5	
Cyclopentane	287-92-3	0-5	
Decane	124-18-5	0-7	
Ethane	74-84-0	0-60	
Ethylbenzene	100-41-4	0-5	
Heptane	142-82-5	0-20	
Hexane	110-54-3	0-30	
Hydrogen Sulfide	7783-06-4	0-1	
Isobutane	75-28-5	0-5	
Methylcyclohexane	108-87-2	0-10	
Methylcyclopentane	96-37-7	0-6	
Naphtha (oil sand), Hydrotreated	128683-33-0	0-100	
Natural gas condensate	68919-39-1	0-100	
Natural gas condensates (petroleum)	64741-47-5	0-100	
Nonane	111-84-2	0-10	
Octane	111-65-9	0-15	
Pentane	109-66-0	0-70	
Propane	74-98-6	0-60	
Toluene	108-88-3	0-10	
Xylene	1330-20-7	0-10	

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

Section 4: First Aid Measures

DESCRIPTION OF NECESSARY MEASURES

Inhalation	• IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If irritation persists: Get medical advice/attention.
Skin	• IF ON SKIN: Wash with plenty of soap and water. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse.
Eye	• IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.
Ingestion	• Do NOT induce vomiting. Call a physician or poison control center. • Aspiration hazard if swallowed—can enter lungs and cause damage.

MOST IMPORTANT SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED

Refer to Section 11 - Toxicological Information

INDICATION OF IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED, IF NECESSARY

Note to the Physician

- Aspiration hazard. Symptoms may be delayed.
- 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.
- Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.

Section 5: Fire Fighting Measures

EXTINGUISHING MEDIA

Suitable Extinguishing Media	• SMALL FIRES: Dry chemical, CO_2, water spray or regular foam. • LARGE FIRE: Water spray, fog or regular foam.
Unsuitable Extinguishing Media	• CAUTION: Use of water spray when fighting fire may be inefficient. • Do not use straight streams.

FIREFIGHTING PROCEDURES

- FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: If impossible to extinguish, protect surroundings and allow fire to burn itself out.
- Stay upwind.
- Ventilate closed spaces before entering.
- Fire fighters should wear complete protective clothing including self-contained breathing apparatus.
- FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions.
- FIRE: When a large quantity of this material is involved in a major fire, consider an initial evacuation distance of 300 meters (1000 feet) in all directions.
- Move containers from fire area if you can do it without risk.

- LARGE FIRES: Use water spray or fog; do not use straight streams.
- LARGE FIRES: If insufficient water supply: knock down vapors only. If this is impossible, withdraw from area and let fire burn.
- LARGE FIRES: Flood fire area with large quantities of water, while knocking down vapors with water fog.

SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OR MIXTURE

- Vapors may travel to source of ignition and flash back.
- Air/vapor mixtures may explode when ignited.
- Vapors may accumulate in confined areas (basement, tanks, hopper/tank cars etc.).
- Will be easily ignited by heat, sparks or flames.
- Runoff to sewer may create fire or explosion hazard.
- Vapor explosion hazard indoors, outdoors or in sewers.
- MAY EXPLODE AND THROW FRAGMENTS 1600 meters (1 MILE) OR MORE IF FIRE REACHES CARGO.
- May create vapor/air explosion hazard indoors, outdoors or in sewers.
- Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).

EXPLOSION DATA

Hazardous Combustion Products	• Carbon monoxide. Carbon dioxide (CO_2). Nitrogen oxides (NOx). Oxides of sulfur. • Aldehydes, aromatic and other hydrocarbons.
Sensitivity to Mechanical Impact	• None.
Sensitivity to Static Discharge	• Yes.

PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIREFIGHTERS

- As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.
- 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 firefighters.
- Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces.
- Water spray may be useful in minimizing or dispersing vapors.
- Long-duration fires involving diluent stored in tanks may result in a boilover.
- For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear.

Section 6: Accidental Release Measures

PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

Personal Precautions	• Evacuate personnel to safe areas. • Remove all sources of ignition. • Deny entry to unauthorized and unprotected personnel. • Use personal protective equipment. • Avoid contact with skin, eyes and clothing. • Stop leak if you can do it without risk. • Keep people away from and upwind of spill/leak. • Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. • Ventilate enclosed areas. • Do not walk through spilled material.
Protective Equipment	• Wear appropriate breathing apparatus (if applicable) and protective clothing.

	Emergency Procedures	• ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area) Keep unauthorized personnel away. Evacuate area. Keep out of low areas. Stop leak if you can do it without risk. • Report spills to local or federal authorities as appropriate or required.
ENVIRONMENTAL PRECAUTIONS	• Avoid run off to waterways and sewers. Do NOT wash away into sewer. Prevent entry into waterways, sewers, basements or confined areas. Runoff from fire control may cause pollution.	
METHODS AND MATERIAL FOR CONTAINMENT AND CLEANING UP	**Methods for Containment**	• Stop leak if you can do it without risk. • Contain and recover liquid when possible. • A vapor suppressing foam may be used to reduce vapors. • Dike far ahead of spill; use dry sand to contain the flow of material; contain water spills by booming. • Use water spray to reduce vapors or divert vapor cloud drift. • A fine water spray remotely directed to the edge of the spill pool can be used to direct and maintain a hot flare fire which will burn the spilled material in a controlled manner.
	Methods for Cleaning Up	• Clean up spill immediately. • LARGE SPILLS: DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST. • SMALL LIQUID SPILLS: Use a non-combustible material like vermiculite or sand to soak up the product and place into a container for later disposal. • Use appropriate Personal Protective Equipment (PPE). • Use clean non-sparking tools to collect absorbed material. • Vacuum spilled material. • Try to work upwind of spill. • All equipment used when handling the product must be grounded. • Recover and return free product to proper containers • Use suitable absorbent materials such as vermiculite, sands, soil, or clay to clean up residual liquids. • Do not place spilled materials back in the original container. • Do not flush to sewer or allow to enter waterways.

Section 7: Handling and Storage

PRECAUTIONS FOR SAFE HANDLING	**Handling**	• All equipment used when handling the product must be grounded. Avoid contact with heat and ignition sources and oxidizers. Do not breathe (dust, vapor or spray mist). Do not use in areas without adequate ventilation. Do not use sparking tools. Keep away from heat, sparks, and flame. No open flames, no sparks and no smoking. Use only with adequate ventilation. Do not use or store near heat or open flame. Keep away from fire, sparks and heated surfaces. • The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes). • The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits. • Take precautionary measures against static discharges.

	Handling	• Do not cut drill, grind or weld on empty containers since they may contain explosive residues. • Stay upwind and vent open hatches before uploading. • Avoid contact with skin, eyes and clothing. • Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water. • Wear personal protective equipment. • Remove and wash contaminated clothing before re-use. • Do not eat, drink or smoke when using this product. • Do not take internally. • Wash thoroughly after handling. • Empty containers pose a potential fire and explosion hazard.
CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES	**Storage**	• Ventilate enclosed areas. • Store in a well-ventilated place. • Keep container tightly closed. • Store locked up. • Avoid shock, impact, friction, and rough handling. Do not use sparking tools. • Store in a cool/low-temperature, well-ventilated place away from heat and ignition sources. • Keep away from sources of ignition. • No Smoking. • Do not enter confined spaces such as tanks or pits without following proper entry procedures. • Store in properly closed containers that are appropriately labeled and in a cool well-ventilated area. • Harmful concentrations of hydrogen sulfide (H_2S) gas can accumulate in excavations and low-lying areas as well as the vapor space of storage and bulk transport compartments. • Keep away from open flames, hot surfaces and sources of ignition. • Keep product and empty container away from heat and sources of ignition. • Storage containers should be grounded and bonded. • Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge. • Store away from incompatible materials.
	Incompatible Products	• Strong oxidizers such as nitrates, chlorates, peroxides, chlorine.

Section 8: Exposure Controls/Personal Protection

CONTROL PARAMETERS: EXPOSURE GUIDELINES

CHEMICAL NAME	ACGIH	OSHA	NIOSH
1,2,4-Trimethylbenzene	–	–	TWA 25 ppm TWA 125 mg/m^3
2-Methylbutane (In Liquid form)	TLV 1000 ppm	–	–
Benzene	TLV 0.5 ppm TLV 1.6 mg/m^3 STEL 2.5 ppm STEL 8 mg/m^3	PEL 1 ppm STEL 5 ppm	TWA 0.1 ppm STEL 1 ppm IDLH 500 ppm
Benzene, trimethyl-	TLV 25 ppm	–	–

Butane	STEL 1000 ppm	–	TWA 800 ppm TWA 1900 mg/m^3
Cyclohexane	TLV 100 ppm TLV 334 mg/m^3	PEL 300 ppm PEL 1050 mg/m^3	TWA 300 ppm TWA 1050 mg/m^3 IDLH 1300 ppm
Cyclopentane	TLV 600 ppm	–	TWA 600 ppm TWA 1720 mg/m^3
Ethane	TLV 1000 ppm	–	–
Ethylbenzene	TLV 20 ppm TLV 87 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 125 ppm STEL 545 mg/m^3 IDLH 800 ppm
Heptane	TLV 400 ppm TLV 1640 mg/m^3 STEL 500 ppm STEL 2000 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 85 ppm TWA 350 mg/m^3 Ceiling 440 ppm Ceiling 1800 mg/m^3 IDLH 750 ppm
Hexane	TLV 50 ppm TLV 176 mg/m^3	PEL 500 ppm PEL 1800 mg/m^3	TWA 50 ppm TWA 180 mg/m^3 IDLH 1100 ppm
Hydrogen sulfide	TLV 1 ppm TLV 1.4 mg/m^3 STEL 5 ppm STEL 7 mg/m^3	Ceiling 20 ppm	Ceiling 10 ppm Ceiling 15 mg/m^3 IDLH 100 ppm
Isobutane	TWA 1000 ppm		
Methylcyclohexane	TLV 400 ppm TLV 1610 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 400 ppm TWA 1600 mg/m^3 IDLH 1200 ppm
Nonane	TLV 200 ppm TLV 1050 mg/m^3	–	TWA 200 ppm TWA 1050 mg/m^3
Octane	TLV 300 ppm TLV 1401 mg/m^3	PEL 500 ppm PEL 2350 mg/m^3	TWA 75 ppm TWA 350 mg/m^3 Ceiling 385 ppm Ceiling 1800 mg/m^3 IDLH 1000 ppm
Pentane	TLV 600 ppm TLV 1770 mg/m^3	PEL 1000 ppm PEL 2950 mg/m^3	TWA 120 ppm TWA 350 mg/m^3 Ceiling 610 ppm Ceiling 1800 mg/m^3 IDLH 1500 ppm

Propane	TLV 1000 ppm (listed under Aliphatic hydrocarbon gases: Alkane C1-4)	TWA 1000 ppm TWA 1800 mg/m^3	TWA 1000 ppm TWA 1800 mg/m^3
Toluene	TLV 20 ppm TLV 75 mg/m^3	PEL 200 ppm STEL 300 mg/m^3	TWA 100 ppm TWA 375 mg/m^3 STEL 150 ppm STEL 560 mg/m^3 IDLH 500 ppm
Xylenes	TLV 100 ppm TLV 434 mg/m^3 STEL 150 ppm STEL 651 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 150 ppm STEL 655 mg/m^3 IDLH 900 ppm

APPROPRIATE ENGINEERING CONTROLS

- Adequate ventilation systems as needed to control concentrations of airborne contaminants below applicable threshold limit values. Prevent vapor build up by providing adequate ventilation during and after use. Use only appropriately classified electrical equipment.

INDIVIDUAL PROTECTION MEASURES

Eye and Face	• Wear face shield and eye protection.
Skin and Body	• The use of gloves (nitrile or neoprene) is advised to prevent skin contact and possible irritation. • Wear protective gloves/protective clothing/eye protection/face protection. Wear long sleeves and/or protective coveralls.
Respiratory	• Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or symptoms are experienced.
General Hygiene Measures	• Handle in accordance with good industrial hygiene and safety practice.

Section 9: Physical and Chemical Properties

MATERIAL DESCRIPTION

Physical State	Liquid	**Odor**	Petroleum like odor
Substance Type	Mixture	**Odor Threshold**	No data available
Appearance	Yellow/green to Brown/black liquid		

PROPERTIES

pH	No data available	**Vapor Pressure**	No data available
Melting Point/ Freezing Point	No data available	**Vapor Density**	>1 Air=1
Boiling Point/ Boiling Range	-30 to 538°C -22 to 1000.4°F	**Relative Density**	No data available

Flash Point	>-40 °C >-40 °F	**Water Solubility**	Negligible
Evaporation Rate	No data available	**PartitionCoefficient: n-octanol/water**	No data available
Flammability (solid, gas)	No data available	**Autoignition Temperature**	No data available
Upper Flammability Limit	No data available	**Decomposition Temperature**	No data available
Lower Flammability Limit	No data available	**Specific Gravity**	No data available
Viscosity	No data available		

Section 10: Stability and Reactivity

REACTIVITY	Chlorine Dioxide
CHEMICAL STABILITY	Stable at 70 °F, 760 mm Hg pressure
POSSIBILITY OF HAZARDOUS REACTIONS	None under normal processing
CONDITIONS TO AVOID	Excessive heat, sources of ignition, sparks, open flames, and buildup of static electricity
INCOMPATIBLE MATERIALS	Strong oxidizers such as nitrates, chlorates, peroxides, chlorine
HAZARDOUS DECOMPOSITION PRODUCTS	Combustion produces carbon monoxide, aldehydes, sulfur dioxide, aromatic and other hydrocarbons
HAZARDOUS POLYMERIZATION	Will not occur

Section 11: Toxicological Information

INFORMATION ON THE LIKELY ROUTES OF EXPOSURE

Inhalation	• May cause irritation of respiratory tract. May cause drowsiness and dizziness.
Eye Contact	• Causes serious eye irritation.
Skin Contact	• Causes skin irritation.
Ingestion	• Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. • Potential for aspiration if swallowed. • Aspiration may cause pulmonary edema and pneumonitis.

TOXICOLOGICAL DATA

CHEMICAL NAME	LD50 ORAL	LD50 DERMAL	LC50 INHALATION
1,2,4-Trimethylbenzene	5 g/kg (Rat)	–	18000 mg/m^3 (Rat) 4h
2-Methylbutane (In Liquid form)	–	–	= 150,000 mg/m^3 (Rat) 2 h
Benzene	1800 mg/kg (Rat)	–	13050 - 14380 ppm (Rat) 4 h
Benzene, trimethyl-	8970 mg/kg (Rat)	–	–
Butane	–	–	658 mg/L (Rat) 4 h
Cyclohexane	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	= 13.9 mg/L (Rat) 4 h
Cyclopentane	11400 mg/kg (Rat)	–	72 g/m^3 (Mouse)
Decane	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rat)	–
Ethylbenzene	= 3500 mg/kg (Rat)	= 15400 mg/kg (Rabbit)	= 17.2 mg/L (Rat) 4 h
Heptane	–	= 3000 mg/kg (Rabbit)	= 103 g/m^3 (Rat) 4 h
Hexane	= 25 g/kg (Rat)	= 3000 mg/kg (Rabbit)	= 48000 ppm (Rat) 4 h
Hydrogen sulfide	–	–	= 444 ppm (Rat)
Isobutane	–	–	= 658,000 mg/m^3 (Rat) 4 h
Methylcyclohexane	> 3200 mg/kg (Rat)	–	–
Natural gas condensates (petroleum)	–	–	= 600 mg/m^3 (Rat)
Nonane	–	–	= 3200 ppm (Rat) 4 h
Octane	–	–	= 118 g/m^3 (Rat) 4 h = 25260 ppm (Rat) 4 h
Pentane	>2000 mg/kg (Rat)	–	364 g/cu (Rat) 4 h
Propane	–	–	>800000 ppm (Rat) 15 min
Hydrogen sulfide	–	–	= 444 ppm (Rat)
Toluene	2.6 to 7.5 g/kg (Rat)	14.1 ml/kg (Rabbit)	–
Xylenes	= 3500 mg/kg (Rat)	> 4350 mg/kg (Rabbit) > 1700 mg/kg (Rabbit)	= 29.08 mg/L (Rat) 4 h = 5000 ppm (Rat) 4 h

SYMPTOMS RELATED TO THE PHYSICAL, CHEMICAL AND TOXICOLOGICAL CHARACTERISTICS

Benzene

- Repeated or prolonged exposure to benzene at concentrations in excess of the TLV may cause serious injury to blood-forming organs. Significant chronic exposure to benzene vapor has been reported to produce various blood disorders ranging from anemia to certain forms of leukemia (cancer) in humans. Benzene produced tumors in rats and mice in lifetime chronic toxicity studies, but the response has not been consistent across species, strain, sex or route of exposure. Animal studies on benzene have demonstrated immune toxicity, chromosomal aberrations, testicular effects and alterations in reproductive cycles and embryo/fetotoxicity, but not teratogenicity.

Ethylbenzene	**Carcinogenicity:** Rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study demonstrated limited evidence of kidney, liver, and lung cancer. Ethyl benzene has been listed as a possible human carcinogen by IARC. **Target Organs:** In rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study there was mild damage to the kidney (tubular hyperplasia), liver (eosinophilio foci, hypertrophy, necrosis), lung (alveolar epithelium metaplasia), thyroid (hyperplasia), thyroid (hyperplasia) and pituitary (hyperplasia). In animal models (particularly rats), ethyl benzene affects the auditory function mainly in the cochlear mid-frequency range and ototoxicity was observed after combined exposure to noise and ethyl benzene. There is no evidence of either ethyl benzene-induced hearing losses or ototoxicity with combined exposure to ethyl benzene and noise in workers.
Hexane	• This product may contain hexane at a level of >1.0%. Studies in laboratory animals have produced systemic toxicity in blood, spleen and lungs. Fetotoxicity has been observed at hexane concentrations that produced maternal toxicity. Long term exposure to high concentrations of hexane has been shown to cause testicular effects and nervous system damage.
Hydrogen Sulfide Gas (H_2S)	• Toxic by inhalation. Prolonged breathing of 50-100 ppm H_2S vapors can produce eye and respiratory tract irritation. Higher concentration (250-600 ppm) for 15-30 minutes can produce headache, dizziness, nervousness, nausea and pulmonary edema or bronchial pneumonia. Concentrations of >1000 ppm will cause immediate unconsciousness and death through respiratory paralysis. Rats and mice exposed to 80 ppm H_2S, 6 hrs/day, 5 days/week for 10 weeks, did not produce any toxicity except for irritation of nasal passages. H_2S did not affect reproduction and development (birth defects or neurotoxicity) in rats exposed to concentrations of 75-80 ppm or 150 ppm H_2S, respectively. Over the years a number of acute cases of H_2S poisoning have been reported. Complete and rapid recovery is the general rule. However, if the exposure was sufficiently intense and sustained causing cerebral hypoxia (lack of oxygen to the brain), neurologic effects such as amnesia, intention tremors or brain damage are possible.
Toluene	**Carcinogenicity:** Exposure of rats and mice to toluene at concentrations ranging from 120-1200 ppm for two years did not demonstrate evidence of carcinogenicity. Toluene has not been listed as a carcinogen by IARC. **Target Organs:** Epidemiology studies suggest that chronic occupational overexposure to toluene may damage color vision. Subchronic and chronic inhalation studies with toluene produced kidney and liver damage, hearing loss and central nervous system (brain) damage in laboratory animals. Intentional misuse by deliberate inhalation of high concentrations of toluene has been shown to cause liver, kidney, and central nervous system damage, including hearing loss and visual disturbances. **Reproductive Toxicity:** Exposure to toluene during pregnancy has demonstrated limited evidence of developmental toxicity in laboratory animals. Decreased fetal body weight and increased skeletal variations in both inhalation and oral studies, but only at doses that were maternally toxic. No fetal toxicity was seen at doses that were not maternally toxic. Decreased sperm counts have been observed in male rats in the absence of a reduction in fertility. Toluene has been reported to cause mental or growth retardation in the children of solvent abusers who directly inhale toluene during pregnancy.
Xylenes	• Gross overexposure or severe poisoning incidents in humans to xylenes has been reported to cause lung, liver, kidney, heart and brain damage as well as neurologic disturbances. Laboratory animals exposed to high dose of xylenes showed evidence of effects in the liver, kidneys, lungs, spleen, heart and adrenals, Exposure of pregnant rats, mice and rabbits during gestation to significant concentrations of xylenes produced maternal, fetal and developmental toxicity (skeletal retardation, cleft palate, and wavy ribs) generally at maternally toxic doses. These types of fetotoxic effects have been associated with maternal toxicity. Repeated inhalation of high xylene concentrations has shown impairment of performance abilities (behavioral tests) in animals and man. Xylenes produced a mild frequency hearing loss in rats subchronically exposed to high concentrations of xylenes.

DELAYED AND IMMEDIATE EFFECTS AND ALSO CHRONIC EFFECTS FROM SHORT- AND LONG-TERM EXPOSURE	**Sensitization**	• No information available
	Mutagenic Effects	• May cause genetic defects
	Carcinogenicity	• May cause cancer

CARCINOGENIC INFORMATION

CHEMICAL NAME	ACGIH	ACGIH SKIN*	IARC	NTP	OSHA
Benzene	A1	X	Group 1	Known	X
Ethylbenzene	A3	–	Group 2B	Evidence	X
Hexane	–	X	–	–	–
Toluene	A4	–	Group 3	Evidence	–
Xylenes	A4	–	Group 3	Evidence	–

**ACGIH Skin designation refers to the potential significant contribution of overall exposure by cutaneous route, including mucous membranes and eyes, from airborne exposure to gases, vapor, or liquid OR by direct skin contact.*

REPRODUCTIVE TOXICITY

• Suspected of damaging fertility or the unborn child.

STOT—SINGLE EXPOSURE

• May cause drowsiness and dizziness.

STOT—REPEATED EXPOSURE

• Causes damage to organs through prolonged or repeated exposure.

ASPIRATION HAZARD

May be fatal if swallowed and enters airways Risk of serious damage to the lungs (by aspiration).

Section 12: Ecological Information

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
1,2,4-Trimethylbenzene	–	LC50 96 h: 7.72 mg/L (Pimephales promelas)	EC50 48h: 30 mmol/cu (Daphnia magna)	LC50 24h: 100 mmol/cu Artemia salina (Brine Shrimp)
2-Methylbutane (In Liquid form)			EC50 48 h: = 2.3 mg/L (Daphnia magna)	

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Benzene	EC50 72 h: = 29 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 10.7 - 14.7 mg/L flow-through (Pimephales promelas) LC50 96 h: = 5.3 mg/L flow-through (Oncorhynchus mykiss) LC50 96 h: = 22.49 mg/L static (Lepomis macrochirus) LC50 96 h: = 28.6 mg/L static (Poecilia reticulata) LC50 96 h: 22330 - 41160 µg/L static (Pimephales promelas) LC50 96 h: 70000 - 142000 µg/L static (Lepomis macrochirus)	EC50 48 h: 8.76 - 15.6 mg/L Static (Daphnia magna) EC50 48 h: = 10 mg/L (Daphnia magna)	–
Benzene, trimethyl-	–	–	–	LC50 24h: 7000 ug/L Palaemonetes pugio (Daggerblade grass shrimp)
Cyclohexane	EC50 72 h: > 500 mg/L (Desmodesmus subspicatus)	LC50 96 h: 3.96 - 5.18 mg/L flow-through (Pimephales promelas) LC50 96 h: 23.03 - 42.07 mg/L static (Pimephales promelas) LC50 96 h: 24.99 - 44.69 mg/L static (Lepomis macrochirus) LC50 96 h: 48.87 - 68.76 mg/L static (Poecilia reticulata)	EC50 24 h: > 400 mg/L (Daphnia magna	EC50 = 85.5 mg/L 5 min EC50 = 93 mg/L 10 min (Microorganisms)
Cyclopentane			EC50 48 h: 150 nmol/cu m (Daphnia magna)	LC50 24h: 280 mmol/cu m Artemia salina (Brine Shrimp)
Decane	EC50 24 h: = 0.043 mg/L (Chlorella vulgaris)	–	EC50 48 h: = 0.029 mg/L (Daphnia magna)	–
Ethylbenzene	EC50 72 h: = 4.6 mg/L (Pseudokirchneriella subcapitata) EC50 96 h: > 438 mg/L (Pseudokirchneriella subcapitata) EC50 72 h: 2.6 - 11.3 mg/L static (Pseudokirchneriella subcapitata) EC50 96 h: 1.7 - 7.6 mg/L static (Pseudokirchneriella subcapitata) EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 11.0 - 18.0 mg/L static (Oncorhynchus mykiss) LC50 96 h: = 4.2 mg/L semi-static (Oncorhynchus mykiss) LC50 96 h: 7.55 - 11 mg/L flow-through (Pimephales promelas) LC50 96 h: = 32 mg/L static (Lepomis macrochirus) LC50 96 h: 9.1 - 15.6 mg/L static (Pimephales promelas) LC50 96 h: = 9.6 mg/L static (Poecilia reticulata)	EC50 48 h: 1.8 - 2.4 mg/L (Daphnia magna)	EC50 = 9.68 mg/L 30 min EC50 = 96mg/L 24 h (Microorganisms)
Heptane	–	LC50 96 h: = 375.0 mg/L (Cichlid fish)	EC50 24 h: > 10 mg/L (Daphnia magna)	–
Hexane	–	LC50 96 h: 2.1 - 2.98 mg/L flow-through (Pimephales promelas)	EC50 24 h: > 1000 mg/L (Daphnia magna)	–

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Hydrogen sulfide	–	LC50 96h: 49 µg/l Oncorhynchus mykiss (Rainbow Trout) eggs LC50 24h: 1059.7 µg/l Pimephales promelas (Fathead Minnow)	EC50 48h: 62 µg/l Gammarus pseudolimnaeus (Scud)	–
MethylCyclohexane	–	LC50 96hr: 72.0 mg/l (Golden Shiner)	–	–
Natural gas condensates (petroleum)	–	LC50 96 h: = 119 mg/L static (Alburnus alburnus) LC50 96 h: = 82 mg/L static (Cyprinodon variegatus)	EC50 24 h: = 170 mg/L (Daphnia magna)	–
Octane	–	–	EC50 48 h: = 0.38 mg/L (water flea) EC50 48 h: = 0.02856 mg/L (Daphnia magna)	EC50 = 890 mg/L 30 min (Microorganisms) EC50 <1.67hr: 120 µg/l Mytilus edulis (Common Bay Mussel)
Pentane	–	–	EC50 48h: 135 mmol/cu	LC50 24h: 165 mmol/cu Artemia salina (Brine Shrimp)
Toluene	EC50: >433 mg/L Pseudokirchneriella subcapitata 96 h EC50: 12.5 mg/L Pseudokirchneriella subcapitata 72 h static	LC50: 15.22 - 19.05 mg/L Pimephales promelas 96 h flow-through LC50: 12.6 mg/L Pimephales promelas 96 h static LC50: 5.89 - 7.81 mg/L Oncorhynchus mykiss 96 h flow-through LC50: 14.1 - 17.16 mg/L Oncorhynchus mykiss 96 h static LC50: 5.8 mg/L Oncorhynchus mykiss 96 h semi-static LC50: 11.0-15.0 mg/L Lepomis macrochirus 96 h static LC50: 54 mg/L Oryzias latipes 96 h static LC50: 28.2 mg/L Poecilia reticulata 96 h semi-static LC50: 50.87-70.34 mg/L Poecilia reticulata 96 h static	EC50 48 h: 5.46 - 9.83 mg/L Static (Daphnia magna) EC50 48 h: = 11.5 mg/L (Daphnia magna)	EC50 = 19.7 mg/L 30 min (Microorganisms)

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Xylenes	EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: = 13.4 mg/L flow-through (Pimephales promelas) LC50 96 h: 2.661 - 4.093 mg/L static (Oncorhynchus mykiss) LC50 96 h: 13.5 - 17.3 mg/L (Oncorhynchus mykiss) LC50 96 h: 13.1 - 16.5 mg/L flow-through (Lepomis macrochirus)	EC50 48 h: = 3.82 mg/L (water flea) LC50 48 h: = 0.6 mg/L (Gammarus lacustris)	-

PERSISTENCE AND DEGRADABILITY

- No information available

BIOACCUMULATIVE POTENTIAL

CHEMICAL	LOG POW
1,2,4-Trimethylbenzene	3.78
2-Methylbutane (In Liquid form)	2.72
Benzene	1.83
Butane	2.89
YCyclohexane	3.44
Cyclopentane	3.00
Decane	5.1
Ethane	1.81
Ethylbenzene	3.118
Heptane	4.66
Hexane	3.90
Hydrogen Sulfide	0.45
Isobutane	2.76
Methylcyclohexane	3.61
Methylcyclopentane	3.37
Nonane	5.65
Octane	5.18
Pentane	3.39
Propane	2.36
Toluene	2.65
Xylene	2.77-3.15

MOBILITY IN SOIL

CHEMICAL	EXPECTED SOIL MOBILITY
1,2,4-Trimethylbenzene	Low
2-Methylbutane (In Liquid form)	Low
Benzene	High
Benzene, trimethyl-	Moderate to High
Butane	Low
Cyclohexane	Moderate
Cyclopentane	Moderate
Decane	Immobile
Ethane	Very High
Ethylbenzene	Low
Heptane	Moderate
Hexane	High
Isobutane	Very High
Methylcyclopentane	Low
Nonane	Immobile
Octane	Immobile
Pentane	High
Propane	Moderate
Toluene	High to Moderate
Xylene	Very High to Moderate

OTHER ADVERSE EFFECTS

- No information available

Section 13: Disposal Considerations

WASTE TREATMENT METHODS

Product Waste	• This product, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA RCRA (40 CFR 261), Environment Canada, or other State, Provincial, and local regulations. If this product is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility. • This product could also contain benzene at >0.5 ppm and could exhibit the characteristic of "toxicity" (D018) as determined by the toxicity characteristic leaching procedure (TCLP). • This material could become a hazardous waste if mixed or contaminated with a hazardous waste or other substance(s). • It is the responsibility of the user to consult federal, state and local waste regulations to determine appropriate disposal options.
Packaging Waste	• Container contents should be completely used and containers should be emptied prior to discard. • Container 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 re-conditioner. • To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

Section 14: Transport Information

****CHART NAME****

	UN NUMBER	PROPER SHIPPING NAME	TRANSPORT HAZARD CLASS	PACKING GROUP	ENVIRONMENTAL HAZARD
DOT	UN1268	Petroleum Distillate, N.O.S.	3	I	Emergency response guide number: 128
TDG	UN1268	Petroleum Distillate, N.O.S.	3	I	–
IMO/IMDG	UN1268	Petroleum Distillate, N.O.S.	3	I	–
IATA/ICAO	UN1268	Petroleum Distillate, N.O.S.	3	I	–

SPECIAL RECAUTIONS FOR USER

• None

Section 15: Regulatory Information

U.S.—CERCLA/SARA HAZARDOUS SUBSTANCES AND THEIR REPORTABLE QUANTITIES

COMPONENT	CAS #	AMOUNT
1,2,4-Trimethylbenzene	95-63-6	Not Listed
2-Methylbutane (In Liquid form)	78-78-4	Not Listed
Benzene	71-43-2	10 lb final RQ; 4.54 kg final RQ
Benzene, trimethyl-	25551-13-7	Not Listed
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	1000 lb final RQ; 454 kg final RQ
Cyclopentane	287-92-3	Not Listed
Decane	124-18-5	Not Listed
Ethane	74-84-0	Not Listed
Ethylbenzene	100-41-4	1000 lb final RQ; 454 kg final RQ
Heptane	142-82-5	Not Listed
Hexane	110-54-3	5000 lb final RQ; 2270 kg final RQ
Hydrogen Sulfide	7783-06-4	100 lb final RQ; 45.4 kg final RQ
Isobutane	75-28-5	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Natural gas condensate	68919-39-1	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Nonane	111-84-2	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed
Propane	74-98-6	Not Listed
Toluene	108-88-3	1000 lb final RQ; 454 kg final RQ
Xylene	1330-20-7	100 lb final RQ; 45.4 kg final RQ

U.S.—CWA (CLEAN WATER ACT)—REPORTABLE QUANTITIES OF DESIGNATED HAZARDOUS SUBSTANCES

COMPONENT	CAS #	AMOUNT
1,2,4-Trimethylbenzene	95-63-6	Not Listed
2-Methylbutane (In Liquid form)	78-78-4	Not Listed
Benzene	71-43-2	10 lb RQ
Benzene, trimethyl-	25551-13-7	Not Listed
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	1000 lb RQ
Cyclopentane	287-92-3	Not Listed
Decane	124-18-5	Not Listed
Ethane	74-84-0	Not Listed
Ethylbenzene	100-41-4	1000 lb RQ
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	100 lb RQ
Isobutane	75-28-5	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Natural gas condensate	68919-39-1	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Nonane	111-84-2	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed
Propane	74-98-6	Not Listed
Toluene	108-88-3	1000 lb RQ
Xylene	1330-20-7	100 lb RQ

U.S.—CWA (CLEAN WATER ACT)—RECOMMENDED WATER QUALITY CRITERIA—CCC FOR FRESHWATER LIFE

COMPONENT	CAS #	AMOUNT
Hydrogen Sulfide	7783-06-4	2.0 µg/L CCC

U.S.—CWA (CLEAN WATER ACT)—RECOMMENDED WATER QUALITY CRITERIA—CCC FOR SALTWATER LIFE

COMPONENT	CAS #	AMOUNT
HydrogenSulfide	7783-06-4	2.0 µg/L CCC

U.S.—CWA (CLEAN WATER ACT)—HAZARDOUS SUBSTANCES

COMPONENT	CAS #	LISTED
1,2,4-Trimethylbenzene	95-63-6	Not Listed
2-Methylbutane (In Liquid form)	78-78-4	Not Listed
Benzene	71-43-2	X
Benzene, trimethyl-	25551-13-7	Not Listed
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	X
Cyclopentane	287-92-3	Not Listed
Decane	124-18-5	Not Listed
Ethane	74-84-0	Not Listed
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	X
Isobutane	75-28-5	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Natural gas condensate	68919-39-1	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Nonane	111-84-2	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed

Propane	74-98-6	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	X

X= The component is listed

U.S.—CWA (CLEAN WATER ACT)—PRIORITY POLLUTANTS

COMPONENT	CAS #	LISTED
1,2,4-Trimethylbenzene	95-63-6	Not Listed
2-Methylbutane (In Liquid form)	78-78-4	Not Listed
Benzene	71-43-2	X
Benzene, trimethyl-	25551-13-7	Not Listed
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	Not Listed
Cyclopentane	287-92-3	Not Listed
Decane	124-18-5	Not Listed
Ethane	74-84-0	Not Listed
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	Not Listed
Isobutane	75-28-5	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Natural gas condensate	68919-39-1	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Nonane	111-84-2	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed
Propane	74-98-6	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	Not Listed

X= The component is listed

CANADA-WHMIS—CLASSIFICATIONS OF SUBSTANCES

COMPONENT	CAS #	CLASSIFICATION
1,2,4-Trimethylbenzene	95-63-6	B3
2-Methylbutane (In Liquid form)	78-78-4	B2
Benzene	71-43-2	B2, D2A, D2B
Benzene, trimethyl-	25551-13-7	B3
Butane	106-97-8	A, B1
Cyclohexane	110-82-7	B2, D2B
Cyclopentane	287-92-3	B2
Decane	124-18-5	B3, D2B
Ethane	74-84-0	A, B1
Ethylbenzene	100-41-4	B2, D2A, D2B
Heptane	142-82-5	B2, D2B
Hexane	110-54-3	B2, D2A, D2B
Hydrogen Sulfide	7783-06-4	A, B1, D1A, D2B
Isobutane	75-28-5	A, B1 (listed under Methyl-2 propane)
Methylcyclohexane	108-87-2	B2
Methylcyclopentane	96-37-7	Not Listed
Natural gas condensate	68919-39-1	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Nonane	111-84-2	B2, D2B
Octane	111-65-9	B2, D2B
Pentane	109-66-0	B2
Propane	74-98-6	A, B1
Toluene	108-88-3	B2, D2A, D2B
Xylene	1330-20-7	B2, D2A, D2B

X= The component is listed

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR FRESHWATER AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	90 µg/L
Toluene	108-88-3	2.0 µg/L
Benzene	71-43-2	370 µg/L

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR MARINE AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	25 µg/L
Toluene	108-88-3	215 µg/L
Benzene	71-43-2	110 µg/L

CANADA—ENVIRONMENTAL EMERGENCIES

COMPONENT	CAS #	LISTED
1,2,4-Trimethylbenzene	95-63-6	Not Listed
2-Methylbutane (In Liquid form)	78-78-4	X
Benzene	71-43-2	X
Benzene, trimethyl-	25551-13-7	Not Listed
Butane	106-97-8	X
Cyclohexane	110-82-7	X
Cyclopentane	287-92-3	Not Listed
Decane	124-18-5	Not Listed
Ethane	74-84-0	X
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	X
Isobutane	75-28-5	X
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Natural gas condensate	68919-39-1	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Nonane	111-84-2	Not Listed
Octane	111-65-9	Not Listed

Pentane	109-66-0	X
Propane	74-98-6	X
Toluene	108-88-3	X
Xylene	1330-20-7	X

X= The component is listed

Section 16: Other Information

NFPA



Health Hazard: 3	**Flammability:** 4	**Instability:** 0	**Physical and Chemical Hazards:** X

HMIS	**Health Hazard:** 3	**Flammability:** 4	**Instability:** 0	**Personal Protection:** X

ISSUING DATE 5/8/15

REVISION DATE 5/8/15

DISCLAIMER

- The information presented herein is based on data considered to be accurate as of the date of preparation of this Safety Data Sheet (SDS). However, SDSs 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.

SAFETY DATA SHEET

MURPHY OIL USA, INC.
200 Peach Street (71730)
P O Box 7000
El Dorado, AR 71731-7000
(870) 862-6411

Gasoline (All Grades)

Section 1. Identification

GHS product identifier : Gasoline (All Grades)

Chemical name : Mixture (C4 to C12 Hydrocarbon)

Other means of identification : Motor Gasoline, Petrol, Gas

Product type : Liquid.

Identified uses

Motor Fuel.

Supplier's details : Murphy Oil USA, Inc.
200 Peach Street
El Dorado, AR 71730
Tel: +1-870-875-7600
Fax: 866-933-1563
Website: http://www.murphyusa.com

Emergency telephone number (with hours of operation) : CHEMTREC, U.S. : 1-800-424-9300 International: +1-703-527-3887 # CCN15145
24 hours/day, 7 days/week

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : FLAMMABLE LIQUIDS - Category 1
SKIN CORROSION/IRRITATION - Category 2
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 2A
GERM CELL MUTAGENICITY - Category 1B
CARCINOGENICITY - Category 1A
TOXIC TO REPRODUCTION (Fertility) - Category 2
TOXIC TO REPRODUCTION (Unborn child) - Category 2
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 1
ASPIRATION HAZARD - Category 1
AQUATIC HAZARD (ACUTE) - Category 2
AQUATIC HAZARD (LONG-TERM) - Category 2

GHS label elements

Hazard pictograms :



Signal word : Danger

Section 2. Hazards identification

Hazard statements : Extremely flammable liquid and vapor.
Causes serious eye irritation.
Causes skin irritation.
May cause genetic defects.
May cause cancer.
Suspected of damaging fertility or the unborn child.
May be fatal if swallowed and enters airways.
Causes damage to organs through prolonged or repeated exposure.
Toxic to aquatic life with long lasting effects.

Precautionary statements

Prevention : Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Use personal protective equipment as required. Wear protective gloves. Wear eye or face protection. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Use explosion-proof electrical, ventilating, lighting and all material-handling equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Keep container tightly closed. Avoid release to the environment. Do not breathe vapor. Do not eat, drink or smoke when using this product. Wash hands thoroughly after handling. High-pressure injection under skin may cause serious damage. Prolonged and repeated exposure to benzene may cause serious injury to blood forming organs and is associated with anemia and to the later development of acute myelogenous leukemia (AML).

Response : Collect spillage. Get medical attention if you feel unwell. IF exposed or concerned: Get medical attention. IF SWALLOWED: Immediately call a POISON CENTER or physician. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing. If skin irritation occurs: Get medical attention. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention.

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

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Hazards not otherwise classified : None known.

Section 3. Composition/information on ingredients

Substance/mixture : Mixture

Chemical name : Mixture (C4 to C12 Hydrocarbon)

Other means of identification : Motor Gasoline, Petrol, Gas

CAS number/other identifiers

CAS number : Not applicable.

Product code : 501, 502, 503, 504, 505, 506, 507, 508, 509, 556, 557, 558, 561, 562, 563, 565, 566, 567, 568, 571, 572, 573, 575, 576, 577, 578, 579, 581, 582, 583, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 665, 666, 667, 668, 687, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 728, 729, 730, 732, 733, 734, 735, 757, 758, 777, 778, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 806, 809, 810,

Section 3. Composition/information on ingredients

Ingredient name	%	CAS number
Gasoline, natural	89 - 100	8006-61-9
Contains:		
Ethyl Alcohol	<11	64-17-5
Xylene	<5	1330-20-7
Toluene	<5	108-88-3
Benzene	<5	71-43-2
Ethylbenzene	<5	100-41-4
n-Hexane	<5	110-54-3
Naphthalene	<5	91-20-3
1,2,4-Trimethylbenzene	<5	95-63-6
Trimethylbenzene	<5	25551-13-7

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 20 minutes. Get medical attention.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway.

Skin contact : Flush contaminated skin with plenty of water. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 20 minutes. Get medical attention. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Get medical attention immediately. Call a poison center or physician. Wash out mouth with water. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Aspiration hazard if swallowed. Can enter lungs and cause damage. Do not induce vomiting. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : May cause mild, short-lasting discomfort to eyes.

Inhalation : Minimally toxic. Elevated temperatures or mechanical action may form vapors, mist, or fumes which may be irritating to the eyes, nose, throat, or lungs.

Skin contact : Causes skin irritation.

Ingestion : May be fatal if swallowed and enters airways. Irritating to mouth, throat and stomach.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Section 4. First aid measures

Inhalation : Adverse symptoms may include the following:
reduced fetal weight
increase in fetal deaths
skeletal malformations

Skin contact : Adverse symptoms may include the following:
irritation
redness
reduced fetal weight
increase in fetal deaths
skeletal malformations

Ingestion : Adverse symptoms may include the following:
nausea or vomiting
reduced fetal weight
increase in fetal deaths
skeletal malformations

Medical conditions aggravated by overexposure : For the product itself: Laboratory animal studies have shown that prolonged and repeated inhalation exposure to light hydrocarbon vapors in the same boiling range as this product can produce adverse kidney effects in male rats. However, these effects were not observed in similar studies with female rats, male and female mice, or in limited studies with other animal species. Additionally, in a number of human studies, there was no clinical evidence of such effects at normal occupational levels. In 1991, The U.S. EPA determined that the male rat kidney is not useful for assessing human risk. Vapor concentrations above recommended exposure levels are irritating to the eyes and the respiratory tract, may cause headaches and dizziness, are anesthetic and may have other central nervous system effects. Small amounts of liquid aspirated into the lungs during ingestion or from vomiting may cause chemical pneumonitis or pulmonary edema. Gasoline unleaded: Caused cancer in animal tests. Chronic inhalation studies resulted in liver tumors in female mice and kidney tumors in male rats. Neither result considered significant for human health risk assessment by the United States EPA and others. Did not cause mutations In Vitro or In Vivo. Negative in inhalation developmental studies and reproductive tox studies. Inhalation of high concentrations in animals resulted in reversible central nervous system depression, but no persistent toxic effect on the nervous system. Non-sensitizing in test animals. Caused nerve damage in humans from abusive use (sniffing).

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use dry chemical, CO_2, water spray (fog) or foam.

Unsuitable extinguishing media : Do not use water jet or water-based fire extinguishers.

Specific hazards arising from the chemical : Extremely flammable liquid and vapor. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back. This material is toxic to aquatic life with long lasting effects. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide

Special protective actions for fire-fighters : Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities. Collect spillage.

Methods and materials for containment and cleaning up

Spill : Use spark-proof tools and explosion-proof equipment. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Avoid breathing vapor or mist. Avoid contact with skin. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Potentially toxic/irritating fumes/ vapors may be evolved from heated or agitated material. Do not siphon by mouth. Use only with adequate ventilation. Use proper bonding and/or grounding procedures. Do not use as a cleaning solvent or other non-motor fuel uses. For use as a motor fuel only. It is dangerous and/or unlawful to put fuel into unapproved containers. Do not fill container while it is in or on a vehicle. Static electricity may ignite vapors and cause fire. Place container on ground when filling and keep nozzle in contact with container. Do not use electronic devices (including but not limited to cellular phones, computers, calculators, pagers or other electronic devices, etc.) in or around any fueling operation or storage area unless the devices are certified intrinsically safe by an approved national testing agency and to the safety standards required by national and/or local laws and regulations. Prevent small spills and leakage to avoid slip hazard. Material can accumulate static charges which may cause an electrical spark (ignition source).

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. See also Section 8 for additional information on hygiene measures. Remove contaminated clothing and protective equipment before entering eating areas.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. Ample fire water supply should be available. A fixed sprinkler/deluge system is recommended. Handle containers with care. Open slowly in order to control possible pressure release. Outside or detached storage preferred. Storage containers should be grounded and bonded. Drums must be grounded and bonded and equipped with self-closing valves, pressure vacuum bungs and flame arresters.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Gasoline, natural	**OSHA PEL 1989 (United States, 3/1989).** STEL: 1500 mg/m³ 15 minutes. STEL: 500 ppm 15 minutes. TWA: 900 mg/m³ 8 hours. TWA: 300 ppm 8 hours.
Ethyl Alcohol	**ACGIH TLV (United States, 6/2013).** STEL: 1000 ppm 15 minutes. **NIOSH REL (United States, 4/2013).** TWA: 1900 mg/m³ 10 hours. TWA: 1000 ppm 10 hours. **OSHA PEL (United States, 2/2013).** TWA: 1900 mg/m³ 8 hours. TWA: 1000 ppm 8 hours.
Xylene	**ACGIH TLV (United States, 6/2013).** STEL: 651 mg/m³ 15 minutes. STEL: 150 ppm 15 minutes. TWA: 434 mg/m³ 8 hours. TWA: 100 ppm 8 hours. **OSHA PEL (United States, 2/2013).**

Section 8. Exposure controls/personal protection

	TWA: 100 ppm 8 hours. TWA: 435 mg/m³ 8 hours.
Toluene	**NIOSH REL (United States, 4/2013).** STEL: 560 mg/m³ 15 minutes. STEL: 150 ppm 15 minutes. TWA: 375 mg/m³ 10 hours. TWA: 100 ppm 10 hours. **OSHA PEL Z2 (United States, 2/2013).** AMP: 500 ppm 10 minutes. CEIL: 300 ppm TWA: 200 ppm 8 hours. **ACGIH TLV (United States, 6/2013).** TWA: 20 ppm 8 hours.
Benzene	**ACGIH TLV (United States, 6/2013). Absorbed through skin.** STEL: 8 mg/m³ 15 minutes. STEL: 2.5 ppm 15 minutes. TWA: 1.6 mg/m³ 8 hours. TWA: 0.5 ppm 8 hours. **NIOSH REL (United States, 4/2013).** STEL: 1 ppm 15 minutes. TWA: 0.1 ppm 10 hours. **OSHA PEL (United States, 2/2013).** STEL: 5 ppm 15 minutes. TWA: 1 ppm 8 hours. **OSHA PEL Z2 (United States, 2/2013).** AMP: 50 ppm 10 minutes. CEIL: 25 ppm TWA: 10 ppm 8 hours.
Ethylbenzene	**ACGIH TLV (United States, 6/2013).** TWA: 20 ppm 8 hours. **NIOSH REL (United States, 4/2013).** STEL: 545 mg/m³ 15 minutes. STEL: 125 ppm 15 minutes. TWA: 435 mg/m³ 10 hours. TWA: 100 ppm 10 hours. **OSHA PEL (United States, 2/2013).** TWA: 435 mg/m³ 8 hours. TWA: 100 ppm 8 hours.
n-Hexane	**ACGIH TLV (United States, 6/2013). Absorbed through skin.** TWA: 50 ppm 8 hours. **NIOSH REL (United States, 4/2013).** TWA: 180 mg/m³ 10 hours. TWA: 50 ppm 10 hours. **OSHA PEL (United States, 2/2013).** TWA: 1800 mg/m³ 8 hours. TWA: 500 ppm 8 hours.
Naphthalene	**ACGIH TLV (United States, 6/2013). Absorbed through skin.** STEL: 79 mg/m³ 15 minutes. STEL: 15 ppm 15 minutes. TWA: 52 mg/m³ 8 hours. TWA: 10 ppm 8 hours. **NIOSH REL (United States, 4/2013).** STEL: 75 mg/m³ 15 minutes. STEL: 15 ppm 15 minutes. TWA: 50 mg/m³ 10 hours. TWA: 10 ppm 10 hours. **OSHA PEL (United States, 2/2013).** TWA: 50 mg/m³ 8 hours. TWA: 10 ppm 8 hours.
1,2,4-Trimethylbenzene	**ACGIH TLV (United States, 6/2013).** TWA: 123 mg/m³ 8 hours. TWA: 25 ppm 8 hours. **NIOSH REL (United States, 4/2013).** TWA: 125 mg/m³ 10 hours. TWA: 25 ppm 10 hours. **OSHA PEL 1989 (United States, 3/1989).** TWA: 25 ppm 8 hours. TWA: 125 mg/m³ 8 hours.

Section 8. Exposure controls/personal protection

Trimethylbenzene	**ACGIH TLV (United States, 6/2013).** TWA: 123 mg/m³ 8 hours. TWA: 25 ppm 8 hours. **OSHA PEL 1989 (United States, 3/1989).** TWA: 25 ppm 8 hours. TWA: 125 mg/m³ 8 hours.

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

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.

Skin protection

Hand protection : Use gloves appropriate for work or task being performed. Recommended: If prolonged or repeated contact is likely, chemical resistant gloves are recommended. If contact with forearms is likely, wear gauntlet style gloves. If contact with forearms is likely, wear gauntlet style gloves.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. Recommended: If prolonged or repeated contact is likely, chemical, and oil resistant clothing is recommended.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Use a properly fitted, air-purifying or supplied air respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state : Liquid.

Color : Clear (May Be Dyed).

Odor : Petroleum/Solvent.

Odor threshold : Not available.

pH : Not applicable.

Melting point : Not available.

Boiling point : 20°C (68°F)

Section 9. Physical and chemical properties

Flash point : Closed cup: <-40°C (<-40°F) [Pensky-Martens.]

Evaporation rate : >10 (Butyl acetate = 1)

Flammability (solid, gas) : Not available.

Lower and upper explosive (flammable) limits : Lower: 1.4%
Upper: 7.5%

Vapor pressure : 7 psi to 13.5 psi, Reid Vapor Pressure (RVP) [depending on the time of year]

Vapor density : 3 [Air = 1]

Relative density : 0.72

Solubility : Negligible.

Partition coefficient: n-octanol/water : Not available.

Auto-ignition temperature : >254°C (>489.2°F)

Decomposition temperature : Not available.

Viscosity : Kinematic (40°C (104°F)): <0.01 cm^2/s (<1 cSt)

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow vapor to accumulate in low or confined areas.

Incompatible materials : Halogens, Strong Acids, Alkalies, Strong oxidizers.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Ethyl Alcohol	LC50 Inhalation Vapor	Rat	124700 mg/m³	4 hours
	LD50 Oral	Rat	7 g/kg	-
Xylene	LC50 Inhalation Gas.	Rat	5000 ppm	4 hours
	LD50 Oral	Rat	4300 mg/kg	-
Toluene	LC50 Inhalation Vapor	Rat	49 g/m³	4 hours
	LD50 Oral	Rat	636 mg/kg	-
Benzene	LD50 Oral	Rat	930 mg/kg	-
Ethylbenzene	LD50 Dermal	Rabbit	>5000 mg/kg	-
	LD50 Oral	Rat	3500 mg/kg	-
n-Hexane	LC50 Inhalation Gas.	Rat	48000 ppm	4 hours
	LD50 Oral	Rat	15840 mg/kg	-
Naphthalene	LD50 Dermal	Rabbit	>20 g/kg	-
	LD50 Oral	Rat	490 mg/kg	-
1,2,4-Trimethylbenzene	LC50 Inhalation Vapor	Rat	18000 mg/m³	4 hours
	LD50 Oral	Rat	5 g/kg	-

Section 11. Toxicological information

Trimethylbenzene	LD50 Oral	Rat	8970 mg/kg	-

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
Gasoline, natural	Eyes - Mild irritant	Human	-	8 hours 140 ppm	-
	Eyes - Moderate irritant	Man	-	1 hours 500 ppm	-
Ethyl Alcohol	Eyes - Moderate irritant	Rabbit	-	100 µL	-
	Skin - Moderate irritant	Rabbit	-	24 hours 20 mg	-
	Eyes - Mild irritant	Rabbit	-	24 hours 500 mg	-
	Eyes - Moderate irritant	Rabbit	-	0.06 minutes 100 mg	-
	Eyes - Severe irritant	Rabbit	-	500 mg	-
	Skin - Mild irritant	Rabbit	-	400 mg	-
Xylene	Eyes - Mild irritant	Rabbit	-	87 mg	-
	Eyes - Severe irritant	Rabbit	-	24 hours 5 mg	-
	Skin - Mild irritant	Rat	-	8 hours 60 µL	-
	Skin - Moderate irritant	Rabbit	-	24 hours 500 mg	-
	Skin - Moderate irritant	Rabbit	-	100%	-
Toluene	Eyes - Mild irritant	Rabbit	-	0.5 minutes 100 mg	-
	Skin - Moderate irritant	Rabbit	-	24 hours 20 mg	-
	Eyes - Mild irritant	Rabbit	-	870 µg	-
	Eyes - Severe irritant	Rabbit	-	24 hours 2 mg	-
	Skin - Mild irritant	Pig	-	24 hours 250 µL	-
	Skin - Mild irritant	Rabbit	-	435 mg	-
	Skin - Moderate irritant	Rabbit	-	500 mg	-
Benzene	Eyes - Moderate irritant	Rabbit	-	88 mg	-
	Skin - Moderate irritant	Rabbit	-	24 hours 20 mg	-
	Eyes - Severe irritant	Rabbit	-	24 hours 2 mg	-
	Skin - Mild irritant	Rat	-	8 hours 60 µL	-
	Skin - Mild irritant	Rabbit	-	24 hours 15 mg	-
Ethylbenzene	Eyes - Severe irritant	Rabbit	-	500 mg	-
	Skin - Mild irritant	Rabbit	-	24 hours 15 mg	-
n-Hexane	Eyes - Mild irritant	Rabbit	-	10 milligrams	-
Naphthalene	Skin - Mild irritant	Rabbit	-	495 mg	-
	Skin - Severe irritant	Rabbit	-	24 hours 0.05 mL	-
Trimethylbenzene	Eyes - Mild irritant	Rabbit	-	24 hours 500 mg	-
	Skin - Moderate irritant	Rabbit	-	24 hours 500 mg	-

Sensitization

There is no data available.

Carcinogenicity

Classification

Product/ingredient name	OSHA	IARC	NTP	ACGIH	EPA	NIOSH
Gasoline, natural	-	2B	-	-	-	+
Xylene	-	3	-	A4	-	-
Toluene	-	3	-	A4	-	-
Benzene	+	1	Known to be a human carcinogen.	A1	-	+
Ethylbenzene	-	2B	-	A3	-	None.
Naphthalene	-	2B	Reasonably anticipated to be a human carcinogen.	A4	-	None.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
Ethyl Alcohol	Category 3	Not applicable.	Narcotic effects
Toluene	Category 3	Not applicable.	Narcotic effects
n-Hexane	Category 3	Not applicable.	Narcotic effects
1,2,4-Trimethylbenzene	Category 3	Not applicable.	Respiratory tract irritation

Specific target organ toxicity (repeated exposure)

Section 11. Toxicological information

Name	Category	Route of exposure	Target organs
Toluene	Category 2	Not determined	Not determined
Benzene	Category 1	Not determined	Not determined
n-Hexane	Category 2	Not determined	Not determined

Aspiration hazard

Name	Result
Gasoline, natural	ASPIRATION HAZARD - Category 1
Toluene	ASPIRATION HAZARD - Category 1
Benzene	ASPIRATION HAZARD - Category 1
n-Hexane	ASPIRATION HAZARD - Category 1

Information on the likely routes of exposure : Dermal contact. Eye contact. Inhalation. Ingestion.

Potential acute health effects

Eye contact : May cause mild, short-lasting discomfort to eyes.

Inhalation : Minimally toxic. Elevated temperatures or mechanical action may form vapors, mist, or fumes which may be irritating to the eyes, nose, throat, or lungs.

Skin contact : Causes skin irritation.

Ingestion : May be fatal if swallowed and enters airways. Irritating to mouth, throat and stomach.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : Adverse symptoms may include the following:
reduced fetal weight
increase in fetal deaths
skeletal malformations

Skin contact : Adverse symptoms may include the following:
irritation
redness
reduced fetal weight
increase in fetal deaths
skeletal malformations

Ingestion : Adverse symptoms may include the following:
nausea or vomiting
reduced fetal weight
increase in fetal deaths
skeletal malformations

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : No known significant effects or critical hazards.

Potential delayed effects : No known significant effects or critical hazards.

Long term exposure

Potential immediate effects : No known significant effects or critical hazards.

Section 11. Toxicological information

Potential delayed effects : No known significant effects or critical hazards.

Potential chronic health effects

General : Causes damage to organs through prolonged or repeated exposure.

Carcinogenicity : May cause cancer. Risk of cancer depends on duration and level of exposure.

Mutagenicity : May cause genetic defects.

Teratogenicity : Suspected of damaging the unborn child.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : Suspected of damaging fertility.

Numerical measures of toxicity

Acute toxicity estimates

Route	ATE value
Oral	4244.9 mg/kg
Dermal	11111.1 mg/kg
Inhalation (gases)	101010.1 ppm
Inhalation (vapors)	137.9 mg/L

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
Gasoline, natural	Acute EC50 17.5 mg/L Marine water	Crustaceans - Artemia sp. - Nauplii	48 hours
	Acute EC50 1.5 mg/L Marine water	Daphnia - Daphnia magna - Neonate	48 hours
Ethyl Alcohol	Acute EC50 17.921 mg/L Marine water	Algae - Ulva pertusa	96 hours
	Acute EC50 2000 µg/l Fresh water	Daphnia - Daphnia magna	48 hours
	Acute LC50 25500 µg/l Marine water	Crustaceans - Artemia franchiscana - Larvae	48 hours
	Acute LC50 42000 µg/l Fresh water	Fish - Oncorhynchus mykiss	4 days
	Chronic NOEC 4.995 mg/L Marine water	Algae - Ulva pertusa	96 hours
	Chronic NOEC 0.375 ul/L Fresh water	Fish - Gambusia holbrooki - Larvae	12 weeks
Xylene	Acute IC50 10 mg/L	Algae	72 hours
	Acute LC50 8500 µg/l Marine water	Crustaceans - Palaemonetes pugio	48 hours
	Acute LC50 13400 µg/l Fresh water	Fish - Pimephales promelas	96 hours
Toluene	Acute EC50 433 ppm Marine water	Algae - Skeletonema costatum	96 hours
	Acute EC50 12500 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata	72 hours
	Acute EC50 11600 µg/l Fresh water	Crustaceans - Gammarus pseudolimnaeus - Adult	48 hours
	Acute EC50 6000 µg/l Fresh water	Daphnia - Daphnia magna - Juvenile (Fledgling, Hatchling, Weanling)	48 hours
	Acute LC50 5500 µg/l Fresh water	Fish - Oncorhynchus kisutch - Fry	96 hours
	Chronic NOEC 500000 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata	96 hours
	Chronic NOEC 1000 µg/l Fresh water	Daphnia - Daphnia magna	21 days
Benzene	Acute EC50 29000 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata	72 hours
	Acute EC50 1360000 µg/l Fresh water	Algae - Scenedesmus abundans	96 hours
	Acute EC50 9230 µg/l Fresh water	Daphnia - Daphnia magna - Neonate	48 hours
	Acute LC50 21000 µg/l Marine water	Crustaceans - Artemia salina - Nauplii	48 hours
	Acute LC50 5.28 ul/L Fresh water	Fish - Oncorhynchus gorbuscha - Fry	96 hours
	Chronic NOEC 1.5 to 5.4 ul/L Marine water	Fish - Morone saxatilis - Juvenile (Fledgling, Hatchling, Weanling)	4 weeks
Ethylbenzene	Acute EC50 4600 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata	72 hours
	Acute EC50 3600 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata	96 hours
	Acute EC50 2970 µg/l Fresh water	Daphnia - Daphnia magna - Neonate	48 hours
	Acute LC50 5200 µg/l Marine water	Crustaceans - Americamysis bahia	48 hours
	Acute LC50 4200 µg/l Fresh water	Fish - Oncorhynchus mykiss	96 hours
	Chronic NOEC 1000 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata	96 hours
n-Hexane	Acute LC50 113000 µg/l Fresh water	Fish - Oreochromis mossambicus	96 hours
Naphthalene	Acute EC50 1600 µg/l Fresh water	Daphnia - Daphnia magna - Neonate	48 hours
	Acute LC50 2350 µg/l Marine water	Crustaceans - Palaemonetes pugio	48 hours
	Acute LC50 213 µg/l Fresh water	Fish - Melanotaenia fluviatilis - Larvae	96 hours

Section 12. Ecological information

1,2,4-Trimethylbenzene	Chronic NOEC 0.67 ppm Fresh water Acute LC50 4910 µg/l Marine water	Fish - Oncorhynchus kisutch Crustaceans - Elasmopus pectenicrus - Adult	40 days 48 hours
Trimethylbenzene	Acute LC50 22.4 mg/L Fresh water Acute LC50 5600 µg/l Marine water	Fish - Tilapia zillii Crustaceans - Palaemonetes pugio	96 hours 48 hours

Persistence and degradability

There is no data available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Gasoline, natural	-	10 to 2500	high
Ethyl Alcohol	-0.32	-	low
Xylene	3.12	8.1 to 25.9	low
Toluene	2.73	90	low
Benzene	2.13	11	low
Ethylbenzene	3.6	-	low
n-Hexane	4	501.187	high
Naphthalene	3.4	36.5 to 168	low
1,2,4-Trimethylbenzene	3.63	243	low
Trimethylbenzene	3.4 to 3.8	-	low

Mobility in soil

Soil/water partition coefficient (K_{OC}) : There is no data available.

Other adverse effects : **Mobility**
More volatile component -- Highly volatile, will partition rapidly to air. Not expected to partition to sediment and wastewater solids.
Less volatile component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.
Persistence/degradability
Majority of components -- Expected to be inherently biodegradable.
More volatile component -- Expected to degrade rapidly in air.
Bioaccumulative potential
Majority of components -- Has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. This material and its container must be disposed of in a safe way. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Empty containers or liners may retain some product residues. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor.

United States - RCRA Toxic hazardous waste "U" List

Ingredient	CAS #	Status	Reference number
Xylene	1330-20-7	Listed	U239
Toluene	108-88-3	Listed	U220
Benzene	71-43-2	Listed	U019
Naphthalene	91-20-3	Listed	U165

Section 14. Transport information

	DOT Classification	IMDG	IATA
UN number	UN1203	UN1203	UN1203
UN proper shipping name	GASOLINE	GASOLINE	GASOLINE
Transport hazard class(es)	3 	3 	3 
Packing group	II	II	II
Environmental hazards	No.	Yes.	No.
Additional information	The marine pollutant mark is not required when transported on inland waterways in sizes of ≤5 L or ≤5 kg or by road, rail, or inland air in non-bulk sizes. **Reportable quantity** 202.02 lbs / 91.717 kg [33.652 gal / 127.38 L] Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.	The marine pollutant mark is not required when transported in sizes of ≤5 L or ≤5 kg. **Emergency schedules (EmS)** F-E, S-E	The environmentally hazardous substance mark may appear if required by other transportation regulations.

AERG : 128

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) PAIR**: Naphthalene

TSCA 8(a) CDR Exempt/Partial exemption: Not determined

United States inventory (TSCA 8b): All components are listed or exempted.

Clean Water Act (CWA) 307: Toluene; Benzene; Ethylbenzene; Naphthalene

Clean Water Act (CWA) 311: Xylene; Toluene; Benzene; Ethylbenzene; Naphthalene

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

Section 15. Regulatory information

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Fire hazard
Immediate (acute) health hazard
Delayed (chronic) health hazard

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
Gasoline, natural	89 - 100	No.	No.	No.	No.	Yes.
Ethyl Alcohol	<11	Yes.	No.	No.	Yes.	No.
Xylene	<5	Yes.	No.	No.	Yes.	No.
Toluene	<5	Yes.	No.	No.	Yes.	Yes.
Benzene	<5	Yes.	No.	No.	Yes.	Yes.
Ethylbenzene	<5	Yes.	No.	No.	Yes.	Yes.
n-Hexane	<5	Yes.	No.	No.	Yes.	Yes.
Naphthalene	<5	Yes.	No.	No.	Yes.	Yes.
1,2,4-Trimethylbenzene	<5	Yes.	No.	No.	Yes.	No.
Trimethylbenzene	<5	Yes.	No.	No.	Yes.	No.

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	Xylene Toluene Benzene Ethylbenzene n-Hexane Naphthalene 1,2,4-Trimethylbenzene	1330-20-7 108-88-3 71-43-2 100-41-4 110-54-3 91-20-3 95-63-6	<5 <5 <5 <5 <5 <5 <5
Supplier notification	Xylene Toluene Benzene Ethylbenzene n-Hexane Naphthalene 1,2,4-Trimethylbenzene	1330-20-7 108-88-3 71-43-2 100-41-4 110-54-3 91-20-3 95-63-6	<5 <5 <5 <5 <5 <5 <5

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

State regulations

Massachusetts : The following components are listed: Gasoline, natural; Ethyl Alcohol; Xylene; Toluene; Benzene; Ethylbenzene; n-Hexane; Naphthalene; 1,2,4-Trimethylbenzene; Trimethylbenzene

New York : The following components are listed: Xylene; Toluene; Benzene; Ethylbenzene; n-Hexane; Naphthalene

New Jersey : The following components are listed: Gasoline, natural; Ethyl Alcohol; Xylene; Toluene; Benzene; Ethylbenzene; n-Hexane; Naphthalene; 1,2,4-Trimethylbenzene; Trimethylbenzene

Section 15. Regulatory information

Pennsylvania : The following components are listed: Ethyl Alcohol; Xylene; Toluene; Benzene; Ethylbenzene; n-Hexane; Naphthalene; 1,2,4-Trimethylbenzene; Trimethylbenzene

California Prop. 65

WARNING: This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

Ingredient name	Cancer	Reproductive	No significant risk level	Maximum acceptable dosage level
Toluene	No.	Yes.	No.	7000 µg/day (ingestion) 13000 µg/day (inhalation)
Benzene	Yes.	Yes.	6.4 µg/day (ingestion) 13 µg/day (inhalation)	24 µg/day (ingestion) 49 µg/day (inhalation)
Ethylbenzene	Yes.	No.	41 µg/day (ingestion) 54 µg/day (inhalation)	No.
Naphthalene	Yes.	No.	Yes.	No.

Section 16. Other information

History

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Version : 3

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Prepared by : KMK Regulatory Services Inc.

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

ENBRIDGE

Safety Data Sheet

Section 1: Identification

PRODUCT IDENTIFIER	Petroleum Crude Oil—Dilbit	
OTHER MEANS OF IDENTIFICATION	**UN-Number**	UN1993
	Synonyms	Dilbit Kearl, Diluted Kearl Bitumen, Kearl Blend, Kearl Dilbit, Kearl Lake Dilbit (KDB)
	Chemical Category	Crude oils—extremely flammable Bitumen Products
RECOMMENDED USE	Feedstock	
RESTRICTIONS OF USE	No information available	
SUPPLIER INFORMATION	Enbridge Pipelines Inc. 10201 Jasper Avenue Edmonton, Alberta T5J 3N7 Canada TEL: 1-780-420-5210	
EMERGENCY CONTACT INFORMATION	**CHEMTREC**	1-800-424-9300 for US 703- 527- 3887 outside US
	CANUTEC (Canadian Transportation)	613-996-6666

Section 2: Hazards Identification

CLASSIFICATION

Skin Irritation	Category 2
Eye Irritation	Category 2
Germ Cell Mutagenicity	Category 1B
Carcinogenicity	Category 1A
Reproductive Toxicity	Category 2
Specific Target Organ Systemic Toxicity (Single Exposure)	Category 3
Specific Target Organ Toxicity (Repeated Exposure)	Category 1
Aspiration Toxicity	Category 1
Flammable liquids	Category 1

LABEL ELEMENTS

Signal Word

Danger

Hazard Pictograms



Hazard Statements

- Causes skin irritation.
- Causes serious eye irritation.
- May cause genetic defects.
- May cause cancer.
- Suspected of damaging fertility or the unborn child.
- May cause respiratory irritation.
- Causes damage to organs through prolonged or repeated exposure.
- May be fatal if swallowed and enters airways.
- Extremely flammable liquid and vapor.

PRECAUTIONARY STATEMENTS

Prevention

- Wash face, hands and any exposed skin thoroughly after handling.
- Wear protective gloves/protective clothing/eye protection/face protection.
- Obtain special instructions before use.
- Do not handle until all safety precautions have been read and understood.
- Use personal protective equipment as required.
- Do not breathe dust/fume/gas/mist/vapors/spray.
- Use only outdoors or in a well-ventilated area.
- Do not eat, drink or smoke when using this product.
- Keep away from heat/sparks/open flames/hot surfaces.
- Keep container tightly closed.
- No smoking.
- Ground/bond container and receiving equipment.
- Use explosion-proof electrical/ventilating/lighting/equipment.
- Use only non-sparking tools.
- Take precautionary measures against static discharge.
- In case of inadequate ventilation wear respiratory protection.

Response

- IF EXPOSED or concerned: Get medical advice/attention.
- IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
- Call a POISON CENTER or doctor/physician if you feel unwell.
- IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
- Do NOT induce vomiting.
- IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower and soap.
- In case of fire: Use CO_2, dry chemical, or foam for extinction.
- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- If SKIN irritation occurs: Get medical advice/attention.
- If EYE irritation persists: Get medical advice/attention.

Storage/Disposal

- Store locked up and keep cool.
- Store in a well-ventilated place. Keep container tightly closed.
- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

OTHER INFORMATION

- Under United States Regulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered hazardous.
- Very toxic to aquatic life with long lasting effects.

Section 3: Composition/Information on Ingredients

COMPONENT NAME	CAS NUMBER	PERCENTAGE (%)*	NOTES
Benzene	71-43-2	0-1.2	
Bitumen	8052-42-4	0-85	
Hexane	110-54-3	0-3.5	
Natural Gas Condensate	68919-39-1	15-40	
Sulfur	7704-34-9	0-3.5	

**Values do not reflect absolute minimums and maximums; those values may vary from time to time. All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.*

Section 4: First Aid Measures

DESCRIPTION OF NECESSARY MEASURES

Inhalation

- IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If irritation persists: Get medical advice/attention.

Skin

- IF ON SKIN: Wash with plenty of soap and water. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse.

Eye

- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.

Ingestion

- Do NOT induce vomiting. Call a physician or poison control center.
- Aspiration hazard if swallowed—can enter lungs and cause damage.

MOST IMPORTANT SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED

Refer to Section 11 - Toxicological Information

INDICATION OF IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED, IF NECESSARY

Note to the Physician

- Aspiration hazard. Symptoms may be delayed.
- 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.
- Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.

Section 5: Fire Fighting Measures

EXTINGUISHING MEDIA

Suitable Extinguishing Media

- SMALL FIRES: Dry chemical, CO_2, water spray or regular foam.
- LARGE FIRE: Water spray, fog or regular foam.

Unsuitable Extinguishing Media

- CAUTION: Use of water spray when fighting fire may be inefficient.
- Do not use straight streams.

FIREFIGHTING PROCEDURES

- FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: If impossible to extinguish, protect surroundings and allow fire to burn itself out.
- Stay upwind.
- Ventilate closed spaces before entering.
- Fire fighters should wear complete protective clothing including self-contained breathing apparatus.
- FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions.
- FIRE: When a large quantity of this material is involved in a major fire, consider an initial evacuation distance of 300 meters (1000 feet) in all directions.
- Move containers from fire area if you can do it without risk.

- LARGE FIRES: Use water spray or fog; do not use straight streams.
- LARGE FIRES: If insufficient water supply: knock down vapors only. If this is impossible, withdraw from area and let fire burn.
- LARGE FIRES: Flood fire area with large quantities of water, while knocking down vapors with water fog.

SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OR MIXTURE

- Vapors may travel to source of ignition and flash back.
- Air/vapor mixtures may explode when ignited.
- Vapors may accumulate in confined areas (basement, tanks, hopper/tank cars etc.).
- Will be easily ignited by heat, sparks or flames.
- Runoff to sewer may create fire or explosion hazard.
- Vapor explosion hazard indoors, outdoors or in sewers.
- MAY EXPLODE AND THROW FRAGMENTS 1600 meters (1 MILE) OR MORE IF FIRE REACHES CARGO.
- May create vapor/air explosion hazard indoors, outdoors or in sewers.
- Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).

EXPLOSION DATA

Hazardous Combustion Products

- Carbon monoxide, Carbon dioxide (CO2), Nitrogen oxides (NOx), Oxides of sulfur, Hydrogen Sulfide.
- Aldehydes, aromatic and other hydrocarbons.

Sensitivity to Mechanical Impact

- None.

Sensitivity to Static Discharge

- Yes.

PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIREFIGHTERS

- As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.
- 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 firefighters.
- Carbon dioxide can displace oxygen.
- Use caution when applying carbon dioxide in confined spaces.
- Water spray may be useful in minimizing or dispersing vapors.
- Long-duration fires involving diluent stored in tanks may result in a boilover.
- For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear.

Section 6: Accidental Release Measures

PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

Personal Precautions

- Evacuate personnel to safe areas.
- Remove all sources of ignition.
- Deny entry to unauthorized and unprotected personnel.
- Use personal protective equipment.
- Avoid contact with skin, eyes and clothing.
- Stop leak if you can do it without risk.
- Keep people away from and upwind of spill/leak.
- Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
- Ventilate enclosed areas.
- Do not walk through spilled material.

Protective Equipment

- Wear appropriate breathing apparatus (if applicable) and protective clothing.

Emergency Procedures

- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area) Keep unauthorized personnel away. Evacuate area. Keep out of low areas. Stop leak if you can do it without risk.
- Report spills to local or federal authorities as appropriate or required.

ENVIRONMENTAL PRECAUTIONS

- Avoid run off to waterways and sewers. Do NOT wash away into sewer. Prevent entry into waterways, sewers, basements or confined areas. Runoff from fire control may cause pollution.

METHODS AND MATERIAL FOR CONTAINMENT AND CLEANING UP

Methods for Containment

- Stop leak if you can do it without risk.
- Contain and recover liquid when possible.
- A vapor suppressing foam may be used to reduce vapors.
- Dike far ahead of spill; use dry sand to contain the flow of material; contain water spills by booming.
- Use water spray to reduce vapors or divert vapor cloud drift.
- A fine water spray remotely directed to the edge of the spill pool can be used to direct and maintain a hot flare fire which will burn the spilled material in a controlled manner.

Methods for Cleaning Up	• Clean up spill immediately. • LARGE SPILLS: DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST. • SMALL LIQUID SPILLS: Use a non-combustible material like vermiculite or sand to soak up the product and place into a container for later disposal. • Use appropriate Personal Protective Equipment (PPE). • Use clean non-sparking tools to collect absorbed material. • Vacuum spilled material. • Try to work upwind of spill. • All equipment used when handling the product must be grounded. • Recover and return free product to proper containers • Use suitable absorbent materials such as vermiculite, sands, soil, or clay to clean up residual liquids. • Do not place spilled materials back in the original container. • Do not flush to sewer or allow to enter waterways.

Section 7: Handling and Storage

PRECAUTIONS FOR SAFE HANDLING

Handling	• This material is a static accumulator. A liquid is typically considered a nonconductive, static accumulator if its conductivity is below 100 pS/m (100x10E-12 Siemens per meter) and is considered a semiconductive, static accumulator if its conductivity is below 10,000 pS/m. Whether a liquid is nonconductive or semiconductive, the precautions are the same. A number of factors, for example liquid temperature, presence of contaminants, anti-static additives and filtration can greatly influence the conductivity of a liquid. • Hydrogen sulfide (H_2S) may be given off when this material is heated. • All equipment used when handling the product must be grounded. Avoid contact with heat and ignition sources and oxidizers. Do not breathe (dust, vapor or spray mist). Do not use in areas without adequate ventilation. Do not use sparking tools. Keep away from heat, sparks, and flame. No open flames, no sparks and no smoking. Use only with adequate ventilation. Do not use or store near heat or open flame. Keep away from fire, sparks and heated surfaces. • The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes). • The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits. • Take precautionary measures against static discharges.
Handling	• Do not cut drill, grind or weld on empty containers since they may contain explosive residues. • Stay upwind and vent open hatches before uploading. • Avoid contact with skin, eyes and clothing. • Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water. • Wear personal protective equipment. • Remove and wash contaminated clothing before re-use. • Do not eat, drink or smoke when using this product. • Do not take internally. • Wash thoroughly after handling. • Empty containers pose a potential fire and explosion hazard.

CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES	**Storage**	• Ventilate enclosed areas. • Store in a well-ventilated place. • Keep container tightly closed. • Store locked up. • Avoid shock, impact, friction, and rough handling. Do not use sparking tools. • Store in a cool/low-temperature, well-ventilated place away from heat and ignition sources. • Keep away from sources of ignition. • No Smoking. • Do not enter confined spaces such as tanks or pits without following proper entry procedures. • Store in properly closed containers that are appropriately labeled and in a cool well-ventilated area. • Harmful concentrations of hydrogen sulfide (H_2S) gas can accumulate in excavations and low-lying areas as well as the vapor space of storage and bulk transport compartments. • Keep away from open flames, hot surfaces and sources of ignition. • Keep product and empty container away from heat and sources of ignition. • Storage containers should be grounded and bonded. • Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge. • Store away from incompatible materials.
	Incompatible Products	• Strong oxidizers such as nitrates, chlorates, peroxides, chlorine.

Section 8: Exposure Controls/Personal Protection

CONTROL PARAMETERS: EXPOSURE GUIDELINES

CHEMICAL NAME	ACGIH	OSHA	NIOSH
Benzene	TLV 0.5 ppm TLV 1.6 mg/m^3 STEL 2.5 ppm STEL 8 mg/m^3	PEL 1 ppm STEL 5 ppm	TWA 0.1 ppm STEL 1 ppm IDLH 500 ppm
Bitumen	TLV 0.5 mg/m^3	–	Ceiling 5 mg/m^3
Hexane	TLV 50 ppm TLV 176 mg/m^3	PEL 500 ppm PEL 1800 mg/m^3	TWA 50 ppm TWA 180 mg/m^3 IDLH 1100 ppm

APPROPRIATE ENGINEERING CONTROLS

• Adequate ventilation systems as needed to control concentrations of airborne contaminants below applicable threshold limit values. Prevent vapor build up by providing adequate ventilation during and after use. Use only appropriately classified electrical equipment.

INDIVIDUAL PROTECTION MEASURES	**Eye and Face**	• Wear face shield and eye protection.
	Skin and Body	• The use of gloves (nitrile or neoprene) is advised to prevent skin contact and possible irritation. • Wear protective gloves/protective clothing/eye protection/face protection. Wear long sleeves and/or protective coveralls.

Respiratory	• Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or symptoms are experienced.
General Hygiene Measures	• Handle in accordance with good industrial hygiene and safety practice.

Section 9: Physical and Chemical Properties

MATERIAL DESCRIPTION

Physical State	Liquid	**Odor**	Petroleum/solvent like odor
Substance Type	Mixture	**Odor Threshold**	No data available
Appearance	Black		

PROPERTIES

pH	No data available	**Vapor pressure**	12 to 21 kPa @ 24 °C (75.2 °F)
Melting Point/ Freezing Point	No data available	**Vapor density**	No data available
Boiling Point/ Boiling Range	68 to 1049 °F 20 to 565°C	**Density**	900 to 1200 kg/m³ @ 15.5 °C (59.9°F
Flash Point	<-0.4 to 60.8 °F <-18 to 16 °C (Closed Cup)	**Water Solubility**	No data available
Evaporation Rate	No data available	**Partition coefficient: n-octanol/water**	No data available
Flammability (solid, gas)	No data available	**Autoignition temperature**	No data available
Upper Flammability Limit	No data available	**Decomposition temperature**	No data available
Lower Flammability Limit	No data available	**Specific Gravity**	0.94
Viscosity	52 to 96 Centistoke (cSt, cS) or mm^2/sec @ 38 °C (100.4 °F)		

Section 10: Stability and Reactivity

REACTIVITY	Chlorine Dioxide
CHEMICAL STABILITY	Stable at 70 °F, 760 mm Hg pressure
POSSIBILITY OF HAZARDOUS REACTIONS	None under normal processing
CONDITIONS TO AVOID	Excessive heat, sources of ignition, sparks, open flames, and buildup of static electricity
INCOMPATIBLE MATERIALS	Strong oxidizers such as nitrates, chlorates, peroxides
HAZARDOUS DECOMPOSITION PRODUCTS	Combustion produces carbon monoxide, aldehydes, hydrogen sulfide, sulfur dioxide, aromatic and other hydrocarbons
HAZARDOUS POLYMERIZATION	Will not occur

Section 11: Toxicological Information

INFORMATION ON THE LIKELY ROUTES OF EXPOSURE

Inhalation	• May cause irritation of respiratory tract. May cause drowsiness and dizziness.
Eye Contact	• Causes serious eye irritation.
Skin Contact	• Causes skin irritation.
Ingestion	• Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. • Potential for aspiration if swallowed. • Aspiration may cause pulmonary edema and pneumonitis.

TOXICOLOGICAL DATA

CHEMICAL NAME	LD50 ORAL	LD50 DERMAL	LC50 INHALATION
Benzene	1800 mg/kg (Rat)	–	13050 - 14380 ppm (Rat) 4 h
Bitumen	>5000 mg/kg (Rat)	–	>94.4 mg/m^3 (Rat)
Hexane	= 25 g/kg (Rat)	= 3000 mg/kg (Rabbit)	= 48000 ppm (Rat) 4 h
Sulfur	–	–	1660 mg/m^3 (Mammal)

SYMPTOMS RELATED TO THE PHYSICAL, CHEMICAL AND TOXICOLOGICAL CHARACTERISTICS

Benzene

• Repeated or prolonged exposure to benzene at concentrations in excess of the TLV may cause serious injury to blood-forming organs. Significant chronic exposure to benzene vapor has been reported to produce various blood disorders ranging from anemia to certain forms of leukemia (cancer) in humans. Benzene produced tumors in rats and mice in lifetime chronic toxicity studies, but the response has not been consistent across species, strain, sex or route of exposure. Animal studies on benzene have demonstrated immune toxicity, chromosomal aberrations, testicular effects and alterations in reproductive cycles and embryo/fetotoxicity, but not teratogenicity.

Hexane	• This product may contain hexane at a level of >1.0%. Studies in laboratory animals have produced systemic toxicity in blood, spleen and lungs. Fetotoxicity has been observed at hexane concentrations that produced maternal toxicity. Long term exposure to high concentrations of hexane has been shown to cause testicular effects and nervous system damage.
Hydrogen Sulfide Gas (H_2S)	• Toxic by inhalation. Prolonged breathing of 50-100 ppm H_2S vapors can produce eye and respiratory tract irritation. Higher concentration (250-600 ppm) for 15-30 minutes can produce headache, dizziness, nervousness, nausea and pulmonary edema or bronchial pneumonia. Concentrations of >1000 ppm will cause immediate unconsciousness and death through respiratory paralysis. Rats and mice exposed to 80 ppm H_2S, 6 hrs/day, 5 days/week for 10 weeks, did not produce any toxicity except for irritation of nasal passages. H_2S did not affect reproduction and development (birth defects or neurotoxicity) in rats exposed to concentrations of 75-80 ppm or 150 ppm H_2S, respectively. Over the years a number of acute cases of H_2S poisoning have been reported. Complete and rapid recovery is the general rule. However, if the exposure was sufficiently intense and sustained causing cerebral hypoxia (lack of oxygen to the brain), neurologic effects such as amnesia, intention tremors or brain damage are possible.

DELAYED AND IMMEDIATE EFFECTS AND ALSO CHRONIC EFFECTS FROM SHORT- AND LONG-TERM EXPOSURE

Sensitization	• No information available
Mutagenic Effects	• May cause genetic defects
Carcinogenicity	• May cause cancer

CARCINOGENIC INFORMATION

CHEMICAL NAME	ACGIH	ACGIH SKIN*	IARC	NTP	OSHA
Benzene	A1	X	Group 1	Known	X
Bitumen	A4	–	–	–	–
Hexane	–	X	–	–	–

**ACGIH Skin designation refers to the potential significant contribution of overall exposure by cutaneous route, including mucous membranes and eyes, from airborne exposure to gases, vapor, or liquid OR by direct skin contact.*

REPRODUCTIVE TOXICITY

• Suspected of damaging fertility or the unborn child.

STOT—SINGLE EXPOSURE

• May cause drowsiness and dizziness.

STOT—REPEATED EXPOSURE

• Causes damage to organs through prolonged or repeated exposure.

ASPIRATION HAZARD

May be fatal if swallowed and enters airways Risk of serious damage to the lungs (by aspiration).

Section 12: Ecological Information

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Benzene	EC50 72 h: = 29 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 10.7 - 14.7 mg/L flow-through (Pimephales promelas) LC50 96 h: = 5.3 mg/L flow-through (Oncorhynchus mykiss) LC50 96 h: = 22.49 mg/L static (Lepomis macrochirus) LC50 96 h: = 28.6 mg/L static (Poecilia reticulata) LC50 96 h: 22330 - 41160 µg/L static (Pimephales promelas) LC50 96 h: 70000 - 142000 µg/L static (Lepomis macrochirus)	EC50 48 h: 8.76 - 15.6 mg/L Static (Daphnia magna) EC50 48 h: = 10 mg/L (Daphnia magna)	–
Hexane	–	LC50 96 h: 2.1 - 2.98 mg/L flow-through (Pimephales promelas)	EC50 24 h: > 1000 mg/L (Daphnia magna)	–
Sulfur	–	LC50 96h: <14000 ug/l (Lepomis macrochirus)	EC50 48 h: = >5000000 ug/L (Daphnia magna)	–

PERSISTENCE AND DEGRADABILITY

- Low molecular wt. component—Expected to be inherently biodegradable
- High molecular wt. component—Expected to be persistent.

BIOACCUMULATIVE POTENTIAL

CHEMICAL	LOG POW
Benzene	1.83
Hexane	3.90

MOBILITY IN SOIL

CHEMICAL	EXPECTED SOIL MOBILITY
Benzene	High
Hexane	High

OTHER ADVERSE EFFECTS

- VOC (EPA Method 24): 2.353 lbs/gal

Section 13: Disposal Considerations

WASTE TREATMENT METHODS

Product Waste	• This product, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA RCRA (40 CFR 261), Environment Canada, or other State, Provincial, and local regulations. If this product is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility. • This product could also contain benzene at >0.5 ppm and could exhibit the characteristic of "toxicity" (D018) as determined by the toxicity characteristic leaching procedure (TCLP). • This material could become a hazardous waste if mixed or contaminated with a hazardous waste or other substance(s). • It is the responsibility of the user to consult federal, state and local waste regulations to determine appropriate disposal options.
Packaging Waste	• Container contents should be completely used and containers should be emptied prior to discard. • Container 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 re-conditioner. • To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

Section 14: Transport Information

****CHART NAME****

	UN NUMBER	PROPER SHIPPING NAME	TRANSPORT HAZARD CLASS	PACKING GROUP	ENVIRONMENTAL HAZARD
DOT	UN1993	FLAMMABLE LIQUIDS, N.O.S.	3	I	Emergency response guide number: 128
TDG	UN1993	FLAMMABLE LIQUIDS, N.O.S.	3	I	Special Provision: 16
IMO/IMDG	UN1993	FLAMMABLE LIQUIDS, N.O.S.	3	I	EMS No. F-E, S-E
IATA/ICAO	UN1993	FORBIDDEN	–	–	–

SPECIAL RECAUTIONS FOR USER

• None specified

Section 15: Regulatory Information

U.S.—CERCLA/SARA HAZARDOUS SUBSTANCES AND THEIR REPORTABLE QUANTITIES

COMPONENT	CAS #	AMOUNT
Benzene	71-43-2	10 lb final RQ; 4.54 kg final RQ
Hexane	110-54-3	5000 lb final RQ; 2270 kg final RQ

U.S.—CWA (CLEAN WATER ACT)—REPORTABLE QUANTITIES OF DESIGNATED HAZARDOUS SUBSTANCES

COMPONENT	CAS #	AMOUNT
Benzene	71-43-2	10 lb RQ

U.S.—CWA (CLEAN WATER ACT)—HAZARDOUS SUBSTANCES

COMPONENT	CAS #	LISTED
Benzene	71-43-2	X
Bitumen	8052-42-4	Not Listed
Hexane	110-54-3	Not Listed
Natural gas condensates (petroleum)	68919-39-1	Not Listed
Sulfur	7704-34-9	Not Listed

X= The component is listed

U.S.—CWA (CLEAN WATER ACT)—PRIORITY POLLUTANTS

COMPONENT	CAS #	LISTED
Benzene	71-43-2	X
Bitumen	8052-42-4	Not Listed
Hexane	110-54-3	Not Listed
Natural gas condensates (petroleum)	68919-39-1	Not Listed
Sulfur	7704-34-9	Not Listed

X= The component is listed

CANADA-WHMIS—CLASSIFICATIONS OF SUBSTANCES

COMPONENT	CAS #	CLASSIFICATION
Benzene	71-43-2	B2, D2A, D2B
Bitumen	8052-42-4	Not Listed
Hexane	110-54-3	B2, D2A, D2B
Natural gas condensates (petroleum)	68919-39-1	Not Listed
Sulfur	7704-34-9	B4

X= The component is listed

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR FRESHWATER AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Benzene	71-43-2	370 µg/L

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR MARINE AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Benzene	71-43-2	110 µg/L

CANADA—ENVIRONMENTAL EMERGENCIES

COMPONENT	CAS #	LISTED
Benzene	71-43-2	X
Bitumen	8052-42-4	Not Listed
Hexane	110-54-3	Not Listed
Natural gas condensates (petroleum)	68919-39-1	Not Listed
Sulfur	7704-34-9	Not Listed

X= The component is listed

Section 16: Other Information

NFPA



Health Hazard: 2	**Flammability:** 3	**Instability:** 0	**Physical and Chemical Hazards:** X

HMIS	**Health Hazard:** 2	**Flammability:** 3	**Instability:** 0	**Personal Protection:** X

ISSUING DATE 4/19/15

REVISION DATE 4/19/15

DISCLAIMER

- The information presented herein is based on data considered to be accurate as of the date of preparation of this Safety Data Sheet (SDS). However, SDSs 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

Safety Data Sheet

Section 1: Identification

PRODUCT IDENTIFIER	Petroleum Crude Oil—Sour	
OTHER MEANS OF IDENTIFICATION	**UN-Number**	UN1267
	Synonyms	Medium Sour Blend (MSB), Central Alberta Pipeline (CAL 1), Pembina Light Sour (PLS 1), Gibsons Light Sour (GLS 1), Pembina Low Sour (PLO 1), Gibson Sour (MGS 2), Kinder Morgan High Sour (KHE 2), Pembina High Sour (PHO 2), Peace Pipe Sour (SPR 2), Rangeland Sour (RSO 2), Gibsons High Sour (GHE 2), Hardisty Light (MBL 3), Manitoba Medium (MM 4), Wespur Midale (MSM 4), Tundra Light Sour (MLS), Moose Jaw Tops (MJT)
	Chemical Category	Crude oils—extremely flammable
RECOMMENDED USE	No information available	
RESTRICTIONS OF USE	No information available	
SUPPLIER INFORMATION	Enbridge Pipelines Inc. 10201 Jasper Avenue Edmonton, Alberta T5J 3N7 Canada TEL: 1-780-420-5210	
EMERGENCY CONTACT INFORMATION	**CHEMTREC**	1-800-424-9300 for US 703- 527- 3887 outside US
	CANUTEC (Canadian Transportation)	613-996-6666

Section 2: Hazards Identification

CLASSIFICATION

Skin Irritation	Category 2
Eye Irritation	Category 2
Germ Cell Mutagenicity	Category 1B
Carcinogenicity	Category 1A
Reproductive Toxicity	Category 2
Specific Target Organ Systemic Toxicity (Single Exposure)	Category 3
Specific Target Organ Toxicity (Repeated Exposure)	Category 1
Aspiration Toxicity	Category 1
Flammable liquids	Category 1

LABEL ELEMENTS

Signal Word

Danger

Hazard Pictograms



Hazard Statements

- Causes skin irritation.
- Causes serious eye irritation.
- May cause genetic defects.
- May cause cancer.
- Suspected of damaging fertility or the unborn child.
- May cause respiratory irritation.
- Causes damage to organs through prolonged or repeated exposure.
- May be fatal if swallowed and enters airways.
- Extremely flammable liquid and vapor.
- May cause drowsiness or dizziness.

PRECAUTIONARY STATEMENTS

Prevention

- Wash face, hands and any exposed skin thoroughly after handling.
- Wear protective gloves/protective clothing/eye protection/face protection.
- Obtain special instructions before use.
- Do not handle until all safety precautions have been read and understood.
- Use personal protective equipment as required.
- Do not breathe dust/fume/gas/mist/vapors/spray.
- Use only outdoors or in a well-ventilated area.
- Do not eat, drink or smoke when using this product.
- Keep away from heat/sparks/open flames/hot surfaces.
- Keep container tightly closed.
- No smoking.
- Ground/bond container and receiving equipment.
- Use explosion-proof electrical/ventilating/lighting/equipment.
- Use only non-sparking tools.
- Take precautionary measures against static discharge.
- In case of inadequate ventilation wear respiratory protection.

Response

- IF EXPOSED or concerned: Get medical advice/attention.
- IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
- Call a POISON CENTER or doctor/physician if you feel unwell.
- IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
- Do NOT induce vomiting.
- IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower and soap.
- In case of fire: Use CO_2, dry chemical, or foam for extinction.
- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- If SKIN irritation occurs: Get medical advice/attention.
- If EYE irritation persists: Get medical advice/attention.

Storage/Disposal

- Store locked up and keep cool.
- Store in a well-ventilated place. Keep container tightly closed.
- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

OTHER INFORMATION

- Under United States Regulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered hazardous.
- Very toxic to aquatic life with long lasting effects.

Section 3: Composition/Information on Ingredients

COMPONENT NAME	CAS NUMBER	PERCENTAGE (%)*	NOTES
2-Methylbutane (In Liquid form)	78-78-4	0-4	
Benzene	71-43-2	0-5	
Butane	106-97-8	0-5	
Cyclohexane	110-82-7	0-5	
Ethylbenzene	100-41-4	0-2	
Heptane	142-82-5	0-10	
Hexane	110-54-3	0-8	
Hydrogen Sulfide	7783-06-4	0-5	
Isobutane	75-28-5	0-5	
Methylcyclohexane	108-87-2	0-3	
Methylcyclopentane	96-37-7	0-3	
Naphthalene	91-20-3	0-1	
Natural gas condensates (petroleum)	64741-47-5	0-25	
Octane	111-65-9	0-10	
Pentane	109-66-0	0-3	
Petroleum	8002-05-9	0-100	
Toluene	108-88-3	0-5	
Xylene	1330-20-7	0-3	

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

Section 4: First Aid Measures

DESCRIPTION OF NECESSARY MEASURES

Inhalation	• IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If irritation persists: Get medical advice/attention.
Skin	• IF ON SKIN: Wash with plenty of soap and water. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse.
Eye	• IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.
Ingestion	• Do NOT induce vomiting. Call a physician or poison control center. • Aspiration hazard if swallowed—can enter lungs and cause damage.

MOST IMPORTANT SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED

Refer to Section 11 - Toxicological Information

INDICATION OF IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED, IF NECESSARY

Note to the Physician

- Aspiration hazard. Symptoms may be delayed.
- 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.
- Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.

Section 5: Fire Fighting Measures

EXTINGUISHING MEDIA

Suitable Extinguishing Media	• SMALL FIRES: Dry chemical, CO_2, water spray or regular foam. • LARGE FIRE: Water spray, fog or regular foam.
Unsuitable Extinguishing Media	• CAUTION: Use of water spray when fighting fire may be inefficient. • Do not use straight streams.

FIREFIGHTING PROCEDURES

- FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: If impossible to extinguish, protect surroundings and allow fire to burn itself out.
- Stay upwind.
- Ventilate closed spaces before entering.
- Fire fighters should wear complete protective clothing including self-contained breathing apparatus.
- FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions.
- FIRE: When a large quantity of this material is involved in a major fire, consider an initial evacuation distance of 300 meters (1000 feet) in all directions.
- Move containers from fire area if you can do it without risk.

- LARGE FIRES: Use water spray or fog; do not use straight streams.
- LARGE FIRES: If insufficient water supply: knock down vapors only. If this is impossible, withdraw from area and let fire burn.
- LARGE FIRES: Flood fire area with large quantities of water, while knocking down vapors with water fog.

SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OR MIXTURE

- Vapors may travel to source of ignition and flash back.
- Air/vapor mixtures may explode when ignited.
- Vapors may accumulate in confined areas (basement, tanks, hopper/tank cars etc.).
- Will be easily ignited by heat, sparks or flames.
- Runoff to sewer may create fire or explosion hazard.
- Vapor explosion hazard indoors, outdoors or in sewers.
- MAY EXPLODE AND THROW FRAGMENTS 1600 meters (1 MILE) OR MORE IF FIRE REACHES CARGO.
- May create vapor/air explosion hazard indoors, outdoors or in sewers.
- Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).

EXPLOSION DATA

Hazardous Combustion Products	• Carbon monoxide. Carbon dioxide (CO_2). Nitrogen oxides (NOx). Oxides of sulfur. • Aldehydes, aromatic and other hydrocarbons.
Sensitivity to Mechanical Impact	• None.
Sensitivity to Static Discharge	• Yes.

PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIREFIGHTERS

- As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.
- 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 firefighters.
- Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces.
- Water spray may be useful in minimizing or dispersing vapors.
- Long-duration fires involving diluent stored in tanks may result in a boilover.
- For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear.

Section 6: Accidental Release Measures

PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

Personal Precautions	• Evacuate personnel to safe areas. • Remove all sources of ignition. • Deny entry to unauthorized and unprotected personnel. • Use personal protective equipment. • Avoid contact with skin, eyes and clothing. • Stop leak if you can do it without risk. • Keep people away from and upwind of spill/leak. • Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. • Ventilate enclosed areas. • Do not walk through spilled material.
Protective Equipment	• Wear appropriate breathing apparatus (if applicable) and protective clothing.

	Emergency Procedures	• ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area) Keep unauthorized personnel away. Evacuate area. Keep out of low areas. Stop leak if you can do it without risk. • Report spills to local or federal authorities as appropriate or required.
ENVIRONMENTAL PRECAUTIONS	• Avoid run off to waterways and sewers. Do NOT wash away into sewer. Prevent entry into waterways, sewers, basements or confined areas. Runoff from fire control may cause pollution.	
METHODS AND MATERIAL FOR CONTAINMENT AND CLEANING UP	**Methods for Containment**	• Stop leak if you can do it without risk. • Contain and recover liquid when possible. • A vapor suppressing foam may be used to reduce vapors. • Dike far ahead of spill; use dry sand to contain the flow of material; contain water spills by booming. • Use water spray to reduce vapors or divert vapor cloud drift. • A fine water spray remotely directed to the edge of the spill pool can be used to direct and maintain a hot flare fire which will burn the spilled material in a controlled manner.
	Methods for Cleaning Up	• Clean up spill immediately. • LARGE SPILLS: DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST. • SMALL LIQUID SPILLS: Use a non-combustible material like vermiculite or sand to soak up the product and place into a container for later disposal. • Use appropriate Personal Protective Equipment (PPE). • Use clean non-sparking tools to collect absorbed material. • Vacuum spilled material. • Try to work upwind of spill. • All equipment used when handling the product must be grounded. • Recover and return free product to proper containers • Use suitable absorbent materials such as vermiculite, sands, soil, or clay to clean up residual liquids. • Do not place spilled materials back in the original container. • Do not flush to sewer or allow to enter waterways.

Section 7: Handling and Storage

PRECAUTIONS FOR SAFE HANDLING	**Handling**	• All equipment used when handling the product must be grounded. Avoid contact with heat and ignition sources and oxidizers. Do not breathe (dust, vapor or spray mist). Do not use in areas without adequate ventilation. Do not use sparking tools. Keep away from heat, sparks, and flame. No open flames, no sparks and no smoking. Use only with adequate ventilation. Do not use or store near heat or open flame. Keep away from fire, sparks and heated surfaces. • The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes). • The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits. • Take precautionary measures against static discharges.

	Handling	• Do not cut drill, grind or weld on empty containers since they may contain explosive residues. • Stay upwind and vent open hatches before uploading. • Avoid contact with skin, eyes and clothing. • Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water. • Wear personal protective equipment. • Remove and wash contaminated clothing before re-use. • Do not eat, drink or smoke when using this product. • Do not take internally. • Wash thoroughly after handling. • Empty containers pose a potential fire and explosion hazard.
CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES	**Storage**	• Ventilate enclosed areas. • Store in a well-ventilated place. • Keep container tightly closed. • Store locked up. • Avoid shock, impact, friction, and rough handling. Do not use sparking tools. • Store in a cool/low-temperature, well-ventilated place away from heat and ignition sources. • Keep away from sources of ignition. • No Smoking. • Do not enter confined spaces such as tanks or pits without following proper entry procedures. • Store in properly closed containers that are appropriately labeled and in a cool well-ventilated area. • Harmful concentrations of hydrogen sulfide (H_2S) gas can accumulate in excavations and low-lying areas as well as the vapor space of storage and bulk transport compartments. • Keep away from open flames, hot surfaces and sources of ignition. • Keep product and empty container away from heat and sources of ignition. • Storage containers should be grounded and bonded. • Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge. • Store away from incompatible materials.
	Incompatible Products	• Strong oxidizers such as nitrates, chlorates, peroxides, chlorine.

Section 8: Exposure Controls/Personal Protection

CONTROL PARAMETERS: EXPOSURE GUIDELINES

CHEMICAL NAME	ACGIH	OSHA	NIOSH
2-Methylbutane (In Liquid form)	TWA 600 ppm	–	–
Benzene	TLV 0.5 ppm TLV 1.6 mg/m^3 STEL 2.5 ppm STEL 8 mg/m^3	PEL 1 ppm STEL 5 ppm	TWA 0.1 ppm STEL 1 ppm IDLH 500 ppm
Butane	STEL 1000 ppm	–	TWA 800 ppm TWA 1900 mg/m^3

Cyclohexane	TLV 100 ppm TLV 334 mg/m^3	PEL 300 ppm PEL 1050 mg/m^3	TWA 300 ppm TWA 1050 mg/m^3 IDLH 1300 ppm
Ethylbenzene	TLV 20 ppm TLV 87 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 125 ppm STEL 545 mg/m^3 IDLH 800 ppm
Heptane	TLV 400 ppm TLV 1640 mg/m^3 STEL 500 ppm STEL 2000 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 85 ppm TWA 350 mg/m^3 Ceiling 440 ppm Ceiling 1800 mg/m^3 IDLH 750 ppm
Hexane	TLV 50 ppm TLV 176 mg/m^3	PEL 500 ppm PEL 1800 mg/m^3	TWA 50 ppm TWA 180 mg/m^3 IDLH 1100 ppm
Hydrogen sulfide	TLV 1 ppm TLV 1.4 mg/m^3 STEL 5 ppm STEL 7 mg/m^3	Ceiling 20 ppm	Ceiling 10 ppm Ceiling 15 mg/m^3 IDLH 100 ppm
Isobutane	TWA 1000 ppm	–	–
Methylcyclohexane	TLV 400 ppm TLV 1610 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 400 ppm TWA 1600 mg/m^3 IDLH 1200 ppm
Naphthalene	TLV 10 ppm STEL 15 ppm	PEL 10 ppm PEL 50 mg/m^3	TWA 10 ppm TWA 50 mg/m^3 STEL 15 ppm STEL 75 mg/m^3
Octane	TLV 300 ppm TLV 1401 mg/m^3	PEL 500 ppm PEL 2350 mg/m^3	TWA 75 ppm TWA 350 mg/m^3 Ceiling 385 ppm Ceiling 1800 mg/m^3 IDLH 1000 ppm
Pentane	TLV 600 ppm TLV 1770 mg/m^3	PEL 1000 ppm PEL 2950 mg/m^3	TWA 120 ppm TWA 350 mg/m^3 Ceiling 610 ppm Ceiling 1800 mg/m^3 IDLH 1500 ppm
Toluene	TLV 20 ppm TLV 75 mg/m^3	PEL 200 ppm STEL 300 mg/m^3	TWA 100 ppm TWA 375 mg/m^3 STEL 150 ppm STEL 560 mg/m^3 IDLH 500 ppm

Xylenes	TLV 100 ppm TLV 434 mg/m^3 STEL 150 ppm STEL 651 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 150 ppm STEL 655 mg/m^3 IDLH 900 ppm

APPROPRIATE ENGINEERING CONTROLS

- Adequate ventilation systems as needed to control concentrations of airborne contaminants below applicable threshold limit values. Prevent vapor build up by providing adequate ventilation during and after use. Use only appropriately classified electrical equipment.

INDIVIDUAL PROTECTION MEASURES

Eye and Face	• Wear face shield and eye protection.
Skin and Body	• The use of gloves (nitrile or neoprene) is advised to prevent skin contact and possible irritation. • Wear protective gloves/protective clothing/eye protection/face protection. Wear long sleeves and/or protective coveralls.
Respiratory	• Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or symptoms are experienced.
General Hygiene Measures	• Handle in accordance with good industrial hygiene and safety practice.

Section 9: Physical and Chemical Properties

MATERIAL DESCRIPTION

Physical State	Liquid	**Odor**	Petroleum like odor
Substance Type	Mixture	**Odor Threshold**	No data available
Appearance	Yellow/green to Brown/black liquid		

PROPERTIES

pH	No data available	**Vapor Pressure**	No data available
Melting Point/ Freezing Point	No data available	**Vapor Density**	>1 Air=1
Boiling Point/ Boiling Range	-20 to 550°C -4 to 1022°F	**Relative Density**	No data available
Flash Point	-40 to 100 °C -40 to 212 °F	**Water Solubility**	Negligible
Evaporation Rate	No data available	**Partition Coefficient: n-octanol/water**	No data available
Flammability (solid, gas)	No data available	**Autoignition Temperature**	No data available
Upper Flammability Limit	No data available	**Decomposition Temperature**	No data available

Lower Flammability Limit	No data available	**Specific Gravity**	No data available
Viscosity	No data available		

Section 10: Stability and Reactivity

REACTIVITY	Chlorine Dioxide
CHEMICAL STABILITY	Stable at 70 °F, 760 mm Hg pressure
POSSIBILITY OF HAZARDOUS REACTIONS	None under normal processing
CONDITIONS TO AVOID	Excessive heat, sources of ignition, sparks, open flames, and buildup of static electricity
INCOMPATIBLE MATERIALS	Strong oxidizers such as nitrates, chlorates, peroxides, chlorine
HAZARDOUS DECOMPOSITION PRODUCTS	Combustion produces carbon monoxide, aldehydes, sulfur dioxide, aromatic and other hydrocarbons
HAZARDOUS POLYMERIZATION	Will not occur

Section 11: Toxicological Information

INFORMATION ON THE LIKELY ROUTES OF EXPOSURE

Inhalation	• May cause irritation of respiratory tract. May cause drowsiness and dizziness.
Eye Contact	• Causes serious eye irritation.
Skin Contact	• Causes skin irritation.
Ingestion	• Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. • Potential for aspiration if swallowed. • Aspiration may cause pulmonary edema and pneumonitis.

TOXICOLOGICAL DATA

CHEMICAL NAME	LD50 ORAL	LD50 DERMAL	LC50 INHALATION
2-Methylbutane (In Liquid form)	–	–	= 150,000 mg/m^3 (Rat) 2 h
Benzene	1800 mg/kg (Rat)	–	13050 - 14380 ppm (Rat) 4 h
Butane	–	–	658 mg/L (Rat) 4 h
Cyclohexane	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	= 13.9 mg/L (Rat) 4 h
Ethylbenzene	= 3500 mg/kg (Rat)	= 15400 mg/kg (Rabbit)	= 17.2 mg/L (Rat) 4 h
Heptane	–	= 3000 mg/kg (Rabbit)	= 103 g/m^3 (Rat) 4 h
Hexane	= 25 g/kg (Rat)	= 3000 mg/kg (Rabbit)	= 48000 ppm (Rat) 4 h

Hydrogen sulfide	–	–	= 444 ppm (Rat)
Isobutane	–	–	= 658,000 mg/m^3 (Rat) 4 h
Methylcyclohexane	> 3200 mg/kg (Rat)	–	–
Naphthalene	490 mg/kg (Rat)	0.05 ml (Rabbit) 24 h	–
Natural gas condensates (petroleum)	–	–	= 600 mg/m^3 (Rat)
Octane	–	–	= 118 g/m^3 (Rat) 4 h = 25260 ppm (Rat) 4 h
Pentane	>2000 mg/kg (Rat)	–	364 g/cu (Rat) 4 h
Propane	–	–	>800000 ppm (Rat) 15 min
Toluene	2.6 to 7.5 g/kg (Rat)	14.1 ml/kg (Rabbit)	–
Xylenes	= 3500 mg/kg (Rat)	> 4350 mg/kg (Rabbit) > 1700 mg/kg (Rabbit)	= 29.08 mg/L (Rat) 4 h = 5000 ppm (Rat) 4 h

SYMPTOMS RELATED TO THE PHYSICAL, CHEMICAL AND TOXICOLOGICAL CHARACTERISTICS

Benzene	• Repeated or prolonged exposure to benzene at concentrations in excess of the TLV may cause serious injury to blood-forming organs. Significant chronic exposure to benzene vapor has been reported to produce various blood disorders ranging from anemia to certain forms of leukemia (cancer) in humans. Benzene produced tumors in rats and mice in lifetime chronic toxicity studies, but the response has not been consistent across species, strain, sex or route of exposure. Animal studies on benzene have demonstrated immune toxicity, chromosomal aberrations, testicular effects and alterations in reproductive cycles and embryo/fetotoxicity, but not teratogenicity.
Hydrogen Sulfide Gas (H_2S)	• Toxic by inhalation. Prolonged breathing of 50-100 ppm H_2S vapors can produce eye and respiratory tract irritation. Higher concentration (250-600 ppm) for 15-30 minutes can produce headache, dizziness, nervousness, nausea and pulmonary edema or bronchial pneumonia. Concentrations of >1000 ppm will cause immediate unconsciousness and death through respiratory paralysis. Rats and mice exposed to 80 ppm H_2S, 6 hrs/day, 5 days/week for 10 weeks, did not produce any toxicity except for irritation of nasal passages. H_2S did not affect reproduction and development (birth defects or neurotoxicity) in rats exposed to concentrations of 75-80 ppm or 150 ppm H_2S, respectively. Over the years a number of acute cases of H_2S poisoning have been reported. Complete and rapid recovery is the general rule. However, if the exposure was sufficiently intense and sustained causing cerebral hypoxia (lack of oxygen to the brain), neurologic effects such as amnesia, intention tremors or brain damage are possible.
Hexane	• This product may contain hexane at a level of >1.0%. Studies in laboratory animals have produced systemic toxicity in blood, spleen and lungs. Fetotoxicity has been observed at hexane concentrations that produced maternal toxicity. Long term exposure to high concentrations of hexane has been shown to cause testicular effects and nervous system damage.

Xylenes	• Gross overexposure or severe poisoning incidents in humans to xylenes has been reported to cause lung, liver, kidney, heart and brain damage as well as neurologic disturbances. Laboratory animals exposed to high dose of xylenes showed evidence of effects in the liver, kidneys, lungs, spleen, heart and adrenals, Exposure of pregnant rats, mice and rabbits during gestation to significant concentrations of xylenes produced maternal, fetal and developmental toxicity (skeletal retardation, cleft palate, and wavy ribs) generally at maternally toxic doses. These types of fetotoxic effects have been associated with maternal toxicity. Repeated inhalation of high xylene concentrations has shown impairment of performance abilities (behavioral tests) in animals and man. Xylenes produced a mild frequency hearing loss in rats subchronically exposed to high concentrations of xylenes.
Toluene	**Carcinogenicity:** Exposure of rats and mice to toluene at concentrations ranging from 120-1200 ppm for two years did not demonstrate evidence of carcinogenicity. Toluene has not been listed as a carcinogen by IARC. **Target Organs:** Epidemiology studies suggest that chronic occupational overexposure to toluene may damage color vision. Subchronic and chronic inhalation studies with toluene produced kidney and liver damage, hearing loss and central nervous system (brain) damage in laboratory animals. Intentional misuse by deliberate inhalation of high concentrations of toluene has been shown to cause liver, kidney, and central nervous system damage, including hearing loss and visual disturbances. **Reproductive Toxicity:** Exposure to toluene during pregnancy has demonstrated limited evidence of developmental toxicity in laboratory animals. Decreased fetal body weight and increased skeletal variations in both inhalation and oral studies, but only at doses that were maternally toxic. No fetal toxicity was seen at doses that were not maternally toxic. Decreased sperm counts have been observed in male rats in the absence of a reduction in fertility. Toluene has been reported to cause mental or growth retardation in the children of solvent abusers who directly inhale toluene during pregnancy.
Ethylbenzene	**Carcinogenicity:** Rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study demonstrated limited evidence of kidney, liver, and lung cancer. Ethyl benzene has been listed as a possible human carcinogen by IARC. **Target Organs:** In rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study there was mild damage to the kidney (tubular hyperplasia), liver (eosinophilio foci, hypertrophy, necrosis), lung (alveolar epithelium metaplasia), thyroid (hyperplasia), thyroid (hyperplasia) and pituitary (hyperplasia). In animal models (particularly rats), ethyl benzene affects the auditory function mainly in the cochlear mid-frequency range and ototoxicity was observed after combined exposure to noise and ethyl benzene. There is no evidence of either ethyl benzene-induced hearing losses or ototoxicity with combined exposure to ethyl benzene and noise in workers.
Naphthalene	Naphthalene has been evaluated in two year inhalation studies in both rats and mice. The US National Toxicology Program (NTP) concluded that there is clear evidence of carcinogenicity in male and female rats based on increased incidences of respiratory epithelial adenomas and olfactory epithelial neuroblastomas of the nose. NTP found some evidence of carcinogenicity in female mice (alveolar adenomas) and no evidence of carcinogenicity in male mice. Naphthalene has been identified as a carcinogen by IARC and NTP.

DELAYED AND IMMEDIATE EFFECTS AND ALSO CHRONIC EFFECTS FROM SHORT- AND LONG-TERM EXPOSURE

Sensitization	• No information available
Mutagenic Effects	• May cause genetic defects
Carcinogenicity	• May cause cancer

CARCINOGENIC INFORMATION

CHEMICAL NAME	ACGIH	ACGIH SKIN*	IARC	NTP	OSHA
Benzene	A1	X	Group 1	Known	X
Ethylbenzene	A3	–	Group 2B	Evidence	X
Hexane	–	X	–	–	–
Naphthalene	A4	X	2B	Evidence	
Petroleum	–		Group 3	Evidence	
Toluene	A4	–	Group 3	Evidence	–
Xylenes	A4	–	Group 3	Evidence	–

**ACGIH Skin designation refers to the potential significant contribution of overall exposure by cutaneous route, including mucous membranes and eyes, from airborne exposure to gases, vapor, or liquid OR by direct skin contact.*

REPRODUCTIVE TOXICITY

- Suspected of damaging fertility or the unborn child.

STOT—SINGLE EXPOSURE

- May cause drowsiness and dizziness.

STOT—REPEATED EXPOSURE

- Causes damage to organs through prolonged or repeated exposure.

ASPIRATION HAZARD

May be fatal if swallowed and enters airways Risk of serious damage to the lungs (by aspiration).

Section 12: Ecological Information

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
2-Methylbutane (In Liquid form)			EC50 48 h: = 2.3 mg/L (Daphnia magna)	
Benzene	EC50 72 h: = 29 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 10.7 - 14.7 mg/L flow-through (Pimephales promelas) LC50 96 h: = 5.3 mg/L flow-through (Oncorhynchus mykiss) LC50 96 h: = 22.49 mg/L static (Lepomis macrochirus) LC50 96 h: = 28.6 mg/L static (Poecilia reticulata) LC50 96 h: 22330 - 41160 µg/L static (Pimephales promelas) LC50 96 h: 70000 - 142000 µg/L static (Lepomis macrochirus)	EC50 48 h: 8.76 - 15.6 mg/L Static (Daphnia magna) EC50 48 h: = 10 mg/L (Daphnia magna)	–

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Cyclohexane	EC50 72 h: > 500 mg/L (Desmodesmus subspicatus)	LC50 96 h: 3.96 - 5.18 mg/L flow-through (Pimephales promelas) LC50 96 h: 23.03 - 42.07 mg/L static (Pimephales promelas) LC50 96 h: 24.99 - 44.69 mg/L static (Lepomis macrochirus) LC50 96 h: 48.87 - 68.76 mg/L static (Poecilia reticulata)	EC50 24 h: > 400 mg/L (Daphnia magna	EC50 = 85.5 mg/L 5 min EC50 = 93 mg/L 10 min (Microorganisms)
Ethylbenzene	EC50 72 h: = 4.6 mg/L (Pseudokirchneriella subcapitata) EC50 96 h: > 438 mg/L (Pseudokirchneriella subcapitata) EC50 72 h: 2.6 - 11.3 mg/L static (Pseudokirchneriella subcapitata) EC50 96 h: 1.7 - 7.6 mg/L static (Pseudokirchneriella subcapitata) EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 11.0 - 18.0 mg/L static (Oncorhynchus mykiss) LC50 96 h: = 4.2 mg/L semi-static (Oncorhynchus mykiss) LC50 96 h: 7.55 - 11 mg/L flow-through (Pimephales promelas) LC50 96 h: = 32 mg/L static (Lepomis macrochirus) LC50 96 h: 9.1 - 15.6 mg/L static (Pimephales promelas) LC50 96 h: = 9.6 mg/L static (Poecilia reticulata)	EC50 48 h: 1.8 - 2.4 mg/L (Daphnia magna)	EC50 = 9.68 mg/L 30 min EC50 = 96mg/L 24 h (Microorganisms)
Heptane	–	LC50 96 h: = 375.0 mg/L (Cichlid fish)	EC50 24 h: > 10 mg/L (Daphnia magna)	–
Hexane	–	LC50 96 h: 2.1 - 2.98 mg/L flow-through (Pimephales promelas)	EC50 24 h: > 1000 mg/L (Daphnia magna)	–
Hydrogen sulfide	–	LC50 96h: 49 µg/l Oncorhynchus mykiss (Rainbow Trout) eggs LC50 24h: 1059.7 µg/l Pimephales promelas (Fathead Minnow)	EC50 48h: 62 µg/l Gammarus pseudolimnaeus (Scud)	–
Methylcyclohexane	–	LC50 96hr: 72.0 mg/l (Golden Shiner)	–	–
Naphthalene	EC50 24 h: = 33000 ug/L (Chlorella vulgaris)	LC50 96 h: = 1.4 mg/L (Oncorhynchus gorbuscha)	EC50 48 h: 1600 ug/L (Daphnia magna)	–
Natural gas condensates (petroleum)	–	LC50 96 h: = 119 mg/L static (Alburnus alburnus) LC50 96 h: = 82 mg/L static (Cyprinodon variegatus)	EC50 24 h: = 170 mg/L (Daphnia magna)	–

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Octane	–	–	EC50 48 h: = 0.38 mg/L (water flea) EC50 48 h: = 0.02856 mg/L (Daphnia magna)	EC50 = 890 mg/L 30 min (Microorganisms) EC50 <1.67hr: 120 µg/l Mytilus edulis (Common Bay Mussel)
Pentane	–	–	EC50 48h: 135 mmol/cu	LC50 24h: 165 mmol/cu Artemia salina (Brine Shrimp)
Toluene	EC50: >433 mg/L Pseudokirchneriella subcapitata 96 h EC50: 12.5 mg/L Pseudokirchneriella subcapitata 72 h static	LC50: 15.22 - 19.05 mg/L Pimephales promelas 96 h flow-through LC50: 12.6 mg/L Pimephales promelas 96 h static LC50: 5.89 - 7.81 mg/L Oncorhynchus mykiss 96 h flow-through LC50: 14.1 - 17.16 mg/L Oncorhynchus mykiss 96 h static LC50: 5.8 mg/L Oncorhynchus mykiss 96 h semi-static LC50: 11.0-15.0 mg/L Lepomis macrochirus 96 h static LC50: 54 mg/L Oryzias latipes 96 h static LC50: 28.2 mg/L Poecilia reticulata 96 h semi-static LC50: 50.87-70.34 mg/L Poecilia reticulata 96 h static	EC50 48 h: 5.46 - 9.83 mg/L Static (Daphnia magna) EC50 48 h: = 11.5 mg/L (Daphnia magna)	EC50 = 19.7 mg/L 30 min (Microorganisms)
Xylenes	EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: = 13.4 mg/L flow-through (Pimephales promelas) LC50 96 h: 2.661 - 4.093 mg/L static (Oncorhynchus mykiss) LC50 96 h: 13.5 - 17.3 mg/L (Oncorhynchus mykiss) LC50 96 h: 13.1 - 16.5 mg/L flow-through (Lepomis macrochirus)	EC50 48 h: = 3.82 mg/L (water flea) LC50 48 h: = 0.6 mg/L (Gammarus lacustris)	-

PERSISTENCE AND DEGRADABILITY

- No information available

BIOACCUMULATIVE POTENTIAL

CHEMICAL	LOG POW
2-Methylbutane (In Liquid form)	2.72
Benzene	1.83
Butane	2.89

Cyclohexane	3.44
Ethylbenzene	3.118
Heptane	3.90
Hexane	3.90
Hydrogen Sulfide	0.45
Isobutane	2.76
Methylcyclohexane	3.61
Methylcyclopentane	3.37
Naphthalene	3.30
Octane	5.18
Pentane	3.39
Toluene	2.65
Xylene	2.77-3.15

MOBILITY IN SOIL

CHEMICAL	EXPECTED SOIL MOBILITY
2-Methylbutane (In Liquid form)	Low
Benzene	High
Butane	Low
Cyclohexane	Moderate
Ethylbenzene	Low
Heptane	Moderate
Hexane	High
Isobutane	Very High
Methylcyclopentane	Low
Naphthalene	High to None
Octane	Immobile
Pentane	High
Toluene	High to Moderate
Xylene	Very High to Moderate

OTHER ADVERSE EFFECTS

- No information available

Section 13: Disposal Considerations

WASTE TREATMENT METHODS

Product Waste	• This product, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA RCRA (40 CFR 261), Environment Canada, or other State, Provincial, and local regulations. If this product is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility. • This product could also contain benzene at >0.5 ppm and could exhibit the characteristic of "toxicity" (D018) as determined by the toxicity characteristic leaching procedure (TCLP). • This material could become a hazardous waste if mixed or contaminated with a hazardous waste or other substance(s). • It is the responsibility of the user to consult federal, state and local waste regulations to determine appropriate disposal options.
Packaging Waste	• Container contents should be completely used and containers should be emptied prior to discard. • Container 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 re-conditioner. • To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

Section 14: Transport Information

****CHART NAME****

	UN NUMBER	PROPER SHIPPING NAME	TRANSPORT HAZARD CLASS	PACKING GROUP	ENVIRONMENTAL HAZARD
DOT	UN1267	Petroleum Crude Oil	3	I	Emergency response guide number: 128
TDG	UN1267	Petroleum Crude Oil	3	I	Marine Pullutant
IMO/IMDG	UN1267	Petroleum Crude Oil	3	I	Marine Pullutant
IATA/ICAO	UN1267	Petroleum Crude Oil	3	I	ERG Code 3L

SPECIAL RECAUTIONS FOR USER

• None

Section 15: Regulatory Information

U.S.—CERCLA/SARA HAZARDOUS SUBSTANCES AND THEIR REPORTABLE QUANTITIES

COMPONENT	CAS #	AMOUNT
2-Methylbutane (In Liquid form)	78-78-4	Not Listed
Benzene	71-43-2	10 lb final RQ; 4.54 kg final RQ
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	1000 lb final RQ; 454 kg final RQ
Ethylbenzene	100-41-4	1000 lb final RQ; 454 kg final RQ
Heptane	142-82-5	Not Listed
Hexane	110-54-3	5000 lb final RQ; 2270 kg final RQ
Hydrogen Sulfide	7783-06-4	100 lb final RQ; 45.4 kg final RQ
Isobutane	75-28-5	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Naphthalene	91-20-3	100 lb final RQ; 45.4 kg final RQ
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed
Petroleum	8002-05-9	Not Listed
Toluene	108-88-3	1000 lb final RQ; 454 kg final RQ
Xylene	1330-20-7	100 lb final RQ; 45.4 kg final RQ

U.S.—CWA (CLEAN WATER ACT)—REPORTABLE QUANTITIES OF DESIGNATED HAZARDOUS SUBSTANCES

COMPONENT	CAS #	AMOUNT
2-Methylbutane (In Liquid form)	78-78-4	Not Listed
Benzene	71-43-2	10 lb RQ
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	1000 lb RQ
Ethylbenzene	100-41-4	1000 lb RQ
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	100 lb RQ
Isobutane	75-28-5	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Naphthalene	91-20-3	100 lb RQ
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed
Petroleum	8002-05-9	Not Listed
Toluene	108-88-3	1000 lb RQ
Xylene	1330-20-7	100 lb RQ

U.S.—CWA (CLEAN WATER ACT)—RECOMMENDED WATER QUALITY CRITERIA—CCC FOR FRESHWATER LIFE

COMPONENT	CAS #	AMOUNT
Hydrogen Sulfide	7783-06-4	2.0 µg/L CCC

U.S.—CWA (CLEAN WATER ACT)—RECOMMENDED WATER QUALITY CRITERIA—CCC FOR SALTWATER LIFE

COMPONENT	CAS #	AMOUNT
Hydrogen Sulfide	7783-06-4	2.0 µg/L CCC

U.S.—CWA (CLEAN WATER ACT)— HAZARDOUS SUBSTANCES

COMPONENT	CAS #	LISTED
2-Methylbutane (In Liquid form)	78-78-4	Not Listed
Benzene	71-43-2	X
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	X
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	X
Isobutane	75-28-5	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Naphthalene	91-20-3	X
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed
Petroleum	8002-05-9	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	X

X= The component is listed

U.S.—CWA (CLEAN WATER ACT)— PRIORITY POLLUTANTS

COMPONENT	CAS #	LISTED
2-Methylbutane (In Liquid form)	78-78-4	Not Listed
Benzene	71-43-2	X
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	Not Listed
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	Not Listed
Isobutane	75-28-5	Not Listed
Methylcyclohexane	108-87-2	Not Listed

Methylcyclopentane	96-37-7	Not Listed
Naphthalene	91-20-3	X
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed
Petroleum	8002-05-9	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	Not Listed

X= The component is listed

CANADA-WHMIS—CLASSIFICATIONS OF SUBSTANCES

COMPONENT	CAS #	CLASSIFICATION
2-Methylbutane (In Liquid form)	78-78-4	B2
Benzene	71-43-2	B2, D2A, D2B
Butane	106-97-8	A, B1
Cyclohexane	110-82-7	B2, D2B
Ethylbenzene	100-41-4	B2, D2A, D2B
Heptane	142-82-5	B2, D2B
Hexane	110-54-3	B2, D2A, D2B
Hydrogen Sulfide	7783-06-4	A, B1, D1A, D2B
Isobutane	75-28-5	A, B1 (listed under Methyl-2 propane)
Methylcyclohexane	108-87-2	B2
Methylcyclopentane	96-37-7	Not Listed
Naphthalene	91-20-3	B4, D2A
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Octane	111-65-9	B2, D2B
Pentane	109-66-0	B2
Petroleum	8002-05-9	B2
Toluene	108-88-3	B2, D2A, D2B
Xylene	1330-20-7	B2, D2A, D2B

X= The component is listed

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR FRESHWATER AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	90 µg/L
Toluene	108-88-3	2.0 µg/L
Benzene	71-43-2	370 µg/L
Naphthalene	91-20-3	1.1 µg/L (listed under Polycyclic aromatic hydrocarbons (PAHs))

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR MARINE AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	25 µg/L
Toluene	108-88-3	215 µg/L
Benzene	71-43-2	110 µg/L
Naphthalene	91-20-3	1.4 µg/L (listed under Polycyclic aromatic hydrocarbons (PAHs))

CANADA—ENVIRONMENTAL EMERGENCIES

COMPONENT	CAS #	LISTED
2-Methylbutane (In Liquid form)	78-78-4	X
Benzene	71-43-2	X
Butane	106-97-8	X
Cyclohexane	110-82-7	X
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	X
Isobutane	75-28-5	X
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Naphthalene	91-20-3	X
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	X
Petroleum	8002-05-9	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	X

X= The component is listed

Section 16: Other Information

NFPA



Health Hazard: 3	**Flammability:** 4	**Instability:** 0	**Physical and Chemical Hazards:** X

HMIS	**Health Hazard:** 3	**Flammability:** 4	**Instability:** 0	**Personal Protection:** X

ISSUING DATE 5/7/15

REVISION DATE 5/7/15

DISCLAIMER

- The information presented herein is based on data considered to be accurate as of the date of preparation of this Safety Data Sheet (SDS). However, SDSs 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

Safety Data Sheet

Section 1: Identification

PRODUCT IDENTIFIER	Petroleum Crude Oil—Sweet	
OTHER MEANS OF IDENTIFICATION	**UN-Number**	UN1267
	Synonyms	Mixed Sweet Blend (MSW) , Pembina (P), Gibson Light (MGL), Joarcam (MLN), Pembina Sweet Blend (PSB), Rangeland Sweet (RSW), Rainbow Light (RA), Federated (FD), Light Smiley (MSY), Manitoba Sweet Tundra (MST)
	Chemical Category	Crude oils—extremely flammable
RECOMMENDED USE	No information available	
RESTRICTIONS OF USE	No information available	
SUPPLIER INFORMATION	Enbridge Pipelines Inc. 10201 Jasper Avenue Edmonton, Alberta T5J 3N7 Canada TEL: 1-780-420-5210	
EMERGENCY CONTACT INFORMATION	**CHEMTREC**	1-800-424-9300 for US 703- 527- 3887 outside US
	CANUTEC (Canadian Transportation)	613-996-6666

Section 2: Hazards Identification

CLASSIFICATION

Skin Irritation	Category 3
Eye Irritation	Category 2
Germ Cell Mutagenicity	Category 1B
Carcinogenicity	Category 1A
Reproductive Toxicity	Category 2
Specific Target Organ Systemic Toxicity (Single Exposure)	Category 3
Specific Target Organ Toxicity (Repeated Exposure)	Category 1
Aspiration Toxicity	Category 1
Flammable liquids	Category 1

LABEL ELEMENTS

Signal Word

Danger

Hazard Pictograms



Hazard Statements

- Causes skin irritation.
- Causes serious eye irritation.
- May cause genetic defects.
- May cause cancer.
- Suspected of damaging fertility or the unborn child.
- May cause respiratory irritation.
- Causes damage to organs through prolonged or repeated exposure.
- May be fatal if swallowed and enters airways.
- Extremely flammable liquid and vapor.
- May cause drowsiness or dizziness.

PRECAUTIONARY STATEMENTS

Prevention

- Wash face, hands and any exposed skin thoroughly after handling.
- Wear protective gloves/protective clothing/eye protection/face protection.
- Obtain special instructions before use.
- Do not handle until all safety precautions have been read and understood.
- Use personal protective equipment as required.
- Do not breathe dust/fume/gas/mist/vapors/spray.
- Use only outdoors or in a well-ventilated area.
- Do not eat, drink or smoke when using this product.
- Keep away from heat/sparks/open flames/hot surfaces.
- Keep container tightly closed.
- No smoking.
- Ground/bond container and receiving equipment.
- Use explosion-proof electrical/ventilating/lighting/equipment.
- Use only non-sparking tools.
- Take precautionary measures against static discharge.
- In case of inadequate ventilation wear respiratory protection.

Response

- IF EXPOSED or concerned: Get medical advice/attention.
- IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
- Call a POISON CENTER or doctor/physician if you feel unwell.
- IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
- Do NOT induce vomiting.
- IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower and soap.
- In case of fire: Use CO_2, dry chemical, or foam for extinction.
- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- If SKIN irritation occurs: Get medical advice/attention.
- If EYE irritation persists: Get medical advice/attention.

Storage/Disposal

- Store locked up and keep cool.
- Store in a well-ventilated place. Keep container tightly closed.
- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

OTHER INFORMATION

- Under United States Regulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered hazardous.
- Very toxic to aquatic life with long lasting effects.

Section 3: Composition/Information on Ingredients

COMPONENT NAME	CAS NUMBER	PERCENTAGE (%)*	NOTES
1,2,4-Trimethylbenzene	95-63-6	0-1	
2-Methylbutane (In Liquid form)	78-78-4	0-30	
Benzene	71-43-2	0-3	
Butane	106-97-8	0-5	
Cyclohexane	110-82-7	0-5	
Cyclopentane	287-92-3	0-5	
Decane	124-18-5	0-5	
Ethane	74-84-0	0-60	
Ethylbenzene	100-41-4	0-5	
Heptane	142-82-5	0-20	
Hexane	110-54-3	0-20	
Hydrogen Sulfide	7783-06-4	0-1	
Isobutane	75-28-5	0-5	
Methylcyclohexane	108-87-2	0-6	
Methylcyclopentane	96-37-7	0-6	
Natural Gas Condensate	68919-39-1	0-100	
Natural Gas Condensates (petroleum)	64741-47-5	0-25	
Nonane	111-84-2	0-6	
Octane	111-65-9	0-15	
Pentane	109-66-0	0-30	
Petroleum	8002-05-9	0-100	
Propane	74-98-6	0-60	
Toluene	108-88-3	0-5	
Xylene	1330-20-7	0-5	

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

Section 4: First Aid Measures

DESCRIPTION OF NECESSARY MEASURES	**Inhalation**	• IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If irritation persists: Get medical advice/attention.
	Skin	• IF ON SKIN: Wash with plenty of soap and water. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse.
	Eye	• IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.
	Ingestion	• Do NOT induce vomiting. Call a physician or poison control center. • Aspiration hazard if swallowed—can enter lungs and cause damage.
MOST IMPORTANT SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED	**Refer to Section 11 - Toxicological Information**	
INDICATION OF IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED, IF NECESSARY	**Note to the Physician**	• Aspiration hazard. Symptoms may be delayed. • 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. • Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.

Section 5: Fire Fighting Measures

EXTINGUISHING MEDIA	**Suitable Extinguishing Media**	• SMALL FIRES: Dry chemical, CO_2, water spray or regular foam. • LARGE FIRE: Water spray, fog or regular foam.
	Unsuitable Extinguishing Media	• CAUTION: Use of water spray when fighting fire may be inefficient. • Do not use straight streams.
FIREFIGHTING PROCEDURES		• FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. • FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: If impossible to extinguish, protect surroundings and allow fire to burn itself out. • Stay upwind. • Ventilate closed spaces before entering. • Fire fighters should wear complete protective clothing including self-contained breathing apparatus. • FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions. • FIRE: When a large quantity of this material is involved in a major fire, consider an initial evacuation distance of 300 meters (1000 feet) in all directions. • Move containers from fire area if you can do it without risk.

- LARGE FIRES: Use water spray or fog; do not use straight streams.
- LARGE FIRES: If insufficient water supply: knock down vapors only. If this is impossible, withdraw from area and let fire burn.
- LARGE FIRES: Flood fire area with large quantities of water, while knocking down vapors with water fog.

SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OR MIXTURE

- Vapors may travel to source of ignition and flash back.
- Air/vapor mixtures may explode when ignited.
- Vapors may accumulate in confined areas (basement, tanks, hopper/tank cars etc.).
- Will be easily ignited by heat, sparks or flames.
- Runoff to sewer may create fire or explosion hazard.
- Vapor explosion hazard indoors, outdoors or in sewers.
- MAY EXPLODE AND THROW FRAGMENTS 1600 meters (1 MILE) OR MORE IF FIRE REACHES CARGO.
- May create vapor/air explosion hazard indoors, outdoors or in sewers.
- Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).

EXPLOSION DATA

Hazardous Combustion Products	• Carbon monoxide. Carbon dioxide (CO_2). Nitrogen oxides (NOx). Oxides of sulfur. • Aldehydes, aromatic and other hydrocarbons.
Sensitivity to Mechanical Impact	• None.
Sensitivity to Static Discharge	• Yes.

PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIREFIGHTERS

- As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.
- 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 firefighters.
- Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces.
- Water spray may be useful in minimizing or dispersing vapors.
- Long-duration fires involving diluent stored in tanks may result in a boilover.
- For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear.

Section 6: Accidental Release Measures

PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

Personal Precautions	• Evacuate personnel to safe areas. • Remove all sources of ignition. • Deny entry to unauthorized and unprotected personnel. • Use personal protective equipment. • Avoid contact with skin, eyes and clothing. • Stop leak if you can do it without risk. • Keep people away from and upwind of spill/leak. • Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. • Ventilate enclosed areas. • Do not walk through spilled material.
Protective Equipment	• Wear appropriate breathing apparatus (if applicable) and protective clothing.

	Emergency Procedures	• ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area) Keep unauthorized personnel away. Evacuate area. Keep out of low areas. Stop leak if you can do it without risk. • Report spills to local or federal authorities as appropriate or required.
ENVIRONMENTAL PRECAUTIONS	• Avoid run off to waterways and sewers. Do NOT wash away into sewer. Prevent entry into waterways, sewers, basements or confined areas. Runoff from fire control may cause pollution.	
METHODS AND MATERIAL FOR CONTAINMENT AND CLEANING UP	**Methods for Containment**	• Stop leak if you can do it without risk. • Contain and recover liquid when possible. • A vapor suppressing foam may be used to reduce vapors. • Dike far ahead of spill; use dry sand to contain the flow of material; contain water spills by booming. • Use water spray to reduce vapors or divert vapor cloud drift. • A fine water spray remotely directed to the edge of the spill pool can be used to direct and maintain a hot flare fire which will burn the spilled material in a controlled manner.
	Methods for Cleaning Up	• Clean up spill immediately. • LARGE SPILLS: DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST. • SMALL LIQUID SPILLS: Use a non-combustible material like vermiculite or sand to soak up the product and place into a container for later disposal. • Use appropriate Personal Protective Equipment (PPE). • Use clean non-sparking tools to collect absorbed material. • Vacuum spilled material. • Try to work upwind of spill. • All equipment used when handling the product must be grounded. • Recover and return free product to proper containers • Use suitable absorbent materials such as vermiculite, sands, soil, or clay to clean up residual liquids. • Do not place spilled materials back in the original container. • Do not flush to sewer or allow to enter waterways.

Section 7: Handling and Storage

PRECAUTIONS FOR SAFE HANDLING	**Handling**	• All equipment used when handling the product must be grounded. Avoid contact with heat and ignition sources and oxidizers. Do not breathe (dust, vapor or spray mist). Do not use in areas without adequate ventilation. Do not use sparking tools. Keep away from heat, sparks, and flame. No open flames, no sparks and no smoking. Use only with adequate ventilation. Do not use or store near heat or open flame. Keep away from fire, sparks and heated surfaces. • The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes). • The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits. • Take precautionary measures against static discharges.

Handling	• Do not cut drill, grind or weld on empty containers since they may contain explosive residues. • Stay upwind and vent open hatches before uploading. • Avoid contact with skin, eyes and clothing. • Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water. • Wear personal protective equipment. • Remove and wash contaminated clothing before re-use. • Do not eat, drink or smoke when using this product. • Do not take internally. • Wash thoroughly after handling. • Empty containers pose a potential fire and explosion hazard.
Storage	• Ventilate enclosed areas. • Store in a well-ventilated place. • Keep container tightly closed. • Store locked up. • Avoid shock, impact, friction, and rough handling. Do not use sparking tools. • Store in a cool/low-temperature, well-ventilated place away from heat and ignition sources. • Keep away from sources of ignition. • No Smoking. • Do not enter confined spaces such as tanks or pits without following proper entry procedures. • Store in properly closed containers that are appropriately labeled and in a cool well-ventilated area. • Harmful concentrations of hydrogen sulfide (H_2S) gas can accumulate in excavations and low-lying areas as well as the vapor space of storage and bulk transport compartments. • Keep away from open flames, hot surfaces and sources of ignition. • Keep product and empty container away from heat and sources of ignition. • Storage containers should be grounded and bonded. • Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge. • Store away from incompatible materials.
Incompatible Products	• Strong oxidizers such as nitrates, chlorates, peroxides, chlorine.

CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES

Section 8: Exposure Controls/Personal Protection

CONTROL PARAMETERS: EXPOSURE GUIDELINES

CHEMICAL NAME	ACGIH	OSHA	NIOSH
1,2,4-Trimethylbenzene	TWA 25 ppm	–	TWA 25 ppm TWA 125 mg/m^3
2-Methylbutane (In Liquid form)	TWA 600 ppm	–	–
Benzene	TLV 0.5 ppm TLV 1.6 mg/m^3 STEL 2.5 ppm STEL 8 mg/m^3	PEL 1 ppm STEL 5 ppm	TWA 0.1 ppm STEL 1 ppm IDLH 500 ppm
Benzene, trimethyl-	TLV 25 ppm	–	–

Butane	STEL 1000 ppm	–	TWA 800 ppm TWA 1900 mg/m^3
Cyclohexane	TLV 100 ppm TLV 334 mg/m^3	PEL 300 ppm PEL 1050 mg/m^3	TWA 300 ppm TWA 1050 mg/m^3 IDLH 1300 ppm
Cyclopentane	TLV 600 ppm	–	TWA 600 ppm TWA 1720 mg/m^3
Ethane	TLV 1000 ppm (listed under Aliphatic hydrocarbon gases: Alkane C1-4)	–	–
Ethylbenzene	TLV 20 ppm TLV 87 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 125 ppm STEL 545 mg/m^3 IDLH 800 ppm
Heptane	TLV 400 ppm TLV 1640 mg/m^3 STEL 500 ppm STEL 2000 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 85 ppm TWA 350 mg/m^3 Ceiling 440 ppm Ceiling 1800 mg/m^3 IDLH 750 ppm
Hexane	TLV 50 ppm TLV 176 mg/m^3	PEL 500 ppm PEL 1800 mg/m^3	TWA 50 ppm TWA 180 mg/m^3 IDLH 1100 ppm
Hydrogen sulfide	TLV 1 ppm TLV 1.4 mg/m^3 STEL 5 ppm STEL 7 mg/m^3	Ceiling 20 ppm	Ceiling 10 ppm Ceiling 15 mg/m^3 IDLH 100 ppm
Isobutane	TWA 1000 ppm		
MethylCyclohexane	TLV 400 ppm TLV 1610 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 400 ppm TWA 1600 mg/m^3 IDLH 1200 ppm
Nonane	TLV 200 ppm TLV 1050 mg/m^3	–	TWA 200 ppm TWA 1050 mg/m^3
Octane	TLV 300 ppm TLV 1401 mg/m^3	PEL 500 ppm PEL 2350 mg/m^3	TWA 75 ppm TWA 350 mg/m^3 Ceiling 385 ppm Ceiling 1800 mg/m^3 IDLH 1000 ppm
Pentane	TLV 600 ppm TLV 1770 mg/m^3	PEL 1000 ppm PEL 2950 mg/m^3	TWA 120 ppm TWA 350 mg/m^3 Ceiling 610 ppm Ceiling 1800 mg/m^3 IDLH 1500 ppm

Propane	TLV 1000 ppm (listed under Aliphatic hydrocarbon gases: Alkane C1-4)	TWA 1000 ppm TWA 1800 mg/m^3	TWA 1000 ppm TWA 1800 mg/m^3
Toluene	TLV 20 ppm TLV 75 mg/m^3	PEL 200 ppm STEL 300 mg/m^3	TWA 100 ppm TWA 375 mg/m^3 STEL 150 ppm STEL 560 mg/m^3 IDLH 500 ppm
Xylenes	TLV 100 ppm TLV 434 mg/m^3 STEL 150 ppm STEL 651 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 150 ppm STEL 655 mg/m^3 IDLH 900 ppm

APPROPRIATE ENGINEERING CONTROLS

- Adequate ventilation systems as needed to control concentrations of airborne contaminants below applicable threshold limit values. Prevent vapor build up by providing adequate ventilation during and after use. Use only appropriately classified electrical equipment.

INDIVIDUAL PROTECTION MEASURES

Eye and Face	• Wear face shield and eye protection.
Skin and Body	• The use of gloves (nitrile or neoprene) is advised to prevent skin contact and possible irritation. • Wear protective gloves/protective clothing/eye protection/face protection. Wear long sleeves and/or protective coveralls.
Respiratory	• Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or symptoms are experienced.
General Hygiene Measures	• Handle in accordance with good industrial hygiene and safety practice.

Section 9: Physical and Chemical Properties

MATERIAL DESCRIPTION

Physical State	Liquid	**Odor**	Petroleum like odor
Substance Type	Mixture	**Odor Threshold**	No data available
Appearance	Yellow/green to Brown/black liquid		

PROPERTIES

pH	No data available	**Vapor pressure**	10 to 103 kPa @ 37.9°C
Melting Point/ Freezing Point	No data available	**Vapor density**	>1 Air=1
Boiling Point/ Boiling Range	-20 to 722°C -4 to 1331.6°F	**Relative density**	No data available

Flash Point	-40 to 100 °C -40 to 212 °F	**Water Solubility**	Negligible
Evaporation Rate	No data available	**Partition coefficient: n-octanol/water**	No data available
Flammability (solid, gas)	No data available	**Autoignition temperature**	No data available
Upper Flammability Limit	No data available	**Decomposition temperature**	No data available
Lower Flammability Limit	No data available	**Specific Gravity**	0.65-1.1
Viscosity	No data available		

Section 10: Stability and Reactivity

REACTIVITY	Chlorine Dioxide
CHEMICAL STABILITY	Stable at 70 °F, 760 mm Hg pressure
POSSIBILITY OF HAZARDOUS REACTIONS	None under normal processing
CONDITIONS TO AVOID	Excessive heat, sources of ignition, sparks, open flames, and buildup of static electricity
INCOMPATIBLE MATERIALS	Strong oxidizers such as nitrates, chlorates, peroxides, chlorine
HAZARDOUS DECOMPOSITION PRODUCTS	Combustion produces carbon monoxide, aldehydes, sulfur dioxide, aromatic and other hydrocarbons
HAZARDOUS POLYMERIZATION	Will not occur

Section 11: Toxicological Information

INFORMATION ON THE LIKELY ROUTES OF EXPOSURE

Inhalation	• May cause irritation of respiratory tract. May cause drowsiness and dizziness.
Eye Contact	• Causes serious eye irritation.
Skin Contact	• Causes skin irritation.
Ingestion	• Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. • Potential for aspiration if swallowed. • Aspiration may cause pulmonary edema and pneumonitis.

TOXICOLOGICAL DATA

CHEMICAL NAME	LD50 ORAL	LD50 DERMAL	LC50 INHALATION
1,2,4-Trimethylbenzene	5 g/kg (Rat)	–	18000 mg/m^3 (Rat) 4h
2-Methylbutane (In Liquid form)	–	–	= 150,000 mg/m^3 (Rat) 2 h
Benzene	1800 mg/kg (Rat)	–	13050 - 14380 ppm (Rat) 4 h
Butane	–	–	658 mg/L (Rat) 4 h
Cyclohexane	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	= 13.9 mg/L (Rat) 4 h
Cyclopentane	11400 mg/kg (Rat)	–	72 g/m^3 (Mouse)
Decane	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rat)	–
Ethylbenzene	= 3500 mg/kg (Rat)	= 15400 mg/kg (Rabbit)	= 17.2 mg/L (Rat) 4 h
Heptane	–	= 3000 mg/kg (Rabbit)	= 103 g/m^3 (Rat) 4 h
Hexane	= 25 g/kg (Rat)	= 3000 mg/kg (Rabbit)	= 48000 ppm (Rat) 4 h
Hydrogen sulfide	–	–	= 444 ppm (Rat)
Isobutane	–	–	= 658,000 mg/m^3 (Rat) 4 h
MethylCyclohexane	> 3200 mg/kg (Rat)	–	–
Natural gas condensates (petroleum)	–	–	= 600 mg/m^3 (Rat)
Nonane	–	–	= 3200 ppm (Rat) 4 h
Octane	–	–	= 118 g/m^3 (Rat) 4 h = 25260 ppm (Rat) 4 h
Pentane	>2000 mg/kg (Rat)	–	364 g/cu (Rat) 4 h
Petroleum	>4300 mg/kg (Rat)	–	–
Propane	–	–	>800000 ppm (Rat) 15 min
Hydrogen sulfide	–	–	= 444 ppm (Rat)
Toluene	2.6 to 7.5 g/kg (Rat)	14.1 ml/kg (Rabbit)	–
Xylenes	= 3500 mg/kg (Rat)	> 4350 mg/kg (Rabbit) > 1700 mg/kg (Rabbit)	= 29.08 mg/L (Rat) 4 h = 5000 ppm (Rat) 4 h

SYMPTOMS RELATED TO THE PHYSICAL, CHEMICAL AND TOXICOLOGICAL CHARACTERISTICS

Benzene	• Repeated or prolonged exposure to benzene at concentrations in excess of the TLV may cause serious injury to blood-forming organs. Significant chronic exposure to benzene vapor has been reported to produce various blood disorders ranging from anemia to certain forms of leukemia (cancer) in humans. Benzene produced tumors in rats and mice in lifetime chronic toxicity studies, but the response has not been consistent across species, strain, sex or route of exposure. Animal studies on benzene have demonstrated immune toxicity, chromosomal aberrations, testicular effects and alterations in reproductive cycles and embryo/fetotoxicity, but not teratogenicity.
Ethylbenzene	**Carcinogenicity:** Rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study demonstrated limited evidence of kidney, liver, and lung cancer. Ethyl benzene has been listed as a possible human carcinogen by IARC. **Target Organs:** In rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study there was mild damage to the kidney (tubular hyperplasia), liver (eosinophilio foci, hypertrophy, necrosis), lung (alveolar epithelium metaplasia), thyroid (hyperplasia), thyroid (hyperplasia) and pituitary (hyperplasia). In animal models (particularly rats), ethyl benzene affects the auditory function mainly in the cochlear mid-frequency range and ototoxicity was observed after combined exposure to noise and ethyl benzene. There is no evidence of either ethyl benzene-induced hearing losses or ototoxicity with combined exposure to ethyl benzene and noise in workers.
Hexane	• This product may contain hexane at a level of >1.0%. Studies in laboratory animals have produced systemic toxicity in blood, spleen and lungs. Fetotoxicity has been observed at hexane concentrations that produced maternal toxicity. Long term exposure to high concentrations of hexane has been shown to cause testicular effects and nervous system damage.
Hydrogen Sulfide Gas (H_2S)	• Toxic by inhalation. Prolonged breathing of 50-100 ppm H_2S vapors can produce eye and respiratory tract irritation. Higher concentration (250-600 ppm) for 15-30 minutes can produce headache, dizziness, nervousness, nausea and pulmonary edema or bronchial pneumonia. Concentrations of >1000 ppm will cause immediate unconsciousness and death through respiratory paralysis. Rats and mice exposed to 80 ppm H_2S, 6 hrs/day, 5 days/week for 10 weeks, did not produce any toxicity except for irritation of nasal passages. H_2S did not affect reproduction and development (birth defects or neurotoxicity) in rats exposed to concentrations of 75-80 ppm or 150 ppm H_2S, respectively. Over the years a number of acute cases of H_2S poisoning have been reported. Complete and rapid recovery is the general rule. However, if the exposure was sufficiently intense and sustained causing cerebral hypoxia (lack of oxygen to the brain), neurologic effects such as amnesia, intention tremors or brain damage are possible.
Toluene	**Carcinogenicity:** Exposure of rats and mice to toluene at concentrations ranging from 120-1200 ppm for two years did not demonstrate evidence of carcinogenicity. Toluene has not been listed as a carcinogen by IARC. **Target Organs:** Epidemiology studies suggest that chronic occupational overexposure to toluene may damage color vision. Subchronic and chronic inhalation studies with toluene produced kidney and liver damage, hearing loss and central nervous system (brain) damage in laboratory animals. Intentional misuse by deliberate inhalation of high concentrations of toluene has been shown to cause liver, kidney, and central nervous system damage, including hearing loss and visual disturbances. **Reproductive Toxicity:** Exposure to toluene during pregnancy has demonstrated limited evidence of developmental toxicity in laboratory animals. Decreased fetal body weight and increased skeletal variations in both inhalation and oral studies, but only at doses that were maternally toxic. No fetal toxicity was seen at doses that were not maternally toxic. Decreased sperm counts have been observed in male rats in the absence of a reduction in fertility. Toluene has been reported to cause mental or growth retardation in the children of solvent abusers who directly inhale toluene during pregnancy.

Xylenes	• Gross overexposure or severe poisoning incidents in humans to xylenes has been reported to cause lung, liver, kidney, heart and brain damage as well as neurologic disturbances. Laboratory animals exposed to high dose of xylenes showed evidence of effects in the liver, kidneys, lungs, spleen, heart and adrenals, Exposure of pregnant rats, mice and rabbits during gestation to significant concentrations of xylenes produced maternal, fetal and developmental toxicity (skeletal retardation, cleft palate, and wavy ribs) generally at maternally toxic doses. These types of fetotoxic effects have been associated with maternal toxicity. Repeated inhalation of high xylene concentrations has shown impairment of performance abilities (behavioral tests) in animals and man. Xylenes produced a mild frequency hearing loss in rats subchronically exposed to high concentrations of xylenes.

DELAYED AND IMMEDIATE EFFECTS AND ALSO CHRONIC EFFECTS FROM SHORT- AND LONG-TERM EXPOSURE

Sensitization	• No information available
Mutagenic Effects	• May cause genetic defects
Carcinogenicity	• May cause cancer

CARCINOGENIC INFORMATION

CHEMICAL NAME	ACGIH	ACGIH SKIN*	IARC	NTP	OSHA
Benzene	A1	X	Group 1	Known	X
Ethylbenzene	A3	–	Group 2B	Evidence	X
Hexane	–	X	–	–	–
Toluene	A4	–	Group 3	Evidence	–
Xylenes	A4	–	Group 3	Evidence	–

**ACGIH Skin designation refers to the potential significant contribution of overall exposure by cutaneous route, including mucous membranes and eyes, from airborne exposure to gases, vapor, or liquid OR by direct skin contact.*

REPRODUCTIVE TOXICITY

• Suspected of damaging fertility or the unborn child.

STOT—SINGLE EXPOSURE

• May cause drowsiness and dizziness.

STOT—REPEATED EXPOSURE

• Causes damage to organs through prolonged or repeated exposure.

ASPIRATION HAZARD

May be fatal if swallowed and enters airways Risk of serious damage to the lungs (by aspiration).

Section 12: Ecological Information

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
1,2,4-Trimethylbenzene	–	LC50 96 h: 7.72 mg/L (Pimephales promelas)	EC50 48h: 30 mmol/cu (Daphnia magna)	LC50 24h: 100 mmol/cu Artemia salina (Brine Shrimp)
2-Methylbutane (In Liquid form)			EC50 48 h: = 2.3 mg/L (Daphnia magna)	
Benzene	EC50 72 h: = 29 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 10.7 - 14.7 mg/L flow-through (Pimephales promelas) LC50 96 h: = 5.3 mg/L flow-through (Oncorhynchus mykiss) LC50 96 h: = 22.49 mg/L static (Lepomis macrochirus) LC50 96 h: = 28.6 mg/L static (Poecilia reticulata) LC50 96 h: 22330 - 41160 µg/L static (Pimephales promelas) LC50 96 h: 70000 - 142000 µg/L static (Lepomis macrochirus)	EC50 48 h: 8.76 - 15.6 mg/L Static (Daphnia magna) EC50 48 h: = 10 mg/L (Daphnia magna)	–
Cyclohexane	EC50 72 h: > 500 mg/L (Desmodesmus subspicatus)	LC50 96 h: 3.96 - 5.18 mg/L flow-through (Pimephales promelas) LC50 96 h: 23.03 - 42.07 mg/L static (Pimephales promelas) LC50 96 h: 24.99 - 44.69 mg/L static (Lepomis macrochirus) LC50 96 h: 48.87 - 68.76 mg/L static (Poecilia reticulata)	EC50 24 h: > 400 mg/L (Daphnia magna	EC50 = 85.5 mg/L 5 min EC50 = 93 mg/L 10 min (Microorganisms)
Cyclopentane			EC50 48 h: 150 nmol/cu m (Daphnia magna)	LC50 24h: 280 mmol/cu m Artemia salina (Brine Shrimp)
Decane	EC50 24 h: = 0.043 mg/L (Chlorella vulgaris)	–	EC50 48 h: = 0.029 mg/L (Daphnia magna)	–
Ethylbenzene	EC50 72 h: = 4.6 mg/L (Pseudokirchneriella subcapitata) EC50 96 h: > 438 mg/L (Pseudokirchneriella subcapitata) EC50 72 h: 2.6 - 11.3 mg/L static (Pseudokirchneriella subcapitata) EC50 96 h: 1.7 - 7.6 mg/L static (Pseudokirchneriella subcapitata) EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 11.0 - 18.0 mg/L static (Oncorhynchus mykiss) LC50 96 h: = 4.2 mg/L semi-static (Oncorhynchus mykiss) LC50 96 h: 7.55 - 11 mg/L flow-through (Pimephales promelas) LC50 96 h: = 32 mg/L static (Lepomis macrochirus) LC50 96 h: 9.1 - 15.6 mg/L static (Pimephales promelas) LC50 96 h: = 9.6 mg/L static (Poecilia reticulata)	EC50 48 h: 1.8 - 2.4 mg/L (Daphnia magna)	EC50 = 9.68 mg/L 30 min EC50 = 96mg/L 24 h (Microorganisms)

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Heptane	–	LC50 96 h: = 375.0 mg/L (Cichlid fish)	EC50 24 h: > 10 mg/L (Daphnia magna)	–
Hexane	–	LC50 96 h: 2.1 - 2.98 mg/L flow-through (Pimephales promelas)	EC50 24 h: > 1000 mg/L (Daphnia magna)	–
Hydrogen sulfide	–	LC50 96h: 49 µg/l Oncorhynchus mykiss (Rainbow Trout) eggs LC50 24h: 1059.7 µg/l Pimephales promelas (Fathead Minnow)	EC50 48h: 62 µg/l Gammarus pseudolimnaeus (Scud)	–
MethylCyclohexane	–	LC50 96hr: 72.0 mg/l (Golden Shiner)	–	–
Natural gas condensates (petroleum)	–	LC50 96 h: = 119 mg/L static (Alburnus alburnus) LC50 96 h: = 82 mg/L static (Cyprinodon variegatus)	EC50 24 h: = 170 mg/L (Daphnia magna)	–
Octane	–	–	EC50 48 h: = 0.38 mg/L (water flea) EC50 48 h: = 0.02856 mg/L (Daphnia magna)	EC50 = 890 mg/L 30 min (Microorganisms) EC50 <1.67hr: 120 µg/l Mytilus edulis (Common Bay Mussel)
Pentane	–	–	EC50 48h: 135 mmol/cu	LC50 24h: 165 mmol/cu Artemia salina (Brine Shrimp)
Toluene	EC50: >433 mg/L Pseudokirchneriella subcapitata 96 h EC50: 12.5 mg/L Pseudokirchneriella subcapitata 72 h static	LC50: 15.22 - 19.05 mg/L Pimephales promelas 96 h flow-through LC50: 12.6 mg/L Pimephales promelas 96 h static LC50: 5.89 - 7.81 mg/L Oncorhynchus mykiss 96 h flow-through LC50: 14.1 - 17.16 mg/L Oncorhynchus mykiss 96 h static LC50: 5.8 mg/L Oncorhynchus mykiss 96 h semi-static LC50: 11.0-15.0 mg/L Lepomis macrochirus 96 h static LC50: 54 mg/L Oryzias latipes 96 h static LC50: 28.2 mg/L Poecilia reticulata 96 h semi-static LC50: 50.87-70.34 mg/L Poecilia reticulata 96 h static	EC50 48 h: 5.46 - 9.83 mg/L Static (Daphnia magna) EC50 48 h: = 11.5 mg/L (Daphnia magna)	EC50 = 19.7 mg/L 30 min (Microorganisms)

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Xylenes	EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: = 13.4 mg/L flow-through (Pimephales promelas) LC50 96 h: 2.661 - 4.093 mg/L static (Oncorhynchus mykiss) LC50 96 h: 13.5 - 17.3 mg/L (Oncorhynchus mykiss) LC50 96 h: 13.1 - 16.5 mg/L flow-through (Lepomis macrochirus)	EC50 48 h: = 3.82 mg/L (water flea) LC50 48 h: = 0.6 mg/L (Gammarus lacustris)	-

PERSISTENCE AND DEGRADABILITY

- No information available

BIOACCUMULATIVE POTENTIAL

CHEMICAL	LOG POW
1,2,4-Trimethylbenzene	3.78
2-Methylbutane (In Liquid form)	2.72
Benzene	1.83
Butane	2.89
YCyclohexane	3.44
Cyclopentane	3.00
Decane	5.1
Ethane	1.81
Ethylbenzene	3.118
Heptane	4.66
Hexane	3.90
Hydrogen Sulfide	0.45
Isobutane	2.76
Methylcyclohexane	3.61
Methylcyclopentane	3.37
Nonane	5.65
Octane	5.18
Pentane	3.39
Propane	2.36
Toluene	2.65
Xylene	2.77-3.15

MOBILITY IN SOIL

CHEMICAL	EXPECTED SOIL MOBILITY
1,2,4-Trimethylbenzene	Low
2-Methylbutane (In Liquid form)	Low
Benzene	High
Butane	Low
Cyclohexane	Moderate
Cyclopentane	Moderate
Decane	Immobile
Ethane	Very High
Ethylbenzene	Low
Heptane	Moderate
Hexane	High
Isobutane	Very High
Methylcyclopentane	Low
Nonane	Immobile
Octane	Immobile
Pentane	High
Propane	Moderate
Toluene	High to Moderate
Xylene	Very High to Moderate

OTHER ADVERSE EFFECTS

- No information available

Section 13: Disposal Considerations

WASTE TREATMENT METHODS

Product Waste	• This product, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA RCRA (40 CFR 261), Environment Canada, or other State, Provincial, and local regulations. If this product is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility. • This product could also contain benzene at >0.5 ppm and could exhibit the characteristic of "toxicity" (D018) as determined by the toxicity characteristic leaching procedure (TCLP). • This material could become a hazardous waste if mixed or contaminated with a hazardous waste or other substance(s). • It is the responsibility of the user to consult federal, state and local waste regulations to determine appropriate disposal options.
Packaging Waste	• Container contents should be completely used and containers should be emptied prior to discard. • Container 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 re-conditioner. • To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

Section 14: Transport Information

****CHART NAME****

	UN NUMBER	PROPER SHIPPING NAME	TRANSPORT HAZARD CLASS	PACKING GROUP	ENVIRONMENTAL HAZARD
DOT	UN1267	Petroleum Crude Oil	3	I	Emergency response guide number: 129
TDG	UN1267	Petroleum Crude Oil	3	I	Marine Pullutant
IMO/IMDG	UN1267	Petroleum Crude Oil	3	I	Marine Pullutant
IATA/ICAO	UN1267	Petroleum Crude Oil	3	I	ERG Code 3L

SPECIAL RECAUTIONS FOR USER

• None

Section 15: Regulatory Information

U.S.—CERCLA/SARA HAZARDOUS SUBSTANCES AND THEIR REPORTABLE QUANTITIES

COMPONENT	CAS #	AMOUNT
1,2,4-Trimethylbenzene	95-63-6	Not Listed
2-Methylbutane (In Liquid form)	78-78-4	Not Listed
Benzene	71-43-2	10 lb final RQ; 4.54 kg final RQ
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	1000 lb final RQ; 454 kg final RQ
Cyclopentane	287-92-3	Not Listed
Decane	124-18-5	Not Listed
Ethane	74-84-0	Not Listed
Ethylbenzene	100-41-4	1000 lb final RQ; 454 kg final RQ
Heptane	142-82-5	Not Listed
Hexane	110-54-3	5000 lb final RQ; 2270 kg final RQ
Hydrogen Sulfide	7783-06-4	100 lb final RQ; 45.4 kg final RQ
Isobutane	75-28-5	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Natural Gas Condensate	68919-39-1	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Nonane	111-84-2	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed
Petroleum	8002-05-9	Not Listed
Propane	74-98-6	Not Listed
Toluene	108-88-3	1000 lb final RQ; 454 kg final RQ
Xylene	1330-20-7	100 lb final RQ; 45.4 kg final RQ

U.S.—CWA (CLEAN WATER ACT)—REPORTABLE QUANTITIES OF DESIGNATED HAZARDOUS SUBSTANCES

COMPONENT	CAS #	AMOUNT
1,2,4-Trimethylbenzene	95-63-6	Not Listed
2-Methylbutane (In Liquid form)	78-78-4	Not Listed
Benzene	71-43-2	10 lb RQ
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	1000 lb RQ
Cyclopentane	287-92-3	Not Listed
Decane	124-18-5	Not Listed
Ethane	74-84-0	Not Listed
Ethylbenzene	100-41-4	1000 lb RQ
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	100 lb RQ
Isobutane	75-28-5	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Natural Gas Condensate	68919-39-1	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Nonane	111-84-2	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed
Petroleum	8002-05-9	Not Listed
Propane	74-98-6	Not Listed
Toluene	108-88-3	1000 lb RQ
Xylene	1330-20-7	100 lb RQ

U.S.—CWA (CLEAN WATER ACT)—RECOMMENDED WATER QUALITY CRITERIA—CCC FOR FRESHWATER LIFE

COMPONENT	CAS #	AMOUNT
Hydrogen Sulfide	7783-06-4	2.0 µg/L CCC

U.S.—CWA (CLEAN WATER ACT)—RECOMMENDED WATER QUALITY CRITERIA—CCC FOR SALTWATER LIFE

COMPONENT	CAS #	AMOUNT
HydrogenSulfide	7783-06-4	2.0 µg/L CCC

U.S.—CWA (CLEAN WATER ACT)—HAZARDOUS SUBSTANCES

COMPONENT	CAS #	LISTED
1,2,4-Trimethylbenzene	95-63-6	Not Listed
2-Methylbutane (In Liquid form)	78-78-4	Not Listed
Benzene	71-43-2	X
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	X
Cyclopentane	287-92-3	Not Listed
Decane	124-18-5	Not Listed
Ethane	74-84-0	Not Listed
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	X
Isobutane	75-28-5	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Natural Gas Condensate	68919-39-1	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Nonane	111-84-2	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed
Petroleum	8002-05-9	Not Listed

Propane	74-98-6	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	X

X= The component is listed

U.S.—CWA (CLEAN WATER ACT)—PRIORITY POLLUTANTS

COMPONENT	CAS #	LISTED
1,2,4-Trimethylbenzene	95-63-6	Not Listed
2-Methylbutane (In Liquid form)	78-78-4	Not Listed
Benzene	71-43-2	X
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	Not Listed
Cyclopentane	287-92-3	Not Listed
Decane	124-18-5	Not Listed
Ethane	74-84-0	Not Listed
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	Not Listed
Isobutane	75-28-5	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Natural Gas Condensate	68919-39-1	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Nonane	111-84-2	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed
Petroleum	8002-05-9	Not Listed
Propane	74-98-6	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	Not Listed

X= The component is listed

CANADA-WHMIS—CLASSIFICATIONS OF SUBSTANCES

COMPONENT	CAS #	CLASSIFICATION
1,2,4-Trimethylbenzene	95-63-6	B3
2-Methylbutane (In Liquid form)	78-78-4	B2
Benzene	71-43-2	B2, D2A, D2B
Butane	106-97-8	A, B1
Cyclohexane	110-82-7	B2, D2B
Cyclopentane	287-92-3	B2
Decane	124-18-5	B3, D2B
Ethane	74-84-0	A, B1
Ethylbenzene	100-41-4	B2, D2A, D2B
Heptane	142-82-5	B2, D2B
Hexane	110-54-3	B2, D2A, D2B
Hydrogen Sulfide	7783-06-4	A, B1, D1A, D2B
Isobutane	75-28-5	A, B1 (listed under Methyl-2 propane)
Methylcyclohexane	108-87-2	B2
Methylcyclopentane	96-37-7	Not Listed
Natural Gas Condensate	68919-39-1	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Nonane	111-84-2	B2, D2B
Octane	111-65-9	B2, D2B should this row be left in the layout?
Pentane	109-66-0	B2
Petroleum	8002-05-9	B2
Propane	74-98-6	A, B1
Toluene	108-88-3	B2, D2A, D2B
Xylene	1330-20-7	B2, D2A, D2B

X= The component is listed

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR FRESHWATER AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	90 µg/L
Toluene	108-88-3	2.0 µg/L
Benzene	71-43-2	370 µg/L

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR MARINE AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	25 µg/L
Toluene	108-88-3	215 µg/L
Benzene	71-43-2	110 µg/L

CANADA—ENVIRONMENTAL EMERGENCIES

COMPONENT	CAS #	LISTED
1,2,4-Trimethylbenzene	95-63-6	Not Listed
2-Methylbutane (In Liquid form)	78-78-4	X
Benzene	71-43-2	X
Butane	106-97-8	X
Cyclohexane	110-82-7	X
Cyclopentane	287-92-3	Not Listed
Decane	124-18-5	Not Listed
Ethane	74-84-0	X
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	X
Isobutane	75-28-5	X
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Natural Gas Condensate	68919-39-1	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Nonane	111-84-2	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	X

Petroleum	8002-05-9	Not Listed
Propane	74-98-6	X
Toluene	108-88-3	X
Xylene	1330-20-7	X

X= The component is listed

Section 16: Other Information

NFPA



Health Hazard: 2	**Flammability:** 4	**Instability:** 0	**Physical and Chemical Hazards:** X

HMIS	**Health Hazard:** 2	**Flammability:** 4	**Instability:** 0	**Personal Protection:** X

ISSUING DATE 5/6/15

REVISION DATE 5/6/15

DISCLAIMER

- The information presented herein is based on data considered to be accurate as of the date of preparation of this Safety Data Sheet (SDS). However, SDSs 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.

Material Safety Data Sheet (Canada)
Natural Gas Liquids

Section 1 – Material Identification and Use

Material Name: NATURAL GAS LIQUIDS
Use: Feedstock, fuel
WHMIS Classification: Class A; Class B, Div. 1 and Div. 2; Class D, Div. 2, Sub-Div. A and B
TDG: **UN:** 1075 **Class:** 2.1 **Packing Group:** N.Av.
Shipping Name: LIQUIFIED PETROLEUM GASES
Manufacturer/Supplier: ENCANA COPORATION
500 Centre Street SE
CALGARY, ALBERTA, T2P 2S5
Emergency Telephone: CANUTEC: 1-613-996-6666
Chemical Family: Liquified aliphatic paraffinic and aromatic hydrocarbons

Section 2 – Hazardous Ingredients of Materials

Hazardous Ingredients	Approximate Concentrations %	C.A.S. Nos.	LD50/LC50 Specify Species & Route	Exposure Limits
Natural Gas Condensates	25-85	68919-39-1	LC50, rat, >5610 mg/m3	300 & 500 ppm (STEL) (AB, TLV & BC)
Butane	10-40	106-97-8	LC50, rat, 4 hrs, 658 g/m^3	1000/ 600 (750) ppm (AB & TLV/ BC (STEL))
Propane	5-35	74-9-86	N.Av.	1000 ppm (AB & BC)
Ethane	<10	74-8-40	N.Av.	1000 ppm (AB & BC)
Benzene	0.1-1	71-43-2	LD50, rat, oral, 930 mg/kg LC50, rat, 4 hrs, 13200 ppm	0.5 & 2.5 ppm (STEL) (AB, TLV & BC)

All exposure levels are 8-hour time-weighted exposure limits unless otherwise indicated. STEL is a short-term exposure limit over a 15 minute time-weighted average. Gasoline exposure levels presented for Natural Gas Condensates.

Section 3 – Physical Data for Material

Physical State: Liquids and liquified gas
Specific Gravity: 0.54
Vapour Density (air=1): >2
Percent Volatiles, by volume: 100
Freezing Pt. (deg.C): -164
Vapour Pressure: 15000 @ 20°C
Odour Threshold (ppm): N.Av.
Evaporation Rate: N.Av.
Boiling Pt. (deg.C): -26
Coefficient of Water/Oil Distribution: <0.1
Odour & Appearance: colorless, odourless (or may have a mercaptan odour)
(N.AV. = not available N.App. = not applicable)

Section 4 – Fire and Explosion

Flammability: Yes **Conditions**: Product will ignite at normal temperatures.
Means of Extinction: Foam, CO_2, dry chemical. Explosive accumulations can build up in areas of poor ventilation.
Special Procedures: Use water spray to cool fire-exposed containers, and to disperse gas if leak has not ignited. If safe to do so, cut off fuel and allow flame to burn out.
Flash Point (deg.C): <-50 to -135
Upper Explosive Limit (% by vol.): 13
Lower Explosive Limit (% by vol.): 2
Auto-Ignition Temp. (deg.C): >400
Sensitivity to Impact: No
Sensitivity to Static Discharge: Yes, may ignite
TDG Flammability Classification: 2.1
Hazardous Combustion Products: Carbon monoxide and carbon dioxide

Section 5 – Reactivity Data

Chemical Stability: Yes **Conditions**: N.App.
Incompatibility: Yes **Substances**: Chlorine and other strong oxidizing agents
Reactivity: Yes **Conditions**: Heat, strong sunlight
Hazardous Decomposition Products: Carbon dioxide, carbon monoxide

Section 6 – Toxicological Properties of Product

Routes of Entry:
Skin Absorption: Yes **Skin Contact**: Yes (liquid) **Eye Contact**: Yes
Inhalation: **Acute**: Yes **Chronic**: Yes **Ingestion**: Yes (liquid)
Effects of Acute Exposure: Inhalation can cause headache, disorientation, dizziness, drowsiness and possibly unconsciousness. As concentration increases, oxygen deficiency and asphyxiation may occur. Rapidly expanding gas or vaporized liquid may cause frostbite to skin and eyes. Absorbed through intact skin. Contact of liquid with eyes may cause severe irritation.
Effects of Chronic Exposure: Due to presence of benzene, long term or high dose rate exposures may increase the risk of anemia and leukemia.
Sensitization to Product: No.
Irritancy: N.Av.
Synergistic Materials: None reported
Carcinogenicity: Yes **Reproductive Effects**: Possibly **Teratogenicity**: Possibly **Mutagenicity**: Possibly

Section 7 – Preventative Measures

Personal Protective Equipment: Use a NIOSH approved positive pressure self-contained breathing apparatus or supplied air breathing apparatus when concentrations may exceed exposure limits. Use approved gas detectors; however, note that combustible gas detection will likely not offer warning against overexposure to this product.
Respiratory: SCBA, SABA or cartridge APR
Eye: Full facepiece SCBA or SABA
Footwear: Covered footwear such as steel-toed boots. **Clothing** Fire retardant garments that meet NFPA 2112.
Engineering Controls: Use only in well ventilated areas. Mechanical ventilation required in confined areas. Equipment must be explosion proof.
Leaks & Spills: If safe to do so, stop gas flow. Remove all ignition sources. Provide clearing ventilation if possible. Prevent from entering confined spaces. Use appropriate personal protective equipment. Contact applicable regulatory authorities.
Waste Disposal: Controlled burning or venting in accordance with regulatory requirements.
Handling Procedures & Equipment: Avoid contact with liquid. Avoid inhalation. Bond and ground all transfers. Avoid sparking conditions. Industrial hygiene monitoring such as that detailed in NIOSH Methodology 1501 is required when handling or working near this material.
Storage Requirements: Store in a cool, dry, well ventilated area away from heat, strong sunlight and ignition sources.
Special Shipping Information: N.Av.

Section 8 – First aid Measures

Skin: If freeze burn occurs, gently bathe affected area in warm water (38 – 43 deg. C.) Do not rub. Get medical attention.
Eye: Immediately flush with large amounts of luke warm water for 15 minutes, lifting upper and lower lids at intervals. Seek medical attention if irritation persists.
Inhalation: Ensuring own safety, remove victim to fresh air. Give oxygen, artificial respiration, or CPR if needed. Seek immediate medical attention.
Ingestion: Ingestion of liquid causes freeze burns to mouth, throat, esophagus and lungs. Get immediate medical attention.

Section 9 – Preparation Date of MSDS

Prepared By: Encana Environment, Health and Safety (EH&S)
Phone Number: (403) 645-2000 Preparation Date: July 1, 2014 Expiry Date: July 1, 2017

Section 1: PRODUCT AND COMPANY IDENTIFICATION

Product Name: Synthetic Crude Oil

Synonyms: Not available.

Product Use: Refinery feedstock.

Manufacturer/Supplier: Husky Oil Operations Ltd.
PO Box 6525 Station 'D'
Calgary, Alberta
T2P 3G7

Phone Number: 403-298-6111

Emergency Phone: 877-262-2111

Date of Preparation: January 21, 2014

Section 2: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

DANGER
FLAMMABLE LIQUID AND VAPOR. HARMFUL OR FATAL IF SWALLOWED. CAN ENTER LUNGS AND CAUSE DAMAGE. CANCER HAZARD – CAN CAUSE CANCER. IRRITATING TO EYES AND SKIN.

Colour: Straw coloured.
Physical State: Liquid.
Odour: Petroleum.

WHMIS	Personal Protection Equipment	TDG (Ground)
		

Potential Health Effects: See Section 11 for more information.

Likely Routes of Exposure: Eye contact. Skin contact. Inhalation. Ingestion. Skin absorption.

Inhalation: May cause respiratory irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. Excessive inhalation may cause headache, dizziness, confusion, loss of appetite and/or loss of consciousness. This product contains small amounts of Hydrogen sulphide which may accumulate in confined spaces. Inhalation of Hydrogen sulphide may cause loss of sense of smell, major irritation of the respiratory tract, headache, nausea, vomiting, dizziness, and fluid buildup in the lungs (pulmonary edema), which can be fatal. At 300 ppm unconsciousness may occur after 20 minutes. From 300 to 500 ppm, death can occur within 1 to 4 hours of continuous exposure. At 500 ppm the respiratory system is paralyzed, the victim collapses almost instantaneously, and death can occur after exposure of only 30 to 60 minutes. Above 500 ppm Hydrogen sulphide may cause immediate loss of consciousness; death is rapid, and possibly immediate.

Eye: Causes eye irritation. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision. Hydrogen sulphide may cause eye irritation at 1-20 ppm and acute conjunctivitis at higher concentrations. Above 50 ppm H2S, eye irritation may include symptoms of redness, severe swelling, tearing, sensitivity to light and the appearance of 'Halos' around lights.

Skin: Causes skin irritation. Signs/symptoms may include localized redness, swelling, and itching.

Ingestion: May be fatal if swallowed and enters airways. May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

Medical Conditions Aggravated By Exposure: Not available.

Target Organs: Skin. Eyes. Gastrointestinal tract. Respiratory system. Lungs. Blood. Cardiovascular system. Bone marrow. Nervous system.

Potential Environmental Effects: See Section 12 for more information.

This material is considered hazardous by the OSHA Hazard Communication Standard, (29 CFR 1910.1200).

Section 3: COMPOSITION / INFORMATION ON INGREDIENTS

Hazardous Ingredient(s)	CAS No.	% wt./wt.
Gas oils (petroleum), hydrodesulfurized	64742-79-6	60 - 100
Naphtha (petroleum), hydrotreated heavy	64742-48-9	10 - 30
Naphtha (petroleum), hydrotreated light	64742-49-0	3 - 7
Butane	106-97-8	1 - 5
Hydrogen sulfide (H2S)	7783-06-4	0.001 - 0.01

Section 4: FIRST AID MEASURES

Inhalation: If inhaled: Call a poison center or doctor if you feel unwell.

Eye Contact: If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.

Skin Contact: If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. If skin irritation occurs: Get medical advice/attention. Wash contaminated clothing before reuse.

Ingestion: If swallowed: Immediately call a poison center or doctor. If vomiting occurs naturally, have victim lean forward to reduce the risk of aspiration. Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If breathing or the heart stops, trained personnel should immediately begin artificial respiration (AR) or cardiopulmonary resuscitation (CPR) respectively. Get medical attention immediately.

General Advice: In case of accident or if you feel unwell, seek medical advice immediately (show the label or MSDS where possible).

Note to Physicians: Symptoms may not appear immediately. For inhalation of Hydrogen Sulphide, consider oxygen.

Section 5: FIRE FIGHTING MEASURES

Flammability: Flammable liquid by WHMIS criteria. Class IB flammable liquid by OSHA criteria. Will be easily ignited by heat, sparks or flames. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks). Vapor explosion hazard indoors, outdoors or in sewers. Runoff to sewer may create fire or explosion hazard. Containers may explode when heated. Many liquids are lighter than water. When heated, this material may evolve toxic and flammable Hydrogen sulphide.

If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

Fire involving Tanks or Car/Trailer Loads: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

Means of Extinction

Suitable Extinguishing Media: Small Fire: Dry chemical, CO_2, water spray or regular foam.

Large Fire: Water spray, fog or regular foam. Move containers from fire area if you can do it without risk.

Unsuitable Extinguishing Media: Do not use straight streams. CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient.

Products of Combustion: Oxides of carbon. Oxides of sulphur.

Protection of Firefighters: Inhalation or contact with material may irritate or burn skin and eyes. Fire may produce irritating, corrosive and/or toxic gases. Vapors may cause dizziness or suffocation. Runoff from fire control or dilution water may cause pollution. Hydrogen sulphide is heavier than air and may collect in low lying areas and confined spaces. Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters' protective clothing will only provide limited protection.

Explosion Data

Sensitivity to Mechanical Impact: This material is not sensitive to mechanical impact.

Sensitivity to Static Discharge: This material is sensitive to static discharge.

Section 6: ACCIDENTAL RELEASE MEASURES

Emergency Procedures: As an immediate precautionary measure, isolate spill or leak area for at least 50 meters (150 feet) in all directions. Keep unauthorized personnel away. Stay upwind. Keep out of low areas. Ventilate closed spaces before entering. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). All equipment used when handling the product must be grounded.

Personal Precautions: Do not touch or walk through spilled material. Use personal protection recommended in Section 8.Don full-face, positive pressure, self-contained breathing apparatus.

Environmental Precautions: Prevent entry into waterways, sewers, basements or confined areas.

Methods for Containment: Stop leak if you can do it without risk. A vapor suppressing foam may be used to reduce vapors.

Methods for Clean-Up: Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean non-sparking tools to collect absorbed material.

Other Information: See Section 13 for disposal considerations.

Section 7: HANDLING AND STORAGE

Handling:
Do not swallow. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Keep away from heat, sparks, open flames, and hot surfaces. – No smoking. Keep container tightly closed. Ground/bond container and receiving equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Wash thoroughly after handling. See Section 8 for information on Personal Protective Equipment.

Storage:
Store in a well-ventilated place. Store locked up. Store away from incompatible materials. See Section 10 for information on Incompatible Materials. Keep out of the reach of children. Head spaces in storage containers may contain toxic hydrogen sulphide gas. Structural materials and lighting and ventilation systems should be corrosion resistant.

Section 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines
Component

Gas oils (petroleum), hydrodesulfurized [CAS No. 64742-79-6]

ACGIH: A2; Exposure by all routes should be carefully controlled to levels as low as possible (2009); For Mineral oil, excluding metal working fluids; Poorly and mildly refined

OSHA: 5 mg/m³ (TWA); For Oil mist, mineral.

Naphtha (petroleum), hydrotreated heavy [CAS No. 64742-48-9]

ACGIH: 100 ppm (TWA); (1980); For Stoddard solvent

OSHA: 100 ppm (TWA), 400 mg/m³ (TWA); For Petroleum distillates (Naphtha).

Naphtha (petroleum), hydrotreated light [CAS No. 64742-49-0]

ACGIH: 100 ppm (TWA); (1980); For Stoddard solvent

OSHA: 100 ppm (TWA), 400 mg/m³ (TWA); For Petroleum distillates (Naphtha).

Butane [CAS No. 106-97-8]

ACGIH: 1000 ppm (TWA); (2001)

OSHA: 800 ppm (TWA) [Vacated];

Hydrogen sulfide (H2S) [CAS No. 7783-06-4]

ACGIH: 1 ppm (TWA); 5 ppm (STEL); (2009);

OSHA: 20 ppm (C); 50 ppm (Peak) (Maximum duration: 10 mins. once only if no other meas. exp. occurs.)
10 ppm (TWA); 15 ppm (STEL) [Vacated];

Benzene [CAS No. 71-43-2]

ACGIH: 0.5 ppm (TWA); 2.5 ppm (STEL); Skin; A1; BEI (1996)

OSHA: 1 ppm (TWA); 5 ppm (STEL);

Toluene [CAS No. 108-88-3]

ACGIH: 20 ppm (TWA); A4; BEI (2006)

OSHA: 200 ppm (TWA); 300 ppm (C); 500 ppm (Peak) (Maximum duration: 10 minutes.)
100 ppm (TWA); 150 ppm (STEL) [Vacated];

Ethylbenzene [CAS No. 100-41-4]

ACGIH: 20 ppm (TWA); A3; BEI (2010)

OSHA: 100 ppm (TWA), 435 mg/m³ (TWA);
125 ppm (STEL) [Vacated];

Xylene [CAS No. 1330-20-7]

ACGIH: 100 ppm (TWA); 150 ppm (STEL); A4; BEI (1992)

OSHA: 100 ppm (TWA), 435 mg/m³ (TWA);
150 ppm (STEL) [Vacated];

TWA: Time-Weighted Average
STEL: Short-Term Exposure Limit
C: Ceiling

Engineering Controls: Use ventilation adequate to keep exposures (airborne levels of dust, fume, vapour, gas, etc.) below recommended exposure limits. Use explosion-proof electrical, ventilating, and lighting equipment.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Eye/Face Protection:	Wear chemical goggles. Ensure that eyewash stations are close to the workstation location. Use equipment for eye protection that meets the standards referenced by OSHA regulations in 29 CFR 1910.133 for Personal Protective Equipment.
Hand Protection:	Wear protective gloves. Neoprene or nitrile gloves are recommended. Consult manufacturer specifications for further information.
Skin and Body Protection:	Wear protective clothing. Flame resistant clothing that meets the NFPA 2112 and CAN/CGSB 155.20 standards is recommended in areas where material is stored or handled.
Respiratory Protection:	If engineering controls and ventilation are not sufficient to control exposure to below the allowable limits then an appropriate NIOSH/MSHA approved air-purifying respirator with organic vapor cartridge, or self-contained breathing apparatus must be used. Supplied air breathing apparatus must be used when oxygen concentrations are low or if airborne concentrations exceed the limits of the air-purifying respirators.
General Hygiene Considerations:	Handle according to established industrial hygiene and safety practices.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Clear liquid
Colour:	Straw coloured.
Odour:	Petroleum.
Odour Threshold:	0.0047 ppm, (Hydrogen sulphide)
Physical State:	Liquid.
pH:	Not available.
Viscosity:	Not available.
Melting Point:	Not available.
Boiling Point:	Not available.
Flash Point:	20 °C (68 °F) (PMCC)
Evaporation Rate:	Not available.
Lower Flammability Limit:	Not available.
Upper Flammability Limit:	Not available.
Vapor Pressure:	15 to 35 kPa at 20 °C (68 °F)

Vapor Density:	Not available.
Specific Gravity:	0.86 (Water = 1)
Density:	Not available.
Solubility in Water:	Insoluble in cold water.
Coefficient of Water/Oil Distribution:	Not available.
Auto-ignition Temperature:	Not available.
Percent Volatile, wt. %:	Not available.
VOC content, wt. %:	Not available.

Section 10: STABILITY AND REACTIVITY

Stability:	Stable under normal storage conditions.
Conditions of Reactivity:	Contact with incompatible materials. Exposure to heat.
Incompatible Materials:	Strong acids. Strong oxidizers. Halogens.
Hazardous Decomposition Products:	Oxides of carbon. Oxides of nitrogen. Aldehydes. Hazardous sulphur dioxide, and related oxides of sulphur may be generated upon combustion.
Possibility of Hazardous Reactions:	None known.

Section 11: TOXICOLOGICAL INFORMATION

EFFECTS OF ACUTE EXPOSURE

Component Toxicity

Component	CAS No.	LD_{50} oral	LD_{50} dermal	LC_{50}
Gas oils (petroleum), hydrodesulfurized	64742-79-6	Not available.	Not available.	Not available.
Naphtha (petroleum), hydrotreated heavy	64742-48-9	Not available.	Not available.	Not available.
Naphtha (petroleum), hydrotreated light	64742-49-0	Not available.	Not available.	Not available.
Butane	106-97-8	Not available.	Not available.	658000 mg/m³ (rat); 4H
Hydrogen sulfide	7783-06-4	Not available.	Not available.	444 ppm (rat); 4H
Benzene	71-43-2	930 mg/kg (rat)	> 9400 µl/kg (rabbit)	10000 ppm (rat); 7H
Toluene	108-88-3	600 mg/kg (rat)	14.1 mL/kg (rabbit)	49000 mg/m³ (rat); 4H
Ethylbenzene	100-41-4	3500 mg/kg (rat)	17800 µl/kg (rabbit)	Not available.
Xylene	1330-20-7	4300 mg/kg (rat)	> 1700 mg/kg (rabbit)	5000 ppm (rat); 4H

Inhalation: May cause respiratory irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. Excessive inhalation may cause headache, dizziness, confusion, loss of appetite and/or loss of consciousness. This product contains small amounts of Hydrogen sulphide which may accumulate in confined spaces. Inhalation of Hydrogen sulphide may cause loss of sense of smell, major irritation of the respiratory tract, headache, nausea, vomiting, dizziness, and fluid buildup in the lungs (pulmonary edema), which can be fatal. At 300 ppm unconsciousness may occur after 20 minutes. From 300 to 500 ppm, death can occur within 1 to 4 hours of continuous exposure. At 500 ppm the respiratory system is paralyzed, the victim collapses almost instantaneously, and death can occur after exposure of only 30 to 60 minutes. Above 500 ppm Hydrogen sulphide may cause immediate loss of consciousness; death is rapid, and possibly immediate.

Eye: Causes eye irritation. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision. Hydrogen sulphide may cause eye irritation at 1-20 ppm and acute conjunctivitis at higher concentrations. Above 50 ppm H2S, eye irritation may include symptoms of redness, severe swelling, tearing, sensitivity to light and the appearance of 'Halos' around lights.

Skin: Causes skin irritation. Signs/symptoms may include localized redness, swelling, and itching.

Ingestion: May be fatal if swallowed and enters airways. May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

Skin Sensitization: Not available.

Respiratory Sensitization: Not available.

EFFECTS OF CHRONIC EXPOSURE

Target Organs: Skin. Eyes. Gastrointestinal tract. Respiratory system. Lungs. Blood. Cardiovascular system. Bone marrow. Spleen. Liver. Kidneys. Nervous system.

Chronic Effects: Prolonged or repeated contact may dry skin and cause irritation. Exposure to Naphtha may damage the blood-forming organs resulting in fatigue and anaemia (RBC), decreased resistance to infection, and/or excessive bruising and bleeding (platelet effect). Peripheral nerve damage may be evidenced by impairment of motor function (incoordination, unsteady walk, or muscle weakness in the extremities, and/or loss of sensation in the arms and legs). Auditory system effects may include temporary hearing loss and/or ringing in the ears. Hydrogen sulphide may reduce lung function; cause neurological effects such as headaches, nausea, depression and personality changes; eye and mucous membrane irritation: damage to cardiovascular system. Reports of chronic poisoning with Benzene, Toluene, Ethylbenzene or Xylene describe anemia, decreased blood cell count and bone marrow hypoplasia. Liver and kidney damage may occur. Repeated exposure of the eyes to high concentrations of

Xylenes vapour may cause reversible eye damage. Chronic inhalation exposure to xylene causes mid-frequency hearing loss in laboratory animals. Xylene reacts synergistically with n-hexane to enhance hearing loss.

Carcinogenicity: May cause cancer. Gas oils cause cancer in laboratory animals. This material contains Benzene which may cause aplastic anemia or acute myelogenous leukemia (AML). Chronic exposure to benzene has been associated with an increased incidence of leukemia and multiple myeloma (tumour composed of cells of the type normally found in the bone marrow).

Component Carcinogenicity

Component	ACGIH	IARC	NTP	OSHA	Prop 65
Gas oils (petroleum), hydrodesulfurized	A2	Group 1	List 1	OSHA Carcinogen.	Listed.
Benzene	A1	Group 1	List 1	OSHA Carcinogen.	Listed.
Toluene	A4	Group 3	Not listed.	Not listed.	Not listed.
Ethylbenzene	A3	Group 2B	Not listed.	OSHA Carcinogen.	Listed.
Xylene	A4	Group 3	Not listed.	Not listed.	Not listed.

Mutagenicity: May cause heritable genetic damage.

Reproductive Effects: Not available.

Developmental Effects

Teratogenicity: Not available.

Embryotoxicity: Possible risk of harm to the unborn child. Benzene and Xylene have caused adverse fetal effects in laboratory animals. Exposure to Toluene may affect the developing fetus.

Toxicologically Synergistic Materials: Xylene reacts synergistically with n-hexane to enhance hearing loss.

Section 12: ECOLOGICAL INFORMATION

Ecotoxicity: Not available.

Persistence / Degradability: Not available.

Bioaccumulation / Accumulation: Not available.

Mobility in Environment: Not available.

Section 13: DISPOSAL CONSIDERATIONS

Disposal Instructions: Disposal should be in accordance with applicable regional, national and local laws and regulations. Local regulations may be more stringent than regional or national requirements.

Section 14: TRANSPORT INFORMATION

U.S. Department of Transportation (DOT)

Proper Shipping Name:	UN1267, PETROLEUM CRUDE OIL, 3, PG I
Class:	3
UN Number:	UN1267
Packing Group:	I
Label Code:	

Canada Transportation of Dangerous Goods (TDG)

Proper Shipping Name:	UN1267, PETROLEUM CRUDE OIL, 3, PG I
Class:	3
UN Number:	UN1267
Packing Group:	I
Label Code:	

Section 15: REGULATORY INFORMATION

Chemical Inventories

US (TSCA)
The components of this product are in compliance with the chemical notification requirements of TSCA.

Canada (DSL)
The components of this product are in compliance with the chemical notification requirements of the NSN Regulations under CEPA, 1999.

Federal Regulations

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

WHMIS Classification:

Class B2 - Flammable Liquids.
Class D2A - Carcinogenicity.
Class D2A - Embryotoxicity.
Class D2A - Mutagenicity.
Class D2B - Skin irritant.
Class D2B - Eye irritant.

Hazard Symbols:



United States

This MSDS has been prepared to meet the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200.

SARA Title III

Component	Section 302 (EHS) TPQ (lbs.)	Section 304 EHS RQ (lbs.)	CERCLA RQ (lbs.)	Section 313	RCRA CODE	CAA 112(r) TQ (lbs.)
Butane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	10000
Hydrogen sulfide	500	100	100	313s	U135	10000
Benzene	Not listed.	Not listed.	10	313	U019	Not listed.
Toluene	Not listed.	Not listed.	1000	313	U220	Not listed.
Ethylbenzene	Not listed.	Not listed.	1000	313	Not listed.	Not listed.
Xylene	Not listed.	Not listed.	100	313	U239	Not listed.

State Regulations

Massachusetts

US Massachusetts Commonwealth's Right-to-Know Law (Appendix A to 105 Code of Massachusetts Regulations Section 670.000)

Component	CAS No.	RTK List
Gas oils (petroleum), hydrodesulfurized	64742-79-6	Listed.
Naphtha (petroleum), hydrotreated heavy	64742-48-9	Listed.
Naphtha (petroleum), hydrotreated light	64742-49-0	Listed.
Butane	106-97-8	Listed.
Hydrogen sulfide (H2S)	7783-06-4	E
Benzene	71-43-2	E
Toluene	108-88-3	Listed.
Ethylbenzene	100-41-4	Listed.
Xylene	1330-20-7	Listed.

Note: E = Extraordinarily Hazardous Substance

New Jersey

US New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)

Component	CAS No.	RTK List
Gas oils (petroleum), hydrodesulfurized	64742-79-6	Listed.
Butane	106-97-8	SHHS
Hydrogen sulfide (H2S)	7783-06-4	SHHS

Benzene	71-43-2	SHHS
Toluene	108-88-3	SHHS
Ethylbenzene	100-41-4	SHHS
Xylene	1330-20-7	SHHS

Note: SHHS = Special Health Hazard Substance

Pennsylvania

US Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)

Component	CAS No.	RTK List
Gas oils (petroleum), hydrodesulfurized	64742-79-6	Listed.
Naphtha (petroleum), hydrotreated heavy	64742-48-9	Listed.
Naphtha (petroleum), hydrotreated light	64742-49-0	Listed.
Butane	106-97-8	Listed.
Hydrogen sulfide (H2S)	7783-06-4	E
Benzene	71-43-2	ES
Toluene	108-88-3	E
Ethylbenzene	100-41-4	E
Xylene	1330-20-7	E

Note: E = Environmental Hazard; S = Special Hazardous Substance

California

California Prop 65: WARNING: This product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

Component	Type of Toxicity
Gas oils (petroleum), hydrodesulfurized	cancer
Benzene	cancer; developmental, male
Toluene	developmental; female
Ethylbenzene	cancer

Section 16: OTHER INFORMATION

Disclaimer: The information contained in this document applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to satisfy oneself as to the suitability and completeness of this information for their own particular use.

MSDS Expiry Date (Canada): January 20, 2017

Version: 2.0

MSDS Prepared by: **Deerfoot Consulting Inc.**

Phone: (403) 720-3700

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : SUNCOR OSC

Synonyms : Sweet Crude Oil, Synthetic Crude Oil, Petroleum Crude

Manufacturer or supplier's details

SUNCOR ENERGY INC.
P.O. Box 2844, 150 - 6th Avenue South-West
Calgary Alberta T2P 3E3
Canada

Emergency telephone number

Suncor Energy: +1 403-296-3000;
Poison Control Centre: Consult local telephone directory for emergency number(s).

Recommended use of the chemical and restrictions on use

Recommended use : Refinery Feedstock

Prepared by : Product Safety: +1 905-804-4752

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Appearance	liquid
Colour	amber
Odour	Hydrocarbon or "rotten egg" if H2S present, but odour is an unreliable warning, since it may deaden the sense of smell.
Hazard Summary	Flammable liquid Irritating to skin. May cause cancer. May cause harm to the unborn child. May cause heritable genetic damage. May damage the peripheral nervous system.

Potential Health Effects

Primary Routes of Entry : Inhalation
Eye contact
Skin Absorption
Skin contact
Ingestion

Target Organs : Respiratory system
Central nervous system
Peripheral nervous system

Inhalation : May cause respiratory tract irritation.

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Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting.
High concentration of vapours may induce unconsciousness.

Skin : May cause skin irritation.
Prolonged or repeated contact may cause dermatitis, reddening of skin and a chapped appearance.

Eyes : May cause eye irritation.

Ingestion : Aspiration hazard if swallowed - can enter lungs and cause damage.
Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea.

Chronic Exposure : May damage the peripheral nervous system.
Symptoms include tingling sensations in fingers and toes and muscle weakness.

Aggravated Medical Condition : None known.

Carcinogenicity:

IARC	Group 1: Carcinogenic to humans	
	1,3-BUTADIENE	106-99-0
	Benzene	71-43-2
ACGIH	Confirmed human carcinogen	
	Benzene	71-43-2
	Suspected human carcinogen	
	1,3-BUTADIENE	106-99-0

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Mixture

Hazardous components

Chemical Name	CAS-No.	Concentration (%)
fuel, diesel no. 2	68476-34-6	0 - 100 %
Gas oils (oil sand), hydrotreated	128683-29-4	0 - 100 %
Naphtha (oil sand), hydrotreated	128683-33-0	0 - 100 %
butane	106-97-8	0 - 3 %
pentane	109-66-0	0 - 3 %
isobutane	75-28-5	0 - 3 %

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xylene	1330-20-7	1 - 2 %
isopentane	78-78-4	0 - 3 %
n-hexane	110-54-3	1 - 2 %
toluene	108-88-3	0.1 - < 1 %
1,3-butadiene	106-99-0	0.1 - < 1 %
benzene	71-43-2	0.1 - < 1 %

Product may contain 0 - 50ppm hydrogen sulphide.

SECTION 4. FIRST AID MEASURES

If inhaled	:	Move to fresh air. Artificial respiration and/or oxygen may be necessary. Seek medical advice.
In case of skin contact	:	In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash skin thoroughly with soap and water or use recognized skin cleanser. Wash clothing before reuse. Seek medical advice.
In case of eye contact	:	Remove contact lenses. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.
If swallowed	:	Rinse mouth with water. DO NOT induce vomiting unless directed to do so by a physician or poison control center. Never give anything by mouth to an unconscious person. Seek medical advice.
Most important symptoms and effects, both acute and delayed	:	First aider needs to protect himself.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Carbon dioxide (CO2) Dry chemical Foam Water fog.
Unsuitable extinguishing media	:	Do NOT use water jet.
Specific hazards during firefighting	:	Cool closed containers exposed to fire with water spray. Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), smoke and irritating vapours as products of incomplete combustion.

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Hazardous combustion products	:	Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), smoke and irritating vapours as products of incomplete combustion.
Further information	:	Prevent fire extinguishing water from contaminating surface water or the ground water system.
Special protective equipment for firefighters	:	Wear self-contained breathing apparatus for firefighting if necessary.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Use personal protective equipment. Ensure adequate ventilation. Evacuate personnel to safe areas. Material can create slippery conditions.
Environmental precautions	:	If the product contaminates rivers and lakes or drains inform respective authorities.
Methods and materials for containment and cleaning up	:	Prevent further leakage or spillage if safe to do so. Remove all sources of ignition. Soak up with inert absorbent material. Non-sparking tools should be used. Ensure adequate ventilation. Contact the proper local authorities.

SECTION 7. HANDLING AND STORAGE

Advice on safe handling	:	For personal protection see section 8. Smoking, eating and drinking should be prohibited in the application area. Use only with adequate ventilation. In case of insufficient ventilation, wear suitable respiratory equipment. Avoid contact with skin, eyes and clothing. Do not ingest. Keep away from heat and sources of ignition. Keep container closed when not in use.
Conditions for safe storage	:	Store in original container. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Keep in a dry, cool and well-ventilated place. Keep in properly labelled containers. To maintain product quality, do not store in heat or direct sunlight.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

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Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
butane	106-97-8	TWA	1,000 ppm	CA AB OEL
		TWA	600 ppm	CA BC OEL
		STEL	750 ppm	CA BC OEL
		TWAEV	800 ppm 1,900 mg/m3	CA QC OEL
pentane	109-66-0	TWAEV	120 ppm 350 mg/m3	CA QC OEL
xylene	1330-20-7	TWA	100 ppm	ACGIH
		STEL	150 ppm	ACGIH
		TWA	100 ppm 435 mg/m3	OSHA Z-1
		TWA	100 ppm	ACGIH
		STEL	150 ppm	ACGIH
isopentane	78-78-4	TWA	600 ppm 1,770 mg/m3	CA AB OEL
n-hexane	110-54-3	TWA	50 ppm 176 mg/m3	CA AB OEL
		TWA	20 ppm	CA BC OEL
		TWAEV	50 ppm 176 mg/m3	CA QC OEL
		TWA	50 ppm	ACGIH
1,3-butadiene	106-99-0	TWA	2 ppm 4.4 mg/m3	CA AB OEL
		TWA	2 ppm	CA BC OEL
		TWAEV	2 ppm 4.4 mg/m3	CA QC OEL
		TWA	2 ppm	ACGIH
benzene	71-43-2	TWA	0.5 ppm 1.6 mg/m3	CA AB OEL
		STEL	2.5 ppm 8 mg/m3	CA AB OEL
		TWA	0.5 ppm	CA BC OEL
		STEL	2.5 ppm	CA BC OEL
		TWA	0.5 ppm	CA ON OEL
		STEL	2.5 ppm	CA ON OEL
		TWAEV	1 ppm 3 mg/m3	CA QC OEL
		STEV	5 ppm 15.5 mg/m3	CA QC OEL
		TWA	0.5 ppm	ACGIH
		STEL	2.5 ppm	ACGIH

Engineering measures : Use only in well-ventilated areas.

Personal protective equipment

Respiratory protection : Use respiratory protection unless adequate local exhaust ventilation is provided or exposure assessment demonstrates that exposures are within recommended exposure guidelines. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe

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working limits of the selected respirator.

Filter type	:	Wear a NIOSH-approved respirator/breathing apparatus in situations where there may be potential for airborne exposure.
Hand protection		
Material	:	neoprene, nitrile. Consult your PPE provider for breakthrough times and the specific glove that is best for you based on your use patterns. It should be realized that eventually any material regardless of their imperviousness, will get permeated by chemicals. Therefore, protective gloves should be regularly checked for wear and tear. At the first signs of hardening and cracks, they should be changed.
Remarks	:	Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
Eye protection	:	Wear face-shield and protective suit for abnormal processing problems.
Skin and body protection	:	Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place.
Protective measures	:	Wash contaminated clothing before re-use.
Hygiene measures	:	Remove and wash contaminated clothing and gloves, including the inside, before re-use. Wash face, hands and any exposed skin thoroughly after handling.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	liquid
Colour	:	amber
Odour	:	Hydrocarbon or "rotten egg" if H2S present, but odour is an unreliable warning, since it may deaden the sense of smell.
Odour Threshold	:	No data available
pH	:	No data available
Melting point	:	No data available
Boiling point/boiling range	:	estimated 30 - 550 °C (86 - 1022 °F)
Flash point	:	< -35 °C (-31 °F)
Auto-Ignition Temperature	:	No data available
Evaporation rate	:	No data available

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Flammability	:	Easily ignites under almost all normal temperature conditions. Extremely flammable in presence of open flames, sparks, shocks, heat, oxidizing materials. Vapours are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks), and may travel considerable distance to sources of ignition and flash back.
Upper explosion limit	:	No data available
Lower explosion limit	:	No data available
Vapour pressure	:	No data available
Relative vapour density	:	No data available
Relative density	:	No data available
Density	:	estimated 0.71 - 0.91 g/cm3
Solubility(ies)		
Water solubility	:	insoluble
Partition coefficient: n-octanol/water	:	Pow: < 1
Viscosity		
Viscosity, kinematic	:	No data available
Explosive properties	:	Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Vapours may form explosive mixtures with air. Runoff to sewer may create fire or explosion hazard. Liquid may accumulate static charge.

SECTION 10. STABILITY AND REACTIVITY

Possibility of hazardous reactions	:	Hazardous polymerisation does not occur. Stable under normal conditions.
Conditions to avoid	:	Extremes of temperature and direct sunlight.
Incompatible materials	:	Reactive with oxidising agents.
Hazardous decomposition products	:	May release COx, hydrocarbons, smoke and irritating vapours when heated to decomposition.

SECTION 11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure	:	Inhalation Eye contact Skin Absorption Skin contact Ingestion

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Acute toxicity

Product:

Acute oral toxicity : Remarks: No data available

Acute inhalation toxicity : Remarks: No data available

Acute dermal toxicity : Remarks: No data available

Components:

fuel, diesel no. 2:
Acute inhalation toxicity : LC50 Rat: 4.1 mg/l
Exposure time: 4 h
Test atmosphere: dust/mist

butane:
Acute inhalation toxicity : LC50 Rat: 658 mg/l
Exposure time: 4 h
Test atmosphere: gas

pentane:
Acute oral toxicity : LD50 Rat: > 2,000 mg/kg,

Acute inhalation toxicity : LC50 Rat: 364 mg/l
Exposure time: 4 h
Test atmosphere: vapour

isobutane:
Acute inhalation toxicity : LC50 Rat: 658,000 mg/m3
Exposure time: 4 h
Test atmosphere: gas

xylene:
Acute oral toxicity : LD50 Rat: 4,300 mg/kg,

Acute inhalation toxicity : LC50 Rat: 5000 ppm
Exposure time: 4 h
Test atmosphere: dust/mist

Acute dermal toxicity : LD50 Rabbit: > 1,700 mg/kg,

isopentane:
Acute inhalation toxicity : LC50 Rat: 280 mg/l
Exposure time: 4 h
Test atmosphere: vapour

n-hexane:
Acute oral toxicity : LD50 Rat: 15,840 mg/kg,

Acute inhalation toxicity : LC50 Rat: 48000 ppm
Exposure time: 4 h

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Test atmosphere: dust/mist

Acute dermal toxicity : LD50 Rabbit: > 3,295 mg/kg,

toluene:
Acute oral toxicity : LD50 Rat: 5,580 mg/kg,

Acute inhalation toxicity : LC50 Rat: 7585 ppm
Exposure time: 4 h
Test atmosphere: dust/mist

Acute dermal toxicity : LD50 Rabbit: 12,125 mg/kg,

benzene:
Acute oral toxicity : LD50 Rat: 2,990 mg/kg,

Acute inhalation toxicity : LC50 Rat: 13700 ppm
Exposure time: 4 h
Test atmosphere: dust/mist

Acute dermal toxicity : LD50 Rabbit: > 8,240 mg/kg,

Skin corrosion/irritation

Product:

Remarks: No data available

Components:

xylene:
Result: Skin irritation

isopentane:
Result: Mild skin irritation

toluene:
Result: Moderate skin irritant

benzene:
Result: Moderate skin irritant

Serious eye damage/eye irritation

Product:

Remarks: No data available

Components:

isopentane:
Result: Mild eye irritation

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toluene:
Result: Mild eye irritation

benzene:
Result: Moderate eye irritation

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

No data available

Reproductive toxicity

No data available

STOT - single exposure

No data available

STOT - repeated exposure

No data available

Aspiration toxicity

No data available

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Product:

Toxicity to fish	:	Remarks: No data available
Toxicity to daphnia and other aquatic invertebrates	:	Remarks: No data available
Toxicity to algae	:	Remarks: No data available
Toxicity to bacteria	:	Remarks: No data available

Components:
n-hexane :

Toxicity to fish	:	LC50 (Fish): 4.12 mg/l Exposure time: 96 h
Toxicity to daphnia and other aquatic invertebrates	:	EC50 (Daphnia (water flea)): 3.87 mg/l Exposure time: 48 h

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Persistence and degradability

Product:

Biodegradability : Remarks: No data available

Bioaccumulative potential

Components:

butane :

Partition coefficient: n-octanol/water : log Pow: 2.89

pentane :

Partition coefficient: n-octanol/water : log Pow: 3.39

isobutane :

Partition coefficient: n-octanol/water : log Pow: 2.76

Mobility in soil

No data available

Other adverse effects

No data available

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues : The product should not be allowed to enter drains, water courses or the soil.
Offer surplus and non-recyclable solutions to a licensed disposal company.
Waste must be classified and labelled prior to recycling or disposal.
Send to a licensed waste management company.
Dispose of as hazardous waste in compliance with local and national regulations.
Dispose of product residue in accordance with the instructions of the person responsible for waste disposal.

Contaminated packaging : Do not re-use empty containers.

SECTION 14. TRANSPORT INFORMATION

International Regulation

IATA-DGR

UN/ID No. : 1267
Proper shipping name : Petroleum crude oil
Class : 3
Packing group : I
Labels : 3
Packing instruction (cargo aircraft) : 361

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IMDG-Code

UN number	:	1267
Proper shipping name	:	PETROLEUM CRUDE OIL
Class	:	3
Packing group	:	I
Labels	:	3
EmS Code	:	F-E, S-E
Marine pollutant	:	no

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied.

TDG

UN number	:	1267
Proper shipping name	:	PETROLEUM CRUDE OIL
Class	:	3
Packing group	:	I
Labels	:	3
ERG Code	:	128
Marine pollutant	:	no

Special precautions for user

Not applicable

SECTION 15. REGULATORY INFORMATION

WHMIS Classification : B2: Flammable liquid
D2A: Very Toxic Material Causing Other Toxic Effects
D2B: Toxic Material Causing Other Toxic Effects

This product has been classified according to the hazard criteria of the CPR and the MSDS contains all of the information required by the CPR.

The components of this product are reported in the following inventories:
DSL On the inventory, or in compliance with the inventory

SECTION 16. OTHER INFORMATION

For Copy of (M)SDS : Internet: www.petro-canada.ca/msds
Canada-wide: telephone: 1-800-668-0220; fax: 1-800-837-1228
For Product Safety Information: 1 905-804-4752

Prepared by : Product Safety: +1 905-804-4752

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to

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the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

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SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	SUNCOR OSH
Synonyms	:	Sour Crude Blend, Sour Crude Oil
Manufacturer or supplier's details		SUNCOR ENERGY INC. P.O. Box 2844, 150 - 6th Avenue South-West Calgary Alberta T2P 3E3 Canada
Emergency telephone number		Suncor Energy: +1 403-296-3000; Poison Control Centre: Consult local telephone directory for emergency number(s).

Recommended use of the chemical and restrictions on use

Recommended use	:	Refinery Feedstock
Prepared by	:	Product Safety: +1 905-804-4752

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Form	liquid
Colour	brown
Odour	hydrocarbon-like
Hazard Summary	Flammable liquid Contains material which may cause cancer based on animal data. Contains material that may cause adverse reproductive effects. Irritating to eyes and skin. May cause sensitisation by skin contact.

Potential Health Effects

Primary Routes of Entry	:	Inhalation Eye contact Skin contact Ingestion Skin Absorption
Target Organs	:	Respiratory system Central nervous system Eyes Skin
Inhalation	:	Inhalation of high vapour concentrations may cause

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symptoms like headache, dizziness, tiredness, nausea and vomiting.
Inhalation may cause central nervous system effects.

Skin : May cause allergic skin reaction.
May cause skin irritation.

Eyes : May cause eye irritation.

Ingestion : Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea.
Aspiration hazard if swallowed - can enter lungs and cause damage.

Chronic Exposure : This product may cause adverse reproductive effects.

Aggravated Medical Condition : None known.

Carcinogenicity:

IARC Group 2A: Probably carcinogenic to humans
Gas oils, petroleum, heavy vacuum 64741-57-7

OSHA No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

NTP No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

ACGIH No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Pure substance/mixture : Mixture

Hazardous components

Chemical Name	CAS-No.	Concentration (%)
gas oils (petroleum), heavy vacuum	64741-57-7	85 - 92 %
Naphtha (oil sand), hydrotreated	128683-33-0	8 - 15 %
sulfur	7704-34-9	<= 3.3 %
butane	106-97-8	0.5 - 1.5 %
xylene	1330-20-7	0.1 - 0.3 %
toluene	108-88-3	0.1 - 0.2 %

Product may contain trace amounts of hydrogen sulphide

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SECTION 4. FIRST AID MEASURES

If inhaled	:	Move to fresh air. Artificial respiration and/or oxygen may be necessary. Seek medical advice.
In case of skin contact	:	In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash skin thoroughly with soap and water or use recognized skin cleanser. Wash contaminated clothing before reuse. Seek medical advice.
In case of eye contact	:	Remove contact lenses. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.
If swallowed	:	Rinse mouth with water. DO NOT induce vomiting unless directed to do so by a physician or poison control center. Never give anything by mouth to an unconscious person. Seek medical advice.
Most important symptoms and effects, both acute and delayed	:	First aider needs to protect himself.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Carbon dioxide (CO2) Foam Dry chemical
Unsuitable extinguishing media	:	No information available.
Specific hazards during firefighting	:	Cool closed containers exposed to fire with water spray.
Hazardous combustion products	:	Carbon oxides (CO, CO2), sulphur oxides (SOx), sulphur compounds (H2S), hydrocarbons, smoke and irritating vapours as products of incomplete combustion.
Specific extinguishing methods	:	Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Use personal protective equipment. Ensure adequate ventilation. Evacuate personnel to safe areas. Material can create slippery conditions.

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Environmental precautions	:	If the product contaminates rivers and lakes or drains inform respective authorities.
Methods and materials for containment and cleaning up	:	Prevent further leakage or spillage if safe to do so. Remove all sources of ignition. Soak up with inert absorbent material. Non-sparking tools should be used. Ensure adequate ventilation. Contact the proper local authorities.

SECTION 7. HANDLING AND STORAGE

Advice on safe handling	:	For personal protection see section 8. Persons with a history of skin sensitisation problems or asthma, allergies, chronic or recurrent respiratory disease should not be employed in any process in which this mixture is being used. Smoking, eating and drinking should be prohibited in the application area. In case of insufficient ventilation, wear suitable respiratory equipment. Avoid contact with skin, eyes and clothing. Do not ingest. Use only with adequate ventilation. Keep away from heat and sources of ignition. Keep container closed when not in use.
Conditions for safe storage	:	Store in original container. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Keep in a dry, cool and well-ventilated place. Keep in properly labelled containers. To maintain product quality, do not store in heat or direct sunlight.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
butane	106-97-8	TWA	1,000 ppm	CA AB OEL
		TWA	600 ppm	CA BC OEL
		STEL	750 ppm	CA BC OEL
		TWAEV	800 ppm 1,900 mg/m3	CA QC OEL
		TWA	800 ppm 1,900 mg/m3	NIOSH REL
		TWA	800 ppm 1,900 mg/m3	OSHA P0
		TWA	800 ppm	NIOSH REL

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			1,900 mg/m3	
		TWA	800 ppm 1,900 mg/m3	OSHA P0
xylene	1330-20-7	TWA	100 ppm	ACGIH
		STEL	150 ppm	ACGIH
		TWA	100 ppm	ACGIH
		STEL	150 ppm	ACGIH
toluene	108-88-3	TWA	50 ppm 188 mg/m3	CA AB OEL
		TWA	20 ppm	CA BC OEL
		TWAEV	50 ppm 188 mg/m3	CA QC OEL
		TWA	20 ppm	ACGIH
		TWA	100 ppm 375 mg/m3	NIOSH REL
		ST	150 ppm 560 mg/m3	NIOSH REL
		TWA	200 ppm	OSHA Z-2
		CEIL	300 ppm	OSHA Z-2
		Peak	500 ppm	OSHA Z-2
		TWA	100 ppm 375 mg/m3	OSHA P0
		STEL	150 ppm 560 mg/m3	OSHA P0
		TWA	20 ppm	ACGIH
		TWA	100 ppm 375 mg/m3	NIOSH REL
		ST	150 ppm 560 mg/m3	NIOSH REL
		TWA	200 ppm	OSHA Z-2
		CEIL	300 ppm	OSHA Z-2
		Peak	500 ppm	OSHA Z-2
		TWA	100 ppm 375 mg/m3	OSHA P0
		STEL	150 ppm 560 mg/m3	OSHA P0
hydrogen sulphide	7783-06-4	TWA	10 ppm 14 mg/m3	CA AB OEL
		(c)	15 ppm 21 mg/m3	CA AB OEL
		C	10 ppm	CA BC OEL
		TWA	10 ppm	CA ON OEL
		STEL	15 ppm	CA ON OEL
		TWAEV	10 ppm 14 mg/m3	CA QC OEL
		STEV	15 ppm 21 mg/m3	CA QC OEL
		TWA	1 ppm	ACGIH
		STEL	5 ppm	ACGIH
		C	10 ppm 15 mg/m3	NIOSH REL
		CEIL	20 ppm	OSHA Z-2
		Peak	50 ppm	OSHA Z-2
		TWA	10 ppm 14 mg/m3	OSHA P0

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		STEL	15 ppm 21 mg/m3	OSHA P0
		TWA	1 ppm	ACGIH
		STEL	5 ppm	ACGIH
		C	10 ppm 15 mg/m3	NIOSH REL
		CEIL	20 ppm	OSHA Z-2
		Peak	50 ppm	OSHA Z-2
		TWA	10 ppm 14 mg/m3	OSHA P0
		STEL	15 ppm 21 mg/m3	OSHA P0

Engineering measures : Use only in well-ventilated areas.

Personal protective equipment

Respiratory protection : Use respiratory protection unless adequate local exhaust ventilation is provided or exposure assessment demonstrates that exposures are within recommended exposure guidelines. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Filter type : Wear a NIOSH-approved respirator/breathing apparatus in situations where there may be potential for airborne exposure.

Hand protection
Material : polyvinyl alcohol (PVA), neoprene, nitrile rubber.
Remarks : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Eye protection : Wear face-shield and protective suit for abnormal processing problems.
Ensure that eyewash stations and safety showers are close to the workstation location.

Skin and body protection : Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place.

Protective measures : Wash contaminated clothing before re-use.
No special protective equipment required.

Hygiene measures : Remove and wash contaminated clothing and gloves, including the inside, before re-use.
Wash face, hands and any exposed skin thoroughly after handling.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

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Appearance	:	liquid
Colour	:	brown
Odour	:	hydrocarbon-like
Odour Threshold	:	No data available
pH	:	No data available
Melting point/range	:	No data available
Initial boiling point and boiling range	:	> 58 °C (> 136 °F) Method: ASTM D-86
Flash point	:	< -35 °C (-31 °F) Method: ASTM D 93
Fire Point	:	No data available
Auto-Ignition Temperature	:	No data available
Evaporation rate	:	No data available
Flammability	:	Easily ignites under almost all normal temperature conditions. Extremely flammable in presence of open flames, sparks, shocks, heat, oxidizing materials. Vapours are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks), and may travel considerable distance to sources of ignition and flash back.
Upper explosion limit	:	No data available
Lower explosion limit	:	No data available
Vapour pressure	:	18.4 kPaMethod: ASTM D 323A
Relative vapour density	:	> 1(Air = 1.0)
Relative density	:	0.9 - 0.94
Density	:	0.9 - 0.94 g/cm3 (15.5 °C / 59.9 °F)
Solubility(ies)		
Water solubility	:	insoluble
Partition coefficient: n-octanol/water	:	Pow: < 1
Viscosity		
Viscosity, kinematic	:	35.4 mm2/s (30 °C / 86 °F)
		22.5 mm2/s (40 °C / 104 °F)
		14.6 mm2/s (50 °C / 122 °F)
Explosive properties	:	Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Vapours may form explosive mixtures with air. Runoff to sewer may create

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fire or explosion hazard. Liquid may accumulate static charge.

SECTION 10. STABILITY AND REACTIVITY

Possibility of hazardous reactions	:	Hazardous polymerisation does not occur. Stable under normal conditions.
Conditions to avoid	:	Extremes of temperature and direct sunlight.
Incompatible materials	:	Reactive with oxidising agents.
Hazardous decomposition products	:	May release COx, SOx, H2S, hydrocarbons, smoke and irritating vapours when heated to decomposition.

SECTION 11. TOXICOLOGICAL INFORMATION

Acute toxicity

Product:

Acute oral toxicity	:	Remarks: No data available
Acute inhalation toxicity	:	Remarks: No data available
Acute dermal toxicity	:	Remarks: No data available

Components:

butane:

Acute inhalation toxicity	:	LC50 Rat: 658 mg/l Exposure time: 4 h Test atmosphere: gas

xylene:

Acute oral toxicity	:	LD50 Rat: 4,300 mg/kg,
Acute inhalation toxicity	:	LC50 Rat: 5000 ppm Exposure time: 4 h Test atmosphere: vapour
Acute dermal toxicity	:	LD50 Rabbit: > 1,700 mg/kg,

toluene:

Acute oral toxicity	:	LD50 Rat: 636 mg/kg,
Acute inhalation toxicity	:	LC50 Rat: 7585 ppm

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Exposure time: 4 h
Test atmosphere: vapour

Acute dermal toxicity : LD50 Rabbit: 12,125 mg/kg,

Skin corrosion/irritation

Product:

Remarks: No data available

Components:

sulfur:
Result: Moderate skin irritant

xylene:
Result: Skin irritation

toluene:
Result: Moderate skin irritant

Serious eye damage/eye irritation

Product:

Remarks: No data available

Components:

sulfur:
Result: Moderate eye irritation

toluene:
Result: Mild eye irritation

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

No data available

Reproductive toxicity

No data available

gas oils (petroleum), heavy vacuum:
Naphtha (oil sand), hydrotreated:
sulfur:
butane:
xylene:
toluene:

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STOT - single exposure

No data available

STOT - repeated exposure

No data available

Aspiration toxicity

No data available

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Product:

Toxicity to fish	:	Remarks: No data available
Toxicity to daphnia and other aquatic invertebrates	:	Remarks: No data available
Toxicity to algae	:	Remarks: No data available
Toxicity to bacteria	:	Remarks: No data available

Persistence and degradability

No data available

Bioaccumulative potential

Product:

Partition coefficient: n-octanol/water	:	Pow: < 1

Components:

butane :

Partition coefficient: n-octanol/water	:	log Pow: 2.89

Mobility in soil

No data available

Other adverse effects

No data available

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues	:	The product should not be allowed to enter drains, water courses or the soil. Offer surplus and non-recyclable solutions to a licensed disposal company. Waste must be classified and labelled prior to recycling or disposal. Send to a licensed waste management company.

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Dispose of as hazardous waste in compliance with local and national regulations.
Dispose of product residue in accordance with the instructions of the person responsible for waste disposal.

SECTION 14. TRANSPORT INFORMATION

International Regulation

IATA-DGR

UN/ID No.	:	1267
Proper shipping name	:	Petroleum crude oil
Class	:	3
Packing group	:	II
Labels	:	3
Packing instruction (cargo aircraft)	:	364

IMDG-Code

UN number	:	1267
Proper shipping name	:	PETROLEUM CRUDE OIL
Class	:	3
Packing group	:	II
Labels	:	3
EmS Code	:	F-E, S-E
Marine pollutant	:	no

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied.

49 CFR

UN/ID/NA number	:	1267
Proper shipping name	:	Petroleum crude oil
Class	:	3
Packing group	:	II
Labels	:	3
ERG Code	:	128
Marine pollutant	:	no

TDG

UN number	:	1267
Proper shipping name	:	PETROLEUM CRUDE OIL
Class	:	3
Packing group	:	II
Labels	:	3
ERG Code	:	128
Marine pollutant	:	no

Special precautions for user

Not applicable

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SECTION 15. REGULATORY INFORMATION

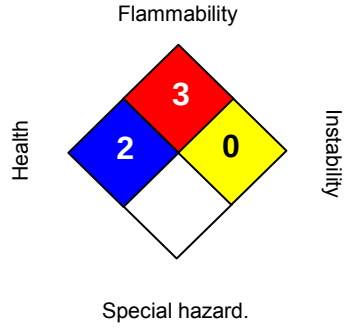
WHMIS Classification : B2: Flammable liquid
D2A: Very Toxic Material Causing Other Toxic Effects
D2B: Toxic Material Causing Other Toxic Effects
Flammable liquid
Carcinogen
Reproductive hazard
Moderate skin irritant
Moderate eye irritant
Skin sensitiser

The components of this product are reported in the following inventories:
DSL All components of this product are on the Canadian DSL.

SECTION 16. OTHER INFORMATION

Further information

NFPA:



HMIS III:

HEALTH	2*
FLAMMABILITY	3
PHYSICAL HAZARD	0
PERSONAL PROTECTION	H

0 = not significant, 1 =Slight,
2 = Moderate, 3 = High
4 = Extreme, * = Chronic

For Copy of (M)SDS : Internet: www.petro-canada.ca/msds
Canada-wide: telephone: 1-800-668-0220; fax: 1-800-837-1228
For Product Safety Information: 1 905-804-4752

Prepared by : Product Safety: +1 905-804-4752

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and

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is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

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SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : SUNCOR OSJ

Synonyms : Light Virgin Distillate, LVGO

Manufacturer or supplier's details

SUNCOR ENERGY INC.
P.O. Box 2844, 150 - 6th Avenue South-West
Calgary Alberta T2P 3E3
Canada

Emergency telephone number

Suncor Energy: +1 403-296-3000;
Poison Control Centre: Consult local telephone directory for emergency number(s).

Recommended use of the chemical and restrictions on use

Recommended use : Refinery Feedstock

Prepared by : Product Safety: +1 905-804-4752

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Appearance	liquid
Colour	amber
Odour	Hydrocarbon or "rotten egg" if H2S present, but odour is an unreliable warning, since it may deaden the sense of smell.
Hazard Summary	Combustible liquid. Toxic by inhalation. Irritating to skin. May cause cancer.

Potential Health Effects

Primary Routes of Entry : Inhalation
Eye contact
Skin Absorption
Skin contact
Ingestion

Target Organs : Respiratory system
Central nervous system

Inhalation : Harmful if inhaled.
May cause respiratory tract irritation.
Inhalation may cause central nervous system effects.
Symptoms of overexposure may be headache, dizziness,

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tiredness, nausea and vomiting.
High concentration of vapours may induce unconsciousness.
Symptoms of hydrogen sulfide overexposure include respiratory tract irritation and shortness of breath.

Skin : Causes moderate skin irritation.
Prolonged skin contact may defat the skin and produce dermatitis.

Eyes : May cause eye irritation.

Ingestion : Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea.
Aspiration hazard if swallowed - can enter lungs and cause damage.

Aggravated Medical Condition : None known.

Carcinogenicity:

IARC Group 2A: Probably carcinogenic to humans

Gas oils, petroleum, light vacuum	64741-58-8
Distillates (petroleum), straight-run middle	64741-44-2

ACGIH No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Mixture

Hazardous components

Chemical Name	CAS-No.	Concentration (%)
Gas oils (petroleum), light vacuum	64741-58-8	50 - 100 %
Distillates (petroleum), straight-run middle	64741-44-2	0 - 50 %
Condensates (petroleum), vacuum tower	64741-49-7	0 - 50 %
sulfur	7704-34-9	<= 3 %

Product may contain 0 - 200 ppm hydrogen sulphide.

SECTION 4. FIRST AID MEASURES

If inhaled : Move to fresh air.
Artificial respiration and/or oxygen may be necessary.

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Seek medical advice.

In case of skin contact	:	In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash skin thoroughly with soap and water or use recognized skin cleanser. Wash clothing before reuse. Seek medical advice.
In case of eye contact	:	Remove contact lenses. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.
If swallowed	:	Rinse mouth with water. DO NOT induce vomiting unless directed to do so by a physician or poison control center. Never give anything by mouth to an unconscious person. Seek medical advice.
Most important symptoms and effects, both acute and delayed	:	First aider needs to protect himself.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Carbon dioxide (CO2) Foam Dry chemical
Unsuitable extinguishing media	:	Do NOT use water jet.
Specific hazards during firefighting	:	Cool closed containers exposed to fire with water spray. Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), smoke and irritating vapours as products of incomplete combustion.
Hazardous combustion products	:	Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), smoke and irritating vapours as products of incomplete combustion.
Further information	:	Prevent fire extinguishing water from contaminating surface water or the ground water system.
Special protective equipment for firefighters	:	Wear self-contained breathing apparatus for firefighting if necessary.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Use personal protective equipment. Ensure adequate ventilation. Evacuate personnel to safe areas.

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Material can create slippery conditions.

Environmental precautions	:	If the product contaminates rivers and lakes or drains inform respective authorities.
Methods and materials for containment and cleaning up	:	Prevent further leakage or spillage if safe to do so. Remove all sources of ignition. Soak up with inert absorbent material. Non-sparking tools should be used. Ensure adequate ventilation. Contact the proper local authorities.

SECTION 7. HANDLING AND STORAGE

Advice on safe handling	:	For personal protection see section 8. Smoking, eating and drinking should be prohibited in the application area. Use only with adequate ventilation. In case of insufficient ventilation, wear suitable respiratory equipment. Avoid contact with skin, eyes and clothing. Do not ingest. Keep away from heat and sources of ignition. Keep container closed when not in use.
Conditions for safe storage	:	Store in original container. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Keep in a dry, cool and well-ventilated place. Keep in properly labelled containers. To maintain product quality, do not store in heat or direct sunlight.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

Engineering measures : Use only in well-ventilated areas.

Personal protective equipment

Respiratory protection	:	Use respiratory protection unless adequate local exhaust ventilation is provided or exposure assessment demonstrates that exposures are within recommended exposure guidelines. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.
Filter type	:	Wear a NIOSH-approved respirator/breathing apparatus in situations where there may be potential for airborne exposure.

Hand protection

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Material	:	neoprene, nitrile, polyvinyl alcohol (PVA). Consult your PPE provider for breakthrough times and the specific glove that is best for you based on your use patterns. It should be realized that eventually any material regardless of their imperviousness, will get permeated by chemicals. Therefore, protective gloves should be regularly checked for wear and tear. At the first signs of hardening and cracks, they should be changed.
Remarks	:	Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
Eye protection	:	Wear face-shield and protective suit for abnormal processing problems.
Skin and body protection	:	Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place.
Protective measures	:	Wash contaminated clothing before re-use.
Hygiene measures	:	Remove and wash contaminated clothing and gloves, including the inside, before re-use. Wash face, hands and any exposed skin thoroughly after handling.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	liquid
Colour	:	amber
Odour	:	Hydrocarbon or "rotten egg" if H2S present, but odour is an unreliable warning, since it may deaden the sense of smell.
Odour Threshold	:	No data available
pH	:	No data available
Melting point	:	No data available
Boiling point/boiling range	:	110 - 450 °C (230 - 842 °F) Method: ASTM D-2887
Flash point	:	50 °C (122 °F) Method: ASTM D 93
Auto-Ignition Temperature	:	248 - 267 °C (478 - 513 °F) Method: ASTM E659
Evaporation rate	:	No data available
Flammability	:	Easily ignites under almost all normal temperature conditions. Extremely flammable in presence of open flames, sparks,

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		shocks, heat, oxidizing materials. Vapours are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks), and may travel considerable distance to sources of ignition and flash back.
Upper explosion limit	:	No data available
Lower explosion limit	:	0.32 - 0.39 %(V) Method: ASTM E681
Vapour pressure	:	< 0.1 kPaMethod: ASTM D 323A
Relative vapour density	:	No data available
Relative density	:	0.89
Density	:	0.89 g/cm3
Solubility(ies)		
Water solubility	:	insoluble
Partition coefficient: n-octanol/water	:	Pow: < 1
Viscosity		
Viscosity, kinematic	:	No data available
Explosive properties	:	Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Vapours may form explosive mixtures with air. Runoff to sewer may create fire or explosion hazard. Liquid may accumulate static charge.

SECTION 10. STABILITY AND REACTIVITY

Possibility of hazardous reactions	:	Hazardous polymerisation does not occur. Stable under normal conditions.
Conditions to avoid	:	Extremes of temperature and direct sunlight.
Incompatible materials	:	Reactive with oxidising agents.
Hazardous decomposition products	:	May release COx, NOx, SOx, H2S, smoke and irritating vapours when heated to decomposition.

SECTION 11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure	:	Inhalation Eye contact Skin Absorption Skin contact Ingestion

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Acute toxicity

Product:

Acute oral toxicity : Remarks: No data available

Acute inhalation toxicity : Remarks: No data available

Acute dermal toxicity : Remarks: No data available

Components:

Gas oils (petroleum), light vacuum:
Acute inhalation toxicity : LC50 Rat: 4.1 mg/l
Exposure time: 4 h
Test atmosphere: dust/mist

Distillates (petroleum), straight-run middle:
Acute oral toxicity : LD50 Rat: > 5,000 mg/kg,

Acute inhalation toxicity : LC50 Rat: 1.78 mg/l
Exposure time: 4 h
Test atmosphere: dust/mist

Acute dermal toxicity : LD50 Rabbit: > 2,000 mg/kg,

Condensates (petroleum), vacuum tower:
Acute inhalation toxicity : LC50 Rat: 4.1 mg/l
Exposure time: 4 h
Test atmosphere: dust/mist

sulfur:
Acute dermal toxicity : LD50 Rabbit: > 2,000 mg/kg,

Skin corrosion/irritation

Product:

Remarks: No data available

Components:

Distillates (petroleum), straight-run middle:
Result: Moderate skin irritant

sulfur:
Result: Moderate skin irritant

Serious eye damage/eye irritation

Product:

Remarks: No data available

Components:

Distillates (petroleum), straight-run middle:

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Result: Mild eye irritation

sulfur:
Result: Moderate eye irritation

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

No data available

Reproductive toxicity

No data available

STOT - single exposure

No data available

STOT - repeated exposure

No data available

Aspiration toxicity

No data available

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Product:

Toxicity to fish	:	Remarks: No data available
Toxicity to daphnia and other aquatic invertebrates	:	Remarks: No data available
Toxicity to algae	:	Remarks: No data available
Toxicity to bacteria	:	Remarks: No data available

Persistence and degradability

Product:

Biodegradability	:	Remarks: No data available

Bioaccumulative potential

Components:
Distillates (petroleum), straight-run middle :

Partition coefficient: n-octanol/water	:	Remarks: No data available

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Mobility in soil

No data available

Other adverse effects

No data available

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues	:	The product should not be allowed to enter drains, water courses or the soil. Offer surplus and non-recyclable solutions to a licensed disposal company. Waste must be classified and labelled prior to recycling or disposal. Send to a licensed waste management company. Dispose of as hazardous waste in compliance with local and national regulations. Dispose of product residue in accordance with the instructions of the person responsible for waste disposal.
Contaminated packaging	:	Do not re-use empty containers.

SECTION 14. TRANSPORT INFORMATION

International Regulation

IATA-DGR

UN/ID No.	:	1268
Proper shipping name	:	Petroleum distillates, n.o.s.
Class	:	3
Packing group	:	III
Labels	:	3
Packing instruction (cargo aircraft)	:	366

IMDG-Code

UN number	:	1268
Proper shipping name	:	PETROLEUM DISTILLATES, N.O.S.
Class	:	3
Packing group	:	III
Labels	:	3
EmS Code	:	F-E, S-E
Marine pollutant	:	no

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied.

TDG

UN number	:	1268
Proper shipping name	:	PETROLEUM DISTILLATES, N.O.S.
Class	:	3

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Packing group	:	III
Labels	:	3
ERG Code	:	128
Marine pollutant	:	no

Special precautions for user

Not applicable

SECTION 15. REGULATORY INFORMATION

WHMIS Classification : B3: Combustible Liquid
D1B: Toxic Material Causing Immediate and Serious Toxic Effects
D2A: Very Toxic Material Causing Other Toxic Effects
D2B: Toxic Material Causing Other Toxic Effects

This product has been classified according to the hazard criteria of the CPR and the MSDS contains all of the information required by the CPR.

The components of this product are reported in the following inventories:

DSL	On the inventory, or in compliance with the inventory
TSCA	All components of this product are on the Canadian DSL.

SECTION 16. OTHER INFORMATION

For Copy of (M)SDS : Internet: www.petro-canada.ca/msds
Canada-wide: telephone: 1-800-668-0220; fax: 1-800-837-1228
For Product Safety Information: 1 905-804-4752

Prepared by : Product Safety: +1 905-804-4752

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

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MATERIAL SAFETY DATA SHEET

1. Product and Company Identification

Material name	**CRUDE OIL - CANADA**
Version #	05
Issue date	01-21-2011
Revision date	03-27-2014
MSDS number	7958
Synonym(s)	PETROLEUM CRUDE * RAW CRUDE
Supplier	Flint Hills Resources Canada, LP 1510, 111-5th Avenue SW Calgary, AB T2P 3Y6 CANADA
Telephone numbers – 24 hour emergency assistance	
Flint Hills Resources Canada, LP	403-716-7600
Chemtrec (United States)	800-424-9300
Canutec (Canada)	613-996-6666
Telephone numbers – general assistance	
8-5 (M-F, MST)	403-716-7600
8-5 (M-F, CST) MSDS Assistance	316-828-7988
Email:	msdsrequest@fhr.com

2. Hazards Identification

Emergency overview

DANGER!

BLACK, BROWN OR GREENISH LIQUID WITH AROMATIC OR PETROLEUM ODOR

HEALTH HAZARDS
CONTAINS HYDROGEN SULFIDE GAS. MAY BE FATAL IF INHALED
GAS MAY EVOLVE FROM THIS MATERIAL AND ACCUMULATE IN CONFINED SPACES
MAY BE HARMFUL OR FATAL IF SWALLOWED
MAY CAUSE LUNG DAMAGE
BREATHING HIGH CONCENTRATIONS CAN CAUSE IRREGULAR HEARTBEATS WHICH MAY BE FATAL
DANGER-CONTAINS BENZENE-CANCER HAZARD
CAN CAUSE LEUKEMIA AND OTHER BLOOD DISORDERS
MAY BE IRRITATING TO THE SKIN AND EYES
OVEREXPOSURE MAY CAUSE CENTRAL NERVOUS SYSTEM DEPRESSION
SEE "TOXICOLOGICAL INFORMATION" (SECTION 11) FOR MORE INFORMATION

FLAMMABILITY HAZARDS
EXTREMELY FLAMMABLE LIQUID AND VAPOR
VAPOR MAY CAUSE FLASH FIRE OR EXPLOSION
FLAMMABLE AND POISONOUS GAS MAY EVOLVE FROM THIS MATERIAL AND ACCUMULATE IN CONFINED SPACES

REACTIVITY HAZARDS
STABLE

Potential health effects

Routes of exposure

Inhalation, ingestion, skin and eye contact.

Eyes

Contact may cause pain and severe reddening and inflammation of the conjunctiva. Effects may become more serious with repeated or prolonged contact.

Vapors may cause eye irritation and sensitivity to light.

Skin

Contact may cause reddening, itching and inflammation. Skin contact may cause harmful effects in other parts of the body.

Inhalation

HIGHLY TOXIC.

May be harmful or fatal if inhaled.

Hydrogen sulfide can cause respiratory paralysis and death, depending on the concentration and duration of exposure. Do not rely on ability to smell vapors, since odor fatigue rapidly occurs. Effects of overexposure include irritation of the nose and throat, nausea, vomiting, diarrhea, abdominal pain and signs of nervous system depression (e.g. headache, drowsiness, dizziness, loss of coordination and fatigue), irregular heartbeats, pulmonary edema, weakness and convulsions.

Breathing of the mists, vapors or fumes may irritate the nose, throat and lungs.

May cause central nervous system depression or effects.

Overexposure to this material may cause systemic damage including target organ effects listed under "Toxicological Information" (Section 11).

Ingestion

Swallowing this material may be harmful. May cause irritation of the mouth, throat and gastrointestinal tract. Symptoms may include salivation, pain, nausea, vomiting and diarrhea.

Aspiration into lungs may cause chemical pneumonia and lung damage.

Exposure may also cause central nervous system symptoms similar to those listed under "Inhalation" (see Inhalation section).

3. Composition / Information on Ingredients

Components	CAS #	Percent
CRUDE OIL	8002-05-9	100 %
N-HEXANE	110-54-3	5 - 8 %
BENZENE	71-43-2	1 - 5 %
TOLUENE	108-88-3	1 - 5 %
XYLENE	1330-20-7	1 - 5 %
HYDROGEN SULFIDE	7783-06-4	1 - 4 %
ETHYLBENZENE	100-41-4	1 - 3 %
POLYCYCLIC AROMATIC COMPOUNDS	130498-29-2	< 0.1 %

Composition comments

Values do not reflect absolute minimums and maximums; these values are typical which may vary from time to time.

This Material Safety Data Sheet is intended to communicate potential health hazards and potential physical hazards associated with the product(s) covered by this sheet, and is not intended to communicate product specification information. For product specification information, contact your Flint Hills Resources, LP representative.

4. First Aid Measures

First aid procedures

Eye contact

Flush immediately with large amounts of water for at least 15 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. Get medical attention if irritation persists.

Skin contact

Immediately wash skin with plenty of soap and water after removing contaminated clothing and shoes. Get medical attention if irritation develops or persists. Place contaminated clothing in closed container for storage until laundered or discarded. If clothing is to be laundered, inform person performing operation of contaminant's hazardous properties. Discard contaminated leather goods.

Inhalation

Remove to fresh air. If not breathing, institute rescue breathing. If breathing is difficult, ensure airway is clear and give oxygen. If heart has stopped, immediately begin cardiopulmonary resuscitation (CPR).

Keep affected person warm and at rest. GET IMMEDIATE MEDICAL ATTENTION.

Ingestion

Do not induce vomiting because of danger of aspirating liquid into lungs, causing serious damage and chemical pneumonitis. If spontaneous vomiting occurs, keep head below hips to prevent aspiration and monitor for breathing difficulty.

Never give anything by mouth to an unconscious person.

Keep affected person warm and at rest. GET IMMEDIATE MEDICAL ATTENTION.

Notes to physician

INHALATION: Inhalation exposure can produce toxic effects. Treat intoxications as hydrogen sulfide exposures. Monitor for respiratory distress. If cough or difficulty in breathing develops, evaluate for upper respiratory tract inflammation, bronchitis, and pneumonitis. This material (or a component) sensitizes 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.

INGESTION: If ingested this material represents a significant aspiration and chemical pneumonitis hazard. Induction of emesis is not recommended.

5. Fire Fighting Measures

Flammable properties

Material will burn in a fire.

Extremely flammable. Vapors form flammable or explosive mixtures with air at room temperature. Vapor or gas may spread to distant ignition sources and flash back.

Explosion hazard if exposed to extreme heat.

Extinguishing media

Suitable extinguishing media

Use water spray, dry chemical, carbon dioxide or fire-fighting foam for Class B fires to extinguish fire.

Protection of firefighters

Specific hazards arising from the chemical

Combustion may produce COx, SOx, reactive hydrocarbons irritating vapors, and other decomposition products in the case of incomplete combustion.

Fire fighting equipment/instructions

Shut off source of flow, if possible.

Evacuate area and fight fire from a safe distance.

If leak or spill has not ignited, ventilate area and use water spray to disperse gas or vapor, cool adjacent structures, and to protect personnel attempting to stop a leak.

Containers can build up pressure if exposed to heat (fire). Stay away from storage tank ends. Withdraw immediately in case of rising sound from venting safety device or any discoloration of storage tank due to fire.

Be aware that a BLEVE (Boiling Liquid Expanding Vapor Explosion) may occur unless surfaces are kept cool with water.

Firefighters must wear NIOSH approved positive pressure breathing apparatus (SCBA) with full face mask and full protective equipment.

Explosion data

Sensitivity to static discharge

None known.

Sensitivity to mechanical impact

None known.

6. Accidental Release Measures

Environmental precautions

Eliminate all sources of ignition. Isolate hazard area and deny entry. If material is released to the environment, take immediate steps to stop and contain release. Caution should be exercised regarding personnel safety and exposure to the released material. Notify local, provincial and/or federal authorities, if required.

Other information

Keep unnecessary people away. Isolate area for at least 50 meters (164 feet) in all directions to preserve public safety. For large spills, if downwind consider initial evacuation for at least 300 meters (1000 feet).

Keep ignition sources out of area and shut off all ignition sources. Absorb spill with inert material (e. g. dry sand or earth) then place in a chemical waste container. Large Spills: Dike far ahead of liquid spill for later disposal.

Use vapor suppressing foam to reduce vapors. Stop leak when safe to do so.

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind. IF TANK, RAILCAR OR TANK TRUCK IS INVOLVED IN A FIRE, isolate for 800 meters (1/2 mile) in all directions. Evacuate area endangered by release as required. (See Exposure Controls/Personal Protection, Section 8.)

7. Handling and Storage

Handling

Bond and ground lines and equipment (tank, transfer lines, pump, floats, etc.) used during transfer to reduce the possibility of static spark-initiated fire or explosion. Use non-sparking tools. Do not cut, grind, drill, weld or reuse containers unless adequate precautions are taken against these hazards.

Good personal hygiene practices such as properly handling contaminated clothing, using wash facilities before entering public areas and restricting eating, drinking and smoking to designated areas are essential for preventing personal chemical contamination. Avoid contact with skin or eyes. Do not breathe fumes or vapor.

Storage

Store in tightly closed containers in a cool, dry, isolated, well-ventilated area away from heat, sources of ignition and incompatibles. Avoid contact with strong oxidizers.

Empty containers may contain material residue. Do not reuse without adequate precautions.

Hydrogen sulfide can build up in the head space of storage vessels containing this material. Use appropriate respiratory protection to prevent exposure. See Exposure Controls/Personal Protection (Section 8).

When entering a storage vessel that has previously contained this material, it is recommended that the atmosphere be monitored for the presence of hydrogen sulfide. See Occupational exposure limits (Section 8) for exposure limits.

Do not eat, drink or smoke in areas of use or storage.

8. Exposure Controls / Personal Protection

Occupational exposure limits

ACGIH Biological Exposure Indices

Components	Type	Value	Form
BENZENE (CAS 71-43-2)	BEI	25 µg/g	
ETHYLBENZENE (CAS 100-41-4)	BEI	0.7 g/g	
N-HEXANE (CAS 110-54-3)	BEI	0.4 mg/l	
TOLUENE (CAS 108-88-3)	BEI	0.3 mg/g	o-Cresol in urine
		0.03 mg/l	Urine
		0.02 mg/l	Blood
XYLENE (CAS 1330-20-7)	BEI	1.5 g/g	

US. ACGIH Threshold Limit Values

Components	Type	Value	Form
BENZENE (CAS 71-43-2)	STEL	2.5 ppm	Skin
	TWA	0.5 ppm	Skin
ETHYLBENZENE (CAS 100-41-4)	STEL	125 ppm	
	TWA	20 ppm	
HYDROGEN SULFIDE (CAS 7783-06-4)	STEL	5 ppm	
	TWA	1 ppm	
N-HEXANE (CAS 110-54-3)	TWA	50 ppm	Skin
POLYCYCLIC AROMATIC COMPOUNDS (CAS 130498-29-2)	TWA	0.2 mg/m3	Coal tar pitch volatiles (benzene soluble fraction)

US. ACGIH Threshold Limit Values

Components	Type	Value	Form
TOLUENE (CAS 108-88-3)	TWA	20 ppm	
XYLENE (CAS 1330-20-7)	STEL	150 ppm	
	TWA	100 ppm	

Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2)

Components	Type	Value
BENZENE (CAS 71-43-2)	STEL	2.5 ppm
	TWA	0.5 ppm
ETHYLBENZENE (CAS 100-41-4)	STEL	125 ppm
	TWA	100 ppm
HYDROGEN SULFIDE (CAS 7783-06-4)	Ceiling	15 ppm
	TWA	10 ppm
N-HEXANE (CAS 110-54-3)	TWA	50 ppm
TOLUENE (CAS 108-88-3)	TWA	50 ppm
XYLENE (CAS 1330-20-7)	STEL	150 ppm
	TWA	100 ppm

Canada. British Columbia OELs. (Occupational Exposure Limits for Chemical Substances, Occupational Health and Safety Regulation 296/97, as amended)

Components	Type	Value
BENZENE (CAS 71-43-2)	STEL	2.5 ppm
	TWA	0.5 ppm
ETHYLBENZENE (CAS 100-41-4)	TWA	20 ppm
HYDROGEN SULFIDE (CAS 7783-06-4)	Ceiling	10 ppm
N-HEXANE (CAS 110-54-3)	TWA	20 ppm
TOLUENE (CAS 108-88-3)	TWA	20 ppm
XYLENE (CAS 1330-20-7)	STEL	150 ppm
	TWA	100 ppm

Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act)

Components	Type	Value	Form
BENZENE (CAS 71-43-2)	STEL	2.5 ppm	
	TWA	0.5 ppm	
ETHYLBENZENE (CAS 100-41-4)	TWA	20 ppm	
HYDROGEN SULFIDE (CAS 7783-06-4)	STEL	5 ppm	
	TWA	1 ppm	
N-HEXANE (CAS 110-54-3)	TWA	50 ppm	
POLYCYCLIC AROMATIC COMPOUNDS (CAS 130498-29-2)	TWA	0.2 mg/m3	Coal tar pitch volatiles (benzene soluble fraction)
TOLUENE (CAS 108-88-3)	TWA	20 ppm	
XYLENE (CAS 1330-20-7)	STEL	150 ppm	
	TWA	100 ppm	

Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents)

Components	Type	Value
BENZENE (CAS 71-43-2)	STEL	2.5 ppm
	TWA	0.5 ppm
ETHYLBENZENE (CAS 100-41-4)	TWA	20 ppm
HYDROGEN SULFIDE (CAS 7783-06-4)	STEL	15 ppm
	TWA	10 ppm

Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents)

Components	Type	Value
N-HEXANE (CAS 110-54-3)	TWA	50 ppm
TOLUENE (CAS 108-88-3)	TWA	20 ppm
XYLENE (CAS 1330-20-7)	STEL	150 ppm
	TWA	100 ppm

Canada. Quebec OELs. (Ministry of Labor - Regulation Respecting the Quality of the Work Environment)

Components	Type	Value
BENZENE (CAS 71-43-2)	STEL	5 ppm
	TWA	1 ppm
ETHYLBENZENE (CAS 100-41-4)	STEL	125 ppm
	TWA	100 ppm
HYDROGEN SULFIDE (CAS 7783-06-4)	STEL	15 ppm
	TWA	10 ppm
N-HEXANE (CAS 110-54-3)	TWA	50 ppm
TOLUENE (CAS 108-88-3)	STEL	150 ppm
	TWA	100 ppm
XYLENE (CAS 1330-20-7)	STEL	150 ppm
	TWA	100 ppm

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

Components	Type	Value
BENZENE (CAS 71-43-2)	STEL	5 ppm
	TWA	1 ppm

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Components	Type	Value
ETHYLBENZENE (CAS 100-41-4)	TWA	100 ppm
N-HEXANE (CAS 110-54-3)	TWA	500 ppm
XYLENE (CAS 1330-20-7)	TWA	100 ppm

US. OSHA Table Z-1-A (29 CFR 1910.1000)

Components	Type	Value
TOLUENE (CAS 108-88-3)	TWA	200 ppm

US. OSHA Table Z-2 (29 CFR 1910.1000)

Components	Type	Value	Form
BENZENE (CAS 71-43-2)	TWA	1 ppm	
CRUDE OIL (CAS 8002-05-9)	TWA	500 ppm	
HYDROGEN SULFIDE (CAS 7783-06-4)	Ceiling	20 ppm	
POLYCYCLIC AROMATIC COMPOUNDS (CAS 130498-29-2)	TWA	0.2 mg/m3	Coal tar pitch volatiles (benzene soluble fraction)
TOLUENE (CAS 108-88-3)	Ceiling	300 ppm	
	TWA	200 ppm	

Exposure guidelines NOTE: Only ingredients with validated exposure limits are shown in section 8.

Canada - Alberta OELs: Skin designation

BENZENE (CAS 71-43-2)	Can be absorbed through the skin.
N-HEXANE (CAS 110-54-3)	Can be absorbed through the skin.
TOLUENE (CAS 108-88-3)	Can be absorbed through the skin.

Canada - British Columbia OELs: Skin designation

BENZENE (CAS 71-43-2)	Can be absorbed through the skin.
N-HEXANE (CAS 110-54-3)	Can be absorbed through the skin.
XYLENE (CAS 1330-20-7)	Can be absorbed through the skin.

Canada - Manitoba OELs: Skin designation

BENZENE (CAS 71-43-2)	Can be absorbed through the skin.
N-HEXANE (CAS 110-54-3)	Can be absorbed through the skin.

Canada - Ontario OELs: Skin designation

BENZENE (CAS 71-43-2)	Can be absorbed through the skin.
N-HEXANE (CAS 110-54-3)	Can be absorbed through the skin.

Canada - Quebec OELs: Skin designation

N-HEXANE (CAS 110-54-3)	Can be absorbed through the skin.
TOLUENE (CAS 108-88-3)	Can be absorbed through the skin.

Canada - Saskatchewan OELs: Skin designation

N-HEXANE (CAS 110-54-3)	Can be absorbed through the skin.
TOLUENE (CAS 108-88-3)	Can be absorbed through the skin.

US ACGIH Threshold Limit Values: Skin designation

BENZENE (CAS 71-43-2)	Can be absorbed through the skin.
N-HEXANE (CAS 110-54-3)	Can be absorbed through the skin.

Engineering controls Ventilation and other forms of engineering controls are the preferred means for controlling exposures.

Personal protective equipment

Eye / face protection Keep away from eyes. Eye contact can be avoided by using chemical safety glasses, goggles and/or face shield. Have eye washing facilities readily available where eye contact can occur.

Skin protection Dermal exposure to this chemical may add to the overall exposure.

Avoid skin contact with this material. Use appropriate chemical protective gloves when handling. Additional protective clothing may be necessary.

Respiratory protection The use of air purifying respirators is not recommended where hydrogen sulfide levels may exceed exposure limits. Use a positive pressure air supplied respirator if there is any potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air purifying respirators may not provide adequate protection. See OSHA 29 CFR 1910.134 for more information regarding respiratory protection and Assigned Protection Factors (APFs).

9. Physical & Chemical Properties

Appearance

Physical state	Liquid.
Form	Not applicable
Color	Black, Brown, or green.
Odor	Aromatic or petroleum
Odor threshold	0.1 - 0.5 ppm
pH	Not available
Vapor pressure	Not available
Vapor density	> 1
Boiling point	< 100 °F (< 37.8 °C)
Melting point/Freezing point	Not available
Solubility (water)	Insoluble
Specific gravity	0.7 - 0.95 at 60/60 °F (15.6/15.6 °C)
Relative density	Not available.
Flash point	> -40 °F (> -40 °C)
Flammability limits in air, upper, % by volume	10 %
Flammability limits in air, lower, % by volume	1 %
Auto-ignition temperature	Not available
VOC	Not available
Evaporation rate	Variable
Viscosity	Varies
Percent volatile	Not available
Partition coefficient (n-octanol/water)	Not available

Pour point	Varies
Bulk density	5.84 - 7.85 Lb./Gal.
Molecular weight	Not available
Molecular formula	Mixture

Other data

Chemical family	Hydrocarbon Mixture

10. Chemical Stability & Reactivity Information

Chemical stability	Stable under normal conditions of use.
Conditions to avoid	Avoid unventilated areas, heat, open flames, sparks and ungrounded electrical equipment.
Incompatible materials	Avoid contact with strong acids and oxidizers. See precautions under Handling & Storage (Section 7).
Hazardous decomposition products	Not anticipated under normal conditions.
Possibility of hazardous reactions	Not anticipated under normal conditions.

11. Toxicological Information

Carcinogenicity

ACGIH Carcinogens

BENZENE (CAS 71-43-2)	A1 Confirmed human carcinogen.
ETHYL BENZENE (CAS 100-41-4)	A3 Confirmed animal carcinogen with unknown relevance to humans.
TOLUENE (CAS 108-88-3)	A4 Not classifiable as a human carcinogen.
XYLENE (O, M AND P ISOMERS) (CAS 1330-20-7)	A4 Not classifiable as a human carcinogen.

IARC Monographs. Overall Evaluation of Carcinogenicity

BENZENE (CAS 71-43-2)	1 Carcinogenic to humans.
CRUDE OIL (CAS 8002-05-9)	3 Not classifiable as to carcinogenicity to humans.
ETHYLBENZENE (CAS 100-41-4)	2B Possibly carcinogenic to humans.
TOLUENE (CAS 108-88-3)	3 Not classifiable as to carcinogenicity to humans.
XYLENE (CAS 1330-20-7)	3 Not classifiable as to carcinogenicity to humans.

Toxicological data

BENZENE: Studies of Workers Overexposed to Benzene: Studies of workers exposed to benzene show clear evidence that overexposure can cause cancer of the blood forming organs (acute myelogenous leukemia) and aplastic anemia, an often fatal disease. Some studies suggest overexposure to benzene may also be associated with other blood disorders including myelodysplastic syndrome. Some studies of workers exposed to benzene have shown an association with increased rates of chromosome aberrations in circulating lymphocytes. One study of women workers exposed to benzene suggested a weak association with irregular menstruation. However, other studies of workers exposed to benzene have not demonstrated clear evidence of an effect on fertility or reproductive outcome in humans. Benzene can cross the placenta and affect the developing fetus. Cases of aplastic anemia have been reported in the offspring of persons severely overexposed to benzene. Studies in Laboratory Animals: Studies in laboratory animals indicate that prolonged, repeated exposure to high levels of benzene vapor can cause bone marrow suppression and cancer in multiple organ systems. Studies in laboratory animals show evidence of adverse effects on male reproductive organs following high levels of exposure but no significant effects on reproduction have been observed. Embryotoxicity has been reported in studies of laboratory animals but effects were limited to reduced fetal weight and skeletal variations. Benzene has been classified as a proven human carcinogen by OSHA and a Group 1 (Carcinogenic to Humans) material by IARC.

ETHYLBENZENE: Findings from a 2-year inhalation study in rodents conducted by NTP were as follows: Effects were observed only at the highest exposure level (750 ppm). At this level the incidence of renal tumors was elevated in male rats (tubular carcinomas) and female rats (tubular adenomas). The incidence of tumors was also elevated in male mice (alveolar and bronchiolar carcinomas) and female mice (hepatocellular carcinomas). IARC has classified ethyl benzene as "possibly carcinogenic to humans" (Group 2B). Studies in laboratory animals indicate some evidence of post-implantation deaths following high levels of maternal exposure. The relevance of these findings to humans is not clear at this time. Studies in laboratory animals indicate limited evidence of renal malformations, resorptions, and developmental delays following high levels of maternal exposure. The relevance of these findings to humans is not clear at this time. Studies in laboratory animals have demonstrated evidence of ototoxicity (hearing loss) following exposure levels as low as 300 ppm for 5 days. Studies in laboratory animals indicate some evidence of adverse effects on the liver, kidney, thyroid, and pituitary gland.

HYDROGEN SULFIDE: Hydrogen sulfide gas has an unpleasant odor that diminishes with increased exposure. Eye irritation may occur at levels above 4 ppm. Olfactory fatigue occurs rapidly at levels of 50 ppm or higher. Odor is not a reliable warning property. Respiratory effects include irritation with possible pulmonary edema at levels above 50 ppm. At 500 ppm immediate loss of consciousness and death can occur.

NIOSH has determined that 100 ppm hydrogen sulfide is immediately dangerous to life and health (IDLH).

N-HEXANE: Long-term or repeated exposure to n-hexane can cause peripheral nerve damage. Initial symptoms are numbness of the fingers and toes. Also, motor weakness can occur in the digits, 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.

POLYCYCLIC AROMATIC HYDROCARBONS (PAHs): Cancer is the most significant endpoint for PAHs. Certain PAHs are weak carcinogens which become carcinogenic after undergoing metabolism. Chronic or repeated exposure increases the likelihood of tumor initiation. Increased incidence of tumors of the skin, bladder, lung and gastrointestinal tract have been described in individuals overexposed to certain PAHs. Overexposure to PAHs has also been associated with photosensitivity and eye irritation. Inhalation overexposure of PAHs has been associated with respiratory tract irritation, cough, and bronchitis. Dermal overexposure has been associated with precancerous lesions, erythema, dermal burns, photosensitivity, acneiform lesions and irritation. Oral overexposure to PAHs has been associated with precancerous growths of the mouth (leukoplakia). Mild nephrotoxicity, congestion and renal cortical hemorrhages and elevated liver function tests, changes in the immune system and other effects have been observed in rats exposed to high levels of PAHs by ingestion.

TOLUENE: Case studies of persons abusing toluene suggest isolated incidences of adverse effects on the fetus including birth defects. Abuse of toluene at high concentrations (e.g., glue sniffing and solvent abuse) has been associated with adverse effects on the liver, kidney and nervous system, and can cause CNS depression, cardiac arrhythmias, and death. Studies of workers indicate longterm exposure may be related to impaired color vision and hearing. Some studies of workers suggest longterm exposure may be related to neurobehavioral and cognitive changes. Some of these effects have been observed in laboratory animals following repeated exposure to high levels of toluene. Several studies of workers suggest longterm exposure may be related to small increases in spontaneous abortions and changes in some gonadotropic hormones. However, the weight of evidence does not indicate toluene is a reproductive hazard to humans. Studies in laboratory animals indicate some changes in reproductive organs following high levels of exposure, but no significant effects on mating performance or reproduction were observed. Case studies of persons abusing toluene suggest isolated incidences of adverse effects on the fetus including birth defects. Findings in laboratory animals have been largely negative. Positive findings include small increases in minor skeletal and visceral malformations and developmental delays following very high levels of maternal exposure. Studies of workers indicate long-term exposure may be related to effects on the liver, kidney and blood, but these appear to be limited to changes in serum enzymes and decreased leukocyte counts. Adverse effects on the liver, kidney, thymus and nervous system were observed in animal studies following very high levels of exposure. The relevance of these findings to humans is not clear at this time.

XYLENES, ALL ISOMERS: Overexposure to xylene may cause upper respiratory tract irritation, headache, cyanosis, blood serum changes, CNS damage and narcosis. Effects may be increased by the use of alcoholic beverages. Evidence of liver and kidney impairment were reported in workers recovering from a gross overexposure. Effects from Prolonged or Repeated Exposure: Impaired neurological function was reported in workers exposed to solvents including xylene. Studies in laboratory animals have shown evidence of impaired hearing following high levels of exposure. Studies in laboratory animals suggest some changes in reproductive organs following high levels of exposure but no significant effects on reproduction were observed. Studies in laboratory animals indicate skeletal and visceral malformations, developmental delays, and increased fetal resorptions following extremely high levels of maternal exposure. The relevance of these observations to humans is not clear at this time. Adverse effects on the liver, kidney, bone marrow (changes in blood cell parameters) were observed in laboratory animals following high levels of exposure. The relevance of these observations to humans is not clear at this time.

CRUDE OIL: Lifetime dermal studies in rodents have shown in an increase in skin tumors with some crude oils. The International Agency for Research on Cancer (IARC) has concluded that there is limited evidence of carcinogenicity in animals and inadequate evidence of carcinogenicity in humans. The Overall IARC evaluation for crude oil is: "not classifiable as to its carcinogenicity to humans (Group 3)." Exposure to this material or its components may cause the following specific symptoms, depending on the concentration and duration of exposure: skin pigmentation changes, hyperkeratosis, folliculitis, warts, and anemia.

Exposure to this material may cause adverse effects or damage to the following organs or organ systems: blood, bone marrow, central nervous system, auditory system, peripheral nervous system, heart, immune system, kidneys, liver, lungs, lymphatic system, thymus, pituitary gland, thyroid, mucous membranes, respiratory tract, reproductive organs, testes, skin, and eyes.

12. Ecological Information

Ecotoxicological data

Product		Species	Test Results
CRUDE OIL - CANADA			
Aquatic			
Fish	LC50	Cutthroat trout (Oncorhynchus clarki)	2.1 - 4.3 mg/l, 96 hours

Ecotoxicity Toxic to aquatic organisms.

Persistence and degradability Not readily biodegradable.

Bioaccumulation / Accumulation May bioaccumulate in aquatic organisms.

Mobility in environmental media May partition into air, soil and water.

13. Disposal Considerations

Disposal instructions The transportation, storage, treatment and disposal of RCRA waste material must be conducted in compliance with federal regulations. Check state and local regulations for any additional requirements as these may be more restrictive than federal laws and regulations. Chemical additions, processing or otherwise altering this material may make the waste management information presented in this MSDS incomplete, inaccurate or otherwise inappropriate. Disposal of this material must be conducted in compliance with all federal, state and local regulations.

In Canada, wastes should be disposed of according to federal, provincial and local regulations.

For additional handling information and protection of employees, see Section 7 (Handling and Storage) and Section 8 (Exposure Controls/Personal Protection).

14. Transport Information

General The above description may not cover shipping in all cases, please consult 49 CFR 100-185 for specific shipping information or Transport Compliance Specialist (CSO).

TDG

UN number	UN1267
UN proper shipping name	PETROLEUM CRUDE OIL (CRUDE OIL - CANADA)
Hazard class	3
Packing group	II
Marine pollutant	D
ERG code	128

TDG



15. Regulatory Information

Canadian regulations

All ingredients are on the Canadian Domestic Substance List (DSL), or are not required to be listed on the DSL.

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

WHMIS status

Controlled

WHMIS classification

B2 - Flammable Liquids
D1A - Immediate/Serious-VERY TOXIC
D2B - Other Toxic Effects-TOXIC

WHMIS labeling



16. Other Information

HMIS® ratings

Health: 3*
Flammability: 3
Physical hazard: 0
Personal protection:
* Indicates chronic health hazard

NFPA ratings

Health: 3
Flammability: 3
Instability: 0

Disclaimer

NOTICE: The information presented herein is based on data considered to be accurate as of the date of preparation of this Material Safety Data Sheet. Adequate training and instruction should be given by you to your employees and affected personnel. Appropriate warnings and safe handling procedures should be provided by you to handlers and users. Additionally, the user should review this information, satisfy itself as to its suitability and completeness, and pass on the information to its employees or customers in accordance with the applicable federal, state, provincial or local hazard communication requirements. This MSDS may not be used as a commercial specification sheet of manufacturer or seller, and no warranty or representation, expressed or implied, is made as to the accuracy or comprehensiveness of the foregoing data and safety information, nor is any authorization given or implied to practice any patented invention without a license. In addition, vendor neither assumes nor retains any responsibility for any damage or injury resulting from abnormal use, from any failure to adhere to appropriate practices, or from any hazards inherent in the nature of the material. Moreover, unless an employee or a customer accesses or receives a MSDS directly from the company, there is no assurance that a document obtained from alternate sources is the most currently available MSDS.

This data sheet contains changes from the previous version in section(s):

This document has undergone significant changes and should be reviewed in its entirety.

Completed by

Flint Hills Resources, LP - Operations EH&S

ENBRIDGE

Safety Data Sheet

Section 1: Identification

PRODUCT IDENTIFIER	Petroleum Crude Oil—Heavy	
OTHER MEANS OF IDENTIFICATION	**UN-Number**	UN1267
	Synonyms	Premium Conventional Heavy (PCH), Conventional Heavy (CHV)
	Chemical Category	Crude oils—extremely flammable
RECOMMENDED USE	No information available	
RESTRICTIONS OF USE	No information available	
SUPPLIER INFORMATION	Enbridge Pipelines Inc. 10201 Jasper Avenue Edmonton, Alberta T5J 3N7 Canada TEL: 1-780-420-5210	
EMERGENCY CONTACT INFORMATION	**CHEMTREC**	1-800-424-9300 for US 703- 527- 3887 outside US
	CANUTEC (Canadian Transportation)	613-996-6666

Section 2: Hazards Identification

CLASSIFICATION

Skin Irritation	Category 2
Eye Irritation	Category 2
Germ Cell Mutagenicity	Category 1B
Carcinogenicity	Category 1A
Reproductive Toxicity	Category 2
Specific Target Organ Systemic Toxicity (Single Exposure)	Category 3
Specific Target Organ Toxicity (Repeated Exposure)	Category 1
Aspiration Toxicity	Category 1
Flammable liquids	Category 1

LABEL ELEMENTS

Signal Word

Danger

Hazard Pictograms



Hazard Statements

- Causes skin irritation.
- Causes serious eye irritation.
- May cause genetic defects.
- May cause cancer.
- Suspected of damaging fertility or the unborn child.
- May cause respiratory irritation.
- Causes damage to organs through prolonged or repeated exposure.
- May be fatal if swallowed and enters airways.
- Extremely flammable liquid and vapor.
- May cause drowsiness or dizziness.

PRECAUTIONARY STATEMENTS

Prevention

- Wash face, hands and any exposed skin thoroughly after handling.
- Wear protective gloves/protective clothing/eye protection/face protection.
- Obtain special instructions before use.
- Do not handle until all safety precautions have been read and understood.
- Use personal protective equipment as required.
- Do not breathe dust/fume/gas/mist/vapors/spray.
- Use only outdoors or in a well-ventilated area.
- Do not eat, drink or smoke when using this product.
- Keep away from heat/sparks/open flames/hot surfaces.
- Keep container tightly closed.
- No smoking.
- Ground/bond container and receiving equipment.
- Use explosion-proof electrical/ventilating/lighting/equipment.
- Use only non-sparking tools.
- Take precautionary measures against static discharge.
- In case of inadequate ventilation wear respiratory protection.

Response

- IF EXPOSED or concerned: Get medical advice/attention.
- IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
- Call a POISON CENTER or doctor/physician if you feel unwell.
- IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
- Do NOT induce vomiting.
- IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower and soap.
- In case of fire: Use CO_2, dry chemical, or foam for extinction.
- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- If SKIN irritation occurs: Get medical advice/attention.
- If EYE irritation persists: Get medical advice/attention.

Storage/Disposal

- Store locked up and keep cool.
- Store in a well-ventilated place. Keep container tightly closed.
- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

OTHER INFORMATION

- Under United States Regulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered hazardous.
- Very toxic to aquatic life with long lasting effects.

Section 3: Composition/Information on Ingredients

COMPONENT NAME	CAS NUMBER	PERCENTAGE (%)*	NOTES
Petroleum distillate (naphtha)	8002-05-9	60-100	
Natural Gas Condensates (petroleum)	64741-47-5	60-100	
Asphalt	8052-42-4	50-90	
Butane	106-97-8	0-10	
Pentane	109-66-0	0-7	
Octane	111-65-9	0-5	
Nonane	111-84-2	0-5	
Heptane	142-82-5	0-5	
2-Methylbutane	78-78-4	0-5	
Isobutane	75-28-5	0-5	
Hexane	110-54-3	0-5	
Decane	124-18-5	0-5	
Benzene	71-43-2	0-2	
Xylene	1330-20-7	0-1	
Toluene	108-88-3	0-1	
Ethylbenzene	100-41-4	0-1	
1,2,4-Trimethylbenzene	95-63-6	0-1	
Hydrogen Sulfide	7783-06-4	0-1	

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

Section 4: First Aid Measures

DESCRIPTION OF NECESSARY MEASURES

Inhalation	• IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If irritation persists: Get medical advice/attention.
Skin	• IF ON SKIN: Wash with plenty of soap and water. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse.

	Eye	• IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/ attention.
	Ingestion	• Do NOT induce vomiting. Call a physician or poison control center. • Aspiration hazard if swallowed—can enter lungs and cause damage.
MOST IMPORTANT SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED	**Refer to Section 11 - Toxicological Information**	
INDICATION OF IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED, IF NECESSARY	**Note to the Physician**	• Aspiration hazard. Symptoms may be delayed. • 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. • Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.

Section 5: Fire Fighting Measures

EXTINGUISHING MEDIA	**Suitable Extinguishing Media**	• SMALL FIRES: Dry chemical, CO_2, water spray or regular foam. • LARGE FIRE: Water spray, fog or regular foam.
	Unsuitable Extinguishing Media	• CAUTION: Use of water spray when fighting fire may be inefficient. • Do not use straight streams.
FIREFIGHTING PROCEDURES		• FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. • FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: If impossible to extinguish, protect surroundings and allow fire to burn itself out. • Stay upwind. • Ventilate closed spaces before entering. • Fire fighters should wear complete protective clothing including self-contained breathing apparatus. • FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions. • FIRE: When a large quantity of this material is involved in a major fire, consider an initial evacuation distance of 300 meters (1000 feet) in all directions. • Move containers from fire area if you can do it without risk. • LARGE FIRES: Use water spray or fog; do not use straight streams. • LARGE FIRES: If insufficient water supply: knock down vapors only. If this is impossible, withdraw from area and let fire burn. • LARGE FIRES: Flood fire area with large quantities of water, while knocking down vapors with water fog.

SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OR MIXTURE		• Vapors may travel to source of ignition and flash back. • Air/vapor mixtures may explode when ignited. • Vapors may accumulate in confined areas (basement, tanks, hopper/tank cars etc.). • Will be easily ignited by heat, sparks or flames. • Runoff to sewer may create fire or explosion hazard. • Vapor explosion hazard indoors, outdoors or in sewers. • MAY EXPLODE AND THROW FRAGMENTS 1600 meters (1 MILE) OR MORE IF FIRE REACHES CARGO. • May create vapor/air explosion hazard indoors, outdoors or in sewers. • Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).
EXPLOSION DATA	**Hazardous Combustion Products**	• Carbon monoxide. Carbon dioxide (CO_2). Nitrogen oxides (NOx). Oxides of sulfur. • Aldehydes, aromatic and other hydrocarbons.
	Sensitivity to Mechanical Impact	• None.
	Sensitivity to Static Discharge	• Yes.
PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIREFIGHTERS		• As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. • 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 firefighters. • Carbon dioxide can displace oxygen. • Use caution when applying carbon dioxide in confined spaces. • Water spray may be useful in minimizing or dispersing vapors. • Long-duration fires involving diluent stored in tanks may result in a boilover. • For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear.

Section 6: Accidental Release Measures

PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES	**Personal Precautions**	• Evacuate personnel to safe areas. • Remove all sources of ignition. • Deny entry to unauthorized and unprotected personnel. • Use personal protective equipment. • Avoid contact with skin, eyes and clothing. • Stop leak if you can do it without risk. • Keep people away from and upwind of spill/leak. • Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. • Ventilate enclosed areas. • Do not walk through spilled material.
	Protective Equipment	• Wear appropriate breathing apparatus (if applicable) and protective clothing.
	Emergency Procedures	• ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area) Keep unauthorized personnel away. Evacuate area. Keep out of low areas. Stop leak if you can do it without risk. • Report spills to local or federal authorities as appropriate or required.

ENVIRONMENTAL PRECAUTIONS

- Avoid run off to waterways and sewers. Do NOT wash away into sewer. Prevent entry into waterways, sewers, basements or confined areas. Runoff from fire control may cause pollution.

METHODS AND MATERIAL FOR CONTAINMENT AND CLEANING UP

Methods for Containment

- Stop leak if you can do it without risk.
- Contain and recover liquid when possible.
- A vapor suppressing foam may be used to reduce vapors.
- Dike far ahead of spill; use dry sand to contain the flow of material; contain water spills by booming.
- Use water spray to reduce vapors or divert vapor cloud drift.
- A fine water spray remotely directed to the edge of the spill pool can be used to direct and maintain a hot flare fire which will burn the spilled material in a controlled manner.

Methods for Cleaning Up

- Clean up spill immediately.
- LARGE SPILLS: DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST.
- SMALL LIQUID SPILLS: Use a non-combustible material like vermiculite or sand to soak up the product and place into a container for later disposal.
- Use appropriate Personal Protective Equipment (PPE).
- Use clean non-sparking tools to collect absorbed material.
- Vacuum spilled material.
- Try to work upwind of spill.
- All equipment used when handling the product must be grounded.
- Recover and return free product to proper containers
- Use suitable absorbent materials such as vermiculite, sands, soil, or clay to clean up residual liquids.
- Do not place spilled materials back in the original container.
- Do not flush to sewer or allow to enter waterways.

Section 7: Handling and Storage

PRECAUTIONS FOR SAFE HANDLING

Handling

- All equipment used when handling the product must be grounded. Avoid contact with heat and ignition sources and oxidizers. Do not breathe (dust, vapor or spray mist). Do not use in areas without adequate ventilation. Do not use sparking tools. Keep away from heat, sparks, and flame. No open flames, no sparks and no smoking. Use only with adequate ventilation. Do not use or store near heat or open flame. Keep away from fire, sparks and heated surfaces.
- The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes).
- The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits.
- Take precautionary measures against static discharges.

Handling	• Do not cut drill, grind or weld on empty containers since they may contain explosive residues. • Stay upwind and vent open hatches before uploading. • Avoid contact with skin, eyes and clothing. • Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water. • Wear personal protective equipment. • Remove and wash contaminated clothing before re-use. • Do not eat, drink or smoke when using this product. • Do not take internally. • Wash thoroughly after handling. • Empty containers pose a potential fire and explosion hazard.
CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES **Storage**	• Ventilate enclosed areas. • Store in a well-ventilated place. • Keep container tightly closed. • Store locked up. • Avoid shock, impact, friction, and rough handling. Do not use sparking tools. • Store in a cool/low-temperature, well-ventilated place away from heat and ignition sources. • Keep away from sources of ignition. • No Smoking. • Do not enter confined spaces such as tanks or pits without following proper entry procedures. • Store in properly closed containers that are appropriately labeled and in a cool well-ventilated area. • Harmful concentrations of hydrogen sulfide (H_2S) gas can accumulate in excavations and low-lying areas as well as the vapor space of storage and bulk transport compartments. • Keep away from open flames, hot surfaces and sources of ignition. • Keep product and empty container away from heat and sources of ignition. • Storage containers should be grounded and bonded. • Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge. • Store away from incompatible materials.
Incompatible Products	• Strong oxidizers such as nitrates, chlorates, peroxides, chlorine.

Section 8: Exposure Controls/Personal Protection

CONTROL PARAMETERS: EXPOSURE GUIDELINES

CHEMICAL NAME	ACGIH	OSHA	NIOSH
Petroleum distillate (naphtha)	–	–	TWA 350 mg/m^3 IDLH 1100 ppm Ceiling 1800 mg/m^3
Asphalt	TLV 0.5 mg/m^3		Ceiling 5 mg/m^3
Butane	STEL 1000 ppm	–	TWA 800 ppm TWA 1900 mg/m^3

Pentane	TLV 600 ppm TLV 1770 mg/m^3	PEL 1000 ppm PEL 2950 mg/m^3	TWA 120 ppm TWA 350 mg/m^3 Ceiling 610 ppm Ceiling 1800 mg/m^3 IDLH 1500 ppm
Octane	TLV 300 ppm TLV 1401 mg/m^3	PEL 500 ppm PEL 2350 mg/m^3	TWA 75 ppm TWA 350 mg/m^3 Ceiling 385 ppm Ceiling 1800 mg/m^3 IDLH 1000 ppm
Nonane	TLV 200 ppm TLV 1050 mg/m^3	–	TWA 200 ppm TWA 1050 mg/m^3
Heptane	TLV 400 ppm TLV 1640 mg/m^3 STEL 500 ppm STEL 2000 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 85 ppm TWA 350 mg/m^3 Ceiling 440 ppm Ceiling 1800 mg/m^3 IDLH 750 ppm
2-Methylbutane	TWA 600 ppm	–	–
Isobutane	TWA 1000 ppm	–	–
Hexane	TLV 50 ppm TLV 176 mg/m^3	PEL 500 ppm PEL 1800 mg/m^3	TWA 50 ppm TWA 180 mg/m^3 IDLH 1100 ppm
Decane	–	–	–
Benzene	TLV 0.5 ppm TLV 1.6 mg/m^3 STEL 2.5 ppm STEL 8 mg/m^3	PEL 1 ppm STEL 5 ppm	TWA 0.1 ppm STEL 1 ppm IDLH 500 ppm
Xylenes	TLV 100 ppm TLV 434 mg/m^3 STEL 150 ppm STEL 651 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 150 ppm STEL 655 mg/m^3 IDLH 900 ppm
Toluene	TLV 20 ppm TLV 75 mg/m^3	PEL 200 ppm STEL 300 mg/m^3	TWA 100 ppm TWA 375 mg/m^3 STEL 150 ppm STEL 560 mg/m^3 IDLH 500 ppm
Ethylbenzene	TLV 20 ppm TLV 87 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 125 ppm STEL 545 mg/m^3 IDLH 800 ppm

1,2,4-Trimethylbenzene	TWA 25 ppm	–	TWA 25 ppm TWA 125 mg/m^3
Hydrogen sulfide	TLV 1 ppm TLV 1.4 mg/m^3 STEL 5 ppm STEL 7 mg/m^3	Ceiling 20 ppm	Ceiling 10 ppm Ceiling 15 mg/m^3 IDLH 100 ppm

APPROPRIATE ENGINEERING CONTROLS

- Adequate ventilation systems as needed to control concentrations of airborne contaminants below applicable threshold limit values. Prevent vapor build up by providing adequate ventilation during and after use. Use only appropriately classified electrical equipment.

INDIVIDUAL PROTECTION MEASURES

Eye and Face	• Wear face shield and eye protection.
Skin and Body	• The use of gloves (nitrile or neoprene) is advised to prevent skin contact and possible irritation. • Wear protective gloves/protective clothing/eye protection/face protection. Wear long sleeves and/or protective coveralls.
Respiratory	• Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or symptoms are experienced.
General Hygiene Measures	• Handle in accordance with good industrial hygiene and safety practice.

Section 9: Physical and Chemical Properties

MATERIAL DESCRIPTION

Physical State	Liquid	**Odor**	Petroleum like odor
Substance Type	Mixture	**Odor Threshold**	No data available
Appearance	Brown		

PROPERTIES

pH	No data available	**Vapor pressure**	No data available
Melting Point/ Freezing Point	No data available	**Vapor density**	2.5 to 5.0 Air=1
Boiling Point/ Boiling Range	34 to 260°C 93.2 to 500°F	**Relative density**	No data available
Flash Point	-40 to 260 °C -40 to 500 °F	**Water Solubility**	Negligible
Evaporation Rate	No data available	**Partition coefficient: n-octanol/water**	No data available
Flammability (solid, gas)	No data available	**Autoignition temperature**	No data available
Upper Flammability Limit	No data available	**Decomposition temperature**	No data available

Lower Flammability Limit	No data available	**Specific Gravity**	0.65-0.98
Viscosity	No data available		

Section 10: Stability and Reactivity

REACTIVITY	Chlorine Dioxide
CHEMICAL STABILITY	Stable at 70 °F, 760 mm Hg pressure
POSSIBILITY OF HAZARDOUS REACTIONS	None under normal processing
CONDITIONS TO AVOID	Excessive heat, sources of ignition, sparks, open flames, and buildup of static electricity
INCOMPATIBLE MATERIALS	Strong oxidizers such as nitrates, chlorates, peroxides, chlorine
HAZARDOUS DECOMPOSITION PRODUCTS	Combustion produces carbon monoxide, aldehydes, sulfur dioxide, aromatic and other hydrocarbons
HAZARDOUS POLYMERIZATION	Will not occur

Section 11: Toxicological Information

INFORMATION ON THE LIKELY ROUTES OF EXPOSURE

Inhalation	• May cause irritation of respiratory tract. May cause drowsiness and dizziness.
Eye Contact	• Causes serious eye irritation.
Skin Contact	• Causes skin irritation.
Ingestion	• Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. • Potential for aspiration if swallowed. • Aspiration may cause pulmonary edema and pneumonitis.

TOXICOLOGICAL DATA

CHEMICAL NAME	LD50 ORAL	LD50 DERMAL	LC50 INHALATION
Asphalt	>5000 mg/kg (Rat)	–	>94.4 mg/m^3 (Rat)
Butane	–	–	658 mg/L (Rat) 4 h
Pentane	>2000 mg/kg (Rat)	–	364 g/cu (Rat) 4 h
Octane	–	–	= 118 g/m^3 (Rat) 4 h = 25260 ppm (Rat) 4 h
Nonane	–	–	= 3200 ppm (Rat) 4 h
Heptane	–	= 3000 mg/kg (Rabbit)	= 103 g/m^3 (Rat) 4 h
2-Methylbutane	–	–	= 150,000 mg/m^3 (Rat) 2 h

Isobutane	–	–	= 658,000 mg/m^3 (Rat) 4 h
Hexane	= 25 g/kg (Rat)	= 3000 mg/kg (Rabbit)	= 48000 ppm (Rat) 4 h
Decane	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	–
Benzene	1800 mg/kg (Rat)	–	13050 - 14380 ppm (Rat) 4 h
Xylenes	= 3500 mg/kg (Rat)	> 4350 mg/kg (Rabbit) > 1700 mg/kg (Rabbit)	= 29.08 mg/L (Rat) 4 h = 5000 ppm (Rat) 4 h
Toluene	2.6 to 7.5 g/kg (Rat)	14.1 ml/kg (Rabbit)	–
Ethylbenzene	= 3500 mg/kg (Rat)	= 15400 mg/kg (Rabbit)	= 17.2 mg/L (Rat) 4 h
1,2,4-Trimethylbenzene	5 g/kg (Rat)	–	18000 mg/m^3 (Rat) 4h
Hydrogen sulfide	–	–	= 444 ppm (Rat)

SYMPTOMS RELATED TO THE PHYSICAL, CHEMICAL AND TOXICOLOGICAL CHARACTERISTICS

Benzene

- Repeated or prolonged exposure to benzene at concentrations in excess of the TLV may cause serious injury to blood-forming organs. Significant chronic exposure to benzene vapor has been reported to produce various blood disorders ranging from anemia to certain forms of leukemia (cancer) in humans. Benzene produced tumors in rats and mice in lifetime chronic toxicity studies, but the response has not been consistent across species, strain, sex or route of exposure. Animal studies on benzene have demonstrated immune toxicity, chromosomal aberrations, testicular effects and alterations in reproductive cycles and embryo/fetotoxicity, but not teratogenicity.

Hydrogen Sulfide Gas (H_2S)

- Toxic by inhalation. Prolonged breathing of 50-100 ppm H_2S vapors can produce eye and respiratory tract irritation. Higher concentration (250-600 ppm) for 15-30 minutes can produce headache, dizziness, nervousness, nausea and pulmonary edema or bronchial pneumonia. Concentrations of >1000 ppm will cause immediate unconsciousness and death through respiratory paralysis. Rats and mice exposed to 80 ppm H_2S, 6 hrs/day, 5 days/week for 10 weeks, did not produce any toxicity except for irritation of nasal passages. H_2S did not affect reproduction and development (birth defects or neurotoxicity) in rats exposed to concentrations of 75-80 ppm or 150 ppm H_2S, respectively. Over the years a number of acute cases of H_2S poisoning have been reported. Complete and rapid recovery is the general rule. However, if the exposure was sufficiently intense and sustained causing cerebral hypoxia (lack of oxygen to the brain), neurologic effects such as amnesia, intention tremors or brain damage are possible.

Hexane

- This product may contain hexane at a level of >1.0%. Studies in laboratory animals have produced systemic toxicity in blood, spleen and lungs. Fetotoxicity has been observed at hexane concentrations that produced maternal toxicity. Long term exposure to high concentrations of hexane has been shown to cause testicular effects and nervous system damage.

Xylenes

- Gross overexposure or severe poisoning incidents in humans to xylenes has been reported to cause lung, liver, kidney, heart and brain damage as well as neurologic disturbances. Laboratory animals exposed to high dose of xylenes showed evidence of effects in the liver, kidneys, lungs, spleen, heart and adrenals, Exposure of pregnant rats, mice and rabbits during gestation to significant concentrations of xylenes produced maternal, fetal and developmental toxicity (skeletal retardation, cleft palate, and wavy ribs) generally at maternally toxic doses. These types of fetotoxic effects have been associated with maternal toxicity. Repeated inhalation of high xylene concentrations has shown impairment of performance abilities (behavioral tests) in animals and man. Xylenes produced a mild frequency hearing loss in rats subchronically exposed to high concentrations of xylenes.

Toluene	**Carcinogenicity:** Exposure of rats and mice to toluene at concentrations ranging from 120-1200 ppm for two years did not demonstrate evidence of carcinogenicity. Toluene has not been listed as a carcinogen by IARC. **Target Organs:** Epidemiology studies suggest that chronic occupational overexposure to toluene may damage color vision. Subchronic and chronic inhalation studies with toluene produced kidney and liver damage, hearing loss and central nervous system (brain) damage in laboratory animals. Intentional misuse by deliberate inhalation of high concentrations of toluene has been shown to cause liver, kidney, and central nervous system damage, including hearing loss and visual disturbances. **Reproductive Toxicity:** Exposure to toluene during pregnancy has demonstrated limited evidence of developmental toxicity in laboratory animals. Decreased fetal body weight and increased skeletal variations in both inhalation and oral studies, but only at doses that were maternally toxic. No fetal toxicity was seen at doses that were not maternally toxic. Decreased sperm counts have been observed in male rats in the absence of a reduction in fertility. Toluene has been reported to cause mental or growth retardation in the children of solvent abusers who directly inhale toluene during pregnancy.
Ethylbenzene	**Carcinogenicity:** Rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study demonstrated limited evidence of kidney, liver, and lung cancer. Ethyl benzene has been listed as a possible human carcinogen by IARC. **Target Organs:** In rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study there was mild damage to the kidney (tubular hyperplasia), liver (eosinophilio foci, hypertrophy, necrosis), lung (alveolar epithelium metaplasia), thyroid (hyperplasia), thyroid (hyperplasia) and pituitary (hyperplasia). In animal models (particularly rats), ethyl benzene affects the auditory function mainly in the cochlear mid-frequency range and ototoxicity was observed after combined exposure to noise and ethyl benzene. There is no evidence of either ethyl benzene-induced hearing losses or ototoxicity with combined exposure to ethyl benzene and noise in workers.

DELAYED AND IMMEDIATE EFFECTS AND ALSO CHRONIC EFFECTS FROM SHORT- AND LONG-TERM EXPOSURE

Sensitization	• No information available
Mutagenic Effects	• May cause genetic defects
Carcinogenicity	• May cause cancer

CARCINOGENIC INFORMATION

CHEMICAL NAME	ACGIH	ACGIH SKIN*	IARC	NTP	OSHA
Petroleum distillate (naphtha)	A2	–	Group 3		–
Asphalt	A4	–	Group 2B	Reasonably Anticipated	–
Hexane	–	X	–	–	–
Benzene	A1	X	Group 1	Known	X
Xylenes	A4	–	Group 3	Evidence	
Toluene	A4	–	Group 3	Evidence	–
Ethylbenzene	A3	–	Group 2B	Evidence	X

**ACGIH Skin designation refers to the potential significant contribution of overall exposure by cutaneous route, including mucous membranes and eyes, from airborne exposure to gases, vapor, or liquid OR by direct skin contact.*

REPRODUCTIVE TOXICITY	• Suspected of damaging fertility or the unborn child.
STOT—SINGLE EXPOSURE	• May cause drowsiness and dizziness.
STOT—REPEATED EXPOSURE	• Causes damage to organs through prolonged or repeated exposure.
ASPIRATION HAZARD	May be fatal if swallowed and enters airways Risk of serious damage to the lungs (by aspiration).

Section 12: Ecological Information

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Petroleum distillate (naphtha)	–	LC50: 258 mg/L Salmo gairdneri 96 h static	EC50 48 h: < 0.26 mg/L Static (Daphnia magna) EC50 24 h: = 36 mg/L (Daphnia magna)	–
Natural gas condensates (petroleum)	–	LC50 96 h: = 119 mg/L static (Alburnus alburnus) LC50 96 h: = 82 mg/L static (Cyprinodon variegatus)	EC50 24 h: = 170 mg/L (Daphnia magna)	–
Butane	–	–	–	–
Pentane	–	LC50 96 h: = 11.59 mg/L (Pimephales promelas) LC50 96 h: = 9.87 mg/L (Oncorhynchus mykiss) LC50 96 h: = 9.99 mg/L (Lepomis macrochirus)	EC50 48h: 135 mmol/cu	LC50 24h: 165 mmol/cu Artemia salina (Brine Shrimp)
Octane	–	–	EC50 48 h: = 0.38 mg/L (water flea) EC50 48 h: = 0.02856 mg/L (Daphnia magna)	EC50 = 890 mg/L 30 min (Microorganisms) EC50 <1.67hr: 120 µg/l Mytilus edulis (Common Bay Mussel)
Heptane	–	LC50 96 h: = 375.0 mg/L (Cichlid fish)	EC50 24 h: > 10 mg/L (Daphnia magna)	–
2-Methylbutane			EC50 48 h: = 2.3 mg/L (Daphnia magna)	
Hexane	–	LC50 96 h: 2.1 - 2.98 mg/L flow-through (Pimephales promelas)	EC50 24 h: > 1000 mg/L (Daphnia magna)	–
Decane	EC50 24 h: = 0.043 mg/L (Chlorella vulgaris)	–	EC50 48 h: = 0.029 mg/L (Daphnia magna)	–

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Benzene	EC50 72 h: = 29 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 10.7 - 14.7 mg/L flow-through (Pimephales promelas) LC50 96 h: = 5.3 mg/L flow-through (Oncorhynchus mykiss) LC50 96 h: = 22.49 mg/L static (Lepomis macrochirus) LC50 96 h: = 28.6 mg/L static (Poecilia reticulata) LC50 96 h: 22330 - 41160 µg/L static (Pimephales promelas) LC50 96 h: 70000 - 142000 µg/L static (Lepomis macrochirus)	EC50 48 h: 8.76 - 15.6 mg/L Static (Daphnia magna) EC50 48 h: = 10 mg/L (Daphnia magna)	–
Xylenes	EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: = 13.4 mg/L flow-through (Pimephales promelas) LC50 96 h: 2.661 - 4.093 mg/L static (Oncorhynchus mykiss) LC50 96 h: 13.5 - 17.3 mg/L (Oncorhynchus mykiss) LC50 96 h: 13.1 - 16.5 mg/L flow-through (Lepomis macrochirus)	EC50 48 h: = 3.82 mg/L (water flea) LC50 48 h: = 0.6 mg/L (Gammarus lacustris)	-
Toluene	EC50: >433 mg/L Pseudokirchneriella subcapitata 96 h EC50: 12.5 mg/L Pseudokirchneriella subcapitata 72 h static	LC50: 15.22 - 19.05 mg/L Pimephales promelas 96 h flow-through LC50: 12.6 mg/L Pimephales promelas 96 h static LC50: 5.89 - 7.81 mg/L Oncorhynchus mykiss 96 h flow-through LC50: 14.1 - 17.16 mg/L Oncorhynchus mykiss 96 h static LC50: 5.8 mg/L Oncorhynchus mykiss 96 h semi-static LC50: 11.0-15.0 mg/L Lepomis macrochirus 96 h static LC50: 54 mg/L Oryzias latipes 96 h static LC50: 28.2 mg/L Poecilia reticulata 96 h semi-static LC50: 50.87-70.34 mg/L Poecilia reticulata 96 h static	EC50 48 h: 5.46 - 9.83 mg/L Static (Daphnia magna) EC50 48 h: = 11.5 mg/L (Daphnia magna)	EC50 = 19.7 mg/L 30 min (Microorganisms)

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Ethylbenzene	EC50 72 h: = 4.6 mg/L (Pseudokirchneriella subcapitata) EC50 96 h: > 438 mg/L (Pseudokirchneriella subcapitata) EC50 72 h: 2.6 - 11.3 mg/L static (Pseudokirchneriella subcapitata) EC50 96 h: 1.7 - 7.6 mg/L static (Pseudokirchneriella subcapitata) EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 11.0 - 18.0 mg/L static (Oncorhynchus mykiss) LC50 96 h: = 4.2 mg/L semi-static (Oncorhynchus mykiss) LC50 96 h: 7.55 - 11 mg/L flow-through (Pimephales promelas) LC50 96 h: = 32 mg/L static (Lepomis macrochirus) LC50 96 h: 9.1 - 15.6 mg/L static (Pimephales promelas) LC50 96 h: = 9.6 mg/L static (Poecilia reticulata)	EC50 48 h: 1.8 - 2.4 mg/L (Daphnia magna)	EC50 = 9.68 mg/L 30 min EC50 = 96mg/L 24 h (Microorganisms)
1,2,4-Trimethylbenzene	–	LC50 96 h: 7.72 mg/L (Pimephales promelas)	EC50 48h: 30 mmol/cu (Daphnia magna)	LC50 24h: 100 mmol/cu Artemia salina (Brine Shrimp)
Hydrogen sulfide	–	LC50 96h: 49 µg/l Oncorhynchus mykiss (Rainbow Trout) eggs LC50 24h: 1059.7 µg/l Pimephales promelas (Fathead Minnow)	EC50 48h: 62 µg/l Gammarus pseudolimnaeus (Scud)	–

PERSISTENCE AND DEGRADABILITY

- No information available

BIOACCUMULATIVE POTENTIAL

CHEMICAL	LOG POW
Asphalt	6.006
Butane	2.89
Pentane	3.39
Octane	5.18
Heptane	4.66
2-Methylbutane	2.72
Isobutane	2.76
Hexane	3.90
Decane	5.1
Benzene	1.83
Xylene	2.77-3.15
Toluene	2.65
Ethylbenzene	3.118

1,2,4-Trimethylbenzene	3.78
Hydrogen Sulfide	0.45

MOBILITY IN SOIL

CHEMICAL	EXPECTED SOIL MOBILITY
Petroleum distillate (naphtha)	High
Butane	Low
Pentane	High
Octane	Immobile
Nonane	Immobile
Heptane	Moderate
2-Methylbutane	Low
Isobutane	Very High
Hexane	High
Decane	Immobile
Benzene	High
Xylene	Very High to Moderate
Toluene	High to Moderate
Ethylbenzene	Low
1,2,4-Trimethylbenzene	Low

OTHER ADVERSE EFFECTS

- No information available

Section 13: Disposal Considerations

WASTE TREATMENT METHODS

Product Waste

- This product, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA RCRA (40 CFR 261), Environment Canada, or other State, Provincial, and local regulations. If this product is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility.
- This product could also contain benzene at >0.5 ppm and could exhibit the characteristic of "toxicity" (D018) as determined by the toxicity characteristic leaching procedure (TCLP).
- This material could become a hazardous waste if mixed or contaminated with a hazardous waste or other substance(s).
- It is the responsibility of the user to consult federal, state and local waste regulations to determine appropriate disposal options.

Packaging Waste	• Container contents should be completely used and containers should be emptied prior to discard. • Container 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 re-conditioner. • To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

Section 14: Transport Information

****CHART NAME****

	UN NUMBER	PROPER SHIPPING NAME	TRANSPORT HAZARD CLASS	PACKING GROUP	ENVIRONMENTAL HAZARD
DOT	UN1267	Petroleum Crude Oil	3	I	Emergency response guide number: 128
TDG	UN1267	Petroleum Crude Oil	3	I	Marine Pullutant
IMO/IMDG	UN1267	Petroleum Crude Oil	3	I	Marine Pullutant
IATA/ICAO	UN1267	Petroleum Crude Oil	3	I	ERG Code 3L

SPECIAL RECAUTIONS FOR USER

• None

Section 15: Regulatory Information

U.S.—CERCLA/SARA HAZARDOUS SUBSTANCES AND THEIR REPORTABLE QUANTITIES

COMPONENT	CAS #	AMOUNT
Petroleum distillate (naphtha)	8002-05-9	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Asphalt	8052-42-4	Not Listed
Butane	106-97-8	Not Listed
Pentane	109-66-0	Not Listed
Octane	111-65-9	Not Listed
Nonane	111-84-2	Not Listed
Heptane	142-82-5	Not Listed
2-Methylbutane	78-78-4	Not Listed

Isobutane	75-28-5	Not Listed
Hexane	110-54-3	5000 lb final RQ; 2270 kg final RQ
Decane	124-18-5	Not Listed
Benzene	71-43-2	10 lb final RQ; 4.54 kg final RQ
Xylene	1330-20-7	100 lb final RQ; 45.4 kg final RQ
Toluene	108-88-3	1000 lb final RQ; 454 kg final RQ
Ethylbenzene	100-41-4	1000 lb final RQ; 454 kg final RQ
1,2,4-Trimethylbenzene	95-63-6	Not Listed
Hydrogen Sulfide	7783-06-4	100 lb final RQ; 45.4 kg final RQ

U.S.—CWA (CLEAN WATER ACT)—REPORTABLE QUANTITIES OF DESIGNATED HAZARDOUS SUBSTANCES

COMPONENT	CAS #	AMOUNT
Petroleum distillate (naphtha)	8002-05-9	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Asphalt	8052-42-4	Not Listed
Butane	106-97-8	Not Listed
Pentane	109-66-0	Not Listed
Octane	111-65-9	Not Listed
Nonane	111-84-2	Not Listed
Heptane	142-82-5	Not Listed
2-Methylbutane	78-78-4	Not Listed
Isobutane	75-28-5	Not Listed
Hexane	110-54-3	Not Listed
Decane	124-18-5	Not Listed
Benzene	71-43-2	10 lb RQ
Xylene	1330-20-7	100 lb RQ
Toluene	108-88-3	1000 lb RQ
Ethylbenzene	100-41-4	1000 lb RQ
1,2,4-Trimethylbenzene	95-63-6	Not Listed
Hydrogen Sulfide	7783-06-4	100 lb RQ

U.S.—CWA (CLEAN WATER ACT)—RECOMMENDED WATER QUALITY CRITERIA—CCC FOR FRESHWATER LIFE

COMPONENT	CAS #	AMOUNT
Hydrogen Sulfide	7783-06-4	2.0 µg/L CCC

U.S.—CWA (CLEAN WATER ACT)—RECOMMENDED WATER QUALITY CRITERIA—CCC FOR SALTWATER LIFE

COMPONENT	CAS #	AMOUNT
HydrogenSulfide	7783-06-4	2.0 µg/L CCC

U.S.—CWA (CLEAN WATER ACT)—HAZARDOUS SUBSTANCES

COMPONENT	CAS #	LISTED
Petroleum distillate (naphtha)	8002-05-9	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Asphalt	8052-42-4	Not Listed
Butane	106-97-8	Not Listed
Pentane	109-66-0	Not Listed
Octane	111-65-9	Not Listed
Nonane	111-84-2	Not Listed
Heptane	142-82-5	Not Listed
2-Methylbutane	78-78-4	Not Listed
Isobutane	75-28-5	Not Listed
Hexane	110-54-3	Not Listed
Decane	124-18-5	Not Listed
Benzene	71-43-2	X
Xylene	1330-20-7	X
Toluene	108-88-3	X
Ethylbenzene	100-41-4	X
1,2,4-Trimethylbenzene	95-63-6	Not Listed
Hydrogen Sulfide	7783-06-4	X

X= The component is listed

U.S.—CWA (CLEAN WATER ACT)—PRIORITY POLLUTANTS

COMPONENT	CAS #	LISTED
Petroleum distillate (naphtha)	8002-05-9	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Asphalt	8052-42-4	Not Listed
Butane	106-97-8	Not Listed
Pentane	109-66-0	Not Listed
Octane	111-65-9	Not Listed
Nonane	111-84-2	Not Listed
Heptane	142-82-5	Not Listed
2-Methylbutane	78-78-4	Not Listed
Isobutane	75-28-5	Not Listed
Hexane	110-54-3	Not Listed
Decane	124-18-5	Not Listed
Benzene	71-43-2	X
Xylene	1330-20-7	Not Listed
Toluene	108-88-3	X
Ethylbenzene	100-41-4	X
1,2,4-Trimethylbenzene	95-63-6	Not Listed
Hydrogen Sulfide	7783-06-4	Not Listed

X= The component is listed

CANADA-WHMIS—CLASSIFICATIONS OF SUBSTANCES

COMPONENT	CAS #	CLASSIFICATION
Petroleum distillate (naphtha)	8002-05-9	B2
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Asphalt	8052-42-4	Not Listed
Butane	106-97-8	A, B1
Pentane	109-66-0	B2

Octane	111-65-9	B2, D2B
Nonane	111-84-2	B2, D2B
Heptane	142-82-5	B2, D2B
2-Methylbutane	78-78-4	B2
Isobutane	75-28-5	A, B1 (listed under Methyl-2 propane)
Hexane	110-54-3	B2, D2A, D2B
Decane	124-18-5	B3, D2B
Benzene	71-43-2	B2, D2A, D2B
Xylene	1330-20-7	B2, D2A, D2B
Toluene	108-88-3	B2, D2A, D2B
Ethylbenzene	100-41-4	B2, D2A, D2B
1,2,4-Trimethylbenzene	95-63-6	B3
Hydrogen Sulfide	7783-06-4	A, B1, D1A, D2B

X= The component is listed

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR FRESHWATER AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	90 µg/L
Toluene	108-88-3	2.0 µg/L
Benzene	71-43-2	370 µg/L

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR MARINE AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	25 µg/L
Toluene	108-88-3	215 µg/L
Benzene	71-43-2	110 µg/L

CANADA—ENVIRONMENTAL EMERGENCIES

COMPONENT	CAS #	LISTED
Petroleum distillate (naphtha)	8002-05-9	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Asphalt	8052-42-4	Not Listed
Butane	106-97-8	X
Pentane	109-66-0	X

Octane	111-65-9	Not Listed
Nonane	111-84-2	Not Listed
Heptane	142-82-5	Not Listed
2-Methylbutane	78-78-4	X
Isobutane	75-28-5	X
Hexane	110-54-3	Not Listed
Decane	124-18-5	Not Listed
Benzene	71-43-2	X
Xylene	1330-20-7	X
Toluene	108-88-3	X
Ethylbenzene	100-41-4	X
1,2,4-Trimethylbenzene	95-63-6	Not Listed
Hydrogen Sulfide	7783-06-4	X

X= The component is listed

Section 16: Other Information

NFPA



Health Hazard: 2	**Flammability:** 4	**Instability:** 0	**Physical and Chemical Hazards:** X

HMIS	**Health Hazard:** 2	**Flammability:** 4	**Instability:** 0	**Personal Protection:** X

ISSUING DATE 5/4/15

REVISION DATE 5/4/15

DISCLAIMER

- The information presented herein is based on data considered to be accurate as of the date of preparation of this Safety Data Sheet (SDS). However, SDSs 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

Safety Data Sheet

Section 1: Identification

PRODUCT IDENTIFIER	Petroleum Crude Oil—Light Synthetic	
OTHER MEANS OF IDENTIFICATION	**UN-Number**	UN1268
	Synonyms	Premium Synthetic (PSY), Hardisty Synthetic Crude (HSC), Synthetic Sweet Blend (SYN).
	Chemical Category	Crude oils—extremely flammable
RECOMMENDED USE	No information available	
RESTRICTIONS OF USE	No information available	
SUPPLIER INFORMATION	Enbridge Pipelines Inc. 10201 Jasper Avenue Edmonton, Alberta T5J 3N7 Canada TEL: 1-780-420-5210	
EMERGENCY CONTACT INFORMATION	**CHEMTREC**	1-800-424-9300 for US 703- 527- 3887 outside US
	CANUTEC (Canadian Transportation)	613-996-6666

Section 2: Hazards Identification

CLASSIFICATION

Skin Irritation	Category 2
Eye Irritation	Category 2
Germ Cell Mutagenicity	Category 1B
Carcinogenicity	Category 1A
Reproductive Toxicity	Category 2
Specific Target Organ Systemic Toxicity (Single Exposure)	Category 3
Specific Target Organ Toxicity (Repeated Exposure)	Category 1
Aspiration Toxicity	Category 1
Flammable liquids	Category 1

LABEL ELEMENTS

Signal Word

Danger

Hazard Pictograms



Hazard Statements

- Causes skin irritation.
- Causes serious eye irritation.
- May cause genetic defects.
- May cause cancer.
- Suspected of damaging fertility or the unborn child.
- May cause respiratory irritation.
- Causes damage to organs through prolonged or repeated exposure.
- May be fatal if swallowed and enters airways.
- Extremely flammable liquid and vapor.
- May cause drowsiness or dizziness.

PRECAUTIONARY STATEMENTS

Prevention

- Wash face, hands and any exposed skin thoroughly after handling.
- Wear protective gloves/protective clothing/eye protection/face protection.
- Obtain special instructions before use.
- Do not handle until all safety precautions have been read and understood.
- Use personal protective equipment as required.
- Do not breathe dust/fume/gas/mist/vapors/spray.
- Use only outdoors or in a well-ventilated area.
- Do not eat, drink or smoke when using this product.
- Keep away from heat/sparks/open flames/hot surfaces.
- Keep container tightly closed.
- No smoking.
- Ground/bond container and receiving equipment.
- Use explosion-proof electrical/ventilating/lighting/equipment.
- Use only non-sparking tools.
- Take precautionary measures against static discharge.
- In case of inadequate ventilation wear respiratory protection.

Response

- IF EXPOSED or concerned: Get medical advice/attention.
- IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
- Call a POISON CENTER or doctor/physician if you feel unwell.
- IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
- Do NOT induce vomiting.
- IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower and soap.
- In case of fire: Use CO_2, dry chemical, or foam for extinction.
- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- If SKIN irritation occurs: Get medical advice/attention.
- If EYE irritation persists: Get medical advice/attention.

Storage/Disposal

- Store locked up and keep cool.
- Store in a well-ventilated place. Keep container tightly closed.
- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

OTHER INFORMATION

- Under United States Regulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered hazardous.
- Very toxic to aquatic life with long lasting effects.

Section 3: Composition/Information on Ingredients

COMPONENT NAME	CAS NUMBER	PERCENTAGE (%)*	NOTES
1,2,4-Trimethylbenzene	95-63-6	0-5	
Benzene	71-43-2	0-5	
Butane	106-97-8	0-5	
Cyclohexane	110-82-7	0-5	
Decane	124-18-5	0-10	
Distillates (petroleum), hydrotreated middle	64742-46-7	0-60	
Ethylbenzene	100-41-4	0-5	
Fuels, diesel, No. 2	68476-34-6	0-30	
Gas Oils, Petroleum, Hydrodesulfurized	64742-79-6	0-100	
Heptane	142-82-5	0-7	
Hexane	110-54-3	0-7	
Methylcyclohexane	108-87-2	0-7	
Naphtha (petroleum), hydrotreated light	64742-49-0	0-7	
Naphtha, (petroleum), heavy, hydrotreated	64742-48-9	0-60	
Octane	111-65-9	0-7	
o-Xylene	95-47-6	0-5	
Petroleum distillate (naphtha)	8002-05-9	0-100	
Toluene	108-88-3	0-5	
Xylene	1330-20-7	0-5	

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

Section 4: First Aid Measures

DESCRIPTION OF NECESSARY MEASURES

Inhalation	• IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If irritation persists: Get medical advice/attention.
Skin	• IF ON SKIN: Wash with plenty of soap and water. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse.
Eye	• IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.
Ingestion	• Do NOT induce vomiting. Call a physician or poison control center. • Aspiration hazard if swallowed—can enter lungs and cause damage.

MOST IMPORTANT SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED

Refer to Section 11 - Toxicological Information

INDICATION OF IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED, IF NECESSARY

Note to the Physician

- Aspiration hazard. Symptoms may be delayed.
- 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.
- Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.

Section 5: Fire Fighting Measures

EXTINGUISHING MEDIA

Suitable Extinguishing Media	• SMALL FIRES: Dry chemical, CO_2, water spray or regular foam. • LARGE FIRE: Water spray, fog or regular foam.
Unsuitable Extinguishing Media	• CAUTION: Use of water spray when fighting fire may be inefficient. • Do not use straight streams.

FIREFIGHTING PROCEDURES

- FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: If impossible to extinguish, protect surroundings and allow fire to burn itself out.
- Stay upwind.
- Ventilate closed spaces before entering.
- Fire fighters should wear complete protective clothing including self-contained breathing apparatus.
- FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions.
- FIRE: When a large quantity of this material is involved in a major fire, consider an initial evacuation distance of 300 meters (1000 feet) in all directions.
- Move containers from fire area if you can do it without risk.

- LARGE FIRES: Use water spray or fog; do not use straight streams.
- LARGE FIRES: If insufficient water supply: knock down vapors only. If this is impossible, withdraw from area and let fire burn.
- LARGE FIRES: Flood fire area with large quantities of water, while knocking down vapors with water fog.

SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OR MIXTURE

- Vapors may travel to source of ignition and flash back.
- Air/vapor mixtures may explode when ignited.
- Vapors may accumulate in confined areas (basement, tanks, hopper/tank cars etc.).
- Will be easily ignited by heat, sparks or flames.
- Runoff to sewer may create fire or explosion hazard.
- Vapor explosion hazard indoors, outdoors or in sewers.
- MAY EXPLODE AND THROW FRAGMENTS 1600 meters (1 MILE) OR MORE IF FIRE REACHES CARGO.
- May create vapor/air explosion hazard indoors, outdoors or in sewers.
- Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).

EXPLOSION DATA

Hazardous Combustion Products	• Carbon monoxide. Carbon dioxide (CO_2). Nitrogen oxides (NOx). Oxides of sulfur. • Aldehydes, aromatic and other hydrocarbons.
Sensitivity to Mechanical Impact	• None.
Sensitivity to Static Discharge	• Yes.

PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIREFIGHTERS

- As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.
- 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 firefighters.
- Carbon dioxide can displace oxygen.
- Use caution when applying carbon dioxide in confined spaces.
- Water spray may be useful in minimizing or dispersing vapors.
- Long-duration fires involving diluent stored in tanks may result in a boilover.
- For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear.

Section 6: Accidental Release Measures

PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

Personal Precautions	• Evacuate personnel to safe areas. • Remove all sources of ignition. • Deny entry to unauthorized and unprotected personnel. • Use personal protective equipment. • Avoid contact with skin, eyes and clothing. • Stop leak if you can do it without risk. • Keep people away from and upwind of spill/leak. • Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. • Ventilate enclosed areas. • Do not walk through spilled material.
Protective Equipment	• Wear appropriate breathing apparatus (if applicable) and protective clothing.

	Emergency Procedures	• ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area) Keep unauthorized personnel away. Evacuate area. Keep out of low areas. Stop leak if you can do it without risk. • Report spills to local or federal authorities as appropriate or required.
ENVIRONMENTAL PRECAUTIONS	• Avoid run off to waterways and sewers. Do NOT wash away into sewer. Prevent entry into waterways, sewers, basements or confined areas. Runoff from fire control may cause pollution.	
METHODS AND MATERIAL FOR CONTAINMENT AND CLEANING UP	**Methods for Containment**	• Stop leak if you can do it without risk. • Contain and recover liquid when possible. • A vapor suppressing foam may be used to reduce vapors. • Dike far ahead of spill; use dry sand to contain the flow of material; contain water spills by booming. • Use water spray to reduce vapors or divert vapor cloud drift. • A fine water spray remotely directed to the edge of the spill pool can be used to direct and maintain a hot flare fire which will burn the spilled material in a controlled manner.
	Methods for Cleaning Up	• Clean up spill immediately. • LARGE SPILLS: DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST. • SMALL LIQUID SPILLS: Use a non-combustible material like vermiculite or sand to soak up the product and place into a container for later disposal. • Use appropriate Personal Protective Equipment (PPE). • Use clean non-sparking tools to collect absorbed material. • Vacuum spilled material. • Try to work upwind of spill. • All equipment used when handling the product must be grounded. • Recover and return free product to proper containers • Use suitable absorbent materials such as vermiculite, sands, soil, or clay to clean up residual liquids. • Do not place spilled materials back in the original container. • Do not flush to sewer or allow to enter waterways.

Section 7: Handling and Storage

PRECAUTIONS FOR SAFE HANDLING	**Handling**	• All equipment used when handling the product must be grounded. Avoid contact with heat and ignition sources and oxidizers. Do not breathe (dust, vapor or spray mist). Do not use in areas without adequate ventilation. Do not use sparking tools. Keep away from heat, sparks, and flame. No open flames, no sparks and no smoking. Use only with adequate ventilation. Do not use or store near heat or open flame. Keep away from fire, sparks and heated surfaces. • The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes). • The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits. • Take precautionary measures against static discharges. • Do not cut drill, grind or weld on empty containers since they may contain explosive residues. • Stay upwind and vent open hatches before uploading. • Avoid contact with skin, eyes and clothing. • Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water.

Handling	• Wear personal protective equipment. • Remove and wash contaminated clothing before re-use. • Do not eat, drink or smoke when using this product. • Do not take internally. • Wash thoroughly after handling. • Empty containers pose a potential fire and explosion hazard.
Storage	• Ventilate enclosed areas. • Store in a well-ventilated place. • Keep container tightly closed. • Store locked up. • Avoid shock, impact, friction, and rough handling. Do not use sparking tools. • Store in a cool/low-temperature, well-ventilated place away from heat and ignition sources. • Keep away from sources of ignition. • No Smoking. • Do not enter confined spaces such as tanks or pits without following proper entry procedures. • Store in properly closed containers that are appropriately labeled and in a cool well-ventilated area. • Harmful concentrations of hydrogen sulfide (H_2S) gas can accumulate in excavations and low-lying areas as well as the vapor space of storage and bulk transport compartments. • Keep away from open flames, hot surfaces and sources of ignition. • Keep product and empty container away from heat and sources of ignition. • Storage containers should be grounded and bonded. • Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge. • Store away from incompatible materials.
Incompatible Products	• Strong oxidizers such as nitrates, chlorates, peroxides, chlorine.

CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES

Section 8: Exposure Controls/Personal Protection

CONTROL PARAMETERS: EXPOSURE GUIDELINES

CHEMICAL NAME	ACGIH	OSHA	NIOSH
1,2,4-Trimethylbenzene	–	–	TWA 25 ppm TWA 125 mg/m^3
Benzene	TLV 0.5 ppm TLV 1.6 mg/m^3 STEL 2.5 ppm STEL 8 mg/m^3	PEL 1 ppm STEL 5 ppm	TWA 0.1 ppm STEL 1 ppm IDLH 500 ppm
Butane	STEL 1000 ppm	–	TWA 800 ppm TWA 1900 mg/m^3
Cyclohexane	TLV 100 ppm TLV 334 mg/m^3	PEL 300 ppm PEL 1050 mg/m^3	TWA 300 ppm TWA 1050 mg/m^3 IDLH 1300 ppm

Ethylbenzene	TLV 20 ppm TLV 87 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 125 ppm STEL 545 mg/m^3 IDLH 800 ppm
Fuels, diesel, No. 2	TLV 100 mg/m^3	–	–
Heptane	TLV 400 ppm TLV 1640 mg/m^3 STEL 500 ppm STEL 2000 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 85 ppm TWA 350 mg/m^3 Ceiling 440 ppm Ceiling 1800 mg/m^3 IDLH 750 ppm
Hexane	TLV 50 ppm TLV 176 mg/m^3	PEL 500 ppm PEL 1800 mg/m^3	TWA 50 ppm TWA 180 mg/m^3 IDLH 1100 ppm
Methylcyclohexane	TLV 400 ppm TLV 1610 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 400 ppm TWA 1600 mg/m^3 IDLH 1200 ppm
Octane	TLV 300 ppm TLV 1401 mg/m^3	PEL 500 ppm PEL 2350 mg/m^3	TWA 75 ppm TWA 350 mg/m^3 Ceiling 385 ppm Ceiling 1800 mg/m^3 IDLH 1000 ppm
o-Xylene	TLV 100 ppm STEL 150 ppm	–	TLV 100 ppm STEL 150 ppm
Petroleum distillate (naptha)	–	–	TWA 350 mg/m^3 Ceiling 1800 mg/m^3
Toluene	TLV 20 ppm TLV 75 mg/m^3	PEL 200 ppm STEL 300 mg/m^3	TWA 100 ppm TWA 375 mg/m^3 STEL 150 ppm STEL 560 mg/m^3 IDLH 500 ppm
Xylenes	TLV 100 ppm TLV 434 mg/m^3 STEL 150 ppm STEL 651 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 150 ppm STEL 655 mg/m^3 IDLH 900 ppm

APPROPRIATE ENGINEERING CONTROLS

- Adequate ventilation systems as needed to control concentrations of airborne contaminants below applicable threshold limit values. Prevent vapor build up by providing adequate ventilation during and after use. Use only appropriately classified electrical equipment.

INDIVIDUAL PROTECTION MEASURES	**Eye and Face**	• Wear face shield and eye protection.
	Skin and Body	• The use of gloves (nitrile or neoprene) is advised to prevent skin contact and possible irritation. • Wear protective gloves/protective clothing/eye protection/face protection. Wear long sleeves and/or protective coveralls.
	Respiratory	• Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or symptoms are experienced.
	General Hygiene Measures	• Handle in accordance with good industrial hygiene and safety practice.

Section 9: Physical and Chemical Properties

MATERIAL DESCRIPTION	**Physical State**	Liquid	**Odor**	Petroleum like odor
	Substance Type	Mixture	**Odor Threshold**	No data available
	Appearance	Yellow/green to Brown/black liquid		
PROPERTIES	**pH**	No data available	**Vapor pressure**	No data available
	Melting Point/ Freezing Point	No data available	**Vapor density**	No data available
	Boiling Point/ Boiling Range	-18 to 560°C -0.4 to 1040°F	**Relative density**	No data available
	Flash Point	>-35 °C >-31 °F	**Water Solubility**	Negligible
	Evaporation Rate	No data available	**Partition coefficient: n-octanol/water**	No data available
	Flammability (solid, gas)	No data available	**Decomposition temperature**	No data available
	Upper Flammability Limit	No data available	**Specific Gravity**	No data available
	Lower Flammability Limit	No data available		
	Viscosity	No data available		

Section 10: Stability and Reactivity

REACTIVITY	Chlorine Dioxide
CHEMICAL STABILITY	Stable at 70 °F, 760 mm Hg pressure

POSSIBILITY OF HAZARDOUS REACTIONS	None under normal processing
CONDITIONS TO AVOID	Excessive heat, sources of ignition, sparks, open flames, and buildup of static electricity
INCOMPATIBLE MATERIALS	Strong oxidizers such as nitrates, chlorates, peroxides, chlorine
HAZARDOUS DECOMPOSITION PRODUCTS	Combustion produces carbon monoxide, aldehydes, sulfur dioxide, aromatic and other hydrocarbons
HAZARDOUS POLYMERIZATION	Will not occur

Section 11: Toxicological Information

INFORMATION ON THE LIKELY ROUTES OF EXPOSURE

Inhalation	• May cause irritation of respiratory tract. May cause drowsiness and dizziness.
Eye Contact	• Causes serious eye irritation.
Skin Contact	• Causes skin irritation.
Ingestion	• Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. • Potential for aspiration if swallowed. • Aspiration may cause pulmonary edema and pneumonitis.

TOXICOLOGICAL DATA

CHEMICAL NAME	LD50 ORAL	LD50 DERMAL	LC50 INHALATION
1,2,4-Trimethylbenzene	5 g/kg (Rat)	–	18000 mg/m^3 (Rat) 4h
Benzene	=1800 mg/kg (Rat)	–	13050 - 14380 ppm (Rat) 4 h
Butane	–	–	658 mg/L (Rat) 4 h
Cyclohexane	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	= 13.9 mg/L (Rat) 4 h
Decane	–	–	>1369 ppm (Rat) h h 72300 mg/m^3 (Rat) 2 h
Ethylbenzene	= 3500 mg/kg (Rat)	= 15400 mg/kg (Rabbit)	= 17.2 mg/L (Rat) 4 h
Heptane	–	= 3000 mg/kg (Rabbit)	= 103 g/m^3 (Rat) 4 h
Hexane	= 25 g/kg (Rat)	= 3000 mg/kg (Rabbit)	= 48000 ppm (Rat) 4 h
Methylcyclohexane	> 3200 mg/kg (Rat)	–	–
Naphtha, (petroleum), heavy, hydrotreated	= >6 g/kg (Rat)	–	= 8500 mg/m^3 (Rat)
Octane	–	–	= 118 g/m^3 (Rat) 4 h = 25260 ppm (Rat) 4 h
o-Xylene	= 3910 mg/kg (Rat)	–	–
Toluene	2.6 to 7.5 g/kg (Rat)	14.1 ml/kg (Rabbit)	–

Xylenes	= 3500 mg/kg (Rat)	> 4350 mg/kg (Rabbit) > 1700 mg/kg (Rabbit)	= 29.08 mg/L (Rat) 4 h = 5000 ppm (Rat) 4 h

SYMPTOMS RELATED TO THE PHYSICAL, CHEMICAL AND TOXICOLOGICAL CHARACTERISTICS

Benzene	• Repeated or prolonged exposure to benzene at concentrations in excess of the TLV may cause serious injury to blood-forming organs. Significant chronic exposure to benzene vapor has been reported to produce various blood disorders ranging from anemia to certain forms of leukemia (cancer) in humans. Benzene produced tumors in rats and mice in lifetime chronic toxicity studies, but the response has not been consistent across species, strain, sex or route of exposure. Animal studies on benzene have demonstrated immune toxicity, chromosomal aberrations, testicular effects and alterations in reproductive cycles and embryo/fetotoxicity, but not teratogenicity.
Hexane	• This product may contain hexane at a level of >1.0%. Studies in laboratory animals have produced systemic toxicity in blood, spleen and lungs. Fetotoxicity has been observed at hexane concentrations that produced maternal toxicity. Long term exposure to high concentrations of hexane has been shown to cause testicular effects and nervous system damage.
Xylenes	• Gross overexposure or severe poisoning incidents in humans to xylenes has been reported to cause lung, liver, kidney, heart and brain damage as well as neurologic disturbances. Laboratory animals exposed to high dose of xylenes showed evidence of effects in the liver, kidneys, lungs, spleen, heart and adrenals, Exposure of pregnant rats, mice and rabbits during gestation to significant concentrations of xylenes produced maternal, fetal and developmental toxicity (skeletal retardation, cleft palate, and wavy ribs) generally at maternally toxic doses. These types of fetotoxic effects have been associated with maternal toxicity. Repeated inhalation of high xylene concentrations has shown impairment of performance abilities (behavioral tests) in animals and man. Xylenes produced a mild frequency hearing loss in rats subchronically exposed to high concentrations of xylenes.
Toluene	**Carcinogenicity:** Exposure of rats and mice to toluene at concentrations ranging from 120-1200 ppm for two years did not demonstrate evidence of carcinogenicity. Toluene has not been listed as a carcinogen by IARC. **Target Organs:** Epidemiology studies suggest that chronic occupational overexposure to toluene may damage color vision. Subchronic and chronic inhalation studies with toluene produced kidney and liver damage, hearing loss and central nervous system (brain) damage in laboratory animals. Intentional misuse by deliberate inhalation of high concentrations of toluene has been shown to cause liver, kidney, and central nervous system damage, including hearing loss and visual disturbances. **Reproductive Toxicity:** Exposure to toluene during pregnancy has demonstrated limited evidence of developmental toxicity in laboratory animals. Decreased fetal body weight and increased skeletal variations in both inhalation and oral studies, but only at doses that were maternally toxic. No fetal toxicity was seen at doses that were not maternally toxic. Decreased sperm counts have been observed in male rats in the absence of a reduction in fertility. Toluene has been reported to cause mental or growth retardation in the children of solvent abusers who directly inhale toluene during pregnancy.
Ethylbenzene	**Carcinogenicity:** Rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study demonstrated limited evidence of kidney, liver, and lung cancer. Ethyl benzene has been listed as a possible human carcinogen by IARC. **Target Organs:** In rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study there was mild damage to the kidney (tubular hyperplasia), liver (eosinophilio foci, hypertrophy, necrosis), lung (alveolar epithelium metaplasia), thyroid (hyperplasia), thyroid (hyperplasia) and pituitary (hyperplasia). In animal models (particularly rats), ethyl benzene affects the auditory function mainly in the cochlear mid-frequency range and ototoxicity was observed after combined exposure to noise and ethyl benzene. There is no evidence of either ethyl benzene-induced hearing losses or ototoxicity with combined exposure to ethyl benzene and noise in workers.

DELAYED AND IMMEDIATE EFFECTS AND ALSO CHRONIC EFFECTS FROM SHORT- AND LONG-TERM EXPOSURE

Sensitization	• No information available
Mutagenic Effects	• May cause genetic defects
Carcinogenicity	• May cause cancer

CARCINOGENIC INFORMATION

CHEMICAL NAME	ACGIH	ACGIH SKIN*	IARC	NTP	OSHA
Benzene	A1	X	Group 1	Known	X
Fuels, diesel, No. 2	A3	X	–	–	–
Ethylbenzene	A3	–	Group 2B	Evidence	X
Hexane	–	X	–	–	–
Petroleum distillate (naphtha)	–	–	Group 3	–	–
Toluene	A4	–	Group 3	Evidence	–
o-Xylene	A4	–	Group 3	Evidence	–
Xylenes	A4	–	Group 3	Evidence	–

**ACGIH Skin designation refers to the potential significant contribution of overall exposure by cutaneous route, including mucous membranes and eyes, from airborne exposure to gases, vapor, or liquid OR by direct skin contact.*

REPRODUCTIVE TOXICITY

• Suspected of damaging fertility or the unborn child.

STOT—SINGLE EXPOSURE

• May cause drowsiness and dizziness.

STOT—REPEATED EXPOSURE

• Causes damage to organs through prolonged or repeated exposure.

ASPIRATION HAZARD

May be fatal if swallowed and enters airways Risk of serious damage to the lungs (by aspiration).

Section 12: Ecological Information

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
1,2,4-Trimethylbenzene	–	LC50 96 h: 7.72 mg/L (Pimephales promelas)	EC50 48h: 30 mmol/cu (Daphnia magna)	LC50 24h: 100 mmol/cu Artemia salina (Brine Shrimp)

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Benzene	EC50 72 h: = 29 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 10.7 - 14.7 mg/L flow-through (Pimephales promelas) LC50 96 h: = 5.3 mg/L flow-through (Oncorhynchus mykiss) LC50 96 h: = 22.49 mg/L static (Lepomis macrochirus) LC50 96 h: = 28.6 mg/L static (Poecilia reticulata) LC50 96 h: 22330 - 41160 µg/L static (Pimephales promelas) LC50 96 h: 70000 - 142000 µg/L static (Lepomis macrochirus)	EC50 48 h: 8.76 - 15.6 mg/L Static (Daphnia magna) EC50 48 h: = 10 mg/L (Daphnia magna)	–
Cyclohexane	EC50 72 h: > 500 mg/L (Desmodesmus subspicatus)	LC50 96 h: 3.96 - 5.18 mg/L flow-through (Pimephales promelas) LC50 96 h: 23.03 - 42.07 mg/L static (Pimephales promelas) LC50 96 h: 24.99 - 44.69 mg/L static (Lepomis macrochirus) LC50 96 h: 48.87 - 68.76 mg/L static (Poecilia reticulata)	EC50 24 h: > 400 mg/L (Daphnia magna	EC50 = 85.5 mg/L 5 min EC50 = 93 mg/L 10 min (Microorganisms)
Decane	EC50 24 h: = 0.043 mg/L (Chlorella vulgaris)	–	EC50 48 h: >90-280 mg/L (Daphnia magna)	–
Distillates (petroleum), hydrotreated middle	–	LC50 96h : 35 mg/L (Pimephales promelas) LC50 96h: >10000 mg/L (Pimephales promelas)	–	–
Ethylbenzene	EC50 72 h: = 4.6 mg/L (Pseudokirchneriella subcapitata) EC50 96 h: > 438 mg/L (Pseudokirchneriella subcapitata) EC50 72 h: 2.6 - 11.3 mg/L static (Pseudokirchneriella subcapitata) EC50 96 h: 1.7 - 7.6 mg/L static (Pseudokirchneriella subcapitata) EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 11.0 - 18.0 mg/L static (Oncorhynchus mykiss) LC50 96 h: = 4.2 mg/L semi-static (Oncorhynchus mykiss) LC50 96 h: 7.55 - 11 mg/L flow-through (Pimephales promelas) LC50 96 h: = 32 mg/L static (Lepomis macrochirus) LC50 96 h: 9.1 - 15.6 mg/L static (Pimephales promelas) LC50 96 h: = 9.6 mg/L static (Poecilia reticulata)	EC50 48 h: 1.8 - 2.4 mg/L (Daphnia magna)	EC50 = 9.68 mg/L 30 min EC50 = 96mg/L 24 h (Microorganisms)
Fuels, diesel, No. 2	–	LC50 96 h: = 35 mg/L (Pimephales promelas)	–	–
Gas Oils, Petroleum, Hydrodesulfurized	LC50 96 h: = 35 mg/L (Pimephales promelas)	–	LC50 96 h: < 1.00 ppm (Diatomus forbesi)	–
Heptane	–	LC50 96 h: = 375.0 mg/L (Cichlid fish)	EC50 24 h: > 10 mg/L (Daphnia magna)	–

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Hexane	–	LC50 96 h: 2.1 - 2.98 mg/L flow-through (Pimephales promelas)	EC50 24 h: > 1000 mg/L (Daphnia magna)	–
Methylcyclohexane	–	LC50 96hr: 72.0 mg/l (Golden Shiner)	–	–
Naphtha (petroleum), hydrotreated light	–	–	LC50 96 h: = 2.6 mg/L (Chaetogammarus marinus)	–
Naphtha, (petroleum), heavy, hydrotreated	–	LC50 96 h: = 2200 mg/L (Pimephales promelas)	LC50 96 h: = 2.6 mg/L (Chaetogammarus marinus)	–
Octane	–	–	EC50 48 h: = 0.38 mg/L (water flea) EC50 48 h: = 0.02856 mg/L (Daphnia magna)	EC50 = 890 mg/L 30 min (Microorganisms) EC50 <1.67hr: 120 µg/l Mytilus edulis (Common Bay Mussel)
o-Xylene	EC50 24 h: = 55000 ug/L (Chlorella vulgaris)	–	–	LC50 96h: 1.3 ppm Crangon franciscorum (Shrimp)
Petroleum distillate (naphtha)	–	LC50: 258 mg/L Salmo gairdneri 96 h static	EC50 48 h: < 0.26 mg/L Static (Daphnia magna) EC50 24 h: = 36 mg/L (Daphnia magna)	–
Toluene	EC50: >433 mg/L Pseudokirchneriella subcapitata 96 h EC50: 12.5 mg/L Pseudokirchneriella subcapitata 72 h static	LC50: 15.22 - 19.05 mg/L Pimephales promelas 96 h flow-through LC50: 12.6 mg/L Pimephales promelas 96 h static LC50: 5.89 - 7.81 mg/L Oncorhynchus mykiss 96 h flow-through LC50: 14.1 - 17.16 mg/L Oncorhynchus mykiss 96 h static LC50: 5.8 mg/L Oncorhynchus mykiss 96 h semi-static LC50: 11.0-15.0 mg/L Lepomis macrochirus 96 h static LC50: 54 mg/L Oryzias latipes 96 h static LC50: 28.2 mg/L Poecilia reticulata 96 h semi-static LC50: 50.87-70.34 mg/L Poecilia reticulata 96 h static	EC50 48 h: 5.46 - 9.83 mg/L Static (Daphnia magna) EC50 48 h: = 11.5 mg/L (Daphnia magna)	EC50 = 19.7 mg/L 30 min (Microorganisms)

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Xylenes	EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: = 13.4 mg/L flow-through (Pimephales promelas) LC50 96 h: 2.661 - 4.093 mg/L static (Oncorhynchus mykiss) LC50 96 h: 13.5 - 17.3 mg/L (Oncorhynchus mykiss) LC50 96 h: 13.1 - 16.5 mg/L flow-through (Lepomis macrochirus)	EC50 48 h: = 3.82 mg/L (water flea) LC50 48 h: = 0.6 mg/L (Gammarus lacustris)	–

PERSISTENCE AND DEGRADABILITY

- No information available

BIOACCUMULATIVE POTENTIAL

CHEMICAL	LOG POW
1,2,4-Trimethylbenzene	3.78
Benzene	1.83
Butane	2.89
Cyclohexane	3.44
Decane	5.1
Ethylbenzene	3.118
Heptane	4.66
Hexane	3.90
Methylcyclohexane	3.61
Octane	5.18
o-Xylene	3.12
Toluene	2.65
Xylene	2.77-3.15

MOBILITY IN SOIL

CHEMICAL	EXPECTED SOIL MOBILITY
1,2,4-Trimethylbenzene	Low
Benzene	High
Butane	Low
Cyclohexane	Moderate
Decane	Immobile
Ethylbenzene	Low
Heptane	Moderate
Hexane	High

Octane	Immobile
o-Xylene	Very High to Moderate
Petroleum distillate (naptha)	High
Toluene	High to Moderate
Xylene	Very High to Moderate

OTHER ADVERSE EFFECTS

- No information available

Section 13: Disposal Considerations

WASTE TREATMENT METHODS

Product Waste	• This product, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA RCRA (40 CFR 261), Environment Canada, or other State, Provincial, and local regulations. If this product is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility. • This product could also contain benzene at >0.5 ppm and could exhibit the characteristic of "toxicity" (D018) as determined by the toxicity characteristic leaching procedure (TCLP). • This material could become a hazardous waste if mixed or contaminated with a hazardous waste or other substance(s). • It is the responsibility of the user to consult federal, state and local waste regulations to determine appropriate disposal options.
Packaging Waste	• Container contents should be completely used and containers should be emptied prior to discard. • Container 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 re-conditioner. • To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

Section 14: Transport Information

****CHART NAME****

	UN NUMBER	PROPER SHIPPING NAME	TRANSPORT HAZARD CLASS	PACKING GROUP	ENVIRONMENTAL HAZARD
DOT	UN1268	Petroleum Distillate, N.O.S.	3	I	Emergency response guide number: 128
TDG	UN1268	Petroleum Distillate, N.O.S.	3	I	–
IMO/IMDG	UN1268	Petroleum Distillate, N.O.S.	3	I	EmS No. F-E, S-E
IATA/ICAO	UN1268	Petroleum Distillate, N.O.S.	3	I	ERG Code 3L

SPECIAL RECAUTIONS FOR USER

- None

Section 15: Regulatory Information

U.S.—CERCLA/SARA HAZARDOUS SUBSTANCES AND THEIR REPORTABLE QUANTITIES

COMPONENT	CAS #	AMOUNT
1,2,4-Trimethylbenzene	95-63-6	Not Listed
Benzene	71-43-2	10 lb final RQ; 4.54 kg final RQ
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	1000 lb final RQ; 454 kg final RQ
Decane	124-18-5	Not Listed
Distillates (petroleum), hydrotreated middle	64742-46-7	Not Listed
Ethylbenzene	100-41-4	1000 lb final RQ; 454 kg final RQ
Fuels, diesel, No. 2	68476-34-6	Not Listed
Gas Oils, Petroleum, Hydrodesulfurized	64742-79-6	Not Listed
Heptane	142-82-5	Not Listed
Hexane	110-54-3	5000 lb final RQ; 2270 kg final RQ
Methylcyclohexane	108-87-2	Not Listed
Naphtha (petroleum), hydrotreated light	64742-49-0	Not Listed
Naphtha, (petroleum), heavy, hydrotreated	64742-48-9	Not Listed
Octane	111-65-9	Not Listed
o-Xylene	95-47-6	1000 lb final RQ; 454 kg final RQ
Petroleum distillate (naphtha)	8002-05-9	Not Listed
Toluene	108-88-3	1000 lb final RQ; 454 kg final RQ
Xylene	1330-20-7	100 lb final RQ; 45.4 kg final RQ

U.S.—CWA (CLEAN WATER ACT)—REPORTABLE QUANTITIES OF DESIGNATED HAZARDOUS SUBSTANCES

COMPONENT	CAS #	AMOUNT
1,2,4-Trimethylbenzene	95-63-6	Not Listed
Benzene	71-43-2	10 lb RQ
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	1000 lb RQ
Decane	124-18-5	Not Listed
Distillates (petroleum), hydrotreated middle	64742-46-7	Not Listed
Ethylbenzene	100-41-4	1000 lb RQ
Fuels, diesel, No. 2	68476-34-6	Not Listed
Gas Oils, Petroleum, Hydrodesulfurized	64742-79-6	Not Listed
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Naphtha (petroleum), hydrotreated light	64742-49-0	Not Listed
Naphtha, (petroleum), heavy, hydrotreated	64742-48-9	Not Listed
Octane	111-65-9	Not Listed
o-Xylene	95-47-6	Not Listed
Petroleum distillate (naphtha)	8002-05-9	Not Listed
Toluene	108-88-3	1000 lb RQ
Xylene	1330-20-7	100 lb RQ

U.S.—CWA (CLEAN WATER ACT)— HAZARDOUS SUBSTANCES

COMPONENT	CAS #	LISTED
1,2,4-Trimethylbenzene	95-63-6	Not Listed
Benzene	71-43-2	X
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	X
Decane	124-18-5	Not Listed
Distillates (petroleum), hydrotreated middle	64742-46-7	Not Listed

Ethylbenzene	100-41-4	X
Fuels, diesel, No. 2	68476-34-6	Not Listed
Gas Oils, Petroleum, Hydrodesulfurized	64742-79-6	Not Listed
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Naphtha (petroleum), hydrotreated light	64742-49-0	Not Listed
Naphtha, (petroleum), heavy, hydrotreated	64742-48-9	Not Listed
Octane	111-65-9	Not Listed
o-Xylene	95-47-6	X
Petroleum distillate (naphtha)	8002-05-9	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	X

X= The component is listed

U.S.—CWA (CLEAN WATER ACT)—PRIORITY POLLUTANTS

COMPONENT	CAS #	LISTED
1,2,4-Trimethylbenzene	95-63-6	Not Listed
Benzene	71-43-2	X
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	Not Listed
Decane	124-18-5	Not Listed
Distillates (petroleum), hydrotreated middle	64742-46-7	Not Listed
Ethylbenzene	100-41-4	X
Fuels, diesel, No. 2	68476-34-6	Not Listed
Gas Oils, Petroleum, Hydrodesulfurized	64742-79-6	Not Listed
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Methylcyclohexane	108-87-2	Not Listed

Naphtha (petroleum), hydrotreated light	64742-49-0	Not Listed
Naphtha, (petroleum), heavy, hydrotreated	64742-48-9	Not Listed
Octane	111-65-9	Not Listed
o-Xylene	95-47-6	Not Listed
Petroleum distillate (naphtha)	8002-05-9	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	Not Listed

X= The component is listed

CANADA-WHMIS—CLASSIFICATIONS OF SUBSTANCES

COMPONENT	CAS #	CLASSIFICATION
1,2,4-Trimethylbenzene	95-63-6	B3
Benzene	71-43-2	B2, D2A, D2B
Butane	106-97-8	A, B1
Cyclohexane	110-82-7	B2, D2B
Decane	124-18-5	B3, D2B
Distillates (petroleum), hydrotreated middle	64742-46-7	Uncontrolled product according to WHMIS classification criteria
Ethylbenzene	100-41-4	B2, D2A, D2B
Fuels, diesel, No. 2	68476-34-6	Not Listed
Gas Oils, Petroleum, Hydrodesulfurized	64742-79-6	Not Listed
Heptane	142-82-5	B2, D2B
Hexane	110-54-3	B2, D2A, D2B
Methylcyclohexane	108-87-2	B2
Naphtha (petroleum), hydrotreated light	64742-49-0	Not Listed
Naphtha, (petroleum), heavy, hydrotreated	64742-48-9	B3
Octane	111-65-9	B2, D2B
o-Xylene	95-47-6	B2, D2B

Petroleum distillate (naphtha)	8002-05-9	B2
Toluene	108-88-3	B2, D2A, D2B
Xylene	1330-20-7	B2, D2A, D2B

X= The component is listed

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR FRESHWATER AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	90 µg/L
Toluene	108-88-3	2.0 µg/L
Benzene	71-43-2	370 µg/L

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR MARINE AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	25 µg/L
Toluene	108-88-3	215 µg/L
Benzene	71-43-2	110 µg/L

CANADA—ENVIRONMENTAL EMERGENCIES

COMPONENT	CAS #	LISTED
1,2,4-Trimethylbenzene	95-63-6	Not Listed
Benzene	71-43-2	X
Butane	106-97-8	X
Cyclohexane	110-82-7	X
Decane	124-18-5	Not Listed
Distillates (petroleum), hydrotreated middle	64742-46-7	Not Listed
Ethylbenzene	100-41-4	X
Fuels, diesel, No. 2	68476-34-6	Not Listed
Gas Oils, Petroleum, Hydrodesulfurized	64742-79-6	Not Listed
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Naphtha (petroleum), hydrotreated light	64742-49-0	Not Listed
Naphtha, (petroleum), heavy, hydrotreated	64742-48-9	Not Listed

Octane	111-65-9	Not Listed
o-Xylene	95-47-6	Not Listed
Petroleum distillate (naphtha)	8002-05-9	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	X

X= The component is listed

Section 16: Other Information

NFPA



Health Hazard: 2	**Flammability:** 4	**Instability:** 0	**Physical and Chemical Hazards:** X

HMIS	**Health Hazard:** 2	**Flammability:** 4	**Instability:** 0	**Personal Protection:** X

ISSUING DATE 5/13/15

REVISION DATE 5/13/15

DISCLAIMER

- The information presented herein is based on data considered to be accurate as of the date of preparation of this Safety Data Sheet (SDS). However, SDSs 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.

Material Safety Data Sheet

Statoil Cheecham Blend

1. Product and Company Identification

Prepared on: 22-01-2014/ LBN

Use: Refinary Feed.
The product is a complex combination of hydrocarbons having carbon numbers predominantly in the range of C1 through C30 and boiling in the range of approximately 20℃ to >565℃. (Petroleum Crude, Diluted Bitumen, Blended Bitumen.)

Manufacturer/supplier:
Statoil
Leismer SE2-079-10-W4M Conklin, Alberta
T0A 2C0 Canada
Tel: Fax:
Emergency Phone: +1-877-5PSCNOW (+1-877-577-2669)
The emergency telephone is open 24 hours.

2. Composition/Information on Ingredients

CAS No.	Designation	LD50 / LC50 of Ingredient	w/w%
64741-56-6	Residues (petroleum) vacuum	N/A	35-50
68955-27-1	Distillates (petroleum), petroleum residues vacuum: Heavy Fuel oil	N/A	10-30
64742-49-0	Naphtha (petroleum), hydrotreated light: Low boiling point hydrogen treated naphtha	N/A	0-30
64741-47-5	Natural gas condensates (petroleum): Low boiling point naphtha-unspecified	N/A	0.05-30
64741-44-2	Distillates (petroleum), straight-run middle	N/A	7-15
64741-41-9	Naphtha (petroleum), heavy straight-run: Low boiling point naphtha	N/A	0.1-5
110-54-3	n-Hexane	LD50, oral, rat: 25000 mg/kg LC50, inhalation, rat: 48000 ppm	0-5
71-43-2	Benzene	LD50, oral, rat: 930 mg/kg LC50, inhalation, mouse: 9980 ppm	0.01-1
108-88-3	Toluene	LD50, oral, rat: 3500 mg/kg LC50, inhalation, rat: 4000 ppm/4h	0.01-1
100-41-4	Ethylbenzene	LD50, oral, rat: 3500 mg/kg LC50, inhalation, rat: 4000 ppm/4h	0.01-1
1330-20-7	Xylene	LD50, oral, mouse: 1590 mg/kg LC50, inhalation, rat: 6350 ppm/4h	0.01-1

3. Hazards Identification

Routes of Entry:
Inhalation, skin contact

Potential Health and Environmental effects:
Highly flammable. May cause cancer. May cause heritable genetic damage. Harmful: May cause lung damage if swallowed. Vapours may cause drowsiness and dizziness. Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

4. First Aid Measures

By inhalation:
Seek fresh air. Seek medical advice in case of persistent discomfort.

By ingestion:
Wash out mouth thoroughly and drink 1-2 glasses of water in small sips. Do not induce vomiting. If vomiting occurs, keep head low so that stomach contents do not enter lungs. Seek medical advice immediately.

By skin contact:
Remove contaminated clothing. Wash skin with soap and water. Seek medical advice in case of persistent discomfort.

By eye contact:
Flush with water (preferably using eye wash equipment) until irritation subsides. Seek medical advice if symptoms persist.

By burns:
Flush with water until pain ceases. Remove clothing that is not stuck to the skin - seek medical advice/transport to hospital. If possible, continue flushing until medical attention is obtained.

Other information:
When obtaining medical advice, show the safety data sheet or label. Symptoms: See section 11.

5. Firefighting Measures

Flammability	**If yes, under which conditions?**
Yes	Combustible liquid. Keep away from heat, sparks and flames.

Means of Extinction
Extinguish with powder, foam, carbon dioxide or water mist. Do not use water stream, as it may spread the fire. Use water or water mist to cool non-ignited stock. Move containers from danger area if it can be done without risk. Avoid inhalation of vapour and flue gases - seek fresh air.

Flashpoint (°C) and Method	**Upper Flammable Limit (% by volume)**	**Lower Flammable Limit (% by volume)**
-35 (PMCC)	N/A	N/A
Autoignition Temperature (°C)	**Explotion Data - Sensitivity to Impact**	**Explotion Data - Sensitivity to Static Discharge**
537	Not sensitive	Static spark may cause ignition

Hazardous Combustion Products
Nitrous gases, Carbon monoxide and Carbon dioxide.

6. Accidental Release Measures

Use the same personal protective equipment as stated in section 8. Smoking and open flames prohibited. Prevent spillage from entering drains and/or surface water. Contain and absorb spill with sand or other absorbent, non-flammable material and transfer to suitable waste containers. See section 13 for instructions on disposal. Notify proper authorities in case of contamination of soil or aquatic environment or discharge to drains.

7. Handling and Storage

Handling:
Smoking and open flames prohibited. See section 8 for information about precautions for use and personal protective equipment.

Storage:
Store safely, out of reach of children and away from food, animal feeding stuffs, medicines, etc. Do not store together with oxidizing agents. Keep in tightly closed original packaging. Do not expose to heat (e.g. sunlight).

8. Exposure Control/Personal Protection

Design of technical systems:
Work under effective process ventilation (e.g. local exhaust ventilation). Running water and eye wash equipment should be available. Smoking and open flames prohibited. Take precautionary measures against static discharges. Use spark-free tools and explosion proof equipment. Wash hands before breaks, before using restroom facilities, and at the end of work. Do not store, use and/or consume foods, beverages or tobacco products in the work room. Store personal protective equipment separately from other clothing.

Respiratory protection:
In case of insufficient ventilation, wear respiratory protective equipment. Use air-supplying respiratory protective equipment as the product contains liquids with a low boiling point which are poorly adsorbed on charcoal filters.

Hand and body protection:
Wear protective gloves made of nitrile rubber.) Change gloves immediately if contaminated, and wash hands with soap and water.

Eye protection:
Wear safety goggles if there is a risk of eye splash.

Occupational exposure limits:

Substance	Exposure limit	Remarks
Ethylbenzene	TWA: 20 ppm	OHS (2B)
Xylenes	TWA: 100 ppm STEL: 150 ppm	OHS
Toluene	TWA: 20 ppm	OHS (R)
n-Hexane	TWA: 20 ppm	OHS(Skin)
Benzene	TWA: 0.5 ppm STEL: 2.5 ppm	OHS(Skin,,A1,1)

TWA: time-weighted average STEL: short-term exposure limit

Remarks:
1: Carcinogenic to humans
2B: Possibly carcinogenic to humans
A1: Confirmed human carcinogen
R: The substance has an adverse reproductive effect
Skin: possibility of significant uptake through the skin

Control methods:
Compliance with the stated occupational exposure limits may be checked by occupational hygiene measurements.

9. Physical and Chemical Properties

Appearance: Dark brown Liquid
Odor: Characteristic (rotten egg if hydrogen sulphide is present)
Odor threshold: N/A
Physical state: Liqiud
pH: N/A
Melting/freezing point: N/A
Boiling point: 20- >565°C
Flash point: -35°C
Evaporation rate: N/A
Flammability: N/A
Upper/lower flammability or explosive limits: N/A
Vapor pressure: 38.0 kPa
Vapor density: N/A
Specific gravity or relative density: 0.9286
Solubility: Negligible in water
Partition coefficient: n-octanol/water: < 1
Auto-ignition temperature: appr. 537°C
Decomposition temperature: N/A

10. Stability and Reactivity

Chemical Stability *Stable* Yes	**If no, under which conditions?**
Incompatibility with Other Substances Yes	**If yes, which ones?** Oxidizing agents
Reactivity, and Under What Conditions? N/A	
Hazardous Decomposition Products N/A	

11. Toxicological Information

Immediate effects

Inhalation:
The product releases organic solvent vapours which may cause lethargy and dizziness. At high concentrations, the vapours may cause headache and intoxication. Inhalation of vapours may cause irritation to the upper airways.

Ingestion:
May cause chemical pneumonia if ingested or vomited. Irritates mucous membranes in mouth and gastrointestinal tract.

Skin contact:
Degreases the skin. Long-term exposure may cause irritation and possible infection. Can be absorbed through the skin with the same symptoms as for inhalation.

Eye contact:
Temporary irritation.

Sensitisation:
Skin, respiratory: None.

Long-term effects

Cancer:
The product contains benzene and ethylbenzene which may cause cancer.

Risk of damage to reproduction, teratogenicity and embryotoxicity:
The product contains toluene, which is a suspected reproductive hazard.

Risk of damage to the central nervous system:
Prolonged or repeated inhalation of vapours may cause damage to the central nervous system.

Risk of damage to genes:
The product contains benzene and toluene which may cause heritable genetic damage.

Risk of irreversible damages:
Synergistic effects: None known.

12. Ecological Information

Avoid discharge to drain or surface water.

Ecotoxicity:
Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Mobility:
The product contains a substance which is insoluble in water, and it will consequently spread on water surfaces.

13. Disposal Considerations

Unusable material should be properly drummed. Consult local, provincial, and federal agencies for proper methods of disposal. Do not contaminate water supply when disposing of wastes or containers.

14. Transport Information

The product must be transported in accordance with national and/or international rules for transport of dangerous goods by road and sea according to TDG and IMDG.

PIN: 1267
TDG: UN 1267 ; PETROLEUM CRUDE OIL ; 3 ; I ;
IMDG: UN 1267 ; PETROLEUM CRUDE OIL ; 3 ; I

Label TDG: 3 Flash point: -35°C Label IMDG: 3 IMDG EmS.: F-E, S-E

15. Regulatory Information

WHMIS Symbol:





WHMIS Classification:
B2; D2A

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

16. Other Information

Restrictions in use:
None.

Training advise:
No special training is required, but a thorough knowledge of this safety data sheet should be a prerequisite condition.

Sources:
OHS Guidelines Part 5, Table of Exposure Limits for Chemical and Biological Substances, May 2013. Consult local authorities for acceptable exposure limits.

Other information:
This safety data sheet was prepared from information provided by the supplier about the product at the time of preparation (e.g. data sheets and the like).
N/A: Not available or not applicable.

Bureau Veritas HSE Denmark A/S Birkemosevej 7, DK-6000 Kolding T: +45 75508811, F: +45 75508810, E-mail: infohse@dk.bureauveritas.com, Web: www.hse.bureauveritas.dk (Made in Toxido®)

ENBRIDGE

Safety Data Sheet

Section 1: Identification

PRODUCT IDENTIFIER	Petroleum Crude Oil—Synbit	
OTHER MEANS OF IDENTIFICATION	**UN-Number**	UN1267
	Synonyms	Statoil Cheecham Synbit (SCS), Surmont Heavy Blend (SHB), Christina SynBit (CSB), MacKay River Heavy (MKH), Long Lake Heavy Synbit Blend (PSH)
	Chemical Category	Crude oils—extremely flammable
RECOMMENDED USE	No information available	
RESTRICTIONS OF USE	No information available	
SUPPLIER INFORMATION	Enbridge Pipelines Inc. 10201 Jasper Avenue Edmonton, Alberta T5J 3N7 Canada TEL: 1-780-420-5210	
EMERGENCY CONTACT INFORMATION	**CHEMTREC**	1-800-424-9300 for US 703- 527- 3887 outside US
	CANUTEC (Canadian Transportation)	613-996-6666

Section 2: Hazards Identification

CLASSIFICATION	
Skin Irritation	Category 2
Eye Irritation	Category 2
Germ Cell Mutagenicity	Category 1B
Carcinogenicity	Category 1A
Reproductive Toxicity	Category 2
Specific Target Organ Systemic Toxicity (Single Exposure)	Category 3
Specific Target Organ Toxicity (Repeated Exposure)	Category 1
Aspiration Toxicity	Category 1
Flammable liquids	Category 1

LABEL ELEMENTS

Signal Word

Danger

Hazard Pictograms



Hazard Statements

- Causes skin irritation.
- Causes serious eye irritation.
- May cause genetic defects.
- May cause cancer.
- Suspected of damaging fertility or the unborn child.
- May cause respiratory irritation.
- Causes damage to organs through prolonged or repeated exposure.
- May be fatal if swallowed and enters airways.
- Extremely flammable liquid and vapor.
- May cause drowsiness or dizziness.

PRECAUTIONARY STATEMENTS

Prevention

- Wash face, hands and any exposed skin thoroughly after handling.
- Wear protective gloves/protective clothing/eye protection/face protection.
- Obtain special instructions before use.
- Do not handle until all safety precautions have been read and understood.
- Use personal protective equipment as required.
- Do not breathe dust/fume/gas/mist/vapors/spray.
- Use only outdoors or in a well-ventilated area.
- Do not eat, drink or smoke when using this product.
- Keep away from heat/sparks/open flames/hot surfaces.
- Keep container tightly closed.
- No smoking.
- Ground/bond container and receiving equipment.
- Use explosion-proof electrical/ventilating/lighting/equipment.
- Use only non-sparking tools.
- Take precautionary measures against static discharge.
- In case of inadequate ventilation wear respiratory protection.

Response

- IF EXPOSED or concerned: Get medical advice/attention.
- IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
- Call a POISON CENTER or doctor/physician if you feel unwell.
- IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
- Do NOT induce vomiting.
- IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower and soap.
- In case of fire: Use CO_2, dry chemical, or foam for extinction.
- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- If SKIN irritation occurs: Get medical advice/attention.
- If EYE irritation persists: Get medical advice/attention.

Storage/Disposal

- Store locked up and keep cool.
- Store in a well-ventilated place. Keep container tightly closed.
- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

OTHER INFORMATION

- Under United States Regulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered hazardous.
- Very toxic to aquatic life with long lasting effects.

Section 3: Composition/Information on Ingredients

COMPONENT NAME	CAS NUMBER	PERCENTAGE (%)*	NOTES
1,2,4-Trimethylbenzene	95-63-6	0-1	
1-Propanethiol	107-03-9	0-1	
2-Butanethiol	513-53-1	0-1	
2-Propanethiol	75-33-2	0-1	
Benzene	71-43-2	0-1	
Bitumen	8052-42-4	0-80	
Butane	106-97-8	0-1.2	
Cyclohexane	110-82-7	0-1	
Distillates, petroleum, petroleum residues vacuum	68955-27-1	0-30	
Ethanethiol	75-08-1	0-1	
Ethylbenzene	100-41-4	0-5	
Fuels, diesel, No. 2	68476-34-6	0-15	
Gas oil, blend	64741-44-2	0-15	
Heavy straight-run (petroluem) naphtha	64741-41-9	0-5	
Heptane	142-82-5	0-2.5	
Hexane	110-54-3	0-5	
Hydrogen Sulfide	7783-06-4	0-0.1	
Methanethiol	74-93-1	0-1	
Methylcyclohexane	108-87-2	0-1	
Methylcyclopentane	96-37-7	0-1	
Naphtha (petroleum), hydrotreated light	64742-49-0	0-30	
Naphthalene	91-20-3	0-5	
Natural Gas Condensates (petroleum)	64741-47-5	0-30	
n-Butanethiol	109-79-5	0-1	
Octane	111-65-9	0-2.5	
Pentane	109-66-0	0-1.5	

COMPONENT NAME	CAS NUMBER	PERCENTAGE (%)*	NOTES
Petroleum	8002-05-9	0-60	
p-Xylene	106-42-3	0-1	
Residues (petroleum), vacuum	64741-56-6	0-50	
Sulfur	7704-34-9	0-3.5	
Toluene	108-88-3	0-1	
Xylene	1330-20-7	0-1	
Hydrocarbon Diluent	–	0-50	
Bitumen	128683-24-9	0-80	
Naphtha (oil sand), hydrotreated	128683-33-0	0-15	

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

Section 4: First Aid Measures

DESCRIPTION OF NECESSARY MEASURES

Inhalation

- IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If irritation persists: Get medical advice/attention.

Skin

- IF ON SKIN: Wash with plenty of soap and water. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse.

Eye

- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.

Ingestion

- Do NOT induce vomiting. Call a physician or poison control center.
- Aspiration hazard if swallowed—can enter lungs and cause damage.

MOST IMPORTANT SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED

Refer to Section 11 - Toxicological Information

INDICATION OF IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED, IF NECESSARY

Note to the Physician

- Aspiration hazard. Symptoms may be delayed.
- 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.
- Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.

Section 5: Fire Fighting Measures

EXTINGUISHING MEDIA

Suitable Extinguishing Media

- SMALL FIRES: Dry chemical, CO_2, water spray or regular foam.
- LARGE FIRE: Water spray, fog or regular foam.

Unsuitable Extinguishing Media

- CAUTION: Use of water spray when fighting fire may be inefficient.
- Do not use straight streams.

FIREFIGHTING PROCEDURES

- FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: If impossible to extinguish, protect surroundings and allow fire to burn itself out.
- Stay upwind.
- Ventilate closed spaces before entering.
- Fire fighters should wear complete protective clothing including self-contained breathing apparatus.
- FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions.
- FIRE: When a large quantity of this material is involved in a major fire, consider an initial evacuation distance of 300 meters (1000 feet) in all directions.
- Move containers from fire area if you can do it without risk.

- LARGE FIRES: Use water spray or fog; do not use straight streams.
- LARGE FIRES: If insufficient water supply: knock down vapors only. If this is impossible, withdraw from area and let fire burn.
- LARGE FIRES: Flood fire area with large quantities of water, while knocking down vapors with water fog.

SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OR MIXTURE

- Vapors may travel to source of ignition and flash back.
- Air/vapor mixtures may explode when ignited.
- Vapors may accumulate in confined areas (basement, tanks, hopper/tank cars etc.).
- Will be easily ignited by heat, sparks or flames.
- Runoff to sewer may create fire or explosion hazard.
- Vapor explosion hazard indoors, outdoors or in sewers.
- MAY EXPLODE AND THROW FRAGMENTS 1600 meters (1 MILE) OR MORE IF FIRE REACHES CARGO.
- May create vapor/air explosion hazard indoors, outdoors or in sewers.
- Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).

EXPLOSION DATA

Hazardous Combustion Products

- Carbon monoxide. Carbon dioxide (CO_2). Nitrogen oxides (NOx). Oxides of sulfur.
- Aldehydes, aromatic and other hydrocarbons.

Sensitivity to Mechanical Impact

- None.

Sensitivity to Static Discharge

- Yes.

PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIREFIGHTERS

- As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.
- 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 firefighters.
- Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces.
- Water spray may be useful in minimizing or dispersing vapors.
- Long-duration fires involving diluent stored in tanks may result in a boilover.
- For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear.

Section 6: Accidental Release Measures

PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

Personal Precautions

- Evacuate personnel to safe areas.
- Remove all sources of ignition.
- Deny entry to unauthorized and unprotected personnel.
- Use personal protective equipment.
- Avoid contact with skin, eyes and clothing.
- Stop leak if you can do it without risk.
- Keep people away from and upwind of spill/leak.
- Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
- Ventilate enclosed areas.
- Do not walk through spilled material.

Protective Equipment

- Wear appropriate breathing apparatus (if applicable) and protective clothing.

Emergency Procedures

- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area) Keep unauthorized personnel away. Evacuate area. Keep out of low areas. Stop leak if you can do it without risk.
- Report spills to local or federal authorities as appropriate or required.

ENVIRONMENTAL PRECAUTIONS

- Avoid run off to waterways and sewers. Do NOT wash away into sewer. Prevent entry into waterways, sewers, basements or confined areas. Runoff from fire control may cause pollution.

METHODS AND MATERIAL FOR CONTAINMENT AND CLEANING UP

Methods for Containment

- Stop leak if you can do it without risk.
- Contain and recover liquid when possible.
- A vapor suppressing foam may be used to reduce vapors.
- Dike far ahead of spill; use dry sand to contain the flow of material; contain water spills by booming.
- Use water spray to reduce vapors or divert vapor cloud drift.
- A fine water spray remotely directed to the edge of the spill pool can be used to direct and maintain a hot flare fire which will burn the spilled material in a controlled manner.

Methods for Cleaning Up	• Clean up spill immediately. • LARGE SPILLS: DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST. • SMALL LIQUID SPILLS: Use a non-combustible material like vermiculite or sand to soak up the product and place into a container for later disposal. • Use appropriate Personal Protective Equipment (PPE). • Use clean non-sparking tools to collect absorbed material. • Vacuum spilled material. • Try to work upwind of spill. • All equipment used when handling the product must be grounded. • Recover and return free product to proper containers • Use suitable absorbent materials such as vermiculite, sands, soil, or clay to clean up residual liquids. • Do not place spilled materials back in the original container. • Do not flush to sewer or allow to enter waterways.

Section 7: Handling and Storage

PRECAUTIONS FOR SAFE HANDLING

Handling	• All equipment used when handling the product must be grounded. Avoid contact with heat and ignition sources and oxidizers. Do not breathe (dust, vapor or spray mist). Do not use in areas without adequate ventilation. Do not use sparking tools. Keep away from heat, sparks, and flame. No open flames, no sparks and no smoking. Use only with adequate ventilation. Do not use or store near heat or open flame. Keep away from fire, sparks and heated surfaces. • The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes). • The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits. • Take precautionary measures against static discharges.
Handling	• Do not cut drill, grind or weld on empty containers since they may contain explosive residues. • Stay upwind and vent open hatches before uploading. • Avoid contact with skin, eyes and clothing. • Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water. • Wear personal protective equipment. • Remove and wash contaminated clothing before re-use. • Do not eat, drink or smoke when using this product. • Do not take internally. • Wash thoroughly after handling. • Empty containers pose a potential fire and explosion hazard.

CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES

Storage	• Ventilate enclosed areas. • Store in a well-ventilated place. • Keep container tightly closed. • Store locked up. • Avoid shock, impact, friction, and rough handling. Do not use sparking tools. • Store in a cool/low-temperature, well-ventilated place away from heat and ignition sources. • Keep away from sources of ignition. • No Smoking. • Do not enter confined spaces such as tanks or pits without following proper entry procedures. • Store in properly closed containers that are appropriately labeled and in a cool well-ventilated area. • Harmful concentrations of hydrogen sulfide (H_2S) gas can accumulate in excavations and low-lying areas as well as the vapor space of storage and bulk transport compartments. • Keep away from open flames, hot surfaces and sources of ignition. • Keep product and empty container away from heat and sources of ignition. • Storage containers should be grounded and bonded. • Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge. • Store away from incompatible materials.
Incompatible Products	• Strong oxidizers such as nitrates, chlorates, peroxides.

Section 8: Exposure Controls/Personal Protection

CONTROL PARAMETERS: EXPOSURE GUIDELINES

CHEMICAL NAME	ACGIH	OSHA	NIOSH
1,2,4-Trimethylbenzene	–	–	TWA 25 ppm TWA 125 mg/m^3
1-Propanethiol	–	–	Ceiling 0.5 ppm Ceiling 1.6 mg/m^3
2-Butanethiol	TLV 0.5 mg/m^3	PEL 10 ppm PEL 35 mg/m^3	Ceiling 0.5 ppm Ceiling 1.8 mg/m^3
Benzene	TLV 0.5 ppm TLV 1.6 mg/m^3 STEL 2.5 ppm STEL 8 mg/m^3	PEL 1 ppm STEL 5 ppm	TWA 0.1 ppm STEL 1 ppm IDLH 500 ppm
Bitumen	TLV 0.5 mg/m^3	–	Ceiling 5 mg/m^3
Butane	TLV 1000 ppm	–	TWA 800 ppm TWA 1900 mg/m^3
Cyclohexane	TLV 100 ppm TLV 334 mg/m^3	PEL 300 ppm PEL 1050 mg/m^3	TWA 300 ppm TWA 1050 mg/m^3 IDLH 1300 ppm

Ethanethiol	TLV 0.5 ppm	Ceiling 10 ppm Ceiling 25 mg/m^3	Ceiling 0.5 ppm Ceiling 1.3 mg/m^3
Ethylbenzene	TLV 20 ppm TLV 87 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 125 ppm STEL 545 mg/m^3 IDLH 800 ppm
Fuels, diesel, No. 2	TLV 100 mg/m^3	–	–
Heptane	TLV 400 ppm TLV 1640 mg/m^3 STEL 500 ppm STEL 2000 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 85 ppm TWA 350 mg/m^3 Ceiling 440 ppm Ceiling 1800 mg/m^3 IDLH 750 ppm
Hexane	TLV 50 ppm TLV 176 mg/m^3	PEL 500 ppm PEL 1800 mg/m^3	TWA 50 ppm TWA 180 mg/m^3 IDLH 1100 ppm
Hydrogen sulfide	TLV 1 ppm TLV 1.4 mg/m^3 STEL 5 ppm STEL 7 mg/m^3	Ceiling 20 ppm	Ceiling 10 ppm Ceiling 15 mg/m^3 IDLH 100 ppm
Methanethiol	TLV 0.5 ppm	Ceiling 10 ppm Ceiling 20 mg/m^3	Ceiling 0.5 ppm Ceiling 1 mg/m^3
Methylcyclohexane	TLV 400 ppm TLV 1610 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 400 ppm TWA 1600 mg/m^3 IDLH 1200 ppm
Naphthalene	TLV 10 ppm STEL 15 ppm	PEL 10 ppm PEL 50 mg/m^3	TWA 10 ppm TWA 50 mg/m^3 STEL 15 ppm STEL 75 mg/m^3
Octane	TLV 300 ppm TLV 1401 mg/m^3	PEL 500 ppm PEL 2350 mg/m^3	TWA 75 ppm TWA 350 mg/m^3 Ceiling 385 ppm Ceiling 1800 mg/m^3 IDLH 1000 ppm
Pentane	TLV 600 ppm TLV 1770 mg/m^3	PEL 1000 ppm PEL 2950 mg/m^3	TWA 120 ppm TWA 350 mg/m^3 Ceiling 610 ppm Ceiling 1800 mg/m^3 IDLH 1500 ppm
Petroleum	–	–	TWA 350 mg/m^3 Ceiling 1800 mg/m^3

p-Xylene	TLV 100 ppm TLV 434 mg/m^3 STEL 150 ppm STEL 651 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 150 ppm STEL 655 mg/m^3 IDLH 900 ppm
Toluene	TLV 20 ppm TLV 75 mg/m^3	PEL 200 ppm STEL 300 mg/m^3	TWA 100 ppm TWA 375 mg/m^3 STEL 150 ppm STEL 560 mg/m^3 IDLH 500 ppm
Xylenes	TLV 100 ppm TLV 434 mg/m^3 STEL 150 ppm STEL 651 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 150 ppm STEL 655 mg/m^3 IDLH 900 ppm

APPROPRIATE ENGINEERING CONTROLS

- Adequate ventilation systems as needed to control concentrations of airborne contaminants below applicable threshold limit values. Prevent vapor build up by providing adequate ventilation during and after use. Use only appropriately classified electrical equipment.

INDIVIDUAL PROTECTION MEASURES

Eye and Face	• Wear face shield and eye protection.
Skin and Body	• The use of gloves (nitrile or neoprene) is advised to prevent skin contact and possible irritation. • Wear protective gloves/protective clothing/eye protection/face protection. Wear long sleeves and/or protective coveralls.
Respiratory	• Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or symptoms are experienced.
General Hygiene Measures	• Handle in accordance with good industrial hygiene and safety practice.

Section 9: Physical and Chemical Properties

MATERIAL DESCRIPTION

Physical State	Liquid	**Odor**	Rotten egg, petroleum like odor
Substance Type	Mixture	**Odor Threshold**	No data available
Appearance	Bark black/brown		

PROPERTIES

pH	No data available	**Vapor pressure**	5 to 76 kPa @ 37.8 C (100.04 F)
Melting Point/ Freezing Point	No data available	**Vapor density**	1.0 to 5.0 Air=1

Boiling Point/ Boiling Range	10 to 1049 °F -12 to 565°C	**Relative density**	No data available
Flash Point	-45.4 to 338 °F -43 to 170 °C	**Water Solubility**	Negligible
Evaporation Rate	No data available	**Partition coefficient: n-octanol/water**	No data available
Flammability (solid, gas)	No data available	**Autoignition temperature**	>482 °F >250°C
Upper Flammability Limit	No data available	**Decomposition temperature**	No data available
Lower Flammability Limit	No data available	**Specific Gravity**	0.9026-0.9400
Viscosity	No data available		

Section 10: Stability and Reactivity

REACTIVITY	Chlorine Dioxide
CHEMICAL STABILITY	Stable at 70 °F, 760 mm Hg pressure
POSSIBILITY OF HAZARDOUS REACTIONS	None under normal processing
CONDITIONS TO AVOID	Excessive heat, sources of ignition, sparks, open flames, and buildup of static electricity
INCOMPATIBLE MATERIALS	Strong oxidizers such as nitrates, chlorates, peroxides, chlorine
HAZARDOUS DECOMPOSITION PRODUCTS	Combustion produces carbon monoxide, aldehydes, sulfur dioxide, aromatic and other hydrocarbons
HAZARDOUS POLYMERIZATION	Will not occur

Section 11: Toxicological Information

INFORMATION ON THE LIKELY ROUTES OF EXPOSURE	**Inhalation**	• May cause irritation of respiratory tract. May cause drowsiness and dizziness.
	Eye Contact	• Causes serious eye irritation.
	Skin Contact	• Causes skin irritation.
	Ingestion	• Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. • Potential for aspiration if swallowed. • Aspiration may cause pulmonary edema and pneumonitis.

TOXICOLOGICAL DATA

CHEMICAL NAME	LD50 ORAL	LD50 DERMAL	LC50 INHALATION
1,2,4-Trimethylbenzene	5 g/kg (Rat)	–	18000 mg/m^3 (Rat) 4h
1-Propanethiol	= 1790 mg/kg (Rat)	–	–
2-Propanethiol	–	–	130 g/m^3 (Mouse) 1h
Benzene	=1800 mg/kg (Rat)	–	13050 - 14380 ppm (Rat) 4 h
Bitumen	>5000 mg/kg (Rat)	–	>94.4 mg/m^3 (Rat)
Butane	–	–	658 mg/L (Rat) 4 h
Cyclohexane	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	= 13.9 mg/L (Rat) 4 h
Ethanethiol	= 682 mg/kg (Rat)	500 mg (Rabbit) 24h	4420 ppm (Rat) 4h
Ethylbenzene	= 3500 mg/kg (Rat)	= 15400 mg/kg (Rabbit)	= 17.2 mg/L (Rat) 4 h
Gas oil, blend	–	= 500 mg (Rabbit)	= 1700 mg/m^3 (Rat) 4 h
Heptane	–	= 3000 mg/kg (Rabbit)	= 103 g/m^3 (Rat) 4 h
Hexane	= 25 g/kg (Rat)	= 3000 mg/kg (Rabbit)	= 48000 ppm (Rat) 4 h
Hydrogen sulfide	–	–	= 444 ppm (Rat)
Methylcyclohexane	> 3200 mg/kg (Rat)	–	–
Naphthalene	490 mg/kg (Rat)	0.05 ml (Rabbit) 24 h	–
Natural gas condensates (petroleum)	–	–	= 600 mg/m^3 (Rat)
Octane	–	–	= 118 g/m^3 (Rat) 4 h = 25260 ppm (Rat) 4 h
Pentane	>2000 mg/kg (Rat)	–	364 g/cu (Rat) 4 h
Petroleum	>4300 mg/kg (Rat)	500 mg (Rabbit) 24 h	–
p-Xylene	= 3910 mg/kg (Rat)	–	4550 ppm (Rat) 4h
Sulfur	–	–	1660 mg/m^3 (Mammal)
Toluene	2.6 to 7.5 g/kg (Rat)	14.1 ml/kg (Rabbit)	–
Xylenes	= 3500 mg/kg (Rat)	> 4350 mg/kg (Rabbit) > 1700 mg/kg (Rabbit)	= 29.08 mg/L (Rat) 4 h = 5000 ppm (Rat) 4 h

SYMPTOMS RELATED TO THE PHYSICAL, CHEMICAL AND TOXICOLOGICAL CHARACTERISTICS

Benzene	• Repeated or prolonged exposure to benzene at concentrations in excess of the TLV may cause serious injury to blood-forming organs. Significant chronic exposure to benzene vapor has been reported to produce various blood disorders ranging from anemia to certain forms of leukemia (cancer) in humans. Benzene produced tumors in rats and mice in lifetime chronic toxicity studies, but the response has not been consistent across species, strain, sex or route of exposure. Animal studies on benzene have demonstrated immune toxicity, chromosomal aberrations, testicular effects and alterations in reproductive cycles and embryo/fetotoxicity, but not teratogenicity.
Hydrogen Sulfide Gas (H_2S)	• Toxic by inhalation. Prolonged breathing of 50-100 ppm H_2S vapors can produce eye and respiratory tract irritation. Higher concentration (250-600 ppm) for 15-30 minutes can produce headache, dizziness, nervousness, nausea and pulmonary edema or bronchial pneumonia. Concentrations of >1000 ppm will cause immediate unconsciousness and death through respiratory paralysis. Rats and mice exposed to 80 ppm H_2S, 6 hrs/day, 5 days/ week for 10 weeks, did not produce any toxicity except for irritation of nasal passages. H_2S did not affect reproduction and development (birth defects or neurotoxicity) in rats exposed to concentrations of 75-80 ppm or 150 ppm H_2S, respectively. Over the years a number of acute cases of H_2S poisoning have been reported. Complete and rapid recovery is the general rule. However, if the exposure was sufficiently intense and sustained causing cerebral hypoxia (lack of oxygen to the brain), neurologic effects such as amnesia, intention tremors or brain damage are possible.
Hexane	• This product may contain hexane at a level of >1.0%. Studies in laboratory animals have produced systemic toxicity in blood, spleen and lungs. Fetotoxicity has been observed at hexane concentrations that produced maternal toxicity. Long term exposure to high concentrations of hexane has been shown to cause testicular effects and nervous system damage.
Xylenes	• Gross overexposure or severe poisoning incidents in humans to xylenes has been reported to cause lung, liver, kidney, heart and brain damage as well as neurologic disturbances. Laboratory animals exposed to high dose of xylenes showed evidence of effects in the liver, kidneys, lungs, spleen, heart and adrenals, Exposure of pregnant rats, mice and rabbits during gestation to significant concentrations of xylenes produced maternal, fetal and developmental toxicity (skeletal retardation, cleft palate, and wavy ribs) generally at maternally toxic doses. These types of fetotoxic effects have been associated with maternal toxicity. Repeated inhalation of high xylene concentrations has shown impairment of performance abilities (behavioral tests) in animals and man. Xylenes produced a mild frequency hearing loss in rats subchronically exposed to high concentrations of xylenes.
Naphthalene	• Naphthalene has been evaluated in two year inhalation studies in both rats and mice. The US National Toxicology Program (NTP) concluded that there is clear evidence of carcinogenicity in male and female rats based on increased incidences of respiratory epithelial adenomas and olfactory epithelial neuroblastomas of the nose. NTP found some evidence of carcinogenicity in female mice (alveolar adenomas) and no evidence of carcinogenicity in male mice. Naphthalene has been identified as a carcinogen by IARC and NTP.

Toluene	**Carcinogenicity:** Exposure of rats and mice to toluene at concentrations ranging from 120-1200 ppm for two years did not demonstrate evidence of carcinogenicity. Toluene has not been listed as a carcinogen by IARC. **Target Organs:** Epidemiology studies suggest that chronic occupational overexposure to toluene may damage color vision. Subchronic and chronic inhalation studies with toluene produced kidney and liver damage, hearing loss and central nervous system (brain) damage in laboratory animals. Intentional misuse by deliberate inhalation of high concentrations of toluene has been shown to cause liver, kidney, and central nervous system damage, including hearing loss and visual disturbances. **Reproductive Toxicity:** Exposure to toluene during pregnancy has demonstrated limited evidence of developmental toxicity in laboratory animals. Decreased fetal body weight and increased skeletal variations in both inhalation and oral studies, but only at doses that were maternally toxic. No fetal toxicity was seen at doses that were not maternally toxic. Decreased sperm counts have been observed in male rats in the absence of a reduction in fertility. Toluene has been reported to cause mental or growth retardation in the children of solvent abusers who directly inhale toluene during pregnancy.
Ethylbenzene	**Carcinogenicity:** Rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study demonstrated limited evidence of kidney, liver, and lung cancer. Ethyl benzene has been listed as a possible human carcinogen by IARC. **Target Organs:** In rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study there was mild damage to the kidney (tubular hyperplasia), liver (eosinophilio foci, hypertrophy, necrosis), lung (alveolar epithelium metaplasia), thyroid (hyperplasia), thyroid (hyperplasia) and pituitary (hyperplasia). In animal models (particularly rats), ethyl benzene affects the auditory function mainly in the cochlear mid-frequency range and ototoxicity was observed after combined exposure to noise and ethyl benzene. There is no evidence of either ethyl benzene-induced hearing losses or ototoxicity with combined exposure to ethyl benzene and noise in workers.

DELAYED AND IMMEDIATE EFFECTS AND ALSO CHRONIC EFFECTS FROM SHORT- AND LONG-TERM EXPOSURE

Sensitization	• No information available
Mutagenic Effects	• May cause genetic defects
Carcinogenicity	• May cause cancer

CARCINOGENIC INFORMATION

CHEMICAL NAME	ACGIH	ACGIH SKIN*	IARC	NTP	OSHA
Benzene	A1	X	Group 1	Known	X
Bitumen	A4	–	–	–	–
Ethylbenzene	A3	–	Group 2B	Evidence	X
Fuels, diesel, No. 2	A3	X	–	–	–
Hexane	–	X	–	–	–
Naphthalene	A4	X			
Toluene	A4	–	Group 3	Evidence	–
Xylenes	A4	–	Group 3	Evidence	–

**ACGIH Skin designation refers to the potential significant contribution of overall exposure by cutaneous route, including mucous membranes and eyes, from airborne exposure to gases, vapor, or liquid OR by direct skin contact.*

REPRODUCTIVE TOXICITY	• Suspected of damaging fertility or the unborn child.
STOT—SINGLE EXPOSURE	• May cause drowsiness and dizziness.
STOT—REPEATED EXPOSURE	• Causes damage to organs through prolonged or repeated exposure.
ASPIRATION HAZARD	May be fatal if swallowed and enters airways Risk of serious damage to the lungs (by aspiration).

Section 12: Ecological Information

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
1,2,4-Trimethylbenzene	–	LC50 96 h: 7.72 mg/L (Pimephales promelas)	EC50 48h: 30 mmol/cu (Daphnia magna)	LC50 24h: 100 mmol/cu Artemia salina (Brine Shrimp)
1-Propanethiol	–	–	LC 48h: 60 ug/L (Daphnia magna)	–
Benzene	EC50 72 h: = 29 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 10.7 - 14.7 mg/L flow-through (Pimephales promelas) LC50 96 h: = 5.3 mg/L flow-through (Oncorhynchus mykiss) LC50 96 h: = 22.49 mg/L static (Lepomis macrochirus) LC50 96 h: = 28.6 mg/L static (Poecilia reticulata) LC50 96 h: 22330 - 41160 µg/L static (Pimephales promelas) LC50 96 h: 70000 - 142000 µg/L static (Lepomis macrochirus)	EC50 48 h: 8.76 - 15.6 mg/L Static (Daphnia magna) EC50 48 h: = 10 mg/L (Daphnia magna)	–
Cyclohexane	EC50 72 h: > 500 mg/L (Desmodesmus subspicatus)	LC50 96 h: 3.96 - 5.18 mg/L flow-through (Pimephales promelas) LC50 96 h: 23.03 - 42.07 mg/L static (Pimephales promelas) LC50 96 h: 24.99 - 44.69 mg/L static (Lepomis macrochirus) LC50 96 h: 48.87 - 68.76 mg/L static (Poecilia reticulata)	EC50 24 h: > 400 mg/L (Daphnia magna	EC50 = 85.5 mg/L 5 min EC50 = 93 mg/L 10 min (Microorganisms)
Ethanethiol	–	–	EC50 48 h: >90-280 mg/L (Daphnia magna)	–

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Ethylbenzene	EC50 72 h: = 4.6 mg/L (Pseudokirchneriella subcapitata) EC50 96 h: > 438 mg/L (Pseudokirchneriella subcapitata) EC50 72 h: 2.6 - 11.3 mg/L static (Pseudokirchneriella subcapitata) EC50 96 h: 1.7 - 7.6 mg/L static (Pseudokirchneriella subcapitata) EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 11.0 - 18.0 mg/L static (Oncorhynchus mykiss) LC50 96 h: = 4.2 mg/L semi-static (Oncorhynchus mykiss) LC50 96 h: 7.55 - 11 mg/L flow-through (Pimephales promelas) LC50 96 h: = 32 mg/L static (Lepomis macrochirus) LC50 96 h: 9.1 - 15.6 mg/L static (Pimephales promelas) LC50 96 h: = 9.6 mg/L static (Poecilia reticulata)	EC50 48 h: 1.8 - 2.4 mg/L (Daphnia magna)	EC50 = 9.68 mg/L 30 min EC50 = 96mg/L 24 h (Microorganisms)
Heptane	–	LC50 96 h: = 375.0 mg/L (Cichlid fish)	EC50 24 h: > 10 mg/L (Daphnia magna)	–
Hexane	–	LC50 96 h: 2.1 - 2.98 mg/L flow-through (Pimephales promelas)	EC50 24 h: > 1000 mg/L (Daphnia magna)	–
Hydrogen sulfide	–	LC50 96h: 49 µg/l Oncorhynchus mykiss (Rainbow Trout) eggs LC50 24h: 1059.7 µg/l Pimephales promelas (Fathead Minnow)	EC50 48h: 62 µg/l Gammarus pseudolimnaeus (Scud)	–
Methanethiol	–	–	–	LC50: 0.55-0.9 mg/L (Salmonides)
Methylcyclohexane	–	LC50 96hr: 72.0 mg/l (Golden Shiner)	–	–
Naphthalene	EC50 24 h: = 33000 ug/L (Chlorella vulgaris)	LC50 96 h: = 1.4 mg/L (Oncorhynchus gorbuscha)	EC50 48 h: 1600 ug/L (Daphnia magna)	–
n-Butanethiol	EC50 96 h: = 1068.3-5478.24 mg/l (Scenedesmus subspicatus)	LC50 96 h: = 1100-3600 mg/L (Ictalurus punctatus)	–	–
Octane	–	–	EC50 48 h: = 0.38 mg/L (water flea) EC50 48 h: = 0.02856 mg/L (Daphnia magna)	EC50 = 890 mg/L 30 min (Microorganisms) EC50 <1.67hr: 120 µg/l Mytilus edulis (Common Bay Mussel)
Pentane	–	–	EC50 48h: 135 mmol/cu	LC50 24h: 165 mmol/cu Artemia salina (Brine Shrimp)
p-Xylene	EC50 3h: 430 mmol/cu (Chlamydomonas angulosa)	LC50 96h: 2600 ug/l (Oncorhynchus mykiss)	–	–

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Sulfur	–	LC50 96h: <14000 ug/l (Lepomis macrochirus)	EC50 48 h: = >5000000 ug/L (Daphnia magna)	–
Toluene	EC50: >433 mg/L Pseudokirchneriella subcapitata 96 h EC50: 12.5 mg/L Pseudokirchneriella subcapitata 72 h static	LC50: 15.22 - 19.05 mg/L Pimephales promelas 96 h flow-through LC50: 12.6 mg/L Pimephales promelas 96 h static LC50: 5.89 - 7.81 mg/L Oncorhynchus mykiss 96 h flow-through LC50: 14.1 - 17.16 mg/L Oncorhynchus mykiss 96 h static LC50: 5.8 mg/L Oncorhynchus mykiss 96 h semi-static LC50: 11.0-15.0 mg/L Lepomis macrochirus 96 h static LC50: 54 mg/L Oryzias latipes 96 h static LC50: 28.2 mg/L Poecilia reticulata 96 h semi-static LC50: 50.87-70.34 mg/L Poecilia reticulata 96 h static	EC50 48 h: 5.46 - 9.83 mg/L Static (Daphnia magna) EC50 48 h: = 11.5 mg/L (Daphnia magna)	EC50 = 19.7 mg/L 30 min (Microorganisms)
Xylenes	EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: = 13.4 mg/L flow-through (Pimephales promelas) LC50 96 h: 2.661 - 4.093 mg/L static (Oncorhynchus mykiss) LC50 96 h: 13.5 - 17.3 mg/L (Oncorhynchus mykiss) LC50 96 h: 13.1 - 16.5 mg/L flow-through (Lepomis macrochirus)	EC50 48 h: = 3.82 mg/L (water flea) LC50 48 h: = 0.6 mg/L (Gammarus lacustris)	-

PERSISTENCE AND DEGRADABILITY

- No information available

BIOACCUMULATIVE POTENTIAL

CHEMICAL	LOG POW
1,2,4-Trimethylbenzene	3.78
1-Propanethiol	1.81
2-butanethiol	2.18
2-Propanethiol	1.7
Benzene	1.83
Butane	2.89
Cyclohexane	3.44
Ethanethiol	1.27
Ethylbenzene	3.118
Gas oil, blend	3.3-7.06
Heptane	4.66
Hexane	3.90
Methanethiol	0.78
Methylcyclohexane	3.61
Methylcyclopentane	3.37
Naphthalene	3.30
n-Butanethiol	2.28
Octane	5.18
Pentane	3.39
p-Xylene	3.15
Toluene	2.65
Xylene	2.77-3.15

MOBILITY IN SOIL

CHEMICAL	EXPECTED SOIL MOBILITY
1,2,4-Trimethylbenzene	Low
1-Propanethiol	Moderate
2-butanethiol	High
2-Propanethiol	Very High
Benzene	High
Butane	Low
Cyclohexane	Moderate
Ethanethiol	Very High

Ethylbenzene	Low
Gas oil, blend	Low
Heptane	Moderate
Hexane	High
Methanethiol	Very High
Methylcyclopentane	Low
Naphthalene	High to None
n-Butanethiol	Moderate
Octane	Immobile
Pentane	High
p-Xylene	Moderate to Low
Toluene	High to Moderate
Xylene	Very high to Moderate

OTHER ADVERSE EFFECTS

- No information available

Section 13: Disposal Considerations

WASTE TREATMENT METHODS

Product Waste

- This product, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA RCRA (40 CFR 261), Environment Canada, or other State, Provincial, and local regulations. If this product is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility.
- This product could also contain benzene at >0.5 ppm and could exhibit the characteristic of "toxicity" (D018) as determined by the toxicity characteristic leaching procedure (TCLP).
- This material could become a hazardous waste if mixed or contaminated with a hazardous waste or other substance(s).
- It is the responsibility of the user to consult federal, state and local waste regulations to determine appropriate disposal options.

Packaging Waste

- Container contents should be completely used and containers should be emptied prior to discard.
- Container 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 re-conditioner.
- To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

Section 14: Transport Information

****CHART NAME****

	UN NUMBER	PROPER SHIPPING NAME	TRANSPORT HAZARD CLASS	PACKING GROUP	ENVIRONMENTAL HAZARD
DOT	UN1267	Petroleum Crude Oil	3	I	Emergency response guide number: 128
TDG	UN1267	Petroleum Crude Oil	3	I	–
IMO/IMDG	UN1267	Petroleum Crude Oil	3	I	EmS No. F-E, S-E
IATA/ICAO	UN1267	Petroleum Crude Oil	3	I	3L

SPECIAL RECAUTIONS FOR USER

- None

Section 15: Regulatory Information

U.S.—CERCLA/SARA HAZARDOUS SUBSTANCES AND THEIR REPORTABLE QUANTITIES

COMPONENT	CAS #	AMOUNT
Benzene	71-43-2	10 lb final RQ; 4.54 kg final RQ
Cyclohexane	110-82-7	1000 lb final RQ; 454 kg final RQ
Ethylbenzene	100-41-4	1000 lb final RQ; 454 kg final RQ
Hexane	110-54-3	5000 lb final RQ; 2270 kg final RQ
Hydrogen Sulfide	7783-06-4	100 lb final RQ; 45.4 kg final RQ
Methanethiol	74-93-1	100 lb final RQ; 45.4 kg final RQ
Naphthalene	91-20-3	100 lb final RQ; 45.4 kg final RQ
p-Xylene	106-42-3	100 lb final RQ; 45.4 kg final RQ
Toluene	108-88-3	1000 lb final RQ; 454 kg final RQ
Xylene	1330-20-7	100 lb final RQ; 45.4 kg final RQ

U.S.—CWA (CLEAN WATER ACT)—REPORTABLE QUANTITIES OF DESIGNATED HAZARDOUS SUBSTANCES

COMPONENT	CAS #	AMOUNT
Benzene	71-43-2	10 lb RQ
Cyclohexane	110-82-7	1000 lb RQ
Ethylbenzene	100-41-4	1000 lb RQ
Hydrogen Sulfide	7783-06-4	100 lb RQ
Methanethiol	74-93-1	100 lb RQ
Naphthalene	91-20-3	100 lb RQ
Toluene	108-88-3	1000 lb RQ
Xylene	1330-20-7	100 lb RQ

U.S.—CWA (CLEAN WATER ACT)—RECOMMENDED WATER QUALITY CRITERIA—CCC FOR FRESHWATER LIFE

COMPONENT	CAS #	AMOUNT
Hydrogen Sulfide	7783-06-4	2.0 µg/L CCC

U.S.—CWA (CLEAN WATER ACT)—RECOMMENDED WATER QUALITY CRITERIA—CCC FOR SALTWATER LIFE

COMPONENT	CAS #	AMOUNT
HydrogenSulfide	7783-06-4	2.0 µg/L CCC

U.S.—CWA (CLEAN WATER ACT)—HAZARDOUS SUBSTANCES

COMPONENT	CAS #	LISTED
1,2,4-Trimethylbenzene	95-63-6	Not Listed
1-Propanethiol	107-03-9	Not Listed
2-Butanethiol	513-53-1	Not Listed
2-Propanethiol	75-33-2	Not Listed
Benzene	71-43-2	X
Bitumen	8052-42-4	Not Listed
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	X
Distillates, petroleum, petroleum residues vacuum	68955-27-1	Not Listed
Ethanethiol	75-08-1	Not Listed
Ethylbenzene	100-41-4	X

Fuels, diesel, No. 2	68476-34-6	Not Listed
Gas oil, blend	64741-44-2	Not Listed
Heavy straight-run (petroluem) naphtha	64741-41-9	Not Listed
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	X
Methanethiol	74-93-1	X
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Naphtha (petroleum), hydrotreated light	64742-49-0	Not Listed
Naphthalene	91-20-3	X
Natural gas condensates (petroleum)	64741-47-5	Not Listed
n-Butanethiol	109-79-5	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed
Petroleum	8002-05-9	Not Listed
p-Xylene	106-42-3	X
Residues (petroleum), vacuum	64741-56-6	Not Listed
Sulfur	7704-34-9	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	X

X= The component is listed

U.S.—CWA (CLEAN WATER ACT)—PRIORITY POLLUTANTS

COMPONENT	CAS #	LISTED
1,2,4-Trimethylbenzene	95-63-6	Not Listed
1-Propanethiol	107-03-9	Not Listed
2-Butanethiol	513-53-1	Not Listed
2-Propanethiol	75-33-2	Not Listed
Benzene	71-43-2	X
Bitumen	8052-42-4	Not Listed

Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	Not Listed
Distillates, petroleum, petroleum residues vacuum	68955-27-1	Not Listed
Ethanethiol	75-08-1	Not Listed
Ethylbenzene	100-41-4	X
Fuels, diesel, No. 2	68476-34-6	Not Listed
Gas oil, blend	64741-44-2	Not Listed
Heavy straight-run (petroluem) naphtha	64741-41-9	Not Listed
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	Not Listed
Methanethiol	74-93-1	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Naphtha (petroleum), hydrotreated light	64742-49-0	Not Listed
Naphthalene	91-20-3	X
Natural gas condensates (petroleum)	64741-47-5	Not Listed
n-Butanethiol	109-79-5	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed
Petroleum	8002-05-9	Not Listed
p-Xylene	106-42-3	Not Listed
Residues (petroleum), vacuum	64741-56-6	Not Listed
Sulfur	7704-34-9	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	Not Listed

X= The component is listed

CANADA-WHMIS—CLASSIFICATIONS OF SUBSTANCES

COMPONENT	CAS #	CLASSIFICATION
1,2,4-Trimethylbenzene	95-63-6	B3
1-Propanethiol	107-03-9	Not Listed
2-Butanethiol	513-53-1	Not Listed
2-Propanethiol	75-33-2	Not Listed
Benzene	71-43-2	B2, D2A, D2B
Bitumen	8052-42-4	Not Listed
Butane	106-97-8	A, B1
Cyclohexane	110-82-7	B2, D2B
Distillates, petroleum, petroleum residues vacuum	68955-27-1	Not Listed
Ethanethiol	75-08-1	B2
Ethylbenzene	100-41-4	B2, D2A, D2B
Fuels, diesel, No. 2	68476-34-6	Not Listed
Gas oil, blend	64741-44-2	Not Listed
Heavy straight-run (petroluem) naphtha	64741-41-9	Not Listed
Heptane	142-82-5	B2, D2B
Hexane	110-54-3	B2, D2A, D2B
Hydrogen Sulfide	7783-06-4	A, B1, D1A, D2B
Methanethiol	74-93-1	A, B1, D1A
Methylcyclohexane	108-87-2	B2
Methylcyclopentane	96-37-7	Not Listed
Naphtha (petroleum), hydrotreated light	64742-49-0	Not Listed
Naphthalene	91-20-3	B4, D2A
Natural gas condensates (petroleum)	64741-47-5	Not Listed
n-Butanethiol	109-79-5	B2, D1B
Octane	111-65-9	B2, D2B
Pentane	109-66-0	B2
Petroleum	8002-05-9	B2

p-Xylene	106-42-3	B2, D2A, D2B
Residues (petroleum), vacuum	64741-56-6	Not Listed
Sulfur	7704-34-9	B4
Toluene	108-88-3	B2, D2A, D2B
Xylene	1330-20-7	B2, D2A, D2B

X= The component is listed

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR FRESHWATER AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Naphthalene	91-20-3	1.1 µg/L
Ethylbenzene	100-41-4	90 µg/L
Toluene	108-88-3	2.0 µg/L
Benzene	71-43-2	370 µg/L

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR MARINE AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	25 µg/L
Toluene	108-88-3	215 µg/L
Benzene	71-43-2	110 µg/L
Naphthalene	91-20-3	1.4 µg/L

CANADA—ENVIRONMENTAL EMERGENCIES

COMPONENT	CAS #	LISTED
1,2,4-Trimethylbenzene	95-63-6	Not Listed
1-Propanethiol	107-03-9	Not Listed
2-Butanethiol	513-53-1	Not Listed
2-Propanethiol	75-33-2	Not Listed
Benzene	71-43-2	X
Bitumen	8052-42-4	Not Listed
Butane	106-97-8	X
Cyclohexane	110-82-7	X
Distillates, petroleum, petroleum residues vacuum	68955-27-1	Not Listed
Ethanethiol	75-08-1	X

Ethylbenzene	100-41-4	X
Fuels, diesel, No. 2	68476-34-6	Not Listed
Gas oil, blend	64741-44-2	Not Listed
Heavy straight-run (petroluem) naphtha	64741-41-9	Not Listed
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	X
Methanethiol	74-93-1	X
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Naphtha (petroleum), hydrotreated light	64742-49-0	Not Listed
Naphthalene	91-20-3	X
Natural gas condensates (petroleum)	64741-47-5	Not Listed
n-Butanethiol	109-79-5	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	X
Petroleum	8002-05-9	Not Listed
p-Xylene	106-42-3	Not Listed
Residues (petroleum), vacuum	64741-56-6	Not Listed
Sulfur	7704-34-9	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	X

X= The component is listed

Section 16: Other Information

NFPA				
	Health Hazard: 2	**Flammability:** 3	**Instability:** 1	**Physical and Chemical Hazards:** X
HMIS	**Health Hazard:** 2	**Flammability:** 4	**Instability:** 0	**Personal Protection:** X
ISSUING DATE	4/10/15			
REVISION DATE	4/10/15			

DISCLAIMER

- The information presented herein is based on data considered to be accurate as of the date of preparation of this Safety Data Sheet (SDS). However, SDSs 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.

Material Safety Data Sheet

1. MATERIAL AND COMPANY IDENTIFICATION

Material Name : **Crude Oil, Sour (=>0.5% S)**
Uses : Refinery Feedstock.

Manufacturer/Supplier : **Shell Canada Limited**
PO Box 100 Station M
400 4th Avenue S.W.
Calgary-AB T2P 2H5
Canada
Telephone : (+1) 800-661-1600

Emergency Telephone Number
: Shell Canada: (+1) 800-661-7378
CANUTEC (24 hr): (+1) 613-996-6666

2. COMPOSITION/INFORMATION ON INGREDIENTS

Mixture Description : Raw petroleum extracted in its natural state from the ground (excluding hydrocarbons from shale) and containing predominantly aliphatic, alicyclic and aromatic hydrocarbons. It may also contain small amounts of nitrogen, oxygen and sulphur compounds. Product is not a mixture according to regulation 1907/2006/EC.
Synonyms : Seal Heavy crude Oil
CAS No. : 8002-05-9

WHMIS Controlled Ingredients

Chemical Identity	CAS No.	Conc. W/W
Petroleum, Crude Oil	8002-05-9	60.00- 100.00 %

Contains Benzene, CAS # 71-43-2.
Contains Ethylbenzene, CAS # 100-41-4.
Contains n-Hexane, CAS # 110-54-3.
Contains Naphthalene, CAS # 91-20-3.
Contains hydrogen sulphide, CAS # 7783-06-4.
Contains Natural Gasoline, CAS # 8006-61-9.
Hydrogen sulphide may be present both in the liquid and the vapour. Composition is complex and varies with the source of the crude oil.

Refer to Chapter 8 for Occupational Exposure Guidelines.

3. HAZARDS IDENTIFICATION



WHMIS Class/Description	:	Class B2 Flammable Liquid Class D2A Other Toxic Effects - Carcinogen/Mutagen Class D2B Other Toxic Effects - Skin Irritant
Routes of Exposure	:	Exposure may occur via inhalation, ingestion, skin absorption, skin or eye contact, and accidental ingestion.
Health Hazards	:	Vapours may cause drowsiness and dizziness. Repeated exposure may cause skin dryness or cracking. Moderately irritating to eyes. Harmful: danger of serious damage to health by prolonged exposure in contact with skin and if swallowed. Harmful: may cause lung damage if swallowed. Hydrogen sulphide is highly toxic and may be fatal if inhaled. Hydrogen sulphide (H2S), an extremely flammable and toxic gas, and other hazardous vapours may evolve and collect in the headspace of storage tanks, transport vessels and other enclosed containers. A component or components of this material may cause cancer. This product contains benzene which may cause leukaemia (AML - acute myelogenous leukaemia). May cause MDS (Myelodysplastic Syndrome). Hydrogen sulphide is highly toxic and may be fatal if inhaled. Hydrogen sulphide (H2S), an extremely flammable and toxic gas, and other hazardous vapours may evolve and collect in the headspace of storage tanks, transport vessels and other enclosed containers. May dull the sense of smell, so do not rely on odour as an indication of hazard. H2S has a broad range of effects dependent on the airborne concentration and length of exposure: 0.02 ppm odour threshold, smell of rotten eggs; 10 ppm eye and respiratory tract irritation; 100 ppm coughing, headache, dizziness, nausea, eye irritation, loss of sense of smell in minutes; 200 ppm potential for pulmonary oedema after >20-30 minutes; 500 ppm loss of consciousness after short exposures, potential for respiratory arrest; >1000ppm immediate loss of consciousness, may lead rapidly to death, prompt cardiopulmonary resuscitation may be required. Do not depend on sense of smell for warning. H2S causes rapid olfactory fatigue (deadens sense of smell). There is no evidence that H2S will accumulate in the body tissue after repeated exposure. Repeated exposure may cause skin dryness or cracking. This product contains benzene which may cause leukaemia (AML - acute myelogenous leukaemia). May cause MDS (Myelodysplastic Syndrome).
Signs and Symptoms	:	Defatting dermatitis signs and symptoms may include a burning sensation and/or a dried/cracked appearance. Eye

		irritation signs and symptoms may include a burning sensation, redness, swelling, and/or blurred vision. If material enters lungs, signs and symptoms may include coughing, choking, wheezing, difficulty in breathing, chest congestion, shortness of breath, and/or fever. The onset of respiratory symptoms may be delayed for several hours after exposure. Breathing of high vapour concentrations may cause central nervous system (CNS) depression resulting in dizziness, light-headedness, headache, nausea and loss of coordination. Continued inhalation may result in unconsciousness and death. H2S has a broad range of effects dependent on the airborne concentration and length of exposure: 0.02 ppm odour threshold, smell of rotten eggs; 10 ppm eye and respiratory tract irritation; 100 ppm coughing, headache, dizziness, nausea, eye irritation, loss of sense of smell in minutes; 200 ppm potential for pulmonary oedema after >20-30 minutes; 500 ppm loss of consciousness after short exposures, potential for respiratory arrest; >1000ppm immediate loss of consciousness, may lead rapidly to death, prompt cardiopulmonary resuscitation may be required. Do not depend on sense of smell for warning. H2S causes rapid olfactory fatigue (deadens sense of smell). There is no evidence that H2S will accumulate in the body tissue after repeated exposure.
Safety Hazards	:	Extremely flammable. May ignite on surfaces at temperatures above auto-ignition temperature. Electrostatic charges may be generated during pumping. Electrostatic discharge may cause fire. Flammable vapours may be present even at temperatures below the flash point.
Environmental Hazards	:	Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Additional Information	:	This product is intended for use in closed systems only.

4. FIRST AID MEASURES

General Information	:	Vaporisation of H2S that has been trapped in clothing can be dangerous to rescuers. Maintain respiratory protection to avoid contamination from the victim to rescuer. Mechanical ventilation should be used to resuscitate if at all possible.
Inhalation	:	Remove to fresh air. If rapid recovery does not occur, transport to nearest medical facility for additional treatment.
Skin Contact	:	Remove contaminated clothing. Immediately flush skin with large amounts of water for at least 15 minutes, and follow by washing with soap and water if available. If redness, swelling, pain and/or blisters occur, transport to the nearest medical facility for additional treatment.
Eye Contact	:	Flush eyes with water while holding eyelids open. Rest eyes for 30 minutes. If redness, burning, blurred vision, or swelling persist transport to the nearest medical facility for additional treatment.
Ingestion	:	If swallowed, do not induce vomiting: transport to nearest

		medical facility for additional treatment. If vomiting occurs spontaneously, keep head below hips to prevent aspiration. Give nothing by mouth. Do not induce vomiting. If any of the following delayed signs and symptoms appear within the next 6 hours, transport to the nearest medical facility: fever greater than 101° F (38.3°C), shortness of breath, chest congestion or continued coughing or wheezing.
Advice to Physician	:	Hydrogen sulphide (H2S) - CNS asphyxiant. May cause rhinitis, bronchitis and occasionally pulmonary oedema after severe exposure. CONSIDER: Oxygen therapy. Consult a Poison Control Center for guidance. Exposure to hydrogen sulphide at concentrations above the recommended occupational exposure standard may cause headache, dizziness, irritation of the eyes, upper respiratory tract, mouth and digestive tract, convulsions, respiratory paralysis, unconsciousness and even death. Call a doctor or poison control center for guidance. Potential for chemical pneumonitis.

5. FIRE FIGHTING MEASURES

Clear fire area of all non-emergency personnel.

Flash point	:	< 23 °C / 73 °F
Upper / lower Flammability or Explosion limits	:	0.6 - 8 %(V)
Auto ignition temperature	:	> 220 °C / 428 °F
Hazardous Combustion Products and Specific Hazards	:	Hazardous combustion products may include: A complex mixture of airborne solid and liquid particulates and gases (smoke). Carbon monoxide. Oxides of nitrogen. Oxides of sulphur. Unidentified organic and inorganic compounds. Flammable vapours may be present even at temperatures below the flash point. The vapour is heavier than air, spreads along the ground and distant ignition is possible. Hydrogen sulphide (H2S) and toxic sulphur oxides may be given off when this material is heated. Do not depend on sense of smell for warning.
Suitable Extinguishing Media	:	Foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only.
Unsuitable Extinguishing Media	:	Do not use direct water jets on the burning product as they could cause a steam explosion and spread of the fire. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam.
Protective Equipment for Firefighters	:	Wear full protective clothing and self-contained breathing apparatus.
Additional Advice	:	Keep adjacent containers cool by spraying with water. If possible remove containers from the danger zone. If the fire cannot be extinguished the only course of action is to evacuate immediately.

6. ACCIDENTAL RELEASE MEASURES

Protective Measures	:	May ignite on surfaces at temperatures above auto-ignition temperature. Do not breathe fumes, vapour. Do not operate electrical equipment. Shut off leaks, if possible without personal risks. Remove all possible sources of ignition in the surrounding area. Use appropriate containment (of product and fire fighting water) to avoid environmental contamination. Prevent from spreading or entering drains, ditches or rivers by using sand, earth, or other appropriate barriers. Attempt to disperse the vapour or to direct its flow to a safe location for example by using fog sprays. Take precautionary measures against static discharge. Ensure electrical continuity by bonding and grounding (earthing) all equipment.
Clean Up Methods	:	For large liquid spills (> 1 drum), transfer by mechanical means such as vacuum truck to a salvage tank for recovery or safe disposal. Do not flush away residues with water. Retain as contaminated waste. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely. For small liquid spills (< 1 drum), transfer by mechanical means to a labelled, sealable container for product recovery or safe disposal. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely.
Additional Advice	:	Notify authorities if any exposure to the general public or the environment occurs or is likely to occur. Local authorities should be advised if significant spillages cannot be contained. Maritime spillages should be dealt with using a Shipboard Oil Pollution Emergency Plan (SOPEP), as required by MARPOL Annex 1 Regulation 26.

7. HANDLING AND STORAGE

General Precautions	:	Use the information in this data sheet as input to a risk assessment of local circumstances to help determine appropriate controls for safe handling, storage and disposal of this material. Properly dispose of any contaminated rags or cleaning materials in order to prevent fires. Prevent spillages. For comprehensive advice on handling, product transfer, storage and tank cleaning refer to the product supplier.
Handling	:	The inherent toxic and olfactory (sense of smell) fatiguing properties of hydrogen sulphide require that air monitoring alarms be used if concentrations are expected to reach harmful levels such as in enclosed spaces, heated transport vessels and spill or leak situations. If the air concentration exceeds 50 ppm, the area should be evacuated unless respiratory protection is in use. Avoid prolonged or repeated contact with skin. When using do not eat or drink. Extinguish any naked flames. Do not smoke. Remove ignition sources. Avoid sparks. Electrostatic charges may be generated during pumping. Electrostatic discharge may cause fire. Earth all equipment.
Storage	:	Drum and small container storage: Drums should be stacked to

		a maximum of 3 high. Use properly labelled and closeable containers. Prevent ingress of water. Keep container in a well-ventilated place equipped with hydrogen sulphide detectors. Tank storage: Tanks must be specifically designed for use with this product. Bulk storage tanks should be diked (bunded). Locate tanks away from heat and other sources of ignition.
Product Transfer	:	Avoid splash filling. Wait 2 minutes after tank filling (for tanks such as those on road tanker vehicles) before opening hatches or manholes. Wait 30 minutes after tank filling (for large storage tanks) before opening hatches or manholes. Keep containers closed when not in use. Do not use compressed air for filling, discharging or handling.
Recommended Materials	:	For containers, or container linings use mild steel, stainless steel. Aluminium may also be used for applications where it does not present an unnecessary fire hazard. Examples of suitable materials are: high density polyethylene (HDPE), polypropylene (PP), polyvinyl chloride (PVC), polyvinyl fluoride (PVDF), and fluoroelastomers (FKM), e.g. Viton, which have been specifically tested for compatibility with this product. For container linings, or coatings, use Epoxy (amine-cured), or Epoxy Novolac, or Phenolic Epoxy. For seals and gaskets use: fluoroelastomers (FKM), e.g. Viton A, B, or F, or Neoprene (CR), or nitrile (NBR, HNBR), or graphite, or expanded PTFE (e.g. Gore-Tex).
Unsuitable Materials	:	Some synthetic materials may be unsuitable for containers or container linings depending on the material specification and intended use. Examples of materials to avoid are: natural rubber (NR), ethylene propylene rubber (EPDM), polymethyl methacrylate (PMMA), polystyrene, polyisobutylene. However, some may be suitable for glove materials.
Container Advice	:	Do not cut, drill, grind, weld or perform similar operations on or near containers. Containers, even those that have been emptied, can contain explosive vapours.
Additional Information	:	Ensure that all local regulations regarding handling and storage facilities are followed. Hydrogen sulphide (H2S) and toxic sulphur oxides may be given off when this material is heated. Do not depend on sense of smell for warning. Hydrogen sulphide (H2S or Sour Gas) may be present when loading and unloading transport vessels. Stay upwind and away from newly opened hatches and allow to vent thoroughly before handling material. Steam may be used to vent hatches. Keep all sources of ignition away from loading area. Use hydrogen sulphide monitors for detection.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

If the American Conference of Governmental Industrial Hygienists (ACGIH) value is provided on this document, it is provided for information only.

Occupational Exposure Limits

Material Safety Data Sheet

Material	Source	Type	ppm	mg/m3	Notation
Benzene	ACGIH	TWA	0.5 ppm		
	ACGIH	STEL	2.5 ppm		
	ACGIH	SKIN_DES			Can be absorbed through the skin.
	SHELL IS	TWA	0.5 ppm	1.6 mg/m3	
	SHELL IS	STEL	2.5 ppm	8 mg/m3	
Hydrogen Sulphide	ACGIH	TWA	1 ppm		
	ACGIH	STEL	5 ppm		
Ethylbenzene	ACGIH	TWA	20 ppm		
n-hexane	ACGIH	TWA	50 ppm		
	ACGIH	SKIN_DES			Can be absorbed through the skin.
Naphthalene	ACGIH	TWA	10 ppm		
	ACGIH	STEL	15 ppm		
	ACGIH	SKIN_DES			Can be absorbed through the skin.

Consult local authorities for acceptable exposure limits within their jurisdiction.

Additional Information : SHELL IS is the Shell Internal Standard.

Biological Exposure Index (BEI) - See reference for full details

Material	Determinant	Sampling Time	BEI	Reference
Benzene	S-Phenylmercapturic acid in Creatinine in urine	Sampling time: End of shift.	25 µg/g	ACGIH BEL (2011)

Material Safety Data Sheet

	t,t-Muconic acid in Creatinine in urine	Sampling time: End of shift.	500 µg/g	ACGIH BEL (2011)
Ethylbenzene	Sum of mandelic acid and phenylglyoxylic acid in Creatinine in urine	Sampling time: End of shift at end of work week.	0.7 g/g	ACGIH BEL (2011)
	Ethyl benzene in End-exhaled air	Sampling time: Not critical.		ACGIH BEL (2011)
n-hexane	2,5-Hexanedion, without hydrolysis in Urine	Sampling time: End of shift at end of work week.	0.4 mg/l	ACGIH BEL (2011)

Exposure Controls : The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include: Use sealed systems as far as possible. Adequate explosion-proof ventilation to control airborne concentrations below the exposure guidelines/limits. Local exhaust ventilation is recommended. Eye washes and showers for emergency use.

Personal Protective Equipment : Personal protective equipment (PPE) should meet recommended national standards. Check with PPE suppliers.

Respiratory Protection : If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker health, select respiratory protection equipment suitable for the specific conditions of use and meeting relevant legislation. Check with respiratory protective equipment suppliers. Where air-filtering respirators are unsuitable (e.g. airborne concentrations are high, risk of oxygen deficiency, confined space) use appropriate positive pressure breathing apparatus. All respiratory protection equipment and use must be in accordance with local regulations. If air-filtering respirators are suitable for conditions of use: Select a filter suitable for combined particulate/organic gases and vapours [boiling point >65 °C (149 °F)] meeting EN14387. Select a filter suitable for acid gases and vapours meeting EN14387.

Hand Protection : Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739) made from the following materials may provide suitable chemical protection: Longer term protection: Nitrile rubber. Incidental contact/Splash protection: PVC. Neoprene

		rubber. Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, glove thickness, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced. Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturizer is recommended. Breakthrough times for gloves varies depending on, e.g. chemical resistance, material thickness, frequency and duration of contact. Selection should also take into account other usage requirements, e.g. dexterity, heat resistance, other chemical substances handled.
Eye Protection	:	Chemical splash goggles (chemical monogoggles).
Protective Clothing	:	Chemical resistant gloves/gauntlets, boots, and apron (where risk of splashing).
Monitoring Methods	:	Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate.
Environmental Exposure Controls	:	Local guidelines on emission limits for volatile substances must be observed for the discharge of exhaust air containing vapour.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	Brown to black. Viscous liquid.
Odour	:	Potential smell of rotten eggs and sulphur..
Odour threshold	:	Data not available
pH	:	Not applicable
Initial Boiling Point and Boiling Range	:	10 - 400 °C / 50 - 752 °F
Freezing Point	:	Data not available
Vapour pressure	:	Typical 10 - 70 kPa
Specific gravity	:	Data not available
Density	:	< 1,010 g/cm3 at 15 °C / 59 °F
Water solubility	:	Insoluble.
n-octanol/water partition coefficient (log Pow)	:	2 - 6
Kinematic viscosity	:	3 - 1,000 mm2/s at 40 °C / 104 °F
Vapour density (air=1)	:	Data not available
Evaporation rate (nBuAc=1)	:	Data not available

10. STABILITY AND REACTIVITY

Stability	:	Stable under normal conditions of use.
Conditions to Avoid	:	Avoid heat, sparks, open flames and other ignition sources.
Materials to Avoid	:	Strong oxidising agents.
Hazardous Decomposition Products	:	Hazardous decomposition products are not expected to form during normal storage. Thermal decomposition is highly

dependent on conditions. A complex mixture of airborne solids, liquids and gases including carbon monoxide, carbon dioxide, sulphur oxides and unidentified organic compounds will be evolved when this material undergoes combustion or thermal or oxidative degradation.

Hazardous Polymerisation	:	No, hazardous, exothermic polymerization cannot occur.
Sensitivity to Mechanical Impact	:	Data not available
Sensitivity to Static Discharge	:	Yes

11. TOXICOLOGICAL INFORMATION

Basis for Assessment	:	Information given is based on product data, a knowledge of the components and the toxicology of similar products.
Routes of Exposure	:	Exposure may occur via inhalation, ingestion, skin absorption, skin or eye contact, and accidental ingestion.
Acute Oral Toxicity	:	Low toxicity: LD50 > 5000 mg/kg , Rat.
Acute Dermal Toxicity	:	Low toxicity: LD50 >2000 mg/kg , Rabbit.
Acute Inhalation Toxicity	:	Extremely toxic: LC100 = 600ppm(v) , 30 min , Man. (Hydrogen Sulphide) Low toxicity by inhalation. (Petroleum, Crude Oil)
Skin Irritation	:	Not irritating to skin. Prolonged/repeated contact may cause defatting of the skin which can lead to dermatitis.
Eye Irritation	:	Expected to be moderately irritating to eyes (but insufficient to classify).
Respiratory Irritation	:	Not expected to be a respiratory irritant.
Sensitisation	:	Not expected to be a sensitiser.
Repeated Dose Toxicity	:	Harmful: danger of serious damage to health by prolonged exposure in contact with skin and if swallowed.
Mutagenicity	:	Not expected to be mutagenic.
Carcinogenicity	:	Causes cancer in laboratory animals. May cause leukaemia (AML - acute myelogenous leukemia). (Benzene)

Material	:	**Carcinogenicity Classification**
Crude Oil	:	IARC: Not classifiable as to carcinogenicity to humans.
Natural Gasoline	:	IARC: Possibly carcinogenic to humans.
Benzene	:	ACGIH: Confirmed human carcinogen.
Benzene	:	IARC: Carcinogenic to humans.
Naphthalene	:	ACGIH: Not classifiable as a human carcinogen.
Naphthalene	:	IARC: Possibly carcinogenic to humans.
Ethylbenzene	:	ACGIH: Confirmed animal carcinogen with unknown relevance to humans.
Ethylbenzene	:	IARC: Possibly carcinogenic to humans.

Reproductive and Developmental Toxicity	:	Not expected to impair fertility. Not expected to be a developmental toxicant.
Additional Information	:	Can cause liver damage. H2S has a broad range of effects dependent on the airborne

concentration and length of exposure: 0.02 ppm odour threshold, smell of rotten eggs; 10 ppm eye and respiratory tract irritation; 100 ppm coughing, headache, dizziness, nausea, eye irritation, loss of sense of smell in minutes; 200 ppm potential for pulmonary oedema after >20-30 minutes; 500 ppm loss of consciousness after short exposures, potential for respiratory arrest; >1000ppm immediate loss of consciousness, may lead rapidly to death, prompt cardiopulmonary resuscitation may be required. Do not depend on sense of smell for warning. H2S causes rapid olfactory fatigue (deadens sense of smell). There is no evidence that H2S will accumulate in the body tissue after repeated exposure. May cause MDS (Myelodysplastic Syndrome).

12. ECOLOGICAL INFORMATION

Incomplete ecotoxicological data are available for this product. The information given below is based partly on a knowledge of the components and the ecotoxicology of similar products.

Acute Toxicity : Expected to be harmful:LL/EL/IL50 1-10 mg/l(to aquatic organisms)LL/EL50 expressed as the nominal amount of product required to prepare aqueous test extract.

Mobility : Contains volatile constituents. Partly evaporates from water or soil surfaces, but a significant proportion will remain after one day. If the product enters soil, one or more constituents will or may be mobile and may contaminate groundwater.

Persistence/degradability : Major constituents are inherently biodegradable, but contains components that may persist in the environment.

Bioaccumulation : Contains constituents with the potential to bioaccumulate.

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

13. DISPOSAL CONSIDERATIONS

Material Disposal : Recover or recycle if possible. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations. Do not dispose into the environment, in drains or in water courses. Do not dispose of tank water bottoms by allowing them to drain into the ground. This will result in soil and groundwater contamination. Waste arising from a spillage or tank cleaning should be disposed of in accordance with prevailing regulations, preferably to a recognised collector or contractor. The competence of the collector or contractor should be established beforehand.

Container Disposal : Send to drum recoverer or metal reclaimer. Drain container thoroughly. After draining, vent in a safe place away from sparks and fire. Residues may cause an explosion hazard if

heated above the flash point. Do not puncture, cut or weld uncleaned drums. Do not pollute the soil, water or environment with the waste container. Comply with any local recovery or waste disposal regulations.

Local Legislation : Disposal should be in accordance with applicable regional, national, and local laws and regulations. Local regulations may be more stringent than regional or national requirements and must be complied with.

14. TRANSPORT INFORMATION

Canadian Road and Rail Shipping Classification

UN/NA Number	UN 1267
Proper shipping name	PETROLEUM CRUDE OIL
Class Division	3
Packing group	II
Shipping Description	PETROLEUM CRUDE OIL, Class 3, UN 1267, PG II

15. REGULATORY INFORMATION

The regulatory information is not intended to be comprehensive. Other regulations may apply to this material.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Class/Description : Class B2 Flammable Liquid
Class D2A Other Toxic Effects - Carcinogen/Mutagen
Class D2B Other Toxic Effects - Skin Irritant

Inventory Status

EINECS	:	All components listed or polymer exempt.
DSL	:	All components listed.
TSCA	:	All components listed.

16. OTHER INFORMATION

MSDS Version Number : 1.0

MSDS Effective Date : 09-05-2012

MSDS Revisions : A vertical bar (|) in the left margin indicates an amendment from the previous version.

MSDS Prepared By : Shell Product Stewardship; 1-800-661-1600

MSDS Distribution : The information in this document should be made available to

Material Safety Data Sheet

all who may handle the product.

Disclaimer : The information contained herein is based on our current knowledge of the underlying data and is intended to describe the product for the purpose of health, safety and environmental requirements only. No warranty or guarantee is expressed or implied regarding the accuracy of these data or the results to be obtained from the use of the product.

Material Safety Data Sheet

According to the Controlled Product Regulations

1. MATERIAL AND COMPANY IDENTIFICATION

Material Name : **Upgraded Crude**
Uses : Refinery Feedstock.
Product Code : 001B3899, 002D2308, 002D2312, 002D2315, 001B3607, 002D2316, 001D1767, 001D1777, 001B4221

Manufacturer/Supplier : **Shell Canada Products**
400 - 4th Avenue S.W
Calgary AB T2P 0J4
Canada
Telephone : (+1) 8006611600
Fax : (+1) 4033848345

Emergency Telephone Number
: Shell Canada: (+1) 800-661-7378
CANUTEC (24 hr): (+1) 613-996-6666

2. COMPOSITION/INFORMATION ON INGREDIENTS

Mixture Description : Crude oil produced by an upgrading process and containing predominantly aliphatic, alicyclic and aromatic hydrocarbons. It may also contain small amounts of nitrogen, oxygen and sulphur compounds.

Synonyms : CRU Albian Synthetic Blend
CRU Long Lake Premium Synthetic Crude
CRU Premium Newgrade Synthetic
CRU Shell Synthetic Blend
CRU Albian Heavy Synthetic
CRU Albian Premium Synthetic
CRU Shell Premium Synthetic (SPX)
CRU Syncrude
Husky Synthetic

WHMIS Controlled Ingredients

Chemical Identity	CAS No.	Conc. W/W
Distillates (petroleum), hydrotreated middle	64742-46-7	10.00- 30.00 %
Naphtha (petroleum), hydrotreated light	64742-49-0	10.00- 30.00 %
Gas oils (petroleum), hydrotreated vacuum	64742-59-2	10.00- 30.00 %
Gas oils (petroleum), hydrodesulfurized	64742-79-6	1.00- 5.00 %
Gas oil (petroleum), heavy atmospheric	68783-08-4	5.00- 10.00 %
Hydrocracked petroleum residues	64741-75-9	5.00- 10.00 %
Natural Gas Condensate	64741-47-5	10.00- 30.00 %
Naphtha (petroleum), heavy hydrocracked	64741-78-2	5.00- 10.00 %
Distillates (petroleum), straight-run, middle	64741-44-2	10.00- 30.00 %
Naphtha (petroleum), light straight-run	64741-46-4	5.00- 10.00 %

Residues (petroleum), vacuum	64741-56-6	5.00- 10.00 %
Clarified oils (petroleum), catalytic cracked	64741-62-4	1.00- 5.00 %

Contains Benzene, CAS # 71-43-2.
Contains n-Hexane, CAS # 110-54-3.
Contains hydrogen sulphide, CAS # 7783-06-4.
Contains Xylene (Mixed Isomers), CAS # 1330-20-7.
Contains Toluene, CAS # 108-88-3.
Hydrogen sulphide may be present both in the liquid and the vapour. Composition is complex and varies with the source of the crude oil.

Refer to Chapter 8 for Occupational Exposure Guidelines.

3. HAZARDS IDENTIFICATION



WHMIS Class/Description : Class B2 Flammable Liquid
Class D2A Other Toxic Effects - Carcinogen/Mutagen
Class D2A Other Toxic Effects - Reproductive Toxicity
Class D2B Other Toxic Effects - Skin Irritant
Class D2B Other Toxic Effects - Narcotic effects.
Class D2B Other Toxic Effects - Blood, Thymus,Liver.

Routes of Exposure : Exposure may occur via inhalation, ingestion, skin absorption, skin or eye contact, and accidental ingestion.

Health Hazards : Vapours may cause drowsiness and dizziness. Repeated exposure may cause skin dryness or cracking. Moderately irritating to eyes. Harmful: danger of serious damage to health by prolonged exposure in contact with skin and if swallowed. Harmful: may cause lung damage if swallowed. Hydrogen sulphide is highly toxic and may be fatal if inhaled. Hydrogen sulphide (H2S), an extremely flammable and toxic gas, and other hazardous vapours may evolve and collect in the headspace of storage tanks, transport vessels and other enclosed containers. A component or components of this material may cause cancer. This product contains benzene which may cause leukaemia (AML - acute myelogenous leukaemia). May cause MDS (Myelodysplastic Syndrome). Hydrogen sulphide is highly toxic and may be fatal if inhaled. Hydrogen sulphide (H2S), an extremely flammable and toxic gas, and other hazardous vapours may evolve and collect in the headspace of storage tanks, transport vessels and other enclosed containers. May dull the sense of smell, so do not rely on odour as an indication of hazard. H2S has a broad range of effects dependent on the airborne concentration and length of exposure: 0.02 ppm odour threshold, smell of rotten eggs; 10 ppm eye and respiratory tract irritation; 100 ppm

		coughing, headache, dizziness, nausea, eye irritation, loss of sense of smell in minutes; 200 ppm potential for pulmonary oedema after >20-30 minutes; 500 ppm loss of consciousness after short exposures, potential for respiratory arrest; >1000ppm immediate loss of consciousness, may lead rapidly to death, prompt cardiopulmonary resuscitation may be required. Do not depend on sense of smell for warning. H2S causes rapid olfactory fatigue (deadens sense of smell). There is no evidence that H2S will accumulate in the body tissue after repeated exposure. Repeated exposure may cause skin dryness or cracking. A component or components of this material may cause cancer. This product contains benzene which may cause leukaemia (AML - acute myelogenous leukaemia). May cause MDS (Myelodysplastic Syndrome).
Signs and Symptoms	:	Defatting dermatitis signs and symptoms may include a burning sensation and/or a dried/cracked appearance. Eye irritation signs and symptoms may include a burning sensation, redness, swelling, and/or blurred vision. If material enters lungs, signs and symptoms may include coughing, choking, wheezing, difficulty in breathing, chest congestion, shortness of breath, and/or fever. The onset of respiratory symptoms may be delayed for several hours after exposure. Breathing of high vapour concentrations may cause central nervous system (CNS) depression resulting in dizziness, light-headedness, headache, nausea and loss of coordination. Continued inhalation may result in unconsciousness and death. H2S has a broad range of effects dependent on the airborne concentration and length of exposure: 0.02 ppm odour threshold, smell of rotten eggs; 10 ppm eye and respiratory tract irritation; 100 ppm coughing, headache, dizziness, nausea, eye irritation, loss of sense of smell in minutes; 200 ppm potential for pulmonary oedema after >20-30 minutes; 500 ppm loss of consciousness after short exposures, potential for respiratory arrest; >1000ppm immediate loss of consciousness, may lead rapidly to death, prompt cardiopulmonary resuscitation may be required. Do not depend on sense of smell for warning. H2S causes rapid olfactory fatigue (deadens sense of smell). There is no evidence that H2S will accumulate in the body tissue after repeated exposure.
Safety Hazards	:	Highly flammable. May ignite on surfaces at temperatures above auto-ignition temperature. Flammable vapours may be present even at temperatures below the flash point. This material is a static accumulator. Even with proper grounding and bonding, this material can still accumulate an electrostatic charge. If sufficient charge is allowed to accumulate, electrostatic discharge and ignition of flammable air-vapour mixtures can occur.
Environmental Hazards	:	Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Additional Information	:	This product is intended for use in closed systems only.

4. FIRST-AID MEASURES

General Information	:	Vaporisation of H2S that has been trapped in clothing can be dangerous to rescuers. Maintain respiratory protection to avoid contamination from the victim to rescuer. Mechanical ventilation should be used to resuscitate if at all possible.
Inhalation	:	Remove to fresh air. If rapid recovery does not occur, transport to nearest medical facility for additional treatment.
Skin Contact	:	Remove contaminated clothing. Immediately flush skin with large amounts of water for at least 15 minutes, and follow by washing with soap and water if available. If redness, swelling, pain and/or blisters occur, transport to the nearest medical facility for additional treatment.
Eye Contact	:	Flush eyes with water while holding eyelids open. Rest eyes for 30 minutes. If redness, burning, blurred vision, or swelling persist transport to the nearest medical facility for additional treatment.
Ingestion	:	If swallowed, do not induce vomiting: transport to nearest medical facility for additional treatment. If vomiting occurs spontaneously, keep head below hips to prevent aspiration. Give nothing by mouth. Do not induce vomiting. If any of the following delayed signs and symptoms appear within the next 6 hours, transport to the nearest medical facility: fever greater than 101° F (38.3°C), shortness of breath, chest congestion or continued coughing or wheezing.
Advice to Physician	:	Hydrogen sulphide (H2S) - CNS asphyxiant. May cause rhinitis, bronchitis and occasionally pulmonary oedema after severe exposure. CONSIDER: Oxygen therapy. Consult a Poison Control Center for guidance. Exposure to hydrogen sulphide at concentrations above the recommended occupational exposure standard may cause headache, dizziness, irritation of the eyes, upper respiratory tract, mouth and digestive tract, convulsions, respiratory paralysis, unconsciousness and even death. Call a doctor or poison control center for guidance. Potential for chemical pneumonitis.

5. FIRE-FIGHTING MEASURES

Clear fire area of all non-emergency personnel.

Flash point	:	< 23 °C / 73 °F
Upper / lower Flammability or Explosion limits	:	0.6 - 8 %(V)
Auto ignition temperature	:	> 220 °C / 428 °F
Hazardous Combustion Products and Specific Hazards	:	Hazardous combustion products may include: A complex mixture of airborne solid and liquid particulates and gases (smoke). Carbon monoxide may be evolved if incomplete combustion occurs. Oxides of sulphur. Unidentified organic and inorganic compounds. Oxides of nitrogen. The vapour is

heavier than air, spreads along the ground and distant ignition is possible. Will float and can be reignited on surface water. Flammable vapours may be present even at temperatures below the flash point. Hydrogen sulphide (H2S) and toxic sulphur oxides may be given off when this material is heated. Do not depend on sense of smell for warning.

Suitable Extinguishing Media	:	Foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only.
Unsuitable Extinguishing Media	:	Do not use direct water jets on the burning product as they could cause a steam explosion and spread of the fire. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam.
Protective Equipment for Firefighters	:	Proper protective equipment including chemical resistant gloves are to be worn; chemical resistant suit is indicated if large contact with spilled product is expected. Self-Contained Breathing Apparatus must be worn when approaching a fire in a confined space. Select fire fighter's clothing approved to relevant Standards (e.g. Europe: EN469).
Additional Advice	:	If the fire cannot be extinguished the only course of action is to evacuate immediately. Keep adjacent containers cool by spraying with water. If possible remove containers from the danger zone. Contain residual material at affected sites to prevent material from entering drains (sewers), ditches, and waterways.

6. ACCIDENTAL RELEASE MEASURES

Protective Measures	:	May ignite on surfaces at temperatures above auto-ignition temperature. Do not breathe fumes, vapour. Do not operate electrical equipment. Shut off leaks, if possible without personal risks. Remove all possible sources of ignition in the surrounding area. Use appropriate containment (of product and fire fighting water) to avoid environmental contamination. Prevent from spreading or entering drains, ditches or rivers by using sand, earth, or other appropriate barriers. Attempt to disperse the vapour or to direct its flow to a safe location for example by using fog sprays. Take precautionary measures against static discharge. Ensure electrical continuity by bonding and grounding (earthing) all equipment.
Clean Up Methods	:	For large liquid spills (> 1 drum), transfer by mechanical means such as vacuum truck to a salvage tank for recovery or safe disposal. Do not flush away residues with water. Retain as contaminated waste. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely. For small liquid spills (< 1 drum), transfer by mechanical means to a labelled, sealable container for product recovery or safe disposal. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely.
Additional Advice	:	Notify authorities if any exposure to the general public or the

environment occurs or is likely to occur. Local authorities should be advised if significant spillages cannot be contained. Maritime spillages should be dealt with using a Shipboard Oil Pollution Emergency Plan (SOPEP), as required by MARPOL Annex 1 Regulation 26. For guidance on selection of personal protective equipment see Chapter 8 of this Material Safety Data Sheet. For guidance on disposal of spilled material see Chapter 13 of this Material Safety Data Sheet.

7. HANDLING AND STORAGE

General Precautions : Use the information in this data sheet as input to a risk assessment of local circumstances to help determine appropriate controls for safe handling, storage and disposal of this material. Properly dispose of any contaminated rags or cleaning materials in order to prevent fires. Prevent spillages. For comprehensive advice on handling, product transfer, storage and tank cleaning refer to the product supplier.

Handling : When using do not eat or drink. Extinguish any naked flames. Do not smoke. Remove ignition sources. Avoid sparks. Never siphon by mouth. The vapour is heavier than air, spreads along the ground and distant ignition is possible. Avoid exposure. Use only non-sparking tools. Use local exhaust ventilation if there is risk of inhalation of vapours, mists or aerosols. Bulk storage tanks should be diked (bunded). Even with proper grounding and bonding, this material can still accumulate an electrostatic charge. If sufficient charge is allowed to accumulate, electrostatic discharge and ignition of flammable air-vapour mixtures can occur. Be aware of handling operations that may give rise to additional hazards that result from the accumulation of static charges. These include but are not limited to pumping (especially turbulent flow), mixing, filtering, splash filling, cleaning and filling of tanks and containers, sampling, switch loading, gauging, vacuum truck operations, and mechanical movements. These activities may lead to static discharge e.g. spark formation. Restrict line velocity during pumping in order to avoid generation of electrostatic discharge (<= 1 m/s until fill pipe submerged to twice its diameter, then <= 7 m/s). Avoid splash filling. Do NOT use compressed air for filling, discharging, or handling operations.

Storage : Drum and small container storage: Keep containers closed when not in use. Drums should be stacked to a maximum of 3 high. Use properly labelled and closeable containers. Packaged product must be kept tightly closed and stored in a diked (bunded) well-ventilated area, away from, ignition sources and other sources of heat. Take suitable precautions when opening sealed containers, as pressure can build up during storage. Tank storage: Tanks must be specifically designed for use with this product. Bulk storage tanks should be diked (bunded). Locate tanks away from heat and other

sources of ignition. Cleaning, inspection and maintenance of storage tanks is a specialist operation, which requires the implementation of strict procedures and precautions. Electrostatic charges will be generated during pumping. Electrostatic discharge may cause fire. Ensure electrical continuity by bonding and grounding (earthing) all equipment to reduce the risk. The vapours in the head space of the storage vessel may lie in the flammable/explosive range and hence may be flammable. Refer to section 15 for any additional specific legislation covering the packaging and storage of this product.

Product Transfer : Wait 2 minutes after tank filling (for tanks such as those on road tanker vehicles) before opening hatches or manholes. Wait 30 minutes after tank filling (for large storage tanks) before opening hatches or manholes.
Avoid splash filling. Keep containers closed when not in use. Do not use compressed air for filling, discharging or handling. Contamination resulting from product transfer may give rise to light hydrocarbon vapour in the headspace of tanks that have previously contained gasoline. This vapour may explode if there is a source of ignition. Partly filled containers present a greater hazard than those that are full, therefore handling, transfer and sampling activities need special care.
Refer to guidance under Handling section.

Recommended Materials : For containers, or container linings use mild steel, stainless steel. Aluminium may also be used for applications where it does not present an unnecessary fire hazard. Examples of suitable materials are: high density polyethylene (HDPE), polypropylene (PP), polyvinyl chloride (PVC), polyvinyl fluoride (PVDF), and fluoroelastomers (FKM), e.g. Viton, which have been specifically tested for compatibility with this product. For container linings, or coatings, use Epoxy (amine-cured), or Epoxy Novolac, or Phenolic Epoxy. For seals and gaskets use: fluoroelastomers (FKM), e.g. Viton A, B, or F, or Neoprene (CR), or nitrile (NBR, HNBR), or graphite, or expanded PTFE (e.g. Gore-Tex).

Unsuitable Materials : Some synthetic materials may be unsuitable for containers or container linings depending on the material specification and intended use. Examples of materials to avoid are: natural rubber (NR), ethylene propylene rubber (EPDM), polymethyl methacrylate (PMMA), polystyrene, polyisobutylene. However, some may be suitable for glove materials.

Container Advice : Do not cut, drill, grind, weld or perform similar operations on or near containers. Containers, even those that have been emptied, can contain explosive vapours.

Additional Information : Ensure that all local regulations regarding handling and storage facilities are followed. Hydrogen sulphide (H2S) and toxic sulphur oxides may be given off when this material is heated. Do not depend on sense of smell for warning. Hydrogen sulphide (H2S or Sour Gas) may be present when loading and unloading transport vessels. Stay upwind and away from

newly opened hatches and allow to vent thoroughly before handling material. Steam may be used to vent hatches. Keep all sources of ignition away from loading area.
Use hydrogen sulphide monitors for detection.
See additional references that provide safe handling practices for liquids that are determined to be static accumulators: American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practices on Static Electricity). CENELEC CLC/TR 50404 (Electrostatics – Code of practice for the avoidance of hazards due to static electricity).

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

If the American Conference of Governmental Industrial Hygienists (ACGIH) value is provided on this document, it is provided for information only.

Occupational Exposure Limits

Material	Source	Type	ppm	mg/m3	Notation
Benzene	ACGIH	TWA	0.5 ppm		
	ACGIH	STEL	2.5 ppm		
	ACGIH	SKIN_DES			Can be absorbed through the skin.
	SHELL IS	TWA	0.5 ppm	1.6 mg/m3	
	SHELL IS	STEL	2.5 ppm	8 mg/m3	
Hydrogen Sulphide	ACGIH	TWA	1 ppm		
	ACGIH	STEL	5 ppm		
Ethylbenzene	ACGIH	TWA	20 ppm		
n-hexane	ACGIH	TWA	50 ppm		
	ACGIH	SKIN_DES			Can be absorbed through the skin.
Naphthalene	ACGIH	TWA	10 ppm		
	ACGIH	STEL	15 ppm		

	ACGIH	SKIN_DES			Can be absorbed through the skin.

Consult local authorities for acceptable exposure limits within their jurisdiction.

Additional Information : SHELL IS is the Shell Internal Standard. Skin notation means that significant exposure can also occur by absorption of liquid through the skin and of vapour through the eyes or mucous membranes.

Biological Exposure Index (BEI)

Material	Determinant	Sampling Time	BEI	Reference
Benzene	t,t-Muconic acid in Creatinine in urine	Sampling time: End of shift.	500 µg/g	ACGIH BEL (2011)
	S-Phenylmercapturic acid in Creatinine in urine	Sampling time: End of shift.	25 µg/g	ACGIH BEL (2011)
Ethylbenzene	Sum of mandelic acid and phenylglyoxylic acid in Creatinine in urine	Sampling time: End of shift at end of work week.	0.7 g/g	ACGIH BEL (2011)
	Ethyl benzene in End-exhaled air	Sampling time: Not critical.		ACGIH BEL (2011)
n-hexane	2,5-Hexanedion, without hydrolysis in Urine	Sampling time: End of shift at end of work week.	0.4 mg/l	ACGIH BEL (2011)

Exposure Controls : The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include: Use sealed systems as far as possible. Adequate explosion-proof ventilation to control airborne concentrations below the exposure guidelines/limits.

Local exhaust ventilation is recommended. Eye washes and showers for emergency use. Firewater monitors and deluge systems are recommended. Always observe good personal hygiene measures, such as washing hands after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping. Define procedures for safe handling and maintenance of controls. Educate and train workers in the hazards and control measures relevant to normal activities associated with this product. Ensure appropriate selection, testing and maintenance of equipment used to control exposure, e.g. personal protective equipment, local exhaust ventilation. Drain down system prior to equipment break-in or maintenance. Retain drain downs in sealed storage pending disposal or for subsequent recycle.

Personal Protective Equipment : Personal protective equipment (PPE) should meet recommended national standards. Check with PPE suppliers.

Respiratory Protection : If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker health, select respiratory protection equipment suitable for the specific conditions of use and meeting relevant legislation. Check with respiratory protective equipment suppliers. Where air-filtering respirators are unsuitable (e.g. airborne concentrations are high, risk of oxygen deficiency, confined space) use appropriate positive pressure breathing apparatus. All respiratory protection equipment and use must be in accordance with local regulations. Crude oil is a complex mixture with low and high boiling point components. When using an air-filtering respirator, careful attention to the filter breakthrough time is advised. If air-filtering respirators are suitable for conditions of use: Select a filter suitable for organic gases and vapours [boiling point >65 °C (149 °F)]. In areas where hydrogen sulphide vapours may accumulate, a positive-pressure air-supplied respirator is advised.

Hand Protection : Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739) made from the following materials may provide suitable chemical protection: PVC. Longer term protection: Nitrile rubber. Incidental contact/Splash protection: Neoprene rubber. For continuous contact we recommend gloves with breakthrough time of more than 240 minutes with preference for > 480 minutes where suitable gloves can be identified. For short-term/splash protection we recommend the same, but recognise that suitable gloves offering this level of protection may not be available and in this case a lower breakthrough time may be acceptable so long as appropriate maintenance and replacement regimes are followed. Glove thickness is not a good predictor of glove resistance to a chemical as it is dependent on the exact composition of the glove material.

		Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced.
Eye Protection	:	Chemical splash goggles (chemical monogoggles).
Protective Clothing	:	Chemical resistant gloves/gauntlets, boots, and apron.
Monitoring Methods	:	Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate. Validated exposure measurement methods should be applied by a competent person and samples analysed by an accredited laboratory. Examples of sources of recommended exposure measurement methods are given below or contact the supplier. Further national methods may be available. National Institute of Occupational Safety and Health (NIOSH), USA: Manual of Analytical Methods http://www.cdc.gov/niosh/ Occupational Safety and Health Administration (OSHA), USA: Sampling and Analytical Methods http://www.osha.gov/
Environmental Exposure Controls	:	Local guidelines on emission limits for volatile substances must be observed for the discharge of exhaust air containing vapour. Take appropriate measures to fulfil the requirements of relevant environmental protection legislation. Avoid contamination of the environment by following advice given in Chapter 6. If necessary, prevent undissolved material from being discharged to waste water. Waste water should be treated in a municipal or industrial waste water treatment plant before discharge to surface water.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	Brown to black. Viscous liquid.
Odour	:	Potential smell of rotten eggs and sulphur..
Odour threshold	:	
pH	:	Not applicable
Initial Boiling Point and Boiling Range	:	Data not available
Freezing Point	:	Data not available
Vapour pressure	:	Data not available
Specific gravity	:	Data not available
Density	:	< 1.010 g/cm3 at 15 °C / 59 °F
Water solubility	:	Insoluble.
n-octanol/water partition coefficient (log Pow)	:	2 - 6
Kinematic viscosity	:	3 - 1,000 mm2/s at 40 °C / 104 °F
Vapour density (air=1)	:	Data not available
Electrical conductivity	:	Low conductivity: < 100 pS/m, The conductivity of this material makes it a static accumulator., A liquid is typically considered

nonconductive if its conductivity is below 100 pS/m and is considered semi-conductive if its conductivity is below 10 000 pS/m., Whether a liquid is nonconductive or semi-conductive, the precautions are the same., A number of factors, for example liquid temperature, presence of contaminants, and anti-static additives can greatly influence the conductivity of a liquid.

Evaporation rate (nBuAc=1) : Data not available

10. STABILITY AND REACTIVITY

Stability	:	Stable under normal conditions of use.
Conditions to Avoid	:	Avoid heat, sparks, open flames and other ignition sources.
Materials to Avoid	:	Strong oxidising agents.
Hazardous Decomposition Products	:	Hazardous decomposition products are not expected to form during normal storage. Thermal decomposition is highly dependent on conditions. A complex mixture of airborne solids, liquids and gases including carbon monoxide, carbon dioxide, sulphur oxides and unidentified organic compounds will be evolved when this material undergoes combustion or thermal or oxidative degradation.
Hazardous Polymerisation	:	No, hazardous, exothermic polymerization cannot occur.
Sensitivity to Mechanical Impact	:	No, product will not become self-reactive.
Sensitivity to Static Discharge	:	Yes, in certain circumstances product can ignite due to static electricity.

11. TOXICOLOGICAL INFORMATION

Basis for Assessment	:	Information given is based on data from components.
Routes of Exposure	:	Exposure may occur via inhalation, ingestion, skin absorption, skin or eye contact, and accidental ingestion.
Acute Oral Toxicity	:	May be harmful if swallowed. LD50 > 2000 - <= 5000 mg/kg , Rat.
Acute Dermal Toxicity	:	Expected to be of low toxicity: LD50 > 5000 mg/kg , Rabbit.
Acute Inhalation Toxicity	:	Expected to be of low toxicity if inhaled. (Hydrogen Sulphide)
Skin Irritation	:	Causes skin irritation.
Eye Irritation	:	Expected to be irritating to eyes.
Respiratory Irritation	:	Not expected to be a respiratory irritant.
Sensitisation	:	Not expected to be a sensitiser.
Repeated Dose Toxicity	:	Repeated exposure may cause skin dryness or cracking. May cause damage to organs or organ systems through prolonged or repeated exposure. Bone Marrow (Benzene) Can cause liver damage. Liver: can cause liver damage at chronic exposure to high concentrations.
Mutagenicity	:	May cause heritable genetic damage. (Benzene)
Carcinogenicity	:	Causes cancer in laboratory animals.

Material	:	**Carcinogenicity Classification**
Crude Oil	:	IARC 3: Not classifiable as to carcinogenicity to humans.
Crude Oil	:	GHS / CLP: No carcinogenicity classification

Natural Gasoline	:	IARC 2B: Possibly carcinogenic to humans.
Natural Gasoline	:	GHS / CLP: No carcinogenicity classification
n-hexane	:	GHS / CLP: No carcinogenicity classification
Benzene	:	ACGIH Group A1: Confirmed human carcinogen.
Benzene	:	NTP: Known To Be Human Carcinogen.
Benzene	:	IARC 1: Carcinogenic to humans.
Benzene	:	GHS / CLP: Carcinogenicity Category 1A
Naphthalene	:	ACGIH Group A4: Not classifiable as a human carcinogen.
Naphthalene	:	NTP: Reasonably Anticipated to be a Human Carcinogen.
Naphthalene	:	IARC 2B: Possibly carcinogenic to humans.
Naphthalene	:	GHS / CLP: Carcinogenicity Category 2
Ethylbenzene	:	ACGIH Group A3: Confirmed animal carcinogen with unknown relevance to humans.
Ethylbenzene	:	IARC 2B: Possibly carcinogenic to humans.
Ethylbenzene	:	GHS / CLP: No carcinogenicity classification
Sulphur	:	GHS / CLP: No carcinogenicity classification

Reproductive and Developmental Toxicity : Suspected of damaging fertility or the unborn child.

Additional Information : May cause MDS (Myelodysplastic Syndrome).
Can cause liver damage.
H2S has a broad range of effects dependent on the airborne concentration and length of exposure: 0.02 ppm odour threshold, smell of rotten eggs; 10 ppm eye and respiratory tract irritation; 100 ppm coughing, headache, dizziness, nausea, eye irritation, loss of sense of smell in minutes; 200 ppm potential for pulmonary oedema after >20-30 minutes; 500 ppm loss of consciousness after short exposures, potential for respiratory arrest; >1000ppm immediate loss of consciousness, may lead rapidly to death, prompt cardiopulmonary resuscitation may be required. Do not depend on sense of smell for warning. H2S causes rapid olfactory fatigue (deadens sense of smell). There is no evidence that H2S will accumulate in the body tissue after repeated exposure.

12. ECOLOGICAL INFORMATION

Incomplete ecotoxicological data are available for this product. The information given below is based partly on a knowledge of the components and the ecotoxicology of similar products.

Acute Toxicity : LL/EL50 expressed as the nominal amount of product required to prepare aqueous test extract.

Fish : Expected to be toxic: LL/EL/IL50 > 1 <= 10 mg/l

Aquatic crustacea : Expected to be toxic: LL/EL/IL50 > 1 <= 10 mg/l

Algae/aquatic plants : Expected to be toxic: LL/EL/IL50 > 1 <= 10 mg/l

Microorganisms : Expected to be harmful: LL/EL/IL50 >10 <= 100 mg/l

Chronic Toxicity

Fish : Data not available

Aquatic crustacea	:	Data not available
Mobility	:	Floats on water. If product enters soil, one or more of its constituents will be moderately mobile and may contaminate groundwater.
Persistence/degradability	:	Oxidises rapidly by photo-chemical reactions in air. Readily biodegradable.
Bioaccumulation	:	Contains constituents with the potential to bioaccumulate.
Other Adverse Effects	:	Films formed on water may affect oxygen transfer and damage organisms.

13. DISPOSAL CONSIDERATIONS

Material Disposal	:	Recover or recycle if possible. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations. Do not dispose into the environment, in drains or in water courses. Do not dispose of tank water bottoms by allowing them to drain into the ground. This will result in soil and groundwater contamination. Waste arising from a spillage or tank cleaning should be disposed of in accordance with prevailing regulations, preferably to a recognised collector or contractor. The competence of the collector or contractor should be established beforehand.
Container Disposal	:	Send to drum recoverer or metal reclaimer. Drain container thoroughly. After draining, vent in a safe place away from sparks and fire. Residues may cause an explosion hazard if heated above the flash point. Do not puncture, cut or weld uncleaned drums. Do not pollute the soil, water or environment with the waste container. Comply with any local recovery or waste disposal regulations.
Local Legislation	:	Disposal should be in accordance with applicable regional, national, and local laws and regulations. Local regulations may be more stringent than regional or national requirements and must be in compliance.

14. TRANSPORT INFORMATION

Canadian Road and Rail Shipping Classification

UN/NA Number	UN 1267
Proper shipping name	PETROLEUM CRUDE OIL
Class Division	3
Packing group	II
Shipping Description	PETROLEUM CRUDE OIL, Class 3, UN 1267, PG II
Additional Information	MARPOL Annex 1 rules apply for bulk shipments by sea.

15. REGULATORY INFORMATION

The regulatory information is not intended to be comprehensive. Other regulations may apply to this material.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Class/Description : Class B2 Flammable Liquid
Class D2A Other Toxic Effects - Carcinogen/Mutagen
Class D2A Other Toxic Effects - Reproductive Toxicity
Class D2B Other Toxic Effects - Skin Irritant
Class D2B Other Toxic Effects - Narcotic effects.
Class D2B Other Toxic Effects - Blood, Thymus,Liver.

Inventory Status

DSL : All components listed.
:

16. OTHER INFORMATION

SDS Version Number : 2.2

SDS Effective Date : 2013-07-25

SDS Revisions : A vertical bar (|) in the left margin indicates an amendment from the previous version.

SDS Regulation : The content and format of this (M)SDS is in accordance with the Controlled Product Regulations.

SDS Prepared By : Shell Product Stewardship; 1-800-661-1600

Uses and Restrictions : This product must not be used in applications other than those recommended in Section 1, without first seeking the advice of the supplier.

SDS Distribution : The information in this document should be made available to all who may handle the product.

Disclaimer : The information contained herein is based on our current knowledge of the underlying data and is intended to describe the product for the purpose of health, safety and environmental requirements only. No warranty or guarantee is expressed or implied regarding the accuracy of these data or the results to be obtained from the use of the product.

Shell Canada Limited
Material Safety Data Sheet

Effective Date: 2010-02-15
Supersedes: 2007-02-23



Class B2 Flammable Liquid



Class D2B Skin Irritation



Class D2A Embryo/Fetotoxicity
Class D2A Carcinogenicity

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT:	**SHELL SYNTHETIC CRUDE BLEND**
SYNONYMS:	SSX Synthetic crude oil is a mixture of paraffins, naphthenes, aromatics and sulphur compounds
PRODUCT USE:	Base product for Petroleum Refining.
PRODUCT CODE:	**873-100**

SUPPLIER
Shell Canada Limited (SCL)
P.O. Box 100, Station M
400-4th Ave. S.W.
Calgary, AB Canada
T2P 2H5

TELEPHONE NUMBERS	
Shell Emergency Number	1-800-661-7378
CANUTEC 24 HOUR EMERGENCY NUMBER	1-613-996-6666
For general information:	1-800-661-1600
	www.shell.ca

This MSDS was prepared by the Toxicology and Product Stewardship Section of Shell Canada Limited.
*An asterisk in the product name designates a trade-mark of Shell Brands International AG. Used under license.

2. COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	CAS Number	% Range	WHMIS Controlled
Hydrocracked Residues	64741-75-9	0 - 100	Yes
Gas Oils (Petroleum), Heavy Atmospheric	68783-08-4	0 - 100	Yes
Distillates (Petroleum), Hydrotreated Middle	64742-46-7	0 - 30	Yes
Naphtha (Petroleum), Hydrotreated Heavy	64742-48-9	0 - 30	Yes
Naphtha (Petroleum), Hydrotreated Light	64742-49-0	0 - 10	Yes
Xylene (Mixed Isomers)	1330-20-7	1 - 2	Yes
n-Hexane	110-54-3	< 1	Yes
Toluene	108-88-3	< 1	Yes
Naphtha (petroleum), heavy straight-run	64741-41-9	0 - 5	Yes

Naphtha, heavy hydrocracked	64741-78-2	0 - 5	Yes
Benzene	71-43-2	< 0.1	Yes
Ethylbenzene	100-41-4	< 0.1	Yes

Note: N-hexane, toluene, xylene, ethylbenzene and benzene are not introduced into the product as intentional additives. These chemicals may be contained in one or more of the blending components that make up the product.

See Section 8 for Occupational Exposure Guidelines.

3. HAZARDS IDENTIFICATION

Physical Description: Viscous Liquid Dark Brown Hydrocarbon Odour

Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.

Hazards:

Flammable Liquid.
Irritating to skin.
May cause cancer.
Contains xylene, which may affect fetal development.
Exposure to vapours may cause irritation of the eyes.
Inhalation of oil mist or vapours from hot oil may cause irritation of the upper respiratory tract.

Handling:

Eliminate all ignition sources.
Wear suitable gloves and eye protection.
Bond and ground transfer containers and equipment to avoid static accumulation.
Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.
Avoid inhalation of vapours.

For further information on health effects, see Section 11.

4. FIRST AID MEASURES

Eyes: Flush eyes with water for at least 15 minutes while holding eyelids open. If irritation occurs and persists, obtain medical attention.

Skin: Wash contaminated skin with mild soap and water for at least 15 minutes. If irritation occurs and persists, obtain medical attention.

Ingestion: Do not induce vomiting; get medical help immediately.

Inhalation: Remove victim from further exposure and restore breathing, if required. Obtain medical attention.

Notes to Physician: Treatment of exposure should be directed at the control of symptoms and the clinical condition.

5. FIRE FIGHTING MEASURES

Extinguishing Media:

Dry Chemical
Carbon Dioxide
Foam
Water Fog

Firefighting Instructions: Flammable. Clear area of unprotected personnel. Do not use a direct stream of water as it may spread fire. Vapours may travel along ground and flashback along vapour trail may occur. Containers exposed to intense heat from fires should be cooled with water to prevent vapour pressure buildup, which could result in container rupture. Do not enter confined fire space without adequate protective clothing and an approved positive pressure self-contained breathing apparatus. Delayed lung damage can be experienced after exposure to combustion products, sometimes hours after the exposure. Fight fire from maximum distance.

Hazardous Combustion Products: A complex mixture of airborne solid, liquid, particulates and gases will evolve when this material undergoes pyrolysis or combustion. Carbon monoxide, carbon dioxide, oxides of nitrogen and oxides of sulphur may be formed on combustion.

6. ACCIDENTAL RELEASE MEASURES

Issue warning "Flammable". See Section 8 for advice on personal protective equipment. Eliminate all ignition sources. Isolate hazard area and restrict access. Stop leak only if safe to do so. Notify appropriate environmental agency(ies). Work upwind of spill if it is safe to do so. Dike and contain land spills; contain spills to water by booming. Do not wash spills into sewers or other public water systems. For large spills remove by mechanical means and place in containers. Adsorb residue or small spills with adsorbent material and remove to non-leaking containers for disposal. After area has been cleaned up to the satisfaction of regulatory authorities, flush area with water to remove trace residue. Dispose of recovered material as noted under Disposal Considerations.

7. HANDLING AND STORAGE

Handling: Flammable. Fixed equipment as well as transfer containers and equipment should be grounded to prevent accumulation of static charge. Avoid breathing vapours and prolonged or repeated contact with skin. Empty containers are hazardous, may contain flammable/explosive dusts, residues or vapours. Do not cut, drill, grind, weld or perform similar operations on or near containers. Launder contaminated clothing prior to reuse. Wash with soap and water prior to eating, drinking, smoking, applying cosmetics or using toilet facilities. Use good personal hygiene.

Storage: Tank storage should be done according to NFPA Code 30 for crude oils.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

The following information, while appropriate for this product, is general in nature. The selection of personal protective equipment will vary depending on the conditions of use.

OCCUPATIONAL EXPOSURE LIMITS (Current ACGIH TLV/TWA unless otherwise noted):
North American exposure limits have not been established for the product. Consult local and provincial authorities for acceptable values.
Xylene: 100 ppm (STEL: 150 ppm)
Petroleum Distillates (Carbon range C9 to C20): Shell Canada's internal guideline is 100 mg/m3 total hydrocarbon as an OEL (8-hour TWA).
Naphtha (Carbon range C3 to C11): Shell Canada's internal guideline is 900 mg/m3 total hydrocarbon as an OEL (8-hour TWA).

Polycyclic Aromatic Hydrocarbons (PAH): Shell Canada's internal guideline is 0.02 mg/m3 as an OEL (8-hour TWA).

Mechanical Ventilation: Use explosion-proof ventilation as required to control vapour concentrations. Concentrations in air should be maintained below the occupational exposure limit if unprotected personnel are involved. Make up air should always be supplied to balance air exhausted (either generally or locally). Local ventilation recommended where general ventilation is ineffective in controlling airborne concentrations below the recommended occupational exposure limit. For personnel entry into confined spaces (i.e. bulk storage tanks) a proper confined space entry procedure must be followed including ventilation and testing of tank atmosphere.

PERSONAL PROTECTIVE EQUIPMENT:

Eye Protection: Chemical safety goggles and/or full face shield to protect eyes and face, if product is handled such that it could be splashed into eyes.

Skin Protection: Avoid contact with skin. Impervious gloves should be worn at all times when handling this product. In confined spaces or where the risk of skin exposure is much higher, impervious clothing should be worn. Use protective clothing and gloves manufactured from nitrile.

Respiratory Protection: Avoid breathing vapour or mists. If exposure exceeds occupational exposure limits, use an appropriate NIOSH-approved respirator. Depending on airborne concentration, use either a NIOSH-approved chemical cartridge respirator with organic vapour cartridges in combination with a P95 particulate filter or use a NIOSH-approved supplied-air respirator, either self-contained or airline, operated in positive pressure mode.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Viscous Liquid
Appearance:	Dark Brown
Odour:	Hydrocarbon Odour
Odour Threshold:	Not available
Boiling Point:	-15 - 590 °C
Density:	860 - 900 kg/m3 @ 15 °C
Specific Gravity (Water = 1):	0.86 - 0.9
pH:	Not available
Flash Point:	< 0 °C
Lower Flammable Limit:	Not available
Upper Flammable Limit:	Not available
Autoignition Temperature:	Not available
Viscosity:	16 cSt @ 30 °C
Evaporation Rate (n-BuAc = 1):	Not available
Partition Coefficient (log K_{OW}):	Not available
Water Solubility:	Insoluble
Other Solvents:	Hydrocarbon Solvents

10. STABILITY AND REACTIVITY

Chemically Stable: Yes

Hazardous Polymerization: No
Sensitive to Mechanical Impact: No
Sensitive to Static Discharge: Yes
Hazardous Decomposition Products: When heated to decomposition, may emit toxic and corrosive fumes of sulphur oxides, as well as CO, CO2, uncombusted hydrocarbons and soot.
Incompatible Materials: Avoid strong oxidizing agents.
Conditions of Reactivity: Avoid excessive heat, formation of vapours or mists.

11. TOXICOLOGICAL INFORMATION

Ingredient (or Product if not specified)	Toxicological Data
Hydrocracked Residues	LD50 Oral Rat = 4320 mg/kg LD50 Dermal Rat > 2000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Gas Oils (Petroleum), Heavy Atmospheric	
Distillates (Petroleum), Hydrotreated Middle	LD50 Dermal Rat > 2000 mg/kg LD50 Oral Rat > 5000 mg/kg
Naphtha (Petroleum), Hydrotreated Heavy	LD50 Oral Rat > 5000 mg/kg LD50 Dermal Rabbit > 3160 mg/kg
Naphtha (Petroleum), Hydrotreated Light	LD50 Oral Rat > 5000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Xylene (Mixed Isomers)	LD50 Oral Rat = 4300 mg/kg LC50 Inhalation Rat = 6700 ppm for 4 hours LD50 Dermal Rabbit > 2000 mg/kg
n-Hexane	LD50 Oral Rat > 8 mL/kg LD50 Dermal Rat > 4 mL/kg LC50 Inhalation Rat = 54090 - 57000 ppm for 4 hours
Toluene	LD50 Oral Rat 5580 mg/kg LC50 Inhalation Rat 26700 ppm for 1 hour LD50 Dermal Rabbit 12400 mg/kg
Naphtha (petroleum), heavy straight-run	LC50 Inhalation Rat > 5000 mg/m3 for 4hours
Naphtha, heavy hydrocracked	LC50 Inhalation Rat > 5240 mg/m3 for 4hours LD50 Oral Rat > 5000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Benzene	LD50 Oral Rat 690 - 3400 mg/kg LC50 Inhalation Rat 13700 ppm for 4 hours LD50 Dermal Rabbit > 8260 mg/kg
Ethylbenzene	LD50 Oral Rat = 3500 mg/kg LC50 Inhalation Rat = 4000 ppm for 4 hours LD50 Dermal Rabbit = 17.8 mL/kg

Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.
Irritancy: Based on the ingredients, this product is expected to be irritating to skin.
Chronic Effects: Prolonged or repeated contact may cause various forms of dermatitis including folliculitis and oil acne. Prolonged exposure to high vapour concentration can cause headache, dizziness, nausea, blurred vision and central nervous system depression. Long term intensive exposure to oil mist may cause benign lung fibrosis.

Feto/Teratogenicity: High exposures to xylene in some animal studies, often at levels toxic to the mother, have affected embryo/fetal development. Other animal and human studies have not shown this effect.

Pre-existing Conditions: Pre-existing skin disorders may be aggravated by exposure to components of this product.

Carcinogenicity and Mutagenicity: Carcinogenic hazard. This product may contain a variety of polycyclic aromatic hydrocarbons (PAH), some of which are associated with the potential of inducing skin cancer. Increasing amounts of PAH may be released if this product is heated above 200 C.

12. ECOLOGICAL INFORMATION

Environmental Effects: The immediate effect of a release is the physical impairment of the environment from the coating of surfaces, resulting in the disruption of oxygen, water and light to flora and fauna. May cause physical fouling of aquatic and avian organisms. Prolonged exposure may result in the partitioning of light-end hydrocarbon fractions into the water and gas phases of the subsurface soil environment with potential to adversely affect soil and groundwater quality.

Biodegradability: Not readily biodegradable.

13. DISPOSAL CONSIDERATIONS

Waste management priorities (depending on volumes and concentration of waste) are: 1. recycle (reprocess), 2. energy recovery 3. incineration, 4. disposal at a licenced waste disposal facility. Do not attempt to combust waste on-site. Incinerate at a licenced waste disposal site with approval of environmental authority. Landfill adsorbed material in a government approved site.

14. TRANSPORT INFORMATION

Canadian Road and Rail Shipping Classification:

UN Number	UN1268
Proper Shipping Name	PETROLEUM DISTILLATES, N.O.S.
Hazard Class	Class 3 Flammable Liquids
Packing Group	PG I
Shipping Description	PETROLEUM DISTILLATES, N.O.S. Class 3 UN1268 PG I

15. REGULATORY INFORMATION

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

WHMIS Class:
Class B2 Flammable Liquid
Class D2B Skin Irritation
Class D2A Embryo/Fetotoxicity
Class D2A Carcinogenicity

DSL/NDSL Status: This product, or all components, are listed on the Domestic Substances List, as required under the Canadian Environmental Protection Act.

Other Regulatory Status: The regulatory information is not intended to be comprehensive. Other regulations may apply to this material. For purposes of TSCA, the product is a mixture of certain blending components, all of which are on the TSCA Inventory. Individual shipments of this product will not necessarily contain all of the blending components listed in Section 2 above.

16. OTHER INFORMATION

LABEL STATEMENTS

Hazard Statement : Flammable Liquid.
Irritating to skin.
May cause cancer.
Contains xylene, which may affect fetal development.

Handling Statement: Eliminate all ignition sources.
Wear suitable gloves and eye protection.
Bond and ground transfer containers and equipment to avoid static accumulation.
Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.
Avoid inhalation of vapours.

First Aid Statement : Wash contaminated skin with soap and water.
Flush eyes with water.
If overcome by vapours remove to fresh air.
Do not induce vomiting.
Obtain medical attention.

Revisions: This MSDS has been reviewed and updated. Changes have been made to: Section 2 Section 15

ENBRIDGE

Safety Data Sheet

Section 1: Identification

PRODUCT IDENTIFIER	High Sweet Clearbrook	
OTHER MEANS OF IDENTIFICATION	**UN-Number**	UN1267
	Synonyms	Bakken Crude Oil; High Sweet Clearbrook (UHC); Hydrocarbons of Petroleum; North Dakota Sweet (NSW)
RECOMMENDED USE	No information available	
RESTRICTIONS OF USE	No information available	
SUPPLIER INFORMATION	Enbridge Pipelines Inc. 10201 Jasper Avenue Edmonton, Alberta T5J 3N7 Canada TEL: 1-780-420- 5210	
EMERGENCY CONTACT INFORMATION	**CHEMTREC**	1-800-424-9300 for US 703- 527- 3887 outside US
	CANUTEC (Canadian Transportation)	613-996-6666

Section 2: Hazards Identification

CLASSIFICATION	Skin Corrosion/Irritation	Category 2
	Eye Irritation	Category 2
	Germ Cell Mutagenicity	Category 1B
	Carcinogenicity	Category 1A
	Reproductive Toxicity	Category 2
	Specific Target Organ Systemic Toxicity (Single Exposure)	Category 3
	Specific Target Organ Toxicity (Repeated Exposure)	Category 1
	Aspiration Toxicity	Category 1
	Flammable liquids	Category 1
LABEL ELEMENTS	**Signal Word**	Danger
	Hazard Pictograms	

	Hazard Statements	• Causes skin irritation. • Causes serious eye irritation. • May cause genetic defects. • May cause cancer. • Suspected of damaging fertility or the unborn child. • May cause respiratory irritation. • Causes damage to organs through prolonged or repeated exposure. • May be fatal if swallowed and enters airways. • Extremely flammable liquid and vapor.
PRECAUTIONARY STATEMENTS	**Prevention**	• Wash face, hands and any exposed skin thoroughly after handling. • Wear protective gloves/protective clothing/eye protection/face protection. • Obtain special instructions before use. • Do not handle until all safety precautions have been read and understood. • Use personal protective equipment as required. • Do not breathe dust/fume/gas/mist/vapors/spray. • Use only outdoors or in a well-ventilated area. • Do not eat, drink or smoke when using this product. • Keep away from heat/sparks/open flames/hot surfaces. • No smoking. • Keep container tightly closed. • Ground/bond container and receiving equipment. • Use explosion-proof electrical/ventilating/lighting/equipment. • Use only non-sparking tools. • Take precautionary measures against static discharge. • In case of inadequate ventilation wear respiratory protection.
	Response	• IF exposed or concerned: Get medical advice/attention. • IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing. • Call a POISON CENTER or doctor/physician if you feel unwell. • Get medical advice/attention if you feel unwell. • IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. • IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. • In case of fire: Use CO2, dry chemical, or foam for extinction. • IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. • Do NOT induce vomiting.
	Storage/Disposal	• Store locked up. • Store in a well-ventilated place. Keep container tightly closed. • Keep cool. • Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.
OTHER INFORMATION		• Under United States Regulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered hazardous. • Very toxic to aquatic life with long lasting effects.

Section 3: Composition/Information on Ingredients

COMPONENT NAME	CAS NUMBER	PERCENTAGE (%)*	NOTES
Petroleum Hydrocarbons	68919-39-1	100	
Trans-1, 2-dimethylcyclopentane	28729-52-4	1.8	
2-Methylhexane	591-76-4	1.0	
2-Methylpentane	107-83-5	1.8	
3-Methylhexane	589-34-4	1.6	
3-Methylpentane	96-14-0	1.3	
2-Methylheptane	592-27-8	1.4	
Benzene	71-43-2	0.4	
Cyclohexane	110-82-7	1.0	
i-Pentane	109-66-0	1.8	
MethylCyclohexane	108-87-2	2.3	
Methylcyclopentane	96-37-7	2.2	
n-Butane	106-97-8	1.9	
n-Heptane	142-82-5	3.4	
n-Hexane	110-54-3	3.4	
n-Pentane	109-66-0	3.4	
n-Octane	111-65-9	3.0	
n-Nonane	111-84-2	2.2	
n-Decane	124-18-5	2.0	
n-Undecane	1120-21-4	1.7	
n-Dodecane	112-40-3	1.5	
n-Tridecane	629-50-5	1.3	
Toluene	108-88-3	0.9	
Hydrogen sulfide	7783-06-4	<0.00001	
Ethylbenzene	100-41-4	0.6	
Xylenes	1330-20-7	0-5	

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

Section 4: First Aid Measures

DESCRIPTION OF NECESSARY MEASURES	**Inhalation**	• IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If irritation persists: Get medical advice/attention.
	Skin	• IF ON SKIN: Wash with plenty of soap and water. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse.
	Eye	• IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.
	Ingestion	• Do NOT induce vomiting. Call a physician or poison control center. • Aspiration hazard if swallowed - can enter lungs and cause damage.
MOST IMPORTANT SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED	**Refer to Section 11 - Toxicological Information**	
INDICATION OF IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED, IF NECESSARY	**Note to the Physician**	• Aspiration hazard. Symptoms may be delayed. • 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. • Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.

Section 5: Fire Fighting Measures

EXTINGUISHING MEDIA	**Suitable Extinguishing Media**	• SMALL FIRES: Dry chemical, CO_2, water spray or regular foam. • LARGE FIRE: Water spray, fog or regular foam.
	Unsuitable Extinguishing Media	• CAUTION: Use of water spray when fighting fire may be inefficient. • Do not use straight streams.
FIREFIGHTING PROCEDURES		• FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. • FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: If impossible to extinguish, protect surroundings and allow fire to burn itself out. • Stay upwind. • Ventilate closed spaces before entering. • Fire fighters should wear complete protective clothing including self-contained breathing apparatus. • FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions.

- FIRE: When a large quantity of this material is involved in a major fire, consider an initial evacuation distance of 300 meters (1000 feet) in all directions.
- Move containers from fire area if you can do it without risk.
- LARGE FIRES: Use water spray or fog; do not use straight streams.
- LARGE FIRES: If insufficient water supply: knock down vapors only. If this is impossible, withdraw from area and let fire burn.
- LARGE FIRES: Flood fire area with large quantities of water, while knocking down vapors with water fog.

SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OR MIXTURE

- Vapors may travel to source of ignition and flash back.
- Air/vapor mixtures may explode when ignited.
- Vapors may accumulate in confined areas (basement, tanks, hopper/tank cars etc.).
- Will be easily ignited by heat, sparks or flames.
- Runoff to sewer may create fire or explosion hazard.
- Vapor explosion hazard indoors, outdoors or in sewers.
- MAY EXPLODE AND THROW FRAGMENTS 1600 meters (1 MILE) OR MORE IF FIRE REACHES CARGO.
- May create vapor/air explosion hazard indoors, outdoors or in sewers.
- Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).

EXPLOSION DATA

Hazardous Combustion Products	• Carbon monoxide. Carbon dioxide (CO2). Nitrogen oxides (NOx). Oxides of sulfur. • Aldehydes, aromatic and other hydrocarbons.
Sensitivity to Mechanical Impact	• None.
Sensitivity to Static Discharge	• Yes.

PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIREFIGHTERS

- As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.
- 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 firefighters.
- Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces.
- Water spray may be useful in minimizing or dispersing vapors.
- Long-duration fires involving diluent stored in tanks may result in a boilover.
- For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear.

Section 6: Accidental Release Measures

PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

Personal Precautions

- Evacuate personnel to safe areas.
- Remove all sources of ignition.
- Deny entry to unauthorized and unprotected personnel.
- Use personal protective equipment.
- Avoid contact with skin, eyes and clothing.
- Stop leak if you can do it without risk.
- Keep people away from and upwind of spill/leak.
- Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.

- Ventilate enclosed areas.
- Do not walk through spilled material.

Protective Equipment

- Wear appropriate breathing apparatus (if applicable) and protective clothing.

Emergency Procedures

- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area) Keep unauthorized personnel away. Evacuate area. Keep out of low areas. Stop leak if you can do it without risk.
- Report spills to local or federal authorities as appropriate or required.

ENVIRONMENTAL PRECAUTIONS

- Avoid run off to waterways and sewers. Do NOT wash away into sewer. Prevent entry into waterways, sewers, basements or confined areas. Runoff from fire control may cause pollution.

METHODS AND MATERIAL FOR CONTAINMENT AND CLEANING UP

Methods for Containment

- Stop leak if you can do it without risk.
- Contain and recover liquid when possible.
- A vapor suppressing foam may be used to reduce vapors.
- Dike far ahead of spill; use dry sand to contain the flow of material; contain water spills by booming.
- Use water spray to reduce vapors or divert vapor cloud drift.
- A fine water spray remotely directed to the edge of the spill pool can be used to direct and maintain a hot flare fire which will burn the spilled material in a controlled manner.

Methods for Cleaning Up

- Clean up spill immediately.
- LARGE SPILLS: DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST.
- SMALL LIQUID SPILLS: Use a non-combustible material like vermiculite or sand to soak up the product and place into a container for later disposal.
- Use appropriate Personal Protective Equipment (PPE).
- Use clean non-sparking tools to collect absorbed material.
- Vacuum spilled material.
- Try to work upwind of spill.
- All equipment used when handling the product must be grounded.
- Recover and return free product to proper containers
- Use suitable absorbent materials such as vermiculite, sands, soil, or clay to clean up residual liquids.
- Do not place spilled materials back in the original container.
- Do not flush to sewer or allow to enter waterways.

Section 7: Handling and Storage

PRECAUTIONS FOR SAFE HANDLING

Handling

- All equipment used when handling the product must be grounded. Avoid contact with heat and ignition sources and oxidizers. Do not breathe (dust, vapor or spray mist). Do not use in areas without adequate ventilation. Do not use sparking tools. Keep away from heat, sparks, and flame. No open flames, no sparks and no smoking. Use only with adequate ventilation. Do not use or store near heat or open flame. Keep away from fire, sparks and heated surfaces.
- The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes).

- The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits.
- Take precautionary measures against static discharges.

Handling

- Do not cut drill, grind or weld on empty containers since they may contain explosive residues.
- Stay upwind and vent open hatches before uploading.
- Avoid contact with skin, eyes and clothing.
- Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water.
- Wear personal protective equipment.
- Remove and wash contaminated clothing before re-use.
- Do not eat, drink or smoke when using this product.
- Do not take internally.
- Wash thoroughly after handling.
- Empty containers pose a potential fire and explosion hazard.

CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES

Storage

- Ventilate enclosed areas.
- Store in a well-ventilated place.
- Keep container tightly closed.
- Store locked up.
- Avoid shock, impact, friction, and rough handling. Do not use sparking tools.
- Store in a cool/low-temperature, well-ventilated place away from heat and ignition sources.
- Keep away from sources of ignition.
- No Smoking.
- Do not enter confined spaces such as tanks or pits without following proper entry procedures.
- Store in properly closed containers that are appropriately labeled and in a cool well-ventilated area.
- Harmful concentrations of hydrogen sulfide (H_2S) gas can accumulate in excavations and low-lying areas as well as the vapor space of storage and bulk transport compartments.
- Keep away from open flames, hot surfaces and sources of ignition.
- Keep product and empty container away from heat and sources of ignition.
- Storage containers should be grounded and bonded.
- Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge.
- Store away from incompatible materials.

Incompatible Products

- Strong oxidizers such as nitrates, chlorates, peroxides.

Section 8: Exposure Controls/Personal Protection

CONTROL PARAMETERS: EXPOSURE GUIDELINES

CHEMICAL NAME	ACGIH	OSHA	NIOSH
2-Methylpentane	-	-	TWA 100 ppm TWA 350 mg/m^3 Ceiling 510 ppm Ceiling 1800 mg/m^3

3-Methylpentane	-	-	TWA 100 ppm TWO 350 mg/m^3 Ceiling 510 ppm Ceiling 1800 mg/m^3
Benzene	TLV 0.5 ppm TLV 1.6 mg/m^3 STEL 2.5 ppm STEL 8 mg/m^3	PEL 1 ppm STEL 5 ppm	TWA 0.1 ppm STEL 1 ppm IDLH 500 ppm
Cyclohexane	TLV 100 ppm TLV 334 mg/m^3	PEL 300 ppm PEL 1050 mg/m^3	TWA 300 ppm TWA 1050 mg/m^3 IDLH 1300 ppm
i-Pentane	TLV 600 ppm TLV 1770 mg/m^3	PEL 1000 ppm PEL 2950 mg/m^3	TWA 120 ppm TWA 350 mg/m^3 Ceiling 610 ppm Ceiling 1800 mg/m^3 IDLH 1500 ppm
MethylCyclohexane	TLV 400 ppm TLV 1610 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 400 ppm TWA 1600 mg/m^3 IDLH 1200 ppm
n-Butane	TLV 1000 ppm	-	TWA 800 ppm TWA 1900 mg/m^3
n-Heptane	TLV 400 ppm TLV 1640 mg/m^3 STEL 500 ppm STEL 2000 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 85 ppm TWA 350 mg/m^3 Ceiling 440 ppm Ceiling 1800 mg/m^3 IDLH 750 ppm
n-Hexane	TLV 50 ppm TLV 176 mg/m^3	PEL 500 ppm PEL 1800 mg/m^3	TWA 50 ppm TWA 180 mg/m^3 IDLH 1100 ppm
n-Pentane	TLV 600 ppm TLV 1770 mg/m^3	PEL 1000 ppm PEL 2950 mg/m^3	TWA 120 ppm TWA 350 mg/m^3 Ceiling 610 ppm Ceiling 1800 mg/m^3 IDLH 1500 ppm
n-Octane	TLV 300 ppm TLV 1401 mg/m^3	PEL 500 ppm PEL 2350 mg/m^3	TWA 75 ppm TWA 350 mg/m^3 Ceiling 385 ppm Ceiling 1800 mg/m^3 IDLH 1000 ppm
n-Nonane	TLV 200 ppm TLV 1050 mg/m^3	-	TWA 200 ppm TWA 1050 mg/m^3

Toluene	TLV 20 ppm TLV 75 mg/m^3	PEL 200 ppm STEL 300 mg/m^3	TWA 100 ppm TWA 375 mg/m^3 STEL 150 ppm STEL 560 mg/m^3 IDLH 500 ppm
Hydrogen sulfide	TLV 1 ppm TLV 1.4 mg/m^3 STEL 5 ppm STEL 7 mg/m^3	Ceiling 20 ppm	Ceiling 10 ppm Ceiling 15 mg/m^3 IDLH 100 ppm
Ethylbenzene	TLV 20 ppm TLV 87 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 125 ppm STEL 545 mg/m^3 IDLH 800 ppm
Xylenes	TLV 100 ppm TLV 434 mg/m^3 STEL 150 ppm STEL 651 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 150 ppm STEL 655 mg/m^3 IDLH 900 ppm

APPROPRIATE ENGINEERING CONTROLS

- Adequate ventilation systems as needed to control concentrations of airborne contaminants below applicable threshold limit values. Prevent vapor build up by providing adequate ventilation during and after use. Use only appropriately classified electrical equipment.

INDIVIDUAL PROTECTION MEASURES

Eye and Face	• Wear face shield and eye protection.
Skin and Body	• The use of gloves (nitrile or neoprene) is advised to prevent skin contact and possible irritation. • Wear protective gloves/protective clothing/eye protection/face protection. Wear long sleeves and/or protective coveralls.
Respiratory	• Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or symptoms are experienced.
General Hygiene Measures	• Handle in accordance with good industrial hygiene and safety practice.

Section 9: Physical and Chemical Properties

MATERIAL DESCRIPTION

Physical State	Liquid	**Odor**	Rotten egg, petroleum-like odor
Substance Type	Mixture	**Odor Threshold**	No data available
Appearance	Clear to brown liquid		

PROPERTIES				
	pH	No data available	**Vapor pressure**	72.3 to 101.35 kPa @ 37.8°C (100.4°F)
	Melting Point/ Freezing Point	No data available	**Vapor density**	1.0 to 3.9 Air=1
	Boiling Point/ Boiling Range	82.6 to 1330 °F 28.1 to 721.1 °C	**Relative density**	41.2 to 42.6
	Flash Point	-38 to -36 °F -38.8 to -37.7 °C	**Water Solubility**	Negligible
	Evaporation Rate	(Ethyl Ether =1) >1	**Partition coefficient: n-octanol/water**	No data available
	Flammability (solid, gas)	No data available	**Autoignition temperature**	No data available
	Upper Flammability Limit	No data available	**Decomposition temperature**	No data available
	Lower Flammability Limit	No data available	**Specific Gravity**	0.82
	Viscosity	5.43 mm^2/s		

Section 10: Stability and Reactivity

REACTIVITY	No data available
CHEMICAL STABILITY	Stable at 70 °F, 760 mm Hg pressure
POSSIBILITY OF HAZARDOUS REACTIONS	None under normal processing
CONDITIONS TO AVOID	Excessive heat, sources of ignition, sparks, open flames, and buildup of static electricity
INCOMPATIBLE MATERIALS	Strong oxidizers such as nitrates, chlorates, peroxides
HAZARDOUS DECOMPOSITION PRODUCTS	Combustion produces carbon monoxide, aldehydes, aromatic and other hydrocarbons
HAZARDOUS POLYMERIZATION	Will not occur

Section 11: Toxicological Information

INFORMATION ON THE LIKELY ROUTES OF EXPOSURE		
	Inhalation	• May cause irritation of respiratory tract. May cause drowsiness and dizziness.
	Eye Contact	• Causes serious eye irritation.
	Skin Contact	• Causes skin irritation.

Ingestion	• Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. • Potential for aspiration if swallowed. • Aspiration may cause pulmonary edema and pneumonitis.

TOXICOLOGICAL DATA

CHEMICAL NAME	LD50 ORAL	LD50 DERMAL	LC50 INHALATION
Benzene	1800 mg/kg (Rat)	-	13050 - 14380 ppm (Rat) 4 h
Cyclohexane	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	= 13.9 mg/L (Rat) 4 h
i-Pentane	>2000 mg/kg (Rat)	-	364 g/cu (Rat) 4 h
MethylCyclohexane	> 3200 mg/kg (Rat)	-	-
n-Butane	-	-	658 mg/L (Rat) 4 h
n-Heptane	-	= 3000 mg/kg (Rabbit)	= 103 g/m^3 (Rat) 4 h
n-Hexane	= 25 g/kg (Rat)	= 3000 mg/kg (Rabbit)	= 48000 ppm (Rat) 4 h
n-Pentane	>2000 mg/kg (Rat)	-	364 g/cu (Rat) 4 h
n-Octane	-	-	= 118 g/m^3 (Rat) 4 h = 25260 ppm (Rat) 4 h
n-Nonane	-	-	= 3200 ppm (Rat) 4 h
n-Decane	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rat)	-
Toluene	2.6 to 7.5 g/kg (Rat)	14.1 ml/kg (Rabbit)	-
Hydrogen sulfide	-	-	= 444 ppm (Rat)
Ethylbenzene	= 3500 mg/kg (Rat)	= 15400 mg/kg (Rabbit)	= 17.2 mg/L (Rat) 4 h
Xylenes	= 3500 mg/kg (Rat)	> 4350 mg/kg (Rabbit) > 1700 mg/kg (Rabbit)	= 29.08 mg/L (Rat) 4 h = 5000 ppm (Rat) 4 h

SYMPTOMS RELATED TO THE PHYSICAL, CHEMICAL AND TOXICOLOGICAL CHARACTERISTICS

Benzene	• Repeated or prolonged exposure to benzene at concentrations in excess of the TLV may cause serious injury to blood-forming organs. Significant chronic exposure to benzene vapor has been reported to produce various blood disorders ranging from anemia to certain forms of leukemia (cancer) in man. Benzene produced tumors in rats and mice in lifetime chronic toxicity studies, but the response has not been consistent across species, strain, sex or route of exposure. Animal studies on benzene have demonstrated immune toxicity, chromosomal aberrations, testicular effects and alterations in reproductive cycles and embryo/fetotoxicity, but not teratogenicity.

Hydrogen Sulfide Gas (H_2S)	• Toxic by inhalation. Prolonged breathing of 50-100 ppm H_2S vapors can produce eye and respiratory tract irritation. Higher concentration (250-600 ppm) for 15-30 minutes can produce headache, dizziness, nervousness, nausea and pulmonary edema or bronchial pneumonia. Concentrations of >1000 ppm will cause immediate unconsciousness and death through respiratory paralysis. Rats and mice exposed to 80 ppm H_2S, 6 hrs/day, 5 days/week for 10 weeks, did not produce any toxicity except for irritation of nasal passages. H_2S did not affect reproduction and development (birth defects or neurotoxicity) in rats exposed to concentrations of 75-80 ppm or 150 ppm H_2S, respectively. Over the years a number of acute cases of H_2S poisoning have been reported. Complete and rapid recovery is the general rule. However, if the exposure was sufficiently intense and sustained causing cerebral hypoxia (lack of oxygen to the brain), neurologic effects such as amnesia, intention tremors or brain damage are possible.
Hexane	• This product may contain hexane at a level of >1.0%. Studies in laboratory animals have produced systemic toxicity in blood, spleen and lungs. Fetotoxicity has been observed at hexane concentrations that produced maternal toxicity. Long term exposure to high concentrations of hexane has been shown to cause testicular effects and nervous system damage.
Xylenes	• Gross overexposure or severe poisoning incidents in humans to xylenes has been reported to cause lung, liver, kidney, heart and brain damage as well as neurologic disturbances. Laboratory animals exposed to high dose of xylenes showed evidence of effects in the liver, kidneys, lungs, spleen, heart and adrenals, Exposure of pregnant rats, mice and rabbits during gestation to significant concentrations of xylenes produced maternal, fetal and developmental toxicity (skeletal retardation, cleft palate, and wavy ribs) generally at maternally toxic doses. These types of fetotoxic effects have been associated with maternal toxicity. Repeated inhalation of high xylene concentrations has shown impairment of performance abilities (behavioral tests) in animals and man. Xylenes produced a mild frequency hearing loss in rats subchronically exposed to high concentrations of xylenes.

DELAYED AND IMMEDIATE EFFECTS AND ALSO CHRONIC EFFECTS FROM SHORT- AND LONG-TERM EXPOSURE

Sensitization	• No information available
Mutagenic Effects	• May cause genetic defects
Carcinogenicity	• May cause cancer

CARCINOGENIC INFORMATION

CHEMICAL NAME	ACGIH	IARC	NTP	OSHA
Benzene	A1	Group 1	Known	X
Toluene	A4	Group 3	Evidence	-
Ethylbenzene	A3	Group 2B	Evidence	X
Xylenes	A4	Group 3	Evidence	-

REPRODUCTIVE TOXICITY

• Suspected of damaging fertility or the unborn child.

STOT - SINGLE EXPOSURE

• No information available.

STOT - REPEATED EXPOSURE

• Causes damage to organs through prolonged or repeated exposure.

ASPIRATION HAZARD

May be fatal if swallowed and enters airways Risk of serious damage to the lungs (by aspiration).

Section 12: Ecological Information

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Benzene	EC50 72 h: = 29 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 10.7 - 14.7 mg/L flow-through (Pimephales promelas) LC50 96 h: = 5.3 mg/L flow-through (Oncorhynchus mykiss) LC50 96 h: = 22.49 mg/L static (Lepomis macrochirus) LC50 96 h: = 28.6 mg/L static (Poecilia reticulata) LC50 96 h: 22330 - 41160 µg/L static (Pimephales promelas) LC50 96 h: 70000 - 142000 µg/L static (Lepomis macrochirus)	EC50 48 h: 8.76 - 15.6 mg/L Static (Daphnia magna) EC50 48 h: = 10 mg/L (Daphnia magna)	-
Cyclohexane	EC50 72 h: > 500 mg/L (Desmodesmus subspicatus)	LC50 96 h: 3.96 - 5.18 mg/L flow-through (Pimephales promelas) LC50 96 h: 23.03 - 42.07 mg/L static (Pimephales promelas) LC50 96 h: 24.99 - 44.69 mg/L static (Lepomis macrochirus) LC50 96 h: 48.87 - 68.76 mg/L static (Poecilia reticulata)	EC50 24 h: > 400 mg/L (Daphnia magna	EC50 = 85.5 mg/L 5 min EC50 = 93 mg/L 10 min (Microorganisms)
Pentane	-	-	EC50 48h: 135 mmol/cu	LC50 24h: 165 mmol/cu Artemia salina (Brine Shrimp)
MethylCyclohexane	-	LC50 96hr: 72.0 mg/l (Golden Shiner)	-	-
n-Heptane	-	LC50 96 h: = 375.0 mg/L (Cichlid fish)	EC50 24 h: > 10 mg/L (Daphnia magna)	-
n-Hexane	-	LC50 96 h: 2.1 - 2.98 mg/L flow-through (Pimephales promelas)	EC50 24 h: > 1000 mg/L (Daphnia magna)	-
n-Octane	-	-	EC50 48 h: = 0.38 mg/L (water flea) EC50 48 h: = 0.02856 mg/L (Daphnia magna)	EC50 = 890 mg/L 30 min (Microorganisms) EC50 <1.67hr: 120 µg/l Mytilus edulis (Common Bay Mussel)
n-Undecane	-	-	-	-
n-Dodecane	-	-	-	-
n-Tridecane	-	-	-	-

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Toluene	EC50: >433 mg/L Pseudokirchneriella subcapitata 96 h EC50: 12.5 mg/L Pseudokirchneriella subcapitata 72 h static	LC50: 15.22 - 19.05 mg/L Pimephales promelas 96 h flow-through LC50: 12.6 mg/L Pimephales promelas 96 h static LC50: 5.89 - 7.81 mg/L Oncorhynchus mykiss 96 h flow-through LC50: 14.1 - 17.16 mg/L Oncorhynchus mykiss 96 h static LC50: 5.8 mg/L Oncorhynchus mykiss 96 h semi-static LC50: 11.0-15.0 mg/L Lepomis macrochirus 96 h static LC50: 54 mg/L Oryzias latipes 96 h static LC50: 28.2 mg/L Poecilia reticulata 96 h semi-static LC50: 50.87-70.34 mg/L Poecilia reticulata 96 h static	EC50 48 h: 5.46 - 9.83 mg/L Static (Daphnia magna) EC50 48 h: = 11.5 mg/L (Daphnia magna)	EC50 = 19.7 mg/L 30 min (Microorganisms)
Hydrogen sulfide		LC50 96h: 49 µg/l Oncorhynchus mykiss (Rainbow Trout) eggs LC50 24h: 1059.7 µg/l Pimephales promelas (Fathead Minnow)	EC50 48h: 62 µg/l Gammarus pseudolimnaeus (Scud)	
Ethylbenzene	EC50 72 h: = 4.6 mg/L (Pseudokirchneriella subcapitata) EC50 96 h: > 438 mg/L (Pseudokirchneriella subcapitata) EC50 72 h: 2.6 - 11.3 mg/L static (Pseudokirchneriella subcapitata) EC50 96 h: 1.7 - 7.6 mg/L static (Pseudokirchneriella subcapitata) EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 11.0 - 18.0 mg/L static (Oncorhynchus mykiss) LC50 96 h: = 4.2 mg/L semi-static (Oncorhynchus mykiss) LC50 96 h: 7.55 - 11 mg/L flow-through (Pimephales promelas) LC50 96 h: = 32 mg/L static (Lepomis macrochirus) LC50 96 h: 9.1 - 15.6 mg/L static (Pimephales promelas) LC50 96 h: = 9.6 mg/L static (Poecilia reticulata)	EC50 48 h: 1.8 - 2.4 mg/L (Daphnia magna)	EC50 = 9.68 mg/L 30 min EC50 = 96mg/L 24 h (Microorganisms)

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Xylenes	EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: = 13.4 mg/L flow-through (Pimephales promelas) LC50 96 h: 2.661 - 4.093 mg/L static (Oncorhynchus mykiss) LC50 96 h: 13.5 - 17.3 mg/L (Oncorhynchus mykiss) LC50 96 h: 13.1 - 16.5 mg/L flow-through (Lepomis macrochirus) LC50 96 h: = 19 mg/L (Lepomis macrochirus) LC50 96 h: 7.711 - 9.591 mg/L static (Lepomis macrochirus) LC50 96 h: 23.53 - 29.97 mg/L static (Pimephales promelas) LC50 96 h: = 780 mg/L semi-static (Cyprinus carpio) LC50 96 h: > 780 mg/L (Cyprinus carpio) LC50 96 h: 30.26 - 40.75 mg/L static (Poecilia reticulata)	EC50 48 h: = 3.82 mg/L (water flea) LC50 48 h: = 0.6 mg/L (Gammarus lacustris)	-

PERSISTENCE AND DEGRADABILITY

- No information available

BIOACCUMULATIVE POTENTIAL

CHEMICAL	LOG POW
Benzene	1.83
Cyclohexane	3.44
Butane	2.89
Octane	5.18
Heptane	4.66
Decane	5.1
Xylene, mixed isomers	2.77 - 3.15
Toluene	2.65
Ethylbenzene	3.118

MOBILITY IN SOIL

CHEMICAL	EXPECTED SOIL MOBILITY
2-Methylpentane	Low
3-Methylpentane	Slight
Benzene	High

Cyclohexane	Moderate
Pentane	High
MethylCyclohexane	Low
Butane	Low
Heptane	Moderate
Hexane	High
Octane	Immobile
Nonane	Immobile
Decane	Immobile
Undecane	Immobile
Dodecane	Immobile
Tridecane	Immobile
Toluene	High to Moderate
Ethylbenzene	Low
Xylenes	Very high to Moderate

OTHER ADVERSE EFFECTS

- No information available

Section 13: Disposal Considerations

WASTE TREATMENT METHODS

Product Waste

- This product, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA RCRA (40 CFR 261), Environment Canada, or other State, Provincial, and local regulations. If this product is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility.
- This product could also contain benzene at >0.5 ppm and could exhibit the characteristic of "toxicity" (D018) as determined by the toxicity characteristic leaching procedure (TCLP).
- This material could become a hazardous waste if mixed or contaminated with a hazardous waste or other substance(s).
- It is the responsibility of the user to consult federal, state and local waste regulations to determine appropriate disposal options.

Packaging Waste	• Container contents should be completely used and containers should be emptied prior to discard. • Container 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 re-conditioner. • To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

Section 14: Transport Information

****CHART NAME****

	UN NUMBER	PROPER SHIPPING NAME	TRANSPORT HAZARD CLASS	PACKING GROUP	ENVIRONMENTAL HAZARD
DOT	UN1267	Petroleum crude oil	3	I	Emergency response guide number: 128
TDG	UN1267	Petroleum crude oil	3	I	-
IMO/IMDG	UN1267	Petroleum crude oil	3	I	EmS No. F-E, S-E
IATA/ICA	UN1267	Petroleum crude oil	3	I	-

SPECIAL RECAUTIONS FOR USER

• None

Section 15: Regulatory Information

U.S. - CERCLA/ SARA - HAZARDOUS SUBSTANCES AND THEIR REPORTABLE QUANTITIES

COMPONENT	CAS #	AMOUNT
Hydrogen Sulfide	7783-06-4	100 lb final RQ; 45.4 kg final RQ
Ethylbenzene	100-41-4	1000 lb final RQ; 454 kg final RQ
Toluene	108-88-3	1000 lb final RQ; 454 kg final RQ
Xylene	1330-20-7	100 lb final RQ; 45.4 kg final RQ
Benzene	71-43-2	10 lb final RQ; 4.54 kg final RQ
Hexane	110-54-3	5000 lb final RQ; 2270 kg final RQ

U.S. - CWA (CLEAN WATER ACT) - REPORTABLE QUANTITIES OF DESIGNATED HAZARDOUS SUBSTANCES

COMPONENT	CAS #	AMOUNT
Hydrogen Sulfide	7783-06-4	100 lb RQ
Ethylbenzene	100-41-4	1000 lb RQ
Toluene	108-88-3	1000 lb RQ
Xylene	1330-20-7	100 lb RQ
Benzene	71-43-2	10 lb RQ

U.S. - CWA (CLEAN WATER ACT) - RECOMMENDED WATER QUALITY CRITERIA - CCC FOR FRESHWATER LIFE

COMPONENT	CAS #	AMOUNT
Hydrogen Sulfide	7783-06-4	2.0 µg/L CCC

U.S. - CWA (CLEAN WATER ACT) - RECOMMENDED WATER QUALITY CRITERIA - CCC FOR SALTWATER LIFE

COMPONENT	CAS #	AMOUNT
HydrogenSulfide	7783-06-4	2.0 µg/L CCC

U.S. - CWA (CLEAN WATER ACT) - HAZARDOUS SUBSTANCES

COMPONENT	CAS #	LISTED
Hydrogen Sulfide	7783-06-4	X
MethylCyclohexane	108-87-2	Not Listed
3- Methylhexane	589-34-4	Not Listed
Hexane, 2-methyl-	591-76-4	Not Listed
Dimethylcyclopentane	28729-52-4	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Pentane	109-66-0	Not Listed
Decane	124-18-5	Not Listed
Octane	111-65-9	Not Listed
Dodecane	112-40-3	Not Listed
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	X
Benzene	71-43-2	X

Butane	106-97-8	Not Listed
Hexane	110-54-3	Not Listed
2-Methylpentane	107-83-5	Not Listed
3-Methylpentane	96-14-0	Not Listed
Tridecane	629-50-5	Not Listed
Undecane	1120-21-4	Not Listed
2-Methylheptane	592-27-8	Not Listed

X= The component is listed

U.S. - CWA (CLEAN WATER ACT) - HAZARDOUS SUBSTANCES

COMPONENT	CAS #	LISTED
Hydrogen Sulfide	7783-06-4	Not Listed
MethylCyclohexane	108-87-2	Not Listed
3- Methylhexane	589-34-4	Not Listed
Hexane, 2-methyl-	591-76-4	Not Listed
Dimethylcyclopentane	28729-52-4	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Pentane	109-66-0	Not Listed
Pentane	109-66-0	Not Listed
Decane	124-18-5	Not Listed
Octane	111-65-9	Not Listed
Dodecane	112-40-3	Not Listed
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	Not Listed
Benzene	71-43-2	X
Butane	106-97-8	Not Listed
Hexane	110-54-3	Not Listed
2-Methylpentane	107-83-5	Not Listed
3-Methylpentane	96-14-0	Not Listed

Tridecane	629-50-5	Not Listed
Undecane	1120-21-4	Not Listed
2-Methylheptane	592-27-8	Not Listed

X= The component is listed

US-STATE-RIGHT-TO-KNOW

CHEMICAL	NEW JERSEY	MASSACHUSETTS	PENNSYLVANIA	ILLINOIS	RHODE ISLAND
Nonane	X	X	X	-	X
Decane	X	-	X	-	X
Hexane	X	X	X	X	X
MethylCyclohexane	X	X	X	-	X
Octane	X	X	X	-	X
n-Heptane	X	X	X	-	X
Butane	X	X	X	-	X
Ethylbenzene	X	X	X	X	X
Toluene	X	X	X	X	X
Cyclohexane	X	X	X	-	X
Xylene, mixed isomers	X	X	X	X	X
Benzene	X	X	X	X	X

CANADA-WHMIS-CLASSIFICATIONS OF SUBSTANCES

COMPONENT	CAS #	CLASSIFICATION
2-Methylhexane	591-76-4	B2
2-Methylpentane	107-83-5	B2
3-Methylhexane	589-34-4	B2
3-Methylpentane	96-14-0	B2
Benzene	71-43-2	B2, D2A, D2B
MethylCyclohexane	108-87-2	B2
Methylcyclopentane	96-37-7	-
n-Butane	106-97-8	A, B1
n-Heptane	142-82-5	B2, D2B
n-Hexane	110-54-3	B2, D2A, D2B

n-Pentane	109-66-0	B2
n-Octane	111-65-9	B2, D2B
n-Decane	124-18-5	B3, D2B
n-Undecane	1120-21-4	B3, D2B
n-Dodecane	112-40-3	B3
n-Tridecane	629-50-5	B3
Toluene	108-88-3	B2, D2A, D2B
Hydrogen sulfide	7783-06-4	A, B1, D1A, D2B
Ethylbenzene	100-41-4	B2, D2A, D2B
Xylenes	1330-20-7	B2, D2A, D2B

X= The component is listed

CANADA - COUNCIL OF MINISTERS OF THE ENVIRONMENT - WATER QUALITY GUIDELINES FOR FRESHWATER AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	90 µg/L
Toluene	108-88-3	2.0 µg/L
Benzene	71-43-2	370 µg/L

CANADA - COUNCIL OF MINISTERS OF THE ENVIRONMENT - WATER QUALITY GUIDELINES FOR MARINE AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	25 µg/L
Toluene	108-88-3	215 µg/L
Benzene	71-43-2	110 µg/L

CANADA - ENVIRONMENTAL EMERGENCIES

COMPONENT	CAS #	LISTED
Hydrogen sulfide	7783-06-4	X
MethylCyclohexane	108-87-2	Not Listed
3-Methylhexane	589-34-4	Not Listed
Hexane, 2-methyl-	591-76-4	Not Listed
Dimethylcyclopentane	28729-52-4	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Pentane	109-66-0	X
Decane	124-18-5	Not Listed
Octane	111-65-9	Not Listed

Dodecane	112-40-3	Not Listed
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	X
Benzene	71-43-2	X
Butane	106-97-8	X
Hexane	110-54-3	Not Listed
2-Methylpentane	107-83-5	Not Listed
3-Methylpentane	96-14-0	Not Listed
Tridecane	629-50-5	Not Listed
Undecane	1120-21-4	Not Listed
2-Methylheptane	592-27-8	Not Listed
Petroleum Hydrocarbons	68919-39-1	Not Listed

X= The component is listed

Section 16: Other Information

NFPA



Health Hazard: 2	**Flammability:** 3	**Instability:** 1	**Physical and Chemical Hazards:** X

HMIS	**Health Hazard:** 2	**Flammability:** 4	**Instability:** 0	**Personal Protection:** X

ISSUING DATE 3/2/15

REVISION DATE 3/2/15

DISCLAIMER

- The information presented herein is based on data considered to be accurate as of the date of preparation of this Safety Data Sheet (SDS). However, SDS'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.

Section 1: PRODUCT AND COMPANY IDENTIFICATION

Product Name: Western Canadian Select (WCS)

Synonyms: Not available.

Product Use: Chemical feedstock.

Manufacturer/Supplier: Husky Oil Operations Ltd.
PO Box 6525 Station 'D'
Calgary, Alberta
T2P 3G7

Phone Number: 403-298-6111

Emergency Phone: 403-262-2111

Date of Preparation: April 15, 2013

Section 2: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

DANGER
EXTREMELY FLAMMABLE LIQUID AND VAPOR - VAPOR MAY CAUSE FLASH FIRE. HARMFUL OR FATAL IF SWALLOWED. CAN ENTER LUNGS AND CAUSE DAMAGE. CANCER HAZARD – CAN CAUSE CANCER. IRRITATING TO EYES AND SKIN.

Colour: Brown to black.
Physical State: Liquid.
Odour: Petroleum. Rotten eggs.

WHMIS	Personal Protection Equipment	TDG (Ground)
		

Potential Health Effects: See Section 11 for more information.

Likely Routes of Exposure: Eye contact. Skin contact. Inhalation. Ingestion. Skin absorption.

Inhalation: May cause respiratory irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. Excessive inhalation may cause headache, dizziness, confusion, loss of appetite and/or loss of consciousness. This product contains small amounts of Hydrogen sulphide that may accumulate in confined spaces. Hydrogen sulphide may cause symptoms such as digestive upset and loss of appetite, loss of sense of smell and pulmonary edema. At 500-1000 ppm Hydrogen sulphide may cause respiratory paralysis, collapse and death without rescue.

Eye: Causes eye irritation. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision.

Skin: Causes skin irritation. Signs/symptoms may include localized redness, swelling, and itching.

Ingestion: May be fatal if swallowed and enters airways. May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

Medical Conditions Aggravated By Exposure: Not available.

Target Organs: Skin. Eyes. Gastrointestinal tract. Respiratory system. Lungs. Blood. Cardiovascular system. Bone marrow. Liver. Reproductive system. Nervous system.

Potential Environmental Effects: See Section 12 for more information.

This material is considered hazardous by the OSHA Hazard Communication Standard, (29 CFR 1910.1200).

Section 3: COMPOSITION / INFORMATION ON INGREDIENTS

Hazardous Ingredient(s)	CAS No.	% wt./wt.
Petroleum	8002-05-9	100
Benzene	71-43-2	0.1 - 1
Toluene	108-88-3	0.1 - 1
Xylenes	1330-20-7	0.1 - 1
Hydrogen sulfide (H2S)	7783-06-4	< 0.1 *

* There is a potential for hazardous hydrogen sulphide concentrations where vapours are present and allowed to accumulate.

Section 4: FIRST AID MEASURES

Inhalation: If inhaled: Call a poison center or doctor if you feel unwell. If breathing or the heart stops, trained personnel should immediately begin artificial respiration (AR) or cardiopulmonary resuscitation (CPR) respectively. Get medical attention immediately.

Eye Contact: If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.

Skin Contact: If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. If skin irritation occurs: Get medical advice/attention. Wash contaminated clothing before reuse.

Ingestion: If swallowed: Immediately call a poison center or doctor. If vomiting occurs naturally, have victim lean forward to reduce the risk of aspiration. Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If breathing or the heart stops, trained personnel should immediately begin artificial respiration (AR) or cardiopulmonary resuscitation (CPR) respectively. Get medical attention immediately.

General Advice: In case of accident or if you feel unwell, seek medical advice immediately (show the label or MSDS where possible).

Note to Physicians: Symptoms may not appear immediately. For inhalation of Hydrogen Sulphide, consider oxygen.

Section 5: FIRE FIGHTING MEASURES

Flammability: Flammable liquid by WHMIS criteria. Class IA flammable liquid by OSHA criteria. HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks). Vapor explosion hazard indoors, outdoors or in sewers. Runoff to sewer may create fire or explosion hazard. Containers may explode when heated. Many liquids are lighter than water. When heated, this material may evolve toxic and flammable Hydrogen sulphide.

If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

Fire involving Tanks or Car/Trailer Loads: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

Means of Extinction

Suitable Extinguishing Media: Small Fire: Dry chemical, CO_2, water spray or regular foam.

Large Fire: Water spray, fog or regular foam. Move containers from fire area if you can do it without risk.

Unsuitable Extinguishing Media: Do not use straight streams. CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient.

Products of Combustion: Oxides of carbon. Oxides of sulphur. Aldehydes. Hazardous sulphur dioxide, and related oxides of sulphur may be generated upon combustion.

Protection of Firefighters: Inhalation or contact with material may irritate or burn skin and eyes. Fire may produce irritating, corrosive and/or toxic gases. Vapors may cause dizziness or suffocation. Runoff from fire control or dilution water may cause pollution. Hydrogen sulphide is heavier than air and may collect in low lying areas and confined spaces. Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters' protective clothing will only provide limited protection.

Explosion Data

Sensitivity to Mechanical Impact: This material is not sensitive to mechanical impact.

Sensitivity to Static Discharge: This material is sensitive to static discharge.

Section 6: ACCIDENTAL RELEASE MEASURES

Emergency Procedures:	As an immediate precautionary measure, isolate spill or leak area for at least 50 meters (150 feet) in all directions. Keep unauthorized personnel away. Stay upwind. Keep out of low areas. Ventilate closed spaces before entering. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). All equipment used when handling the product must be grounded.
Personal Precautions:	Do not touch or walk through spilled material. Use personal protection recommended in Section 8. Don full-face, positive pressure, self-contained breathing apparatus.
Environmental Precautions:	Prevent entry into waterways, sewers, basements or confined areas.
Methods for Containment:	Stop leak if you can do it without risk. A vapor suppressing foam may be used to reduce vapors.
Methods for Clean-Up:	Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean non-sparking tools to collect absorbed material.
Other Information:	See Section 13 for disposal considerations.

Section 7: HANDLING AND STORAGE

Handling:
Do not swallow. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Keep away from heat, sparks, open flames, and hot surfaces. – No smoking. Keep container tightly closed. Ground/bond container and receiving equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Do not breathe mist, vapors, or spray. Wash thoroughly after handling. Harmful concentrations of hydrogen sulfide (H2S) gas can accumulate in excavations and low-lying areas as well as the vapour space of storage and bulk transport compartments. See Section 8 for information on Personal Protective Equipment.

Storage:
Store in a well-ventilated place. Store locked up. Store away from incompatible materials. See Section 10 for information on Incompatible Materials. Keep out of the reach of children. Head spaces in storage containers may contain toxic hydrogen sulphide gas. Structural materials and lighting and ventilation systems should be corrosion resistant.

Section 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines
Component

Petroleum [CAS No. 8002-05-9]

ACGIH: A2; Exposure by all routes should be carefully controlled to levels as low as possible (2009); For Mineral oil, excluding metal working fluids; Poorly and mildly refined

OSHA: 500 ppm (TWA), 2000 mg/m³ (TWA);
400 ppm (TWA) [Vacated];

Benzene [CAS No. 71-43-2]

ACGIH: 0.5 ppm (TWA); 2.5 ppm (STEL); Skin; A1; BEI (1996)

OSHA: 1 ppm (TWA); 5 ppm (STEL);

Toluene [CAS No. 108-88-3]

ACGIH: 20 ppm (TWA); A4; BEI (2006)

OSHA: 200 ppm (TWA); 300 ppm (C); 500 ppm (Peak) (Maximum duration: 10 minutes.)
100 ppm (TWA); 150 ppm (STEL) [Vacated];

Xylenes [CAS No. 1330-20-7]

ACGIH: 100 ppm (TWA); 150 ppm (STEL); A4; BEI (1992)

OSHA: 100 ppm (TWA), 435 mg/m³ (TWA);
150 ppm (STEL) [Vacated]; For Xylenes.

Hydrogen sulphide [CAS No. 7783-06-4]

ACGIH: 1 ppm (TWA); 5 ppm (STEL); (2009); For Hydrogen sulfide

OSHA: 20 ppm (C); 50 ppm (Peak) (Maximum duration: 10 mins. once only if no other meas. exp. occurs.)
10 ppm (TWA); 15 ppm (STEL) [Vacated]; For Hydrogen sulfide.

TWA: Time-Weighted Average
STEL: Short-Term Exposure Limit
C: Ceiling

Engineering Controls: Use ventilation adequate to keep exposures (airborne levels of dust, fume, vapour, gas, etc.) below recommended exposure limits. Use explosion-proof electrical, ventilating, and lighting equipment.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Eye/Face Protection: Wear safety glasses. Ensure that eyewash stations are close to the workstation location. Use equipment for eye protection that meets the standards referenced by OSHA regulations in 29 CFR 1910.133 for Personal Protective Equipment.

Hand Protection: Wear protective gloves. Consult manufacturer specifications for further information.

Skin and Body Protection: Wear protective clothing. Flame resistant clothing that meets the NFPA 2112 and CAN/CGSB 155.20 standards is recommended in areas where material is stored or handled.

Respiratory Protection:	If engineering controls and ventilation are not sufficient to control exposure to below the allowable limits then an appropriate NIOSH/MSHA approved air-purifying respirator with organic vapor cartridge, or self-contained breathing apparatus must be used. Supplied air breathing apparatus must be used when oxygen concentrations are low or if airborne concentrations exceed the limits of the air-purifying respirators.
General Hygiene Considerations:	Handle according to established industrial hygiene and safety practices.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Opaque.
Colour:	Brown to black.
Odour:	Petroleum. Rotten eggs.
Odour Threshold:	0.00047 ppm, (H_2S)
Physical State:	Liquid.
pH:	Not available.
Viscosity:	Not available.
Melting Point:	Not available.
Boiling Point:	10 to > 1100 °C (50 to > 2012 °F)
Flash Point:	-40 °C (-40 °F) (PMCC)
Evaporation Rate:	Not available.
Lower Flammability Limit:	Not available.
Upper Flammability Limit:	Not available.
Vapor Pressure:	Not available.
Vapor Density:	Not available.
Specific Gravity:	Not available.
Density:	Not available.
Solubility in Water:	Insoluble.
Coefficient of Water/Oil Distribution:	Not available.
Auto-ignition Temperature:	Not available.
Percent Volatile, wt. %:	100
VOC content, wt. %:	Not available.

Section 10: STABILITY AND REACTIVITY

Stability: Stable under normal storage conditions.

Conditions of Reactivity: Contact with incompatible materials. Exposure to heat.

Incompatible Materials: Strong acids. Strong oxidizers. Chlorine.

Hazardous Decomposition Products: Hazardous sulphur dioxide, and related oxides of sulphur may be generated upon combustion.

Possibility of Hazardous Reactions: None known.

Section 11: TOXICOLOGICAL INFORMATION

EFFECTS OF ACUTE EXPOSURE

Component Toxicity

Component	CAS No.	LD_{50} oral	LD_{50} dermal	LC_{50}
Petroleum	8002-05-9	4300 mg/kg (rat)	Not available.	Not available.
Benzene	71-43-2	930 mg/kg (rat)	> 9400 µl/kg (rabbit)	10000 ppm (rat); 7H
Toluene	108-88-3	600 mg/kg (rat)	14.1 mL/kg (rabbit)	49000 mg/m³ (rat); 4H
Xylenes	1330-20-7	> 1700 mg/kg (rat)	4300 mg/kg (rabbit)	5000 ppm (rat); 4H
Hydrogen sulfide (H2S)	7783-06-4	Not available.	Not available.	444 ppm (rat); 4H

Inhalation: May cause respiratory irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. Excessive inhalation may cause headache, dizziness, confusion, loss of appetite and/or loss of consciousness. This product contains small amounts of Hydrogen sulphide that may accumulate in confined spaces. Hydrogen sulphide may cause symptoms such as digestive upset and loss of appetite, loss of sense of smell and pulmonary edema. At 500-1000 ppm Hydrogen sulphide may cause respiratory paralysis, collapse and death without rescue.

Eye: Causes eye irritation. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision.

Skin: Causes skin irritation. Signs/symptoms may include localized redness, swelling, and itching.

Ingestion: May be fatal if swallowed and enters airways. May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

Skin Sensitization: Not available.

Respiratory Sensitization: Not available.

EFFECTS OF CHRONIC EXPOSURE

Target Organs: Skin. Eyes. Gastrointestinal tract. Respiratory system. Lungs. Blood. Cardiovascular system. Bone marrow. Liver. Kidneys. Reproductive system. Nervous system.

Chronic Effects: Prolonged or repeated contact may dry skin and cause irritation. Repeated dermal application of crude oils in rats produced systemic toxicity in blood, liver, thymus and bone marrow. Reports of chronic poisoning with Benzene, Toluene or Xylenes describe anemia, decreased blood cell count and bone marrow hypoplasia. Liver and kidney damage may occur. Repeated exposure of the eyes to high concentrations of Xylenes vapour may cause reversible eye damage. Chronic inhalation exposure to xylene causes mid-frequency hearing loss in laboratory animals. Xylene reacts synergistically with n-hexane to enhance hearing loss. Hydrogen sulphide may reduce lung function; cause neurological effects such as headaches, nausea, depression and personality changes; eye and mucous membrane irritation: damage to cardiovascular system.

Carcinogenicity: May cause cancer. Lifetime skin painting studies in animals with whole crude oils and crude oil fractions have produced tumours in animals following prolonged and repeated skin contact. Chronic exposure to benzene has been associated with an increased incidence of leukemia and multiple myeloma (tumour composed of cells of the type normally found in the bone marrow).

Component Carcinogenicity

Component	ACGIH	IARC	NTP	OSHA	Prop 65
Petroleum	A2	Group 3	List 1	OSHA Carcinogen.	Listed.
Benzene	A1	Group 1	List 1	OSHA Carcinogen.	Listed.
Toluene	A4	Group 3	Not listed.	Not listed.	Not listed.
Xylenes	A4	Group 3	Not listed.	Not listed.	Not listed.

Mutagenicity: May cause heritable genetic damage.

Reproductive Effects: Studies exist which report a link to crude oil and reproductive effects including menstrual disorders.

Developmental Effects

Teratogenicity: Not available.

Embryotoxicity: Possible risk of harm to the unborn child. Repeated dermal application of crude oils to pregnant rats produced maternal toxicity and fetal developmental toxicity and fetal tumours. Benzene and Xylenes have caused adverse fetal effects in laboratory animals. Exposure to Toluene may affect the developing fetus.

Toxicologically Synergistic Materials: Xylene reacts synergistically with n-hexane to enhance hearing loss.

Section 12: ECOLOGICAL INFORMATION

Ecotoxicity: Petroleum: 21 and 41 mg/l, 96 hr., Rainbow trout;
Petroleum: 2.7 and 4.1 mg/l, 96 hr., Mysid;
Petroleum: 122 and 528 ml/kg, 96 hr., Algae.

Persistence / Degradability: Not available.

Bioaccumulation / Accumulation: Not available.

Mobility in Environment: Not available.

Section 13: DISPOSAL CONSIDERATIONS

Disposal Instructions: Disposal should be in accordance with applicable regional, national and local laws and regulations. Local regulations may be more stringent than regional or national requirements.

Section 14: TRANSPORT INFORMATION

U.S. Department of Transportation (DOT)

Proper Shipping Name: UN1267, PETROLEUM CRUDE OIL, 3, PG I

Class: 3

UN Number: UN1267

Packing Group: I

Label Code:



Canada Transportation of Dangerous Goods (TDG)

Proper Shipping Name: UN1267, PETROLEUM CRUDE OIL, 3, PG I

Class: 3

UN Number: UN1267

Packing Group: I

Label Code:



Section 15: REGULATORY INFORMATION

Chemical Inventories

US (TSCA)
The components of this product are in compliance with the chemical notification requirements of TSCA.

Canada (DSL)
The components of this product are in compliance with the chemical notification requirements of the NSN Regulations under CEPA, 1999.

Federal Regulations

Canada

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

WHMIS Classification:

Class B2 - Flammable Liquids.
Class D2A - Carcinogenicity.
Class D2A - Embryotoxicity.
Class D2A - Mutagenicity.
Class D2B - Skin irritant.
Class D2B - Eye irritant.

Hazard Symbols:



United States

This MSDS has been prepared to meet the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200.

SARA Title III

Component	Section 302 (EHS) TPQ (lbs.)	Section 304 EHS RQ (lbs.)	CERCLA RQ (lbs.)	Section 313	RCRA CODE	CAA 112(r) TQ (lbs.)
Benzene	Not listed.	Not listed.	10	313	U019	Not listed.
Toluene	Not listed.	Not listed.	1000	313	U220	Not listed.
Xylenes	Not listed.	Not listed.	100	313	U239	Not listed.
Hydrogen sulphide	500	100	100	313s	U135	10000

State Regulations

Massachusetts

US Massachusetts Commonwealth's Right-to-Know Law (Appendix A to 105 Code of Massachusetts Regulations Section 670.000)

Component	CAS No.	RTK List
Petroleum	8002-05-9	Listed.
Benzene	71-43-2	Listed.
Toluene	108-88-3	E
Xylenes	1330-20-7	Listed.
Hydrogen sulphide	7783-06-4	Listed.

Note: E = Extraordinarily Hazardous Substance

New Jersey

US New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)

Component	CAS No.	RTK List
Petroleum	8002-05-9	SHHS
Benzene	71-43-2	SHHS
Toluene	108-88-3	SHHS
Xylenes	1330-20-7	SHHS
Hydrogen sulphide	7783-06-4	SHHS

Note: SHHS = Special Health Hazard Substance

Pennsylvania

US Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)

Component	CAS No.	RTK List
Petroleum	8002-05-9	Listed.
Benzene	71-43-2	ES
Toluene	108-88-3	E
Xylenes	1330-20-7	E
Hydrogen sulphide	7783-06-4	E

Note: E = Environmental Hazard; S = Special Hazardous Substance

California

California Prop 65: WARNING: This product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

Component	Type of Toxicity
Petroleum	cancer
Benzene	cancer; developmental, male
Toluene	female; developmental
Ethylbenzene	cancer

Section 16: OTHER INFORMATION

Disclaimer: The information contained in this document applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to satisfy oneself as to the suitability and completeness of this information for their own particular use.

MSDS Expiry Date (Canada): April 14, 2016

Version: 1.0

MSDS Prepared by: **Deerfoot Consulting Inc.**

Phone: (403) 720-3700

6.13 FORMS

The following forms should be used, when applicable, in the initial phases of an emergency response

Table of Contents

ICP 001	Receiving Emergency Information
ICP 002	First Responder Checklist
ICP 003	Warning Information
ICP 004	General Incident Report
ICP 005	Threat Checklist
ICP 006	Site Monitoring Template
ICP 012	Elevated Security Measures Checklist
ICS 201-1	Incident Briefing Map/Sketch
ICS 201-2	Summary of Current Actions
ICS 201-3/ ICS 207	Current Organization
ICS 201-4	Resource Summary
ICS 201-5	Site Safety and Control Analysis
ICS 214a	Individual Logs

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Purpose: To be used by any employee receiving emergency information on a potential incident or in preparation to attend the emergency location as an early responder.

Notification		
Date and Time of Notification:		
Name of the Employee Receiving Call:		
Caller		
Name of Person Reporting :		
Caller's Location:		
Caller's Telephone # *(next 2 hours)*		(Home):
Caller's Address:		
Emergency Description		
Condition Observed *(spill, cloud, odor, etc):*		
Facility Involved, Location or Land Description:		
Date and Time Incident Observed:		
Nearest Community:		
Local Directions to Site:		
Nearest River, Stream, Lake *(direction & distance):*		
Other Helpful Information *(weather, wind, roads, public interest, injuries):*		
Emergency Reporting		
Did Caller Notify Community Emergency Responders or Other Agencies:		(Time of Call):
Are other Emergency Response Agencies On-Site or En-route *(provide details):*		

Internal Reporting	
If this is a potential emergency and you are the first Enbridge point-of-contact, call the Control Centre at:	
US Regions 1-800-858-5253	**EPSI Region** 1-888-440-4357
CND Region 1-877-420-8800	**Cushing Control Centre** 1-918-223-2461
Athabasca Region 1-888-813-6844	**Enbridge Media Hotline U.S.** 1-888-992-0997
In Quebec 1-780-420-8899	**Enbridge Media Hotline CAN** 1-800-858-5253
North Dakota Region 1-888-838-4534	

Other Information	
Give Warning Information for NGL/Crude oil if appropriate *(see Form B – Warning Information)*	

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ENBRIDGE	First Responder Checklist	ICP 002

Purpose: To be used when exploring a suspected or reported emergency. Safe work practices will be followed per the following guidelines (the order of these actions will depend on the situation).

EXPLORE- To be reviewed by the First Responder prior to taking any immediate action.	
☐	Determine the wind direction and approach cautiously from upwind.
☐	Explore the suspected release area only when wearing appropriate PPE using the buddy system if possible.
☐	Ensure safety of personnel in the area.
☐	Conduct a hazard assessment to determine the potential for fire, explosion and hazardous toxic vapors.
☐	Eliminate or shut off all potential ignition sources in the immediate area.
☐	Use intrinsically safe equipment (e.g., flashlights, two-way radios, gas detectors with audible alarms).
☐	Maintain regular/scheduled communication with the Control Centre and Regional Management/on-call person.
APPROACH	
☐	Verify wind direction and stay upwind.
☐	Are people injured or trapped?
☐	Are there outside people involved in rescue or evacuation?
☐	Are there immediate signs of potential hazards such as:
☐	Electrical lines down or overhead?
☐	Unidentified liquid or solid products visible?
☐	Vapors visible?
☐	Smells or breathing hazards evident?
☐	Fires, sparks or ignition sources visible?
☐	Holes, caverns, deep ditches, fast water or cliffs nearby?
☐	Is local traffic a potential problem?
☐	Ground conditions (select one) ☐ Dry ☐ Wet ☐ Icy
CONFIRM & CONTROL	
☐	Confirm identification of spilled material and check the MSDS sheets.
☐	Assess the spill threat, site safety, and parameters such as spill volume, extent and direction of movement.
☐	Has pipeline(s) been shut down?
☐	If on water, consult Control Point and HCA maps for appropriate response strategies for incoming resources.
☐	Has wind direction been confirmed and windsock erected?
☐	Has the public been protected or evacuation considered if necessary?
☐	Have all ignition sources been identified and eliminated?
☐	Establish Exclusion zone and Safe Work Areas (Hot, Warm, and Cold).
☐	Have personal protection and safety requirements been established and communicated?
☐	Is adequate fire protection equipment available and in place?
☐	Have valves been locked out if necessary?
☐	Are tank and VAC-truck electrical equipment properly grounded?
☐	Have decontamination sites and procedures been established?
☐	Are activities and events being logged/ documented?

COMMUNICATION	
☐	Initiate actions to notify government agencies including local authorities of area affected or at risk areas via the Control Centre, Regional Management or designate.
☐	Complete notifications for emergency call-out, including regulatory agencies. This will be done by Regional Management or designate.
☐	If excavating, has One-Call agency been notified?
☐	Has a Preliminary Incident Report been issued?
☐	Has a radio channel been established for communication between the site and other personnel in field?
CONSIDERATIONS	
☐	If appropriate, request surveillance fly-over to determine: • Size and description of oil slick; • Direction of movement; • Coordinates of leading and trailing edge of oil slick; • Sensitivities endangered; and • Areas of population that are threatened.
☐	If possible, photograph the area for situational awareness.
☐	Once support has arrived conduct transfer of command and start preparing for tactical and planning meetings.

Purpose: To be provided as necessary to community Emergency Responders, such as local police or fire departments or as otherwise required.

Incident Follow-up Calling Guide To Community First Responders

"This is Enbridge Pipelines (*indicate region*) Inc. calling from _____

Our telephone number is _____

We have received a report of a smell of gas or crude oil vapor or a small leak from location (i.e., land description, station, etc.).

We have dispatched Company personnel to confirm the report. We are not requesting your assistance at this time. We will provide you with more factual information when it becomes available and confirm if your assistance is required."

(Give following warning information for NGL/Crude oil as appropriate)

Warning Information For NGL Incident (Community First Responders)

Natural gas liquids are mixtures of hydrocarbons – the major component is propane.

Vapors will usually appear as a white cloud. They are extremely flammable and will collect in low lying areas. Keep all ignition sources and vehicles away from leak and vapor cloud. Approach pipeline leaks using extreme caution.

Warning Information For Crude Oil Incident (Community First Responders)

Crude oil is flammable and toxic.

Vapours collect in low areas.

Approach pipeline leaks using extreme caution.

Keep all ignition sources and vehicles away from leak.

Avoid low lying areas without a self-contained breathing apparatus.

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Incident:	**Incident Date/Time:**
Person Reporting Incident:	**Prepared:** **at:**
Person Contact Number(s):	**Version:**

Pipeline Information and Points of Contact

Pipeline Name:	
Contact:	**Phone:**
Owner:	**Phone:**
Operator:	**Phone:**

Pipeline Specific Information

Type(s) of Product:		
Equipment Involved:		
P/L Marker of Release	**Nearest Upstream Block Valve**	**Nearest Downstream Block Valve**

Incident Information

Incident Location:	**Latitude:**	**Longitude:**
Type of Casualty:		
Total Capacity of Pipeline:	**Potential for Additional Spillage:**	
Material(s) Spilled:	**API Gravity:**	
Estimated Quantity Spilled:	**Classification:**	
Source Secured?:	**If not, Estimated Spill Rate:**	
Notes:		

Incident Status

Injuries/Casualties:		
Fire:	**Fire Status:**	**Fire Assistance:**
Holed:	**Hole Location:**	**Hole Size:**
Notes:		

General Incident Report (Pipeline)	

Incident:	**Incident Date/Time:**
Person Reporting Incident:	**Prepared:** **at:**
Person Contact Number(s):	**Version:**

Facility Information and Points of Contact

Facility Name:	
Type of Facility:	
Number of People at Facility:	
Contact:	**Phone:**
Owner:	**Phone:**
Operator:	**Phone:**

Facility Specific Information

Type(s) of Product:	
Equipment Involved:	

Incident Information

Incident Location:	**Latitude:**	**Longitude:**
Type of Casualty:		
Total Capacity of Common Container:	**Potential for Additional Spillage:**	
Material(s) Spilled:	**API Gravity:**	
Estimated Quantity Spilled:	**Classification:**	
Source Secured?: **Yes** **No**	**If not, Estimated Spill Rate:**	
Notes:		

Incident Status

Injuries/Casualties:		
Fire: **Yes** **No**	**Fire Status:**	**Fire Assistance:**
Notes:		

General Incident Report (Facility)	

ENBRIDGE	Threat Checklist	ICP 005

Date: _____

Person receiving threat/suspicious package: _____

Time received: _____

If by phone, time call terminated: _____

Phone number displayed by Caller ID: _____

Work location of person receiving threat/suspicious package:_____

EXACT WORDING OF THREAT

SUSPICIOUS PACKAGE/MAIL

Time delivered/discovered: _____

Location of delivery/discovery: _____

Who/how delivered or discovered:_____

Characteristics of package/mail (Select all that apply)

- Actual threat message
- Marked with any threatening
- Inappropriate or unusual labeling
- Strange or no return address
- Misspelled common words
- City of postmark does not match return address city
- Oil stains, discoloration or odor
- Lopsided/uneven package or envelope
- Excessive tape, string, or packing materials
- Incorrect titles or title without a name
- Handwritten or poorly typed address
- Protruding wires or aluminum foil
- Excessive postage
- Excessive weight
- Ticking sound

CALLER/SUSPECT VOICE AND DESCRIPTION (select all that apply)

Gender: Male Female

Age: Child Teen 20-29 30-39 40-49 50-59 Older

Voice characteristics: Loud Soft Deep Whisper Stutter Lisp Fast Slow Normal Nasal Slurred Broken Disguised Squeaky

Accent: **Other:**

Manner: Angry Excited Giggling Crying Sincere Stressed Calm

Language: Well-spoken Incoherent Irrational

BOMB THREAT QUESTIONS

When is the bomb going to explode?

Where did you put the bomb?

Where is it right now?

Did you place the bomb? Why?

Do you know who placed the bomb?

What does it look like?

What kind of bomb is it?

What will make the bomb explode?

What is your name?

Where are you calling from?

What is your address?

Have you noticed anyone else?

Whom do you represent?

Do you know that there are innocent people in the building that may be injured or killed? Yes No (select if either is confirmed)

BACKGROUND NOISE

Street noises:

House/residence noises:

Aircraft:

Voices:

Music:

Machinery:

Bar/Tavern:

Other:

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Date:	Time:	Wind Dir.	Wind Speed	Temp.
Event Description:				

Location Description	Time	PID / FID	H_2S	SO_2	CO	LEL	O_2	Benzene	Other	Comments
1.										
2.										
3.										
4.										
5.										
6.										
7.										
8.										
9.										
10.										

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ICP FORM 12

ELEVATED SECURITY MEASURES & PRE-CHECKLIST

ELEVATED SECURITY MEASURES
☐ Ensure gates are locked or secured in the closed position at all times.
☐ Limit visitors and confirm with an employee that the visitor is expected before allowing access.
☐ All unknown visitors must be escorted by company personnel at all times.
☐ Employees entering facility after regular work hours must contact shift personnel.
☐ Identify resource requirements for security service (i.e., number of security officers), and confirm availability to assist with 24-hour coverage as required. Consideration should be given to posting a security guard at locations open to the public.
☐ Employees must complete yard and perimeter circle checks 2 times per day.
☐ Employees must complete daily inspections of buildings (including those that are not regularly used); storage areas, tank and perimeter fencing (alter times). Ensure gates are locked or secured in the closed position at all times.
PRE-CHECKLIST
☐ Determine available contract security staff on hand for while security measures are elevated.
☐ Consider options for project/work restrictions or postponement.
☐ Take into consideration employee compliment and work start/end times.
☐ Review access/egress points for deliveries, employee access and project work.
☐ Review current camera views with respect to gates.
☐ Confirm current recording capabilities for all site cameras.
☐ Ensure all cameras and recording equipment are set with current time/date stamps.
☐ Engage with Local Policing.
☐ Ensure vicinity ownership contacts/contractors are contacted.
☐ Consider alternative access/egress points.

CONTACTS	NAME	PHONE NUMBER
Director/Sr. Manager/Manager		
Supervisor		
Regional Security		

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ENBRIDGE	Incident Briefing Map/Sketch	ICS 201-1

Incident:	Prepared By: at:
Period:	Version Name:

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ENBRIDGE	Summary of Current Actions	ICS 201-2

Incident:	Prepared By: at:
Period: to	Version Name:

Incident Information

Initial Incident Objectives

Summary of Current Actions

Date/Time	Action Notes

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ENBRIDGE

ICS 207 Organization Chart

FORM 201-3/207

Incident Name:	Operational Period:	Prepared by: at_____:_____

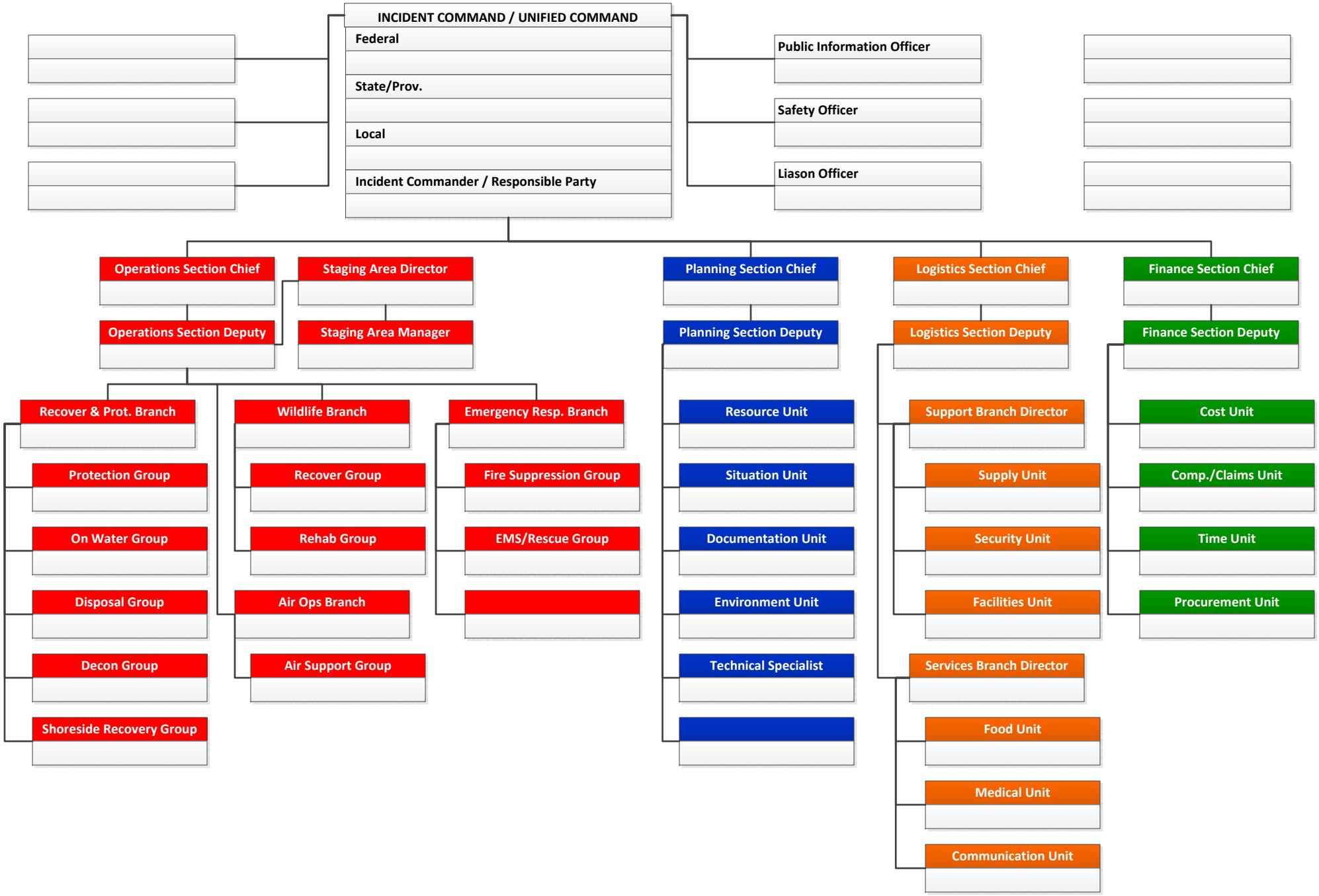


Illustration shows suggested ICS positions. ICS is scalable; the positions are filled according to the needs of the incident.
If positions are not filled, the responsibility is assumed by the Section Chief or Incident Commander.

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Incident:					Period:			
ID	**Supplier**	**Resource Type**	**Description**	**Quantity**	**Size**	**Area of Operation**	**Status**	**Status Date/Time**

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ENBRIDGE	Site Safety and Control Analysis	ICS 201-5

Incident:	Prepared By: at:
Period:	Version Name:

Site Control

1. Is Site Control set up? ☐ Yes ☐ No	2. Is there an on-scene command post? ☐ Yes ☐ No If so, where?
3. Have all personnel been accounted for? ☐ Yes ☐ No ☐ Don't Know	Injuries: Fatalities: Unaccounted: Trapped:
4. Are observers involved, or rescue attempts planned? Observers: ☐ Yes ☐ No Rescuers: ☐ Yes ☐ No	5. Are decon areas setup? ☐ Yes ☐ No If so, where?

Hazard identification, immediate signs of: (if yes, explain in Remarks)

1. Electrical line(s) down or overhead? ☐ Yes ☐ No	2. Unidentified liquid or solid products visible? ☐ Yes ☐ No
3. Wind direction across incident: ☐ Towards your position Wind Speed: ☐ Away from your position	4. Is a safe approach possible? ☐ Yes ☐ No
5. Odors or smells? ☐ Yes ☐ No	6. Vapors visible? ☐ Yes ☐ No
7. Holes, ditches, fast water, cliffs, etc. nearby? ☐ Yes ☐ No	8. Fire, sparks, sources of ignition nearby? ☐ Yes ☐ No
9. Is local traffic a potential problem? ☐ Yes ☐ No	10. Product placards, color codes visible? ☐ Yes ☐ No
11. Other Hazards? ☐ Yes ☐ No	12. As you approach the scene from the upwind side, do you note a change in the status of any of the above? ☐ Yes ☐ No
13. Remarks:	

Hazard Mitigation: have you determined the necessity for any of the following?

1. Entry Objectives:	
2. Warning sign(s), barriers, color codes in place? ☐ Yes ☐ No	
3. Hazardous material being monitored? ☐ Yes ☐ No 3a. Sampling Equipment: 3b. Sampling location(s): 3c. Sampling frequency: 3d. Peak Reading: 3e. Personal exposure monitoring:	
4. Protective gear / level:	4a. Gloves: 4c. Clothing: 4e. Chemical cartridge change frequency:
4b. Respirators: 4d. Boots:	
5. Decon 5a. Instructions: 5b. Decon equipment and materials:	
6. Emergency escape route established? ☐ Yes ☐ No Route?	
7. Field responders briefed on hazards? ☐ Yes ☐ No	
8. Remarks:	

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ENBRIDGE	Individual Logs	ICS 214a

Incident:	Prepared By:	at:
Period:	Version Name:	

Activity Log	
Date/Time	Events/Notes

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