RECEIVED
By Licensing Administrative Assistant at 1:07 pm, May 19, 2011

Spill Response Plan for Joint Queen's University and University of Alberta for field sampling camp at Cape Herschel, Ellesmere Island, NU

Prepared by Marianne Douglas, Professor, Earth and Atmospheric Sciences, University of Alberta

JOINT COMPANY NAME(S), LOCATIONS AND MAILING ADDRESS:

Queen's University: John Smol

John Smol
Department of Biology, Queen's University
116 Barrie St.
Queen's University
Kingston, ON
K7L 3N6, Canada
Phone: 613 533 6147; FAX: 613 533 6617
E-mail: smolj@queensu.ca

University of Alberta: Marianne Douglas

Marianne Douglas
Earth and Atmospheric Sciences, University of Alberta
1-26 Earth Sciences Building
Edmonton, AB
T6G 2E3, Canada
Phone: 780 492 0055; Fax: 780 492 3020
E-Mail: marianne.douglas@ualberta.ca

Project Title: Water quality and environmental change at Cape Herschel, Ellesmere Island, NU

EFFECTIVE DATE OF SPILL CONTINGENCY PLAN:

May 13, 2011

DISTRIBUTION LIST (ONCE ACCEPTED):

The plan, once accepted will be distributed to all field party members, Nunavut Water Board, and Polar Continental Shelf Project headquarters in Resolute Bay, NU.

PURPOSE OF THIS PLAN:

This plan is designed to address the prevention of spills into the environmental and to outline the contingencies in case of a spill. All members of the field party will be familiar with this Spill Response Plan.

COMPANY ENVIRONMENTAL POLICY:

The universities of Queen's and Alberta are committed to protecting the environment and comply with Environmental Impact legislation as required by each university and the granting agencies, such as the Natural Sciences and Engineering Research Council

(NSERC) and Polar Continental Science Program (PCSP) and the Nunavut Research Institute's licensing regulations, e.g., Environmental Impact Review legislation.

PROJECT DESCRIPTION:

We study lakes and ponds at Cape Herschel so as to document the natural and baseline limnological conditions. The Cape Herschel region has become a critical reference site for these sites. We began studying these sites in 1983 and during this time have been able to track significant signs of changing environmental conditions. These changes indicate that warming is occurring at unprecedented rates. Ponds are thawing earlier in the season, lengthening the growing season and some sites are drying up due mainly to increased time for evaporation, an indication of warming conditions.

SITE DESCRIPTION:

The camp is located at Cape Herschel, Ellesmere Island (78°37'01.43" N , 74°40'37.02" W). This is a remote area, situated on Crown Land. See figures 1, 2 and 3. There are no adjacent communities or inhabitants. Grise Fjord, the closest community is located ca. 320 km to the SW. The only people immediately affected by a potential spill are the members of our field party. Our tents will be set up close to a remaining plywood hut (constructed in the 1970s). Temporary storage of the 5 gallons of gasoline and 1 propane tank (the others are in the cook tent) is shown in figure 3 and located 200 m from a pond.

LIST OF HAZARDOUS MATERIALS ON-SITE:

Limited contaminants stored at camp:

Gasoline	5 gallons
Propane tanks	3 20 lb cylinders used in cook tent

EXISTING PREVENTATIVE MEASURES:

These hazardous materials will be brought in with all the rest of the gear for our temporary (ca. 2 weeks) camp. Our field crew will be trained on actions necessary to implement the Spill Response Plan. All hazardous materials will arrive onsite with all gear and will be stored safely outside, away (>er 100m) from any water body. The materials will be shipped and stored in appropriate containers for each product. The gasoline will be stored in a thick plastic-lined container in case of leakage. It will be inspected daily. Any transfer of fuel to the generator will take place over this plastic-lined container. The propane tanks are used in the kitchen tent and placed away from any danger of being punctured.

ADDITIONAL COPIES:

One hard copy of the plan will be kept on-site, readily available. An electronic copy will also be loaded onto several laptops belonging to the fieldcrew.

RESPONSE ORGANIZATION:

PERSONS RESPONSIBLE FOR ACTIVATING THE SPILL PLAN:

Principal Investigators

(1) John Smol

Figure 1: Cape Herschel, Peninsula, Ellesmere I. 1:250,000, from 039F Ekblaw Glacier Area Topo Map

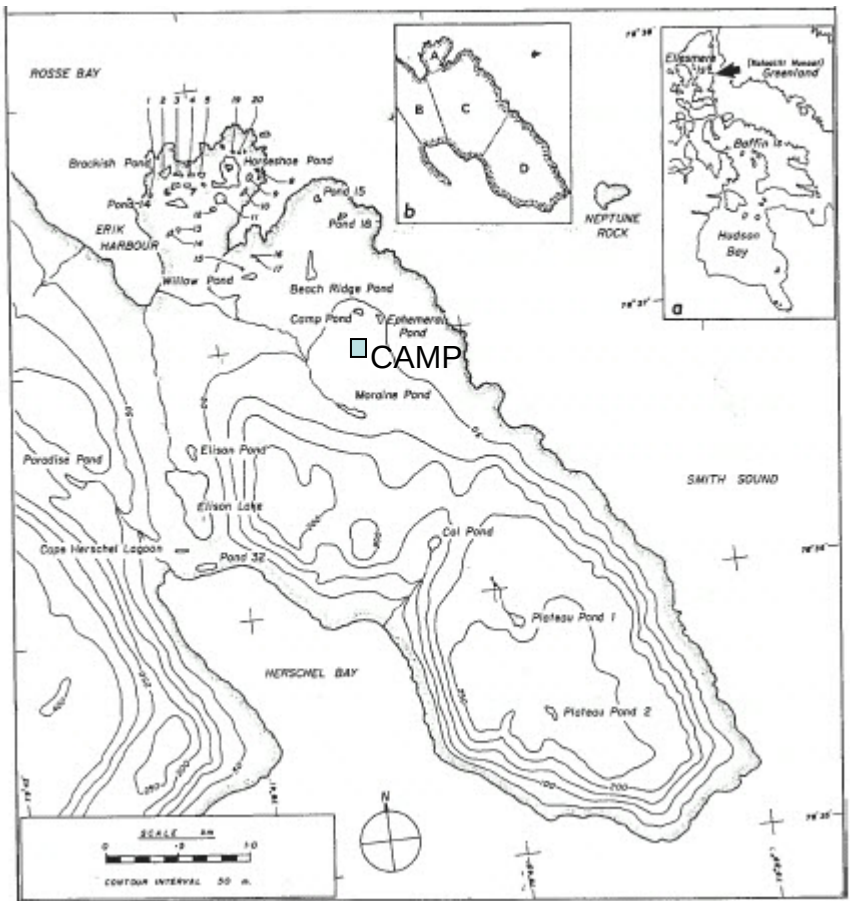


Figure 2: Camp location at Cape Herschel, Ellesmere I.

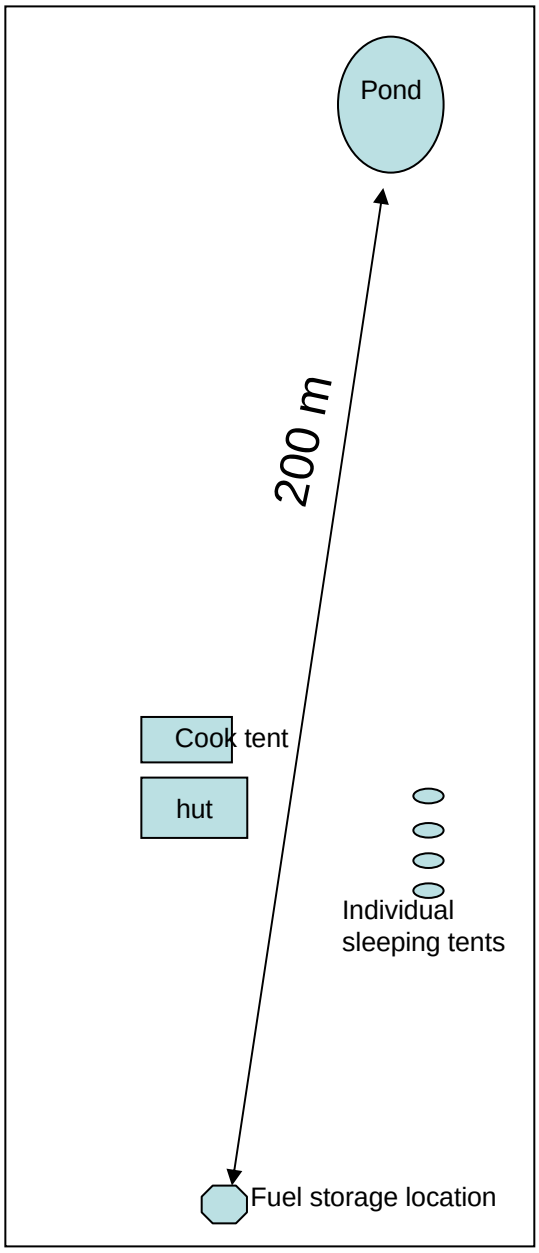


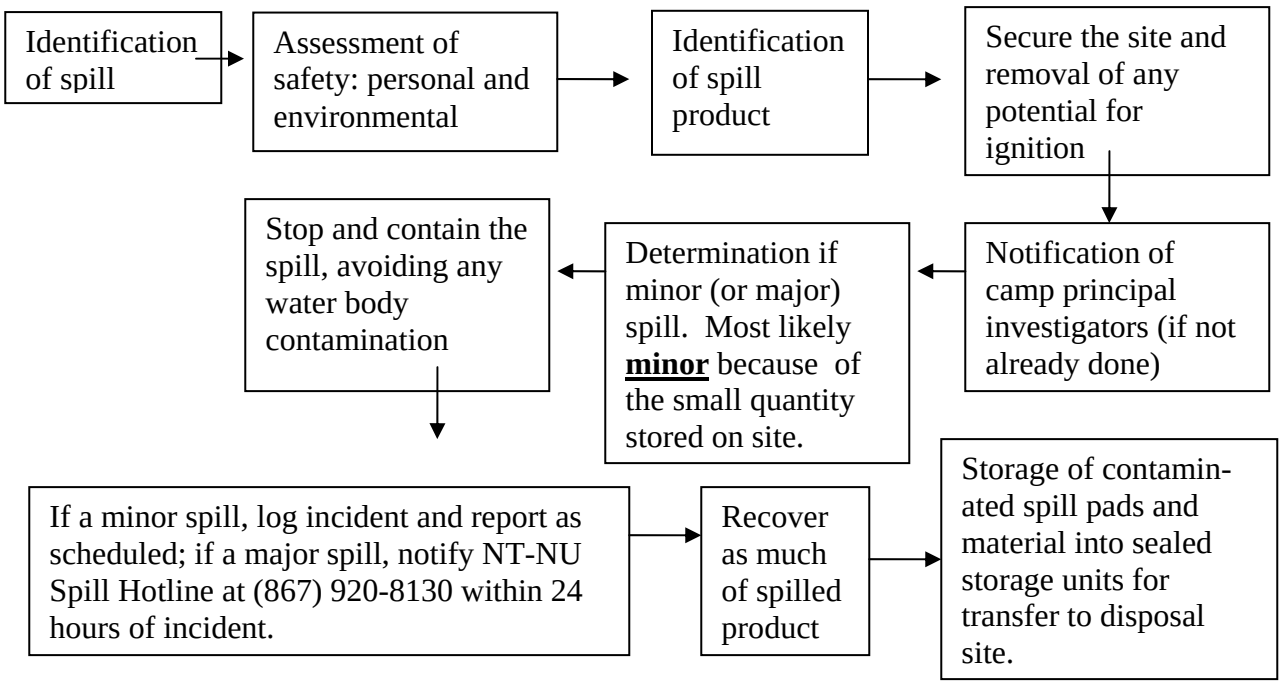
Figure 3: Details of camp layout.

Department of Biology, Queen's University
116 Barrie St.
Queen's University
Kingston, ON
K7L 3N6, Canada
Phone: 1 613 533 6147; FAX: 613 533 6617
E-mail: smolj@queensu.ca

(2) Marianne Douglas
Earth and Atmospheric Sciences, University of Alberta
1-26 Earth Sciences Building
Edmonton, AB
T6G 2E3, Canada
Phone: 780 492 0055; Fax: 780 492 3020
E-Mail: marianne.douglas@ualberta.ca

Both principal investigators will be onsite for the entire field season (ca. 2 weeks) and would initiate the Spill Plan, if the need arises. Outbound and inbound communications will be via satellite telephones which are provided in Resolute Bay, by Polar Continental Shelf Program the day we go into the field.

ACTION PLAN TO REPORT, CONTAIN, CLEAN UP AND DISPOSE OF SPILLS:
In the event of a spill, the following plan will be followed. Actions following identification of a spill are as follows in the diagram below:



These procedures will be carried out for all spills that occur on land. A spill would not occur on snow, ice or muskeg as our containment site is not located on or near such water

bodies. And we will be there during the month of July when typically all snow and ice has melted.
For each incident, we would contact the Nunavut Water Board within 30 days of the incident, with a full report.

Gasoline: This could be spilled when refilling the generator or from leakage. The biggest possible spill would be 5 gallons of gasoline. If this occurs, it will be away from any waterbody and on flat ground.

Environmental Impact of a gasoline spill: can bio-accumulate in the environment. Runoff should be kept away from water bodies.

Procedures for containing and controlling the spill:

- determine cause of spill and then contain the source
- assess trajectory of the spill and contain, using a spill containment kit
- remove contaminated soils and store and seal in thickly lined plastic/solid container, for subsequent removal to a disposal facility (e.g., Resolute Bay).

Propane: Leakage could occur from cylinders while connected to the kitchen stove or punctured. We will have 3 cylinders (20 lbs each) with us in the field, with two connected to the cook stoves. One will be stored away from water bodies, on flat ground, away from any possibility of being punctured.

Environmental Impact of a propane spill: can accumulate and is extremely volatile. Ignition needs to be prevented.

Procedures for containing and controlling the spill:

- determine cause of spill and then contain the source
- assess trajectory of the spill and contain, using a spill containment kit
- remove any contaminated materials and store and seal in thickly lined plastic/solid container, for subsequent removal to a disposal facility (e.g., Resolute Bay).

NOTE: The quantities of hazardous materials are less than the amount requiring "immediate report" (ie < 100L flammable compressed gas, and < 100L flammable liquids). However, any spill will be documented and reported.

RESOURCE INVENTORY

On-site

Spill kit containing gloves, sorbent pads, 2 large tarps, in addition to shovel, duct tape, instruction binder, and sealable containers for any contaminated materials.

Off-site

NT-NU Spill Report
Phone: (867) 920 8130

INAC Manager of Field Operations
Phone: (867) 975 4295; Fax: (867) 975 6445

Polar Continental Shelf Project, Resolute Bay
Phone: (867) 252 3872; Fax: (867) 252 3605

The following document(s) was referenced in preparation of this Spill Response Plan:

- Contingency Planning and Spill Reporting in Nunavut: A Guide to New Regulations
- Guidelines for Spill Contingency Planning. Water Resources Division, Indian and Northern Affairs Canada

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR	REPORT TIME	☐ ORIGINAL SPILL REPORT, OR ☐ UPDATE # _____ TO THE ORIGINAL SPILL REPORT	REPORT NUMBER ____-_____
B	OCCURRENCE DATE: MONTH – DAY – YEAR	OCCURRENCE TIME		

C	LAND USE PERMIT NUMBER (IF APPLICABLE)	WATER LICENCE NUMBER (IF APPLICABLE)
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION	REGION ☐ NWT ☐ NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN
E	LATITUDE DEGREES MINUTES SECONDS	LONGITUDE DEGREES MINUTES SECONDS

F	RESPONSIBLE PARTY OR VESSEL NAME	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION	
G	ANY CONTRACTOR INVOLVED	CONTRACTOR ADDRESS OR OFFICE LOCATION	
H	PRODUCT SPILLED	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER
	SECOND PRODUCT SPILLED (IF APPLICABLE)	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER
I	SPILL SOURCE	SPILL CAUSE	AREA OF CONTAMINATION IN SQUARE METRES
J	FACTORS AFFECTING SPILL OR RECOVERY	DESCRIBE ANY ASSISTANCE REQUIRED	HAZARDS TO PERSONS, PROPERTY OR ENVIRONMENT
K	ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS		

L	REPORTED TO SPILL LINE BY	POSITION	EMPLOYER	LOCATION CALLING FROM	TELEPHONE
M	ANY ALTERNATE CONTACT	POSITION	EMPLOYER	ALTERNATE CONTACT LOCATION	ALTERNATE TELEPHONE

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

Instructions for Completing the NT-NU Spill Report Form

This form can be filled out electronically and e-mailed as an attachment to spills@gov.nt.ca. Until further notice, please verify receipt of e-mail transmissions with a follow-up telephone call to the spill line. Forms can also be printed and faxed to the spill line at 867-873-6924. Spills can still be phoned in by calling collect at 867-920-8130.

A. Report Date/Time	The actual date and time that the spill was reported to the spill line. If the spill is phoned in, the Spill Line will fill this out. **Please do not fill in the Report Number**: the spill line will assign a number after the spill is reported.
B. Occurrence Date/Time	Indicate, to the best of your knowledge, the exact date and time that the spill occurred. Not to be confused with the report date and time (see above).
C. Land Use Permit Number /Water Licence Number	This only needs to be filled in if the activity has been licenced by the Nunavut Water Board and/or if a Land Use Permit has been issued. Applies primarily to mines and mineral exploration sites.
D. Geographic Place Name	In most cases, this will be the name of the city or town in which the spill occurred. For remote locations – outside of human habitations – identify the most prominent geographic feature, such as a lake or mountain and/or the distance and direction from the nearest population center. **You must include the geographic coordinates** (Refer to Section E).
E. Geographic Coordinates	This only needs to be filled out if the spill occurred outside of an established community such as a mine site. Please note that the location should be stated in degrees, minutes and seconds of Latitude and Longitude.
F. Responsible Party Or Vessel Name	This is the person who was in management/control/ownership of the substance at the time that it was spilled. In the case of a spill from a ship/vessel, include the name of the ship/vessel. Please include full address, telephone number and e-mail. Use box K if there is insufficient space. **Please note that, the owner of the spilled substance is ultimately responsible for any spills of that substance, regardless of who may have actually caused the spill.**
G. Contractor involved?	Were there any other parties/contractors involved? An example would be a construction company who is undertaking work on behalf of the owner of the spilled substance and who may have contributed to, or directly caused the spill and/or is responding to the spill.
H. Product Spilled	Identify the product spilled; most commonly, it is gasoline, diesel fuel or sewage. For other substances, avoid trade names. Wherever possible, use the chemical name of the substance and further, identify the product using the four digit UN number (eg: UN1203 for gasoline; UN1202 for diesel fuel; UN1863 for Jet A & B)
I. Spill Source	Identify the source of the spill: truck, ship, home heating fuel tank and, if known, the cause (eg: fuel tank overfill, leaking tank; ship ran aground; traffic accident, vandalism, storm, etc.). Provide an estimate of the extent of the contaminated/impacted area (eg: 10 m^2)
J. Factors Affecting Spill	Any factors which might make it difficult to clean up the spill: rough terrain, bad weather, remote location, lack of equipment. Do you require advice and/or assistance with the cleanup operation? Identify any hazards to persons, property or environment: for example, a gasoline spill beside a daycare centre would pose a safety hazard to children. Use box K if there is insufficient space.
K. Additional Information	Provide any additional, pertinent details about the spill, such as any peculiar/unique hazards associated with the spilled material. State what action is being taken towards cleaning up the spill; disposal of spilled material; notification of affected parties. If necessary, append additional sheets to the spill report. Number the pages in the same format found in the lower right hand corner of the spill form: eg. "Page 1 of 2", "Page 2 of 2" etc. **Please number the pages to ensure that recipients can be certain that they received all pertinent documents.** If only the spill report form was filled out, number the form as "Page 1 of 1".
L. Reported to Spill Line by	Include your full name, employer, contact number and the location from which you are reporting the spill. Use box K if there is insufficient space.
M. Alternate Contact	Identify any alternate contacts. This information assists regulatory agencies to obtain additional information if they cannot reach the individual who reported the spill.
N. Report Line Use Only	**Leave Blank**. This box is for the **Spill Line's use only**.

Shell Canada Limited
Material Safety Data Sheet

Effective Date: 2010-05-07
Supersedes: 2007-05-25

Class B2 Flammable Liquid

Class D2A Carcinogenicity

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT: **REGULAR UNLEADED GASOLINE**
SYNONYMS: Automotive Fuel
Petrol
PRODUCT USE: Fuel
PRODUCT CODE: **211-001**

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
Gasoline	86290-81-5	> 90	Yes
Benzene	71-43-2	< 1.5	Yes

See Section 8 for Occupational Exposure Guidelines.

3. HAZARDS IDENTIFICATION

Physical Description: Volatile Liquid Colourless Typical Gasoline Odour
Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.
Hazards:

Vapour concentrations above the recommended exposure level are irritating to the eyes and respiratory tract, may cause headaches and dizziness, are anesthetic and may have other central nervous system effects.
Flammable Liquid.
Contains Benzene.
May cause cancer.

	Ingestion may result in vomiting. Avoid aspiration of vomitus into lungs as small quantities may result in aspiration pneumonitis. May be absorbed by skin contact. In rare cases may sensitize heart muscle causing heart arrythmia.
Handling:	Eliminate all ignition sources. Wear suitable gloves and eye protection. Bond and ground transfer containers and equipment to avoid static accumulation. Avoid prolonged exposure to vapours. 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! OBTAIN MEDICAL ATTENTION IMMEDIATELY. Guard against aspiration into lungs by having the individual turn on to their left side. If vomiting occurs spontaneously, keep head below hips to prevent aspiration of liquid into the lungs. Do not give anything by mouth to an unconscious person.
Inhalation:	Remove victim from further exposure and restore breathing, if required. Obtain medical attention.
Notes to Physician:	The main hazard following accidental ingestion is aspiration of the liquid into the lungs producing chemical pneumonitis.

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. Product will float and can be reignited on surface of water. Vapour forms a flammable/explosive mixture with air between upper and lower flammable limits. Avoid breathing vapours. Use water to cool fire exposed containers. Vapours may travel along ground and flashback along vapour trail may occur. 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.
Hazardous Combustion Products:	Carbon dioxide, carbon monoxide and unidentified organic compounds may be formed upon combustion.

6. ACCIDENTAL RELEASE MEASURES

Issue warning "Flammable". Eliminate all ignition sources. Isolate hazard area and restrict access. Handling

equipment must be grounded. Work upwind of spill if it is safe to do so. Avoid direct contact with material. Wear appropriate breathing apparatus (if applicable) and protective clothing. Stop leak only if safe to do so. Dike and contain land spills; contain spills to water by booming. Use water fog to knock down vapours; contain runoff. Adsorb residue or small spills with adsorbent material and remove to non-leaking containers for disposal. Notify appropriate environmental agency(ies). 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. Vapours may accumulate and travel to distant ignition sources and flashback. Empty containers are hazardous, may contain flammable/explosive dusts, residues or vapours. Do not pressurize drum containers to empty them. Do not cut, drill, grind, weld or perform similar operations on or near containers. Provide adequate ventilation. Launder contaminated clothing prior to reuse. Wash with soap and water prior to eating, drinking, smoking, applying cosmetics or using toilet facilities.

Storage: Store in a cool, dry, well ventilated area, away from heat and ignition sources. Use explosion-proof ventilation to prevent vapour accumulation.

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):

The exposure limits listed here are provided for guidance only. Consult local, provincial and territorial authorities for specific values.
Gasoline: 300 ppm (STEL: 500 ppm)
Benzene (skin) : 0.5 ppm (STEL: 2.5 ppm)
Benzene: Shell internal standard is 0.5 ppm or 1.6 mg/m3 (8-12 hour time-weighted average limit), 2.5 ppm or 8 mg/m3 (15-minute short term limit)
Skin Notation: Absorption through skin, eyes and mucous membranes may contribute significantly to the total exposure.

Mechanical Ventilation: Concentrations in air should be maintained below the occupational exposure limit if unprotected personnel are involved. Use explosion-proof ventilation as required to control vapour concentrations. Local ventilation recommended where general ventilation is ineffective in controlling airborne concentrations below the recommended occupational exposure limit. Make up air should always be supplied to balance air exhausted (either generally or locally). 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. Provide an eyewash station in the area.

Skin Protection: Avoid contact with skin. Use protective clothing and gloves manufactured from nitrile. Safety showers should be available for emergency use.

Respiratory Protection: Avoid breathing vapour or mists. If exposure has the potential to exceed occupational exposure limits, use an appropriate NIOSH-approved respirator. For high airborne concentrations, use a NIOSH-approved supplied-air respirator, either self-contained or airline breathing apparatus, operated in positive pressure mode.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Volatile Liquid
Appearance:	Colourless
Odour:	Typical Gasoline Odour
Odour Threshold:	< 0.25 ppm
Freezing/Pour Point:	Not available
Boiling Point:	35 - 220 °C
Density:	720 - 760 kg/m3 @ 15 °C
Vapour Density (Air = 1):	3.5
Vapour Pressure (absolute):	< 107 kPa @ 38 °C
Specific Gravity (Water = 1):	0.74
pH:	Not applicable
Flash Point:	TCC -30 °C
Lower Flammable Limit:	1.4 % (vol.)
Upper Flammable Limit:	7.6 % (vol.)
Autoignition Temperature:	280 °C
Viscosity:	< 1 mm2/s @ 38 °C
Evaporation Rate (n-BuAc = 1):	Not available
Partition Coefficient (log K_{OW}):	2.3
Water Solubility:	Insoluble
Other Solvents:	Hydrocarbon Solvents
Formula:	C4 - C11

10. STABILITY AND REACTIVITY

Chemically Stable:	Yes
Hazardous Polymerization:	No
Sensitive to Mechanical Impact:	No
Sensitive to Static Discharge:	Yes
Incompatible Materials:	Avoid contact with strong oxidizing agents and acids.
Conditions of Reactivity:	Avoid excessive heat, open flames and all ignition sources.

11. TOXICOLOGICAL INFORMATION

Ingredient (or Product if not specified)	Toxicological Data
Gasoline	LD50 Oral Rat > 18 mL/kg LD50 Dermal Rabbit > 5 mL/kg
Benzene	LD50 Oral Rat 690 - 3400 mg/kg LC50 Inhalation Rat 13700 ppm for 4 hours LD50 Dermal Rabbit > 8260 mg/kg

Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.

Formulation: No data is specifically available for this product and therefore this toxicological information is based on testing completed with the ingredients.

Irritancy: Based on testing with similar materials, this product is not expected to be a primary skin irritant after exposure of short duration, would not be a skin sensitizer and would not be irritating to the eye.

Acute Toxicity: Vapour concentrations above the recommended exposure level are irritating to the eyes and respiratory tract, may cause headaches and dizziness, are anesthetic and may have other central nervous system effects.

Chronic Effects: Prolonged and repeated contact with skin can cause defatting and drying of the skin resulting in skin irritation and dermatitis. Prolonged exposure to high vapour concentration can cause headache, dizziness, nausea, blurred vision and central nervous system depression. Prolonged and repeated exposure may cause serious injury to blood forming organs, resulting in anemia and similar conditions. Myelodysplastic syndrome (MDS) has been observed in people exposed to very high levels (50 to 300 ppm) of benzene over a long period of time in the workplace. The relevance of these results to lower levels of exposure is not known.

Carcinogenicity and Mutagenicity: According to the International Agency for Research on Cancer (IARC) this product is considered to be possibly carcinogenic to humans. This product contains benzene. Carcinogenic hazard. Repeated exposure to benzene concentrations greater than the recommended TLV/TWA may reduce the cellular components of peripheral blood and bone marrow. Epidemiological studies indicate that long term inhalation of benzene vapour can cause leukaemia in man. Benzene has also produced chromosomal aberrations in peripheral blood lymphocytes. May cause heritable genetic damage.

12. ECOLOGICAL INFORMATION

Do not allow product or runoff from fire control to enter storm or sanitary sewers, lakes, rivers, streams, or public waterways. Block off drains and ditches.

Biodegradability: Inherently biodegradable.
Rapid volatilization.

Bioaccumulation: Potential for bioaccumulation.

Partition Coefficient (log K_{OW}): 2.3

Aquatic Toxicity: Product is expected to be toxic to aquatic organisms.

Ingredient:	Toxicological Data
Gasoline	LL50 (WAF method) Rainbow Trout (96hr) 1 - 10 mg/L. EL50 (WAF method) Daphnia Magna (48hr) 1 - 10 mg/L. EL50 - growth rate (WAF method) Algae (72hr) 1 - 10 mg/L.
Benzene	LL50 Rainbow Trout (96hr) 1 - 10 mg/L. EL50 Daphnia Magna (48hr) 10 - 100 mg/L. EL50 - growth rate Algae (72hr) 10 - 100 mg/L.

Definition(s): LL and EL are the lethal loading concentration and effective loading concentration respectively. The concentration represents the amount of substance added to the system to obtain a toxic concentration. They replace the traditional LC and EC for low solubility substances.
WAF is the water accommodated fraction. A slightly soluble hydrocarbon is stirred

into water and the insoluble portions are removed. The remaining solution is the water accommodated fraction.

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.

14. TRANSPORT INFORMATION

Canadian Road and Rail Shipping Classification:

UN Number	UN1203
Proper Shipping Name	GASOLINE
Hazard Class	Class 3 Flammable Liquids
Packing Group	PG II
Additional Information	Marine Pollutant
Shipping Description	GASOLINE Class 3 UN1203 PG II Marine Pollutant

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 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. This product and/or all components are listed on the U.S. EPA TSCA Inventory.
Other Regulatory Status:	The regulatory information is not intended to be comprehensive. Other regulations may apply to this material.

16. OTHER INFORMATION

LABEL STATEMENTS

Hazard Statement :	Flammable Liquid. Contains Benzene. May cause cancer.
Handling Statement:	Eliminate all ignition sources. Wear suitable gloves and eye protection. Bond and ground transfer containers and equipment to avoid static accumulation. Avoid prolonged exposure to vapours. 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. Section 4 Section 5 Section 7 Section 8 Section 11 Section 15

Shell Canada Limited
Material Safety Data Sheet

Effective Date: 2009-07-20
Supersedes: 2006-07-31

Class A Compressed Gas

Class B1 Flammable Gas

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT: **PROPANE (HD-5 QUALITY, ODORIZED)**
SYNONYMS: Dimethylmethane
PRODUCT USE: Fuel
PRODUCT CODE: **9050-320**

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(s) of Shell Canada Limited, used under license by Shell Canada Products.

2. COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	CAS Number	% Range	WHMIS Controlled
Propane	74-98-6	> 90	Yes
Propylene	115-07-1	< 5	Yes
Hydrocarbons, C4 and up	68476-44-8	< 2.5	Yes

See Section 8 for Occupational Exposure Guidelines.

3. HAZARDS IDENTIFICATION

Physical Description: Liquefied Compressed Gas Colourless Mercaptan Odor.
Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.
Hazards:

This product is not expected to be irritating and has a low level of toxicity under normal use. At high concentrations, hydrocarbon gases may affect the heart rhythm.
Compressed Gas.
Flammable Gas.
The gas is an asphyxiant and may also have a mild narcotic effect.
Exposure to rapidly expanding gas can cause frostbite.

	Exposure to vapours may cause irritation of the respiratory tract. Inhalation of high vapour concentrations of this product can lead to central nervous system depression. Signs of this are headache, nausea, dizziness and incoordination.
Handling:	Eliminate all ignition sources. Wear insulated gloves to avoid freezing burns from liquid. Use with adequate ventilation. 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. Obtain medical attention immediately.
Skin:	If victim has received cold burns, thaw frostbitten areas slowly with lukewarm water or by wrapping affected area in blankets. Let circulation re-establish itself naturally, exercising area if possible. Remove contaminated clothing unless stuck to a burn area in which case cut around it. Obtain medical attention as soon as possible after first aid has been initiated and completed.
Ingestion:	Not applicable.
Inhalation:	Remove victim from further exposure and restore breathing, if required. Obtain medical attention immediately.
Notes to Physician:	Treatment of exposure should be directed at the control of symptoms and the clinical condition. Inhalation of product may have a narcotic effect. Assess central nervous system and cardio-respiratory status.

5. FIRE FIGHTING MEASURES

Extinguishing Media:	Carbon Dioxide Dry Chemical Water Fog
Firefighting Instructions:	Extremely flammable. Vapour forms a flammable/explosive mixture with air between upper and lower flammable limits. Evacuate hazard area. Vapours may travel along ground and flashback along vapour trail may occur. Containers exposed to intense heat may rupture. Allow gas to burn if flow cannot be shut off safely. Do not use a direct stream of water as it may spread fire. Sustained fire attack on vessels may result in a Boiling Liquid Expanding Vapour Explosion (BLEVE). Fight fire from maximum distance. Do not enter confined fire space without adequate protective clothing and an approved positive pressure self-contained breathing apparatus.
Hazardous Combustion Products:	Carbon dioxide, carbon monoxide and unidentified organic compounds may be formed upon combustion.

6. ACCIDENTAL RELEASE MEASURES

Issue warning "Flammable". Evacuate personnel not equipped with protective clothing and NIOSH approved respiratory protection. Isolate hazard area and restrict access. Stop leak only if safe to do so. Eliminate all

ignition sources. Handling equipment must be grounded. Use water fog to knock down vapours; contain runoff. Work upwind of spill if it is safe to do so. Avoid breathing vapours.

7. HANDLING AND STORAGE

Handling: Extremely flammable. Fixed equipment as well as transfer containers and equipment should be grounded to prevent accumulation of static charge. Vapours may accumulate and travel to distant ignition sources and flashback. Do not cut, drill, grind, weld or perform similar operations on or near containers. Hot surfaces may be sufficient to ignite liquid even in the absence of sparks or flames. Extinguish pilot lights, cigarettes and turn off other sources of ignition prior to use and until all vapours are gone. Vapours are heavier than air and will settle and collect in low areas and pits, displacing breathing air. Avoid prolonged or repeated inhalation of vapours. Wash with soap and water prior to eating, drinking, smoking, applying cosmetics or using toilet facilities. Wear appropriate respiratory protection and protective clothing. Air-dry contaminated clothing in a well ventilated area before laundering.

Storage: Store in a cool, dry, well ventilated area, away from heat and ignition sources. Cryogenic liquids are stored at extremely low temperatures that create exposure and pressure hazards in the event of a release.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

The following information, while appropriate for this product, are 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):

Aliphatic Hydrocarbon Gases Alkane (C1 - C4): 1000 ppm
Propylene: 500 ppm

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. Local ventilation recommended where general ventilation is ineffective in controlling airborne concentrations below the recommended occupational exposure limit. Make up air should always be supplied to balance air exhausted (either generally or locally). 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 should be worn. Provide an eyewash station in the area.

Skin Protection: Due to cryogenic properties of liquid product wear insulated gloves suitable for low temperatures, and coveralls. Safety showers should be available for emergency use.

Respiratory Protection: If exposure has the potential to exceed occupational exposure limits, use an appropriate NIOSH-approved respirator. For low airborne concentrations, use a NIOSH-approved chemical cartridge respirator with organic vapour cartridges. For high airborne concentrations, use a NIOSH-approved supplied-air respirator, either self-contained or airline breathing apparatus, operated in positive pressure mode.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquefied Compressed Gas
Appearance:	Colourless
Odour:	Mercaptan Odor.
Freezing/Pour Point:	< -188 °C
Boiling Point:	-42 °C
Vapour Density (Air = 1):	1.5
Vapour Pressure (absolute):	> 400 mm Hg @ -56 °C
Flash Point:	TCC -104 °C
Lower Flammable Limit:	2 % (vol.)
Upper Flammable Limit:	10 % (vol.)
Autoignition Temperature:	432 °C
Partition Coefficient (log K_{OW}):	2.3
Water Solubility:	Slight
Other Solvents:	Alcohol, Ether

10. STABILITY AND REACTIVITY

Chemically Stable:	Yes
Hazardous Polymerization:	No
Sensitive to Mechanical Impact:	No
Sensitive to Static Discharge:	Yes
Hazardous Decomposition Products:	Hazardous decomposition products are not expected to form during normal storage.
Incompatible Materials:	Avoid strong oxidizing agents.
Conditions of Reactivity:	Avoid excessive heat, open flames and all ignition sources. May explode if ignited in an enclosed area.

11. TOXICOLOGICAL INFORMATION

Ingredient (or Product if not specified)	Toxicological Data
Propane	LD50 Dermal Rat = 658 mg/kg
Propylene	
Hydrocarbons, C4 and up	

Routes of Exposure:	Exposure will most likely occur through skin contact or inhalation.
Acute Toxicity:	This product is not expected to be irritating and has a low level of toxicity under normal use. At high concentrations, hydrocarbon gases may affect the heart rhythm.
Chronic Effects:	Prolonged or repeated exposure to high vapour concentration or ingestion can cause headache, nausea, dizziness, and central nervous system depression, and in rare cases may sensitize heart muscles causing heart arrythmia.
Carcinogenicity and Mutagenicity:	Based on the chemical composition, this product is not expected to be carcinogenic.

12. ECOLOGICAL INFORMATION

Provincial regulations require and federal regulations may require that environmental and/or other agencies

be notified of a spill incident.

Biodegradability:	Inherently biodegradable. Rapid volatilization.
Bioaccumulation:	Not likely to bioaccumulate.
Partition Coefficient (log K_{OW}):	2.3
Aquatic Toxicity:	Practically non-toxic.

Ingredient:	Toxicological Data
Propane	EL50 Daphnia Magna (48hr) > 100 mg/L. LL50 Rainbow Trout (96hr) > 100 mg/L. EL50 - growth rate Algae (72hr) > 100 mg/L.
Propylene	
Hydrocarbons, C4 and up	

Definition(s): LL and EL are the lethal loading concentration and effective loading concentration respectively. The concentration represents the amount of substance added to the system to obtain a toxic concentration. They replace the traditional LC and EC for low solubility substances.

13. DISPOSAL CONSIDERATIONS

Incinerate at a licenced waste disposal site with approval of environmental authority.

14. TRANSPORT INFORMATION

Canadian Road and Rail Shipping Classification:

UN Number	UN1075
Proper Shipping Name	LIQUEFIED PETROLEUM GAS
Hazard Class	Class 2.1 Flammable Gases
Shipping Description	LIQUEFIED PETROLEUM GAS Class 2.1 UN1075

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 A Compressed Gas Class B1 Flammable Gas
DSL/NDSL Status:	This product, or all components, are listed on the Domestic Substances List, as required under the Canadian Environmental Protection Act. This product and/or all components are listed on the U.S. EPA TSCA Inventory.
Other Regulatory Status:	The regulatory information is not intended to be comprehensive. Other regulations may apply to this material.

16. OTHER INFORMATION

LABEL STATEMENTS

Hazard Statement :	Compressed Gas. Flammable Gas. The gas is an asphyxiant and may also have a mild narcotic effect. Exposure to rapidly expanding gas can cause frostbite.
Handling Statement:	Eliminate all ignition sources. Wear insulated gloves to avoid freezing burns from liquid. Use with adequate ventilation. 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 :	If overcome by vapours remove to fresh air. Treat freezing burns by immersing in lukewarm water. Obtain medical attention.
Revisions:	This MSDS has been reviewed and updated. Changes have been made to: Section 2 Section 3 Section 4 Section 5 Section 6 Section 7 Section 8 Section 9 Section 10 Section 11 Section 12 Section 15