

# Glacier Mass Balance and Pollution Studies in the Canadian High Arctic

**(Date prepared February 24, 2011)**

## ***Introduction and Project Details***

Collectively, glaciers and ice caps from the Canadian Arctic represent the largest mass of ice outside of the Greenland and Antarctic Ice Sheets. Changes in the volume of these features therefore represent potentially significant impacts on global sea level rise, marine ecosystems, and ocean circulation patterns. Measurements of glacier mass balance to date reveal accelerated rates of ice loss in response to recent climate warming, particularly since the mid 1980's. In addition, levels of atmospheric pollution contained within the annual snow pack across the ice caps have provided valuable information on atmospheric trajectories and potential linkages to glacier health. The objectives of this study are to continue these long term measurements of glacier mass balance and pollution from 4 sites across the Canadian high Arctic in order to monitor the rapid environmental changes that are occurring across this region. Our investigations of glacier mass balance in the Canadian high Arctic are conducted under Nunavut Research Licence #02 100 11R-M, Northwest Territories Scientific Research Licence # 14859, and Nunavut Water Board Licence # 3BC-MBA0919.

### ***Name of responsible person:***

David Burgess

Research Scientist

Geological Survey of Canada, Northern Canada Division

Rm 516, 601 Booth Street,

Ottawa, ON., K1A 0E8, Canada

Tel: (1) 613 995 5891

***Effective Date of spill contingency plan:*** February 24, 2011.

### ***Purpose and Scope***

The purpose of this plan is to outline response actions for potential spills of any size for the “Burgess” research camps on the Meighen, Melville, Agassiz, and Devon ice caps. The plan identifies key response personnel and their roles and responsibilities in the event of a spill. It details spill response procedures that will minimize potential health and safety hazards, environmental damage and clean-up efforts. The plan has been prepared to ensure quick access to all information required in responding to a spill.

### ***Project description***

Glacier mass balance measurements are conducted by repeat measurements of pole length, snow depth and snow density at all pole locations (~211) within our monitoring networks on the Melville, Meighen, Agassiz, and Devon Ice Caps. Field activities on the Devon Ice Cap will also include collection of shallow (~5m) ice cores, GPS, and ground penetrating radar measurements along a 50 kilometer transect in support of calibration and validation of the CryoSat-2 radar altimeter. Travel across ice caps will be performed on snowmobile with komatiq sled in tow. Accommodations will consist of small huts on Meighen and Melville ice caps, tents on Devon ice cap, and hotel in Grise Fiord.

### ***Site Description***

The 4 main project site locations are:

Devon Ice Cap, 75 20’N, 82 40’ W

Agassiz Ice Cap, 80 49’N, 72 54’W

Meighen Ice cap, 79 58’N, 99 09’W

Melville Ice Cap, 75 27’N, 115 0’W

All site locations are identified on the NTS map sheets attached.

With the exception of the Melville ice cap, all base camp locations are located on the ice cap. While this work is conducted in spring (April/May) the ground is snow covered at all locations. The snow will thus serve as the absorbent material should any spill occur.

Our transport from Resolute bay to each site is provided exclusively by the Polar Continental Shelf program (PCSP).

Our accommodations on the Meighen and Melville ice caps consist of small plywood huts. On Agassiz ice cap and Devon ice caps we stay in pyramid tents (7'x7'). Devon ice cap summit camp will also contain a 24' x 8' polar haven tent that is used primarily for cooking and eating. We melt snow or ice for drinking water and ship our waste to Resolute Bay for disposal.

### ***Hazardous Materials On-site***

Hazardous materials on site include:

Meighen ice Cap: 2 x 5gallon cans of gasoline, 1 gallon of Iosol, 2 x 20 lb bottles of propane

Melville ice Cap: 2 x 5gallon cans of gasoline, 1 gallon of Iosol, 2 x 20 lb bottles of propane

Agassiz Ice Cap: 2 x 5gallon cans of gasoline, 1 gallon of Iosol, 2 x 20 lb bottles of propane

Devon Ice cap: 15 x 45 gallon drums of gasoline, 12 x 45 gallon drums of Jet-B Av-gas, 2 x 45 gallon drums of diesel fuel, 5 gallons of Iosol, 6 x 20 lb bottles of propane

### ***On-site spill kit:***

*Plastic Bags*

*Shovel*

*Rubber Gloves*

### ***Preventative Measures***

All fuel will be sealed while not in use.

Proper transfer devices, ie. Funnels, wobble pumps, etc. will be used to transfer fuel from storage vessel to equipment fuel tanks.

### ***Spill Response Procedures***

The limited hazardous materials at our camp almost all fall under the category of “flammable liquids” based on the INAC Guidelines for Spill Contingency Planning (a copy of these guidelines is kept with the Camp Spill Plan for reference to guideline levels) . All fuel at the site is stored in volumes never exceeding 25L on the Melville, Meighen and Agassiz. Fuel storage on Devon ice cap includes sealed drums of 45 gallons in volume. The first person on the site will (1) assess the spill situation, (2) immediately contact the party chief (Burgess) and provide all information about the spill. The following course of action will be undertaken:

Step 1: The product and severity of the spill is assessed

Step 2a: If the spill is very minor (< 1L) the individual will effect an immediate clean up by stopping the spill and putting all contaminated snow in plastic garbage bags. The individual will fill out a minor spill report that is recorded in the field station spill log (NT-NU spill report form Appendix 1).

Step 2b: Larger spill but still Minor according to guideline levels. The camp manager will make sure that the spill is stopped and effect clean up with spill kit materials and put any contaminated soil in spill bags and then place in spill containers. Most spills will be localized due to the small volume of hazardous materials on site, so contaminated snow and materials will be bagged and placed in spill container. The camp manager will file a thorough report for station records as well as a NT-NU spill report form (Appendix 1) which will be sent to the Geological Survey – Northern Canada Division, Ottawa. The log on minor spills will be reported to land use and water board inspectors at scheduled visits.

Contaminated materials (snow) will be removed to an approved storage and decontamination site as soon as practical.

Material Safety Data Sheets for gasoline, diesel, propane, and Iosol are attached as separate files.

### ***Initial response plan***

The initial response to a spill will be to ascertain the safety of all persons in the vicinity of the spill. Stopping the spill and clean up will proceed after.

### ***Procedures***

The spill related procedures fall into 3 levels of action – the first upon identifying a spill is to assure the safety of everyone in the camp, then assess the spill (type, minor, major) and depending on the nature of the spill inform the camp manager and proceed with appropriate measures to limit and clean up the spill (as set out above). Second, depending on the scale and nature of the spill the appropriate territorial and company authorities need to be informed and a spill report will be filed. The camp manager with the assistance of individuals in camp will undertake spill containment and clean up. The third action is the maintenance of records of spills of all levels and the action taken. In this case GPS locations and photographs form an important part of the recording process as well as filing out NT-NU Spill Reports.

Containment procedures for spills will follow the guidelines provided by the NT-NU Guidelines for Spill Contingency Planning based on the amount of substance spilled.

Gasoline / Diesel spill: If possible and if safety permits, stop the flow and eliminate any ignition sources (special care is taken to avoid gas vapor and no smoking). The spill will be absorbed with snow. Contaminated snow is to be put into closed labeled bags/containers, stored in a ventilated area, and transported back to Resolute Bay for disposal as soon as practicable.

Propane: If possible and if safety permits eliminate any ignition sources (special care is taken to avoid gas vapor and no smoking).

### ***Reporting procedures***

- 1: Fill out spill report form as completely as possible before making report
- 2: Report to Yellowknife using 25 hour Spill Report line (867 920-8130)
- 3: Where fax is available follow up with a faxed copy of the spill report to 867 873-6924
- 4: PCSP or RCMP communications may be used if other means are not available
- 5: Notify DIAND's Water Resources Inspector 867 975-4295



### ***Contacts***

INAC Water Resources Inspector 867 975-4295

Environment Canada Enforcement Officer 867 975-4644 (office) 867 222-1925 cell

PCSP Base Manager 867 252-3872

# Appendix 1

				<b>NT-NU SPILL REPORT</b> OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS		<b>NT-NU 24-HOUR SPILL REPORT LINE</b> 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		<input type="checkbox"/> ORIGINAL SPILL REPORT, OR <input type="checkbox"/> UPDATE # _____ TO THE ORIGINAL SPILL REPORT	
B	OCCURRENCE DATE: MONTH – DAY – YEAR			OCCURRENCE TIME		REPORT NUMBER _____	
C	LAND USE PERMIT NUMBER (IF APPLICABLE)			WATER LICENCE NUMBER (IF APPLICABLE)			
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION			REGION <input type="checkbox"/> NWT <input type="checkbox"/> NUNAVUT <input type="checkbox"/> 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	
I	SECOND PRODUCT SPILLED (IF APPLICABLE)			QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES		U.N. NUMBER	
J	SPILL SOURCE			SPILL CAUSE		AREA OF CONTAMINATION IN SQUARE METRES	
K	FACTORS AFFECTING SPILL OR RECOVERY			DESCRIBE ANY ASSISTANCE REQUIRED		HAZARDS TO PERSONS, PROPERTY OR EQUIPMENT	
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 <input type="checkbox"/> EC <input type="checkbox"/> COG <input type="checkbox"/> GNWT <input type="checkbox"/> GN <input type="checkbox"/> ILA <input type="checkbox"/> INAC <input type="checkbox"/> NEB <input type="checkbox"/> TC			SIGNIFICANCE <input type="checkbox"/> MINOR <input type="checkbox"/> MAJOR <input type="checkbox"/> UNKNOWN		FILE STATUS <input type="checkbox"/> OPEN <input type="checkbox"/> CLOSED		
AGENCY		CONTACT NAME		CONTACT TIME		REMARKS	
LEAD AGENCY							
FIRST SUPPORT AGENCY							
SECOND SUPPORT AGENCY							
THIRD SUPPORT AGENCY							