

SCIENTIFIC RESEARCH LICENCE APPLICATION

LAND, FRESHWATER & MARINE BASED RESEARCH

NRI strongly recommends that applicants review the following documents prior to submitting an application: *Scientific Research Licencing Guidelines* and *Negotiating Research Relationships in Inuit Communities: A Guide for Researchers*.

For more information about the Nunavut Research Institute (NRI) please visit our web site www.nri.nu.ca

IMPORTANT

This application fulfills the requirements for the NIRB environmental screening. Please be advised that your application will not be processed until the application form, project summary, and maps are received.

SECTION 1: APPLICANT INFORMATION

1a. Project Title Ice Islands of the Eastern Canadian Arctic

1b. Project Number

Please indicate if applicant has submitted any previous application(s) to NRI Yes ☒ No ☐
related to this project proposal?

If yes, please indicate the previous NRI licence number: 0205810N-M

Please indicate if applicant has submitted any previous application(s) to NIRB Yes ☒ No ☐
related to this project proposal?

If yes, please indicate the previous NIRB project number(s): 09YN071

2. Applicant's full name and mailing address:

<u>Derek Mueller, Assistant Professor</u>	Phone: <u>613-520-2600 x1984</u>
<u>Dept of Geography, Carleton University</u>	Fax: <u>613-520-4301</u>
<u>1125 Colonel By Drive, Ottawa ON K1S 5B6</u>	Email: <u>derek_mueller@carleton.ca</u>

3. Field Supervisor's name and mailing address:

<u>Anna Crawford</u>	Phone: <u>613-520-2600 x2565</u>
<u>As above</u>	Fax: <u>613-520-4301</u>
	Email: <u>acrawfo5@connect.carleton.ca</u>

4. Other Personnel list (name, position, affiliation)

<u>Dr. Peter Wadhams, Professor</u>	<u>University of Cambridge</u>
<u>Dr. Keith Nicholls, Researcher</u>	<u>British Antarctic Survey</u>
<u>Dr. Richard Bates, Professor</u>	<u>University of St. Andrews</u>
<u>Alon Stern, PhD Candidate</u>	<u>New York University</u>
<u>Dr. Richard Mulvaney, Researcher</u>	<u>British Antarctic Survey</u>
<u>Maxwell Fischer, Technician</u>	<u>Netsurvey</u>

SECTION 2: AUTHORIZATION NEEDED

1. Indicate all authorizations associated with the project proposal:

<input type="checkbox"/> Regional Inuit Association (RIA) <input type="checkbox"/> Nunavut Water Board (NWB) <input type="checkbox"/> Nunavut Planning Commission (NPC) <input type="checkbox"/> Department of Indian And Northern Development (DIAND) <input type="checkbox"/> Department of Fisheries and Oceans (DFO) <input type="checkbox"/> Community Government & Services (CG&S) <input checked="" type="checkbox"/> Nunavut Research Institute (NRI/GN) <input type="checkbox"/> Department of Culture, Language, Elders, and Youth (CLEY/GN)	<input type="checkbox"/> Canadian Launch Safety (CLS) <input type="checkbox"/> Environment Canada (EC) <input type="checkbox"/> Department of Environment (GN) <input type="checkbox"/> Department of National Defense (DND) <input type="checkbox"/> Hamlet <input type="checkbox"/> Parks Canada (PC) <input type="checkbox"/> Canadian Wildlife Service (CWS) <input type="checkbox"/> Other (please specify): _____
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2. List the active permits, licences, or other rights related to the project proposal and their expiry date:

3. Have you applied for all authorizations required to conduct the project proposal activities?

☒ YES

☐ NO

SECTION 3: PROJECT PROPOSAL DESCRIPTION

1. Indicate the activities related to the project proposal:

<input type="checkbox"/> Temporary camp (to be removed at end of field season) <input type="checkbox"/> Permanent camp (to remain for life of authorization) <input type="checkbox"/> Construction of recreational or safety cabin <input type="checkbox"/> Temporary fuel storage (to be removed at end of field season) <input type="checkbox"/> Permanent fuel storage (to remain for life of authorization) <input type="checkbox"/> Placement of structures for life of permit (other than camp or cabin – i.e. scientific instruments) <input checked="" type="checkbox"/> Placement of permanent structures (other than camp or cabin – i.e. scientific instruments) <input checked="" type="checkbox"/> Air surveys (i.e. geophysical, wildlife) <input checked="" type="checkbox"/> Use of aircraft/watercraft/land vehicle for personnel drop-off and pick-up to project location <input type="checkbox"/> Use of on-site mechanized vehicles (i.e. atv, snowmobile, truck, zodiac) <input type="checkbox"/> Sewage or grey water disposal via sump <input type="checkbox"/> Hazardous waste storage or disposal <input type="checkbox"/> Solid waste disposal <input type="checkbox"/> Chemical storage <input type="checkbox"/> Explosives storage <input type="checkbox"/> Soil testing	<input type="checkbox"/> Soil disposal/ soil storage <input type="checkbox"/> Incineration of combustible wastes and removal of non-combustible wastes <input type="checkbox"/> River/ stream/ lake crossing or work/ bridge <input type="checkbox"/> Drainage alteration <input type="checkbox"/> Geoscientific sampling by diamond drilling <input type="checkbox"/> Geoscientific sampling by soil sampling <input type="checkbox"/> Geoscientific sampling by trenching <input type="checkbox"/> Geoscientific sampling by borehole core <input type="checkbox"/> Blasting <input type="checkbox"/> Channeling <input type="checkbox"/> Excavation <input type="checkbox"/> Hydrological testing <input type="checkbox"/> Abandonment and restoration <input type="checkbox"/> Site restoration (fertilization/ grubbing/ scarification/ spraying/ recontouring) <input checked="" type="checkbox"/> Research <input type="checkbox"/> Ecological survey <input type="checkbox"/> Harvesting <input type="checkbox"/> Removal of vegetation for scientific purposes <input type="checkbox"/> Other: _____
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2. Personnel

Total No. of personnel on site = (A)	7	Total No. of days on-site = (B)	7	Total No. of Person days (A) x (B) = 49
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3. Timing

Period of operation: July 25, 2012 to August 10, 2012
Proposed term of authorization: April 1, 2012 to Dec. 31, 2016 (multiyear licence)

Please outline the phases of the proposed project (construction/ operation/ decommissioning) including the timing and scheduling of each phase.

Fieldwork will occur in July and August of 2012 on Peterman Ice Island-B in Baffin Bay and perhaps other ice islands in the vicinity if feasible.

4. Location(s) of data collection:

Location Name	Region North Baffin, South Baffin, Kivalliq, Kitikmeot	Co-ordinates Lat (degree / minute), Long (degree / minute)	NTS Map Sheet #	Land Status Crown, Commissioners', Inuit Owned
PII-B-1	South Baffin	69° 37' N 65° 50' W	27D	Crown
PII-B-2a	South Baffin	67° 34' N 63° 00' W	16M	Crown
Other Ice Islands	North and/or South Baffin	The position of these ice islands will change as they drift in the coming years. They can be within the channels of the Canadian Arctic Archipelago, Arctic Ocean or Baffin Bay.	Varies	Crown

If the project proposal includes a **camp**, please provide the coordinates of the camp location

Lat (degree/minute) _____ Long (degree/minute) _____
NTS Map Sheet # (if different from above) _____

The Nunavut Impact Review Board may require additional location information in a subsequent Project Specific Information Requirement (PSIR) submission. This may take the form of a digital Geographic Information Systems (GIS) file.

SECTION 4: NON-TECHNICAL PROJECT PROPOSAL DESCRIPTION

Please attach a non-technical description of the project proposal, no more than 500 words, in English and Inuktitut (+Inuinnaqtun, if in the Kitikmeot). The project description should outline the following:

Ice Islands of the Eastern Canadian Arctic

Anna Crawford¹, Derek Mueller¹, Peter Wadhams², Keith Nicholls³, Richard Bates⁴, Alon Stern⁵

¹Department of Geography, Carleton University, Ottawa, Ontario

²University of Cambridge, Cambridge, United Kingdom

³British Antarctic Survey, Cambridge, United Kingdom

⁴University of St. Andrews, St. Andrews, United Kingdom

⁵New York University, New York, New York, USA

This research program brings together an international team of researchers to continue previous study on the drift, deterioration and shape of ice islands (large tabular icebergs of Arctic ice shelf or floating glacial tongue origin) in the Eastern Canadian Arctic. Four ice islands were studied in July and October of 2011 and future research will build on this work in 2012 and beyond. Ice islands have extensive dimensions (1 km² to 250 km²) and are considered ice hazards for shipping and natural resource exploration and development in the Canadian Arctic and Sub-Arctic. The objective of this work is to better understand the drift and deterioration of these ice islands. This will allow for accurate size and location prediction and proper risk assessment and management by stakeholders.

Northwestern Greenland is often the source of ice islands that transit south along the east coast of Canada and within Canadian waters. The Petermann Ice Islands of study in 2011 and 2012 originated there (Petermann Glacier, Greenland), while ice islands from other sources may be visited in the future. A fragment of the original Petermann Ice Island is now located off shore near Clyde River, Baffin Island and is the intended study site for 2012 (July 25 – August 1). The scientists will commission a ship and helicopters for travel to and from the ice island.

All research methods preserve the condition of the ice and the surrounding environment. To complete the shape analysis of the ice island we will use side-scanning sonar and ground penetrating radar. The affect of wave action on ice island movement and deterioration will be studied with a tilt-meter and a wave-rider buoy. The internal temperature of the ice island will be taken with thermistor probes. The salinity and temperature of the surrounding water will be recorded to determine how melt affects the adjacent environment. A warm water drill will allow for access to the water underneath the ice. Surface melt will be calculated from comparative measurements of stakes (PVC conduit) drilled into the ice. We will service transmitting global positioning system (GPS) beacons located on the ice islands. They transmit data through a satellite and with Radarsat-2 satellite imagery allow for tracking of the ice islands drift route. The beacons and PVC conduit will be the only materials left on the ice island. Updates on the 2010 Petermann Ice Island fragments can be followed at:

<http://www.ec.gc.ca/glaces-ice/default.asp?lang=En&n=0417829C-1&wsdoc=1B226706-42BF-4B94-A481-E9524C81C436>

This project will contribute to the study of ice islands initiated by the Canadian Ice Service (CIS) – Environment Canada and ArcticNet. We will document the science and impact that climate change has on ice in the Arctic through a British Broadcasting Corporation (BBC) documentary. DVDs will be provided to the towns of Baffin Island for public viewing. Community talks will be planned for nearby towns (e.g. Iqaluit). Several papers will be published in international journals (e.g. Polar Research) and copies will be provided to the Nunavut Research Institute.



Fig 1: Example of a Petermann Ice Island (PII) fragment.
At time of picture ('PII-Ba') the ice island was approximately 11.5 km^2 (6.0 km x 2.0 km) and located in Lancaster Sound.

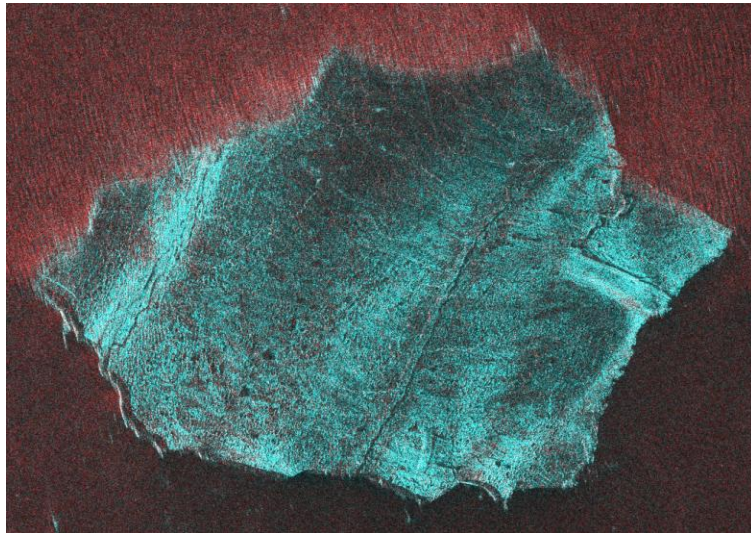


Fig 2: Target ice island 'PII-B'. Radarsat-2 image acquired October 2011. At time of acquisition, the ice island was approximately 60.9 km^2 (11.5 km x 7.9 km). It has since fragmented and is now 40.0 km^2 (9.5 km x 5.1 km). It is grounded in Baffin Bay (near Clyde River).

SECTION 5: MATERIAL USE

1. List equipment (including drills, pumps, aircrafts, vehicles etc.):

Equipment type and number	Size – dimensions	Proposed use
Kovacs ice drill (2)	3 m x 3 cm	Drilling ice
Warm water drill (1)	2.5 m ³	Drilling ice
Oceanographic winch (1)	0.3 m ³	Equipment placement
Jiffy drill (1)	3m x 30cm	Drilling Ice
Ice penetrating radar (2)	50 cm x 50 cm	Measure ice thickness
GPS tracking beacons (3-5)	40 cm x 40 cm	Track ice islands movement
Ablation stakes (1-5)	5 m x 2 cm	Track ice melt
Side-scan sonar (1)	20 cm x 15 cm x 4 cm	Shape analysis of ice island sidewalls
Tilt meter (1)	25 cm x 25 cm x 15 cm	Wave action analysis
Wave-rider buoy (1)	1.1 m x 0.70 m	Recording amplitude and frequency of waves
Thermistor probe (1)	50 m x 1.3 cm	Ice temperature recording
Conductivity/temperature water Profiler (1)	50 cm x 5 cm	Water salinity and temperature measurement
Small boat (1)	5 m x 3 m x 2 m	Transport
Helicopter (2)	15 m x 5 m x 3 m	Transport
Ship (1)	50 m x 9.6 m x 18 m	Transport

2. Detail fuel and hazardous material use:

Fuel	Number of Containers and Capacity of Containers	Total Amount of Fuel (in Litres)	Proposed Storage Methods
Gasoline	3 x 45 gal barrels	510 l	Steel drums - stored on ship
Aviation fuel	20 x 45 gal barrels	3400 l	Steel drums - stored on ship
Hazardous Materials and Chemicals		Total Amount of Hazardous Materials and Chemicals (in Litres)	
Lithium Battery	1 (3 L)	3 L	Inside tracking beacon case

3. Detail daily water consumption rates

Daily amount (in Litres)	Proposed water retrieval methods	Proposed water retrieval location
80 litres	From ship – brought with us	

4. Have you applied for a Class A License with the Nunavut Water Board?

☐ YES

☒ NO

SECTION 6: WASTE DISPOSAL AND TREATMENT METHODS

1. List the types of waste:

Type of waste	Projected amount generated	Method of Disposal	Additional treatment procedures
Sewage (human waste)	10 kg/day	Shipped out	
Greywater	60 L/day	Shipped out	
Combustible wastes	10 kg/day	Shipped out	
Non-Combustible wastes	10 kg/day	Shipped out	
Overburden (organic soil, waste material, tailings)			
Hazardous waste	3 L (battery fluid)	Retrieval if feasible	Bring south for recycling
Other:			

2. Will you be incinerating combustible waste, removing all solid waste, and removing the ash generated from incineration?

☐ YES

☒ NO

SECTION 7: COMMUNITY INVOLVEMENT & REGIONAL BENEFITS

1. List the community representatives that have been contacted and provide the minutes of the meetings if available:

Community	Name	Organization	Date Contacted
Clyde River	Billy Palluq	Hamlet	May 11/2012
Clyde River	htoclyde@qiniq.com	HTO	May 14/2012
Qikiqtarjuaq	munqik@qiniq.com qikfindir@qiniq.com	Hamlet	May 11/2012
Qikiqtarjuaq	Harry Alookie	HTO	May 11/2012

2. How will the proposed project benefit Nunavut?

The proposed research will further our understanding of ice island drift and deterioration in the Canadian Arctic. This will allow for accurate prediction of ice island size and location when off the coast of Nunavut. The ability to model and predict ice island drift and deterioration will decrease the chance of future collisions between ice islands and offshore equipment (e.g. oil platforms) or ships navigating in these waters. A collision of this nature would be disastrous economically, but more importantly, ecologically to the marine and terrestrial environments within the vicinity. This research will give the proper information to stakeholders to make sure that this never happens along Nunavut's coast.

3. Please describe the nature of local services and/or logistic support that will be required from local communities, eg. Equipment, accommodations, outfitting, translations...

For the summer of 2012, the closest community to the intended ice island of study is Clyde River. Helicopters will be chartered from their base in Iqaluit. The translation of science permits and documents will be conducted through Innirvik Support Services Ltd in Iqaluit. Only one researcher will need accommodation in Iqaluit before and after the ice island work.

4. Describe and attach documentation regarding community support or concerns for the proposed project:

No concerns were noted after telephone conversations with the Clyde River and Qikiqtarjuaq Hamlet and HTO offices. Emails were sent with project summaries (English and Inuktitut) to these offices following the conversations. The Nativak HTO board meeting will occur on May 22/2012 and the proposal will be brought to the attention of the board at that time.

5. Is there a traditional knowledge component to this research project? If yes, please explain:

No

SECTION 8: GENERAL QUESTIONS

1. Do you give NRI permission to publish project information in the Nunavut Research Institute Annual Compendium of Research Undertaken in Nunavut?

☒ YES

☐ NO

2. In addition to the application form, applicants are required to submit additional information in an electronic format to the Manager, Research Liaison, cfilion@nac.nu.ca. Please check that the following have been submitted to NRI:

- ☒ **Project Summary** -in English and Inuktitut (+Inuinnaqtun, if in the Kitikmeot)
- ☒ **NTS Maps** of the project

Applicant:



Signature

Field Supervisor
MSc Candidate -
Carleton University

Title

May 18/2012

Date