



## **NIRB Uuktuutinga Ihivriughikhamut #125362**

### **Watershed and permafrost responses to a changing climate in the Resolute Bay area**

**Uuktuutinga Qanurittuq:** New

**Havaap Qanurittunia:** Scientific Research

**Uuktuutinga Ublua:** 6/27/2018 1:21:18 PM

**Period of operation:** from 0001-01-01 to 0001-01-01

**Piumayaat Angirutinga:** from 0001-01-01 to 0001-01-01

**Havauhikhaq Ikayuqtinga:** Queen's University, Scott Lamoureux  
Queen's University  
Department of Geography and Planning MC D201  
Kingston ON K7L3N6  
Canada  
Hivayautit Nampanga:: 6135336033, Kayumiktukkut Nampanga:: 6135336122

# QANURITTUT

## Tukihiannaqtunik havaariyaumayumik uqauhiyun

**Qablunaatitut:** As climate warms, permafrost degradation is accelerating, with numerous impacts on ground stability and soil erosion. Simultaneously, precipitation regimes are expected to shift toward more rainfall and less snow, affecting late summer water quality and sediment transport in rivers. The modification of hydrology is a concern for water quality and availability in Arctic communities and will directly impact freshwater ecosystems, which are among the most vulnerable yet the most poorly understood in North America. This project is aimed at investigating potential effects of permafrost degradation and of increased rainfall on the hydrology, water quality and sediment dynamics of the McMaster River near Resolute Bay, Nunavut. This research will act as a parallel study to the watershed the community is using as a water source, and will provide crucial knowledge of permafrost and hydrological conditions in and around the community. Fieldwork will be performed by Michel Paquette, and based at the Polar Continental Shelf Program (PCSP) in Resolute Bay. The field sites will be accessed by ATV during the month or so of operation. Water sampling of 2L of water for ion, DOC, isotopic composition and sediment concentration will be conducted bi-weekly, and during intense precipitation events at major junctions of the river. Samples will be filtered in the Dr. Roy M. “Fritz” Koerner Laboratory at PCSP, and prepared for further analysis at the Facility for Biogeochemical Research on Environmental Change and the Cryosphere of Queen’s University upon return. Permafrost coring will be performed in 6 locations (including Resolute Bay) using a modified portable earth auger, in order to determine ground ice content and ice composition in selected environmental settings. The cores will be described in-situ and transported to the Geocryolab at the University of Montreal for analysis. Research is conducted near Resolute Bay, where concerns arose in the community concerning permafrost stability since a landslide event occurred in 2017. The facilities and support of PCSP as well as the expressed interest in the community make it an ideal occasion to provide key information to decision makers, while also producing general scientific knowledge. Employment of community members, and general outreach and communication with the community during the field season will provide essential feedback to our research. Community involvement could result in permafrost coring and permafrost temperature monitoring in the hamlet of Resolute Bay, possibly in partnership with the population and/or the local school. Data will be used to publish papers in scientific journals, as well as to provide information to local officials. We will provide feedback to the community on our finding during the 2019 field season, and potentially during the winter months if research funding allows a visit.

**Uiviititut:** Les hausses de températures associées aux changements climatiques engendrent une dégradation du pergélisol, encourageant des impacts sur les conditions de stabilité et d'érosion des sols. Simultanément, la modification du régime des précipitations vers davantage de pluie risque de modifier la qualité des eaux de surfaces ainsi que le transport de sédiments dans les rivières. La modification des régimes hydrologiques est particulièrement problématique pour les ressources en eaux des communautés nordiques, et affectera directement les écosystèmes d'eaux douces arctiques, qui sont parmi les plus vulnérables et les moins bien compris de l'Amérique du Nord. Le projet s'intéresse aux effets potentiels de la dégradation du pergélisol et des pluies accrues sur l'hydrologie, la qualité des eaux et les dynamiques sédimentaires de la rivière McMaster, près de Resolute Bay, au Nunavut. La recherche servira de parallèle au bassin versant utilisé comme source d'eau par la communauté. Elle procurera une connaissance essentielle des conditions de pergélisol et de l'hydrologie à l'intérieur et autour de la communauté. Les travaux de terrain seront basés au Programme du Plateau Continental Polaire (PPCP) à Resolute Bay et exécutés par Michel Paquette. Les sites de recherche sont accessibles par véhicule tout-terrain pendant les mois d'opération. Des échantillons de 2L d'eau seront collectés aux jonctions principales de la rivière deux fois par semaine ainsi que pendant et après des événements de précipitation intenses. Les eaux récoltées seront filtrées au laboratoire de Dr. Roy M. “Fritz” Koerner au PPCP, et seront préparées afin d'être transportées vers le Facility for Biogeochemical Research on Environmental Change and the Cryosphere de l'Université Queen's, où seront analysés les contenus en ions, en carbone organique dissout et en isotopes stables contenus dans l'eau. L'échantillonnage du pergélisol sera effectué par forage et carottage à l'aide d'une foreuse à carottier portative. Un total de 6 sites seront choisis (incluant Resolute Bay) afin de déterminer la composition du sol et de la glace dans différents environnements. Les carottes seront décrites in-situ avant d'être transportées au Geocryolab de l'Université de Montréal pour analyses complètes. La recherche prendra place près de Resolute Bay, où la communauté a récemment communiqué ses inquiétudes à la suite d'un glissement de terrain lié au dégel du pergélisol en 2017. Les installations et le soutien de PPCP, ainsi que l'intérêt exprimé par la communauté font du projet une occasion idéale de fournir aux dirigeants des informations clés sur les conditions environnementales, tout en profitant du savoir local afin d'être guidé pour produire de la connaissance scientifique. Il est prévu, lors du développement des relations avec la communauté, d'employer des membres de la communauté et d'établir une communication où nous communiquons nos résultats et où la communauté nous présente ses impressions et ses préoccupations afin de guider davantage nos recherches. Le développement d'une relation adéquate entre l'équipe de recherche et la communauté pourrait résulter, par exemple, dans des opérations clés de forage et de mesure des

Inuktitut:

[illegible]

## Personnel

Personnel on site: 2

Days on site: 28

Total Person days: 56

Operations Phase: from 2018-07-23 to 2018-08-20

## Hulilukaarutit

Inigiya	Hulilukaarut Qanurittuq	Nunannga Qanurittaakhaanik	Initurlinga qanuritpa	Initurlinga utuqqarnitat unaluuniit Ingilraaqnitat Uyarannguqtut akhuurninnga	Qanitqiyauyuq qanitqiamut nunallaat kitulluuniit ahiruqtaliyainnit nuna
Resolute Bay	Researching	Municipal	Hamlet of Resolute Bay	N/A	N/A
McMaster River sampling site 1	Scientific/International Polar Year Research	Municipal	No known site history	No known archeological value. Any encountered archeological site will be avoided during our research	About 8 km North of Resolute Bay
McMaster River sampling site 2	Scientific/International Polar Year Research	Municipal	No known site history	No known archeological value. Any encountered archeological site will be avoided during our research	About 7 km North of Resolute Bay
McMaster River sampling site 3	Scientific/International Polar Year Research	Municipal	No known site history	No known archeological value. Any encountered archeological site will be avoided during our research	About 5 km North of Resolute Bay
McMaster River sampling site 4	Scientific/International Polar Year Research	Municipal	No known site history	No known archeological value. Any encountered archeological site will be avoided during our research	About 5 km North of Resolute Bay
McMaster River sampling site 5	Scientific/International Polar Year Research	Municipal	No known site history	No known archeological value. Any encountered archeological site will be avoided during our research	About 8 km North-West of Resolute Bay
Permafrost coring site 1	Scientific/International Polar Year Research	Municipal	No known site history	No known archeological value. Any encountered archeological site will be avoided during our research	About 7 km North of Resolute Bay
Permafrost	Scientific/International	Municipal	No known	No known	About 8 km North

coring site 2	Polar Year Research		site history	archeological value. Any encountered archeological site will be avoided during our research	of Resolute Bay
Permafrost coring site 3	Scientific/International Polar Year Research	Municipal	No known site history	No known archeological value. Any encountered archeological site will be avoided during our research	About 7 km North of Resolute Bay
Permafrost coring site 4	Scientific/International Polar Year Research	Municipal	No known site history	No known archeological value. Any encountered archeological site will be avoided during our research	About 7 km North of Resolute Bay
Permafrost coring site 5	Scientific/International Polar Year Research	Municipal	No known site history	No known archeological value. Any encountered archeological site will be avoided during our research	About 8 km North-West of Resolute Bay

**Nunaliin Ilauyun, Aviktuqhimayuniitunullu Ikayuuhiarunguyun**

<b>Nunauyuq</b>	<b>Atia</b>	<b>Timiuyuq</b>	<b>Upluani Uqaqatigiyaungmata</b>
Qausuittuq	Phillip Manik	Hunters Trappers Organizations	2018-02-24

# Angiuttauvaktunik

Naunaiqlugu nunanga talvani havauhikhaq ittuq:

North Baffin

## Angiuttauvaktunik

Munariniqmut Ayuittiaqtuq	Angirutinga Qanurittuq	Tadja Qanurittaakhaanik	Ublua Tuniyauyuq/Uuktuqtuq	Umikvikhaa Ublua
Nunavunmi Ihivriuqniqmut Timiqutigiyanga	N/A	Not Yet Applied		

## Project transportation types

Transportation Type	Qanuq Atuqtauniarmangaa	Length of Use
Land	ATV transport on the roads an in the watershed	

## Project accomodation types

Alaanut,

# Ihuaqutivaluin Atuqtauyukhan

Hanalrutit atuqtaunahuat (ukuallu ikuutat, pampiutainnik, tingmitinik, akhaluutinik, hunaluuniit)

Hanalrutit Qanurittuq	Qaffiuyut	Aktikkulaanga – Qanurittullu	Qanuq Atuqtauniarmangaa
Portable core drill	1	3m	Permafrost coring down to 3m
ATV	1	2m	tansport

Qanurittuq Urhuqyuaq unalu Qayangnaqtut Hunavaluit Aturninnga

Qanurittuq urhuqyuaq hunavaluit aturninnga:	Urhuqyuaq Qanurittuq	Qaffiuyut qattaryut	Qattaryuk Aktikkulaanga	Atauttimut Qaffiuyut	Ilanga	Qanuq Atuqtauniarmangaa
Gasoline	fuel	3	20	60	Liters	For ATV and Drill

Imaqmik Aturninnga

Ubluq qanuraaluk (m3)	Aturumayain imavaluin utiqittagaani qanuq	Atulirumayain imavaluin utiqittagani humi
0	Grab sampling	McMaster River, North River

# Iqqakuq

## Ikkakunik Munakgiyauyunik

Havauhikhaq Hulilukaarut	Qanurittuq Iqqakut	Ihumagiyauyuq Qanuraaluktut Atuqtait	Qanuq Iqqakuurniarmangaa	Halummaqtirarnirutikhan piyutin
Researching	Ikulalaaqtun iqqakuuvaluin	1 kg/d	By PCSP	By PCSP
Camp	Qirnarivyaktuq imaq	50 l/d	By PCSP	by PCSP
Researching	Qirnarivyaktuq imaq	20 L/d	By PCSP	By PCSP
Camp	Ikulalimanngittun iqqakuuvaluin	1 kg/d	By PCSP	By PCSP
Camp	Anaagun (inuin anaaguin)	1L/d	By PCSP	By PCSP

### Avatiliriniqmut Ayurhautingit:

This project involves water sampling (< 10L per day, not everyday) from the two main rivers and coring permafrost in a few (~10) locations. All operations are to be performed on foot, except transport to and from the areas on an ATV. The potential impacts are very limited: 1) Soil disturbance in soil pits when permafrost coring. Mitigation: Backfilling the soil pits after the operation 2) Gas spill from ATV and Drill engine fueling operations. Mitigation: Use of a spill kit, filling in Polar continental shelf garage instead of in the field. The research is based at the Polar Shelf facilities, so all potential waste will be dealt with through their system



# **Additional Information**

**SECTION A1: Project Info**

**SECTION A2: Allweather Road**

**SECTION A3: Winter Road**

**SECTION B1: Project Info**

**SECTION B2: Exploration Activity**

**SECTION B3: Geosciences**

**SECTION B4: Drilling**

**SECTION B5: Stripping**

**SECTION B6: Underground Activity**

**SECTION B7: Waste Rock**

**SECTION B8: Stockpiles**

**SECTION B9: Mine Development**

**SECTION B10: Geology**

**SECTION B11: Mine**

**SECTION B12: Mill**

**SECTION C1: Pits**

**SECTION D1: Facility**

**SECTION D2: Facility Construction**

**SECTION D3: Facility Operation**

**SECTION D4: Vessel Use**

**SECTION E1: Offshore Survey**

**SECTION E2: Nearshore Survey**

**SECTION E3: Vessel Use**

## **SECTION F1: Site Cleanup**

## **SECTION G1: Well Authorization**

## **SECTION G2: Onland Exploration**

## **SECTION G3: Offshore Exploration**

## **SECTION G4: Rig**

## **SECTION H1: Vessel Use**

## **SECTION H2: Disposal At Sea**

## **SECTION I1: Municipal Development**

### **Qanurittuq Ittunik Avatinga: Avatingalluanga**

McMaster and North rivers are mostly natural environments, extending from Allen Bay to the interior of Cornwallis Island, up to 16 km inland. The area is a polar desert: slopes are mostly devoid of vegetation except close to the rivers and where lingering snowbanks occur. Permafrost depth is greater than 600m and active layer thaws to 40-70 cm depending on soil properties and conditions.

### **Qanurittuq Ittunik Avatinga: Inuuhimayunut Avatinga**

### **Qanurittuq Ittunik Avatinga: Inungit-maniliurutingit Avatinga**

## **Miscellaneous Project Information**

### **Naunaiyainiq ukuninnga Ayurhautingit unalu Piumayaat Ikikliyuumiutinahuarutit**

This project involves water sampling (< 10L per day, not everyday) from the two main rivers and coring permafrost in a few (~10) locations. All operations are to be performed on foot, except transport to and from the areas on an ATV. The potential impacts are very limited: 1) Soil disturbance in soil pits when permafrost coring. Mitigation: Backfilling the soil pits after the operation 2) Gas spill from ATV and Drill engine fueling operations. Mitigation: Use of a spill kit, filling in Polar continental shelf garage instead of in the field. The research is based at the Polar Shelf facilities, so all potential waste will be dealt with through their system

### **Tamatkiumayunik Ihuikgutivaktunik**

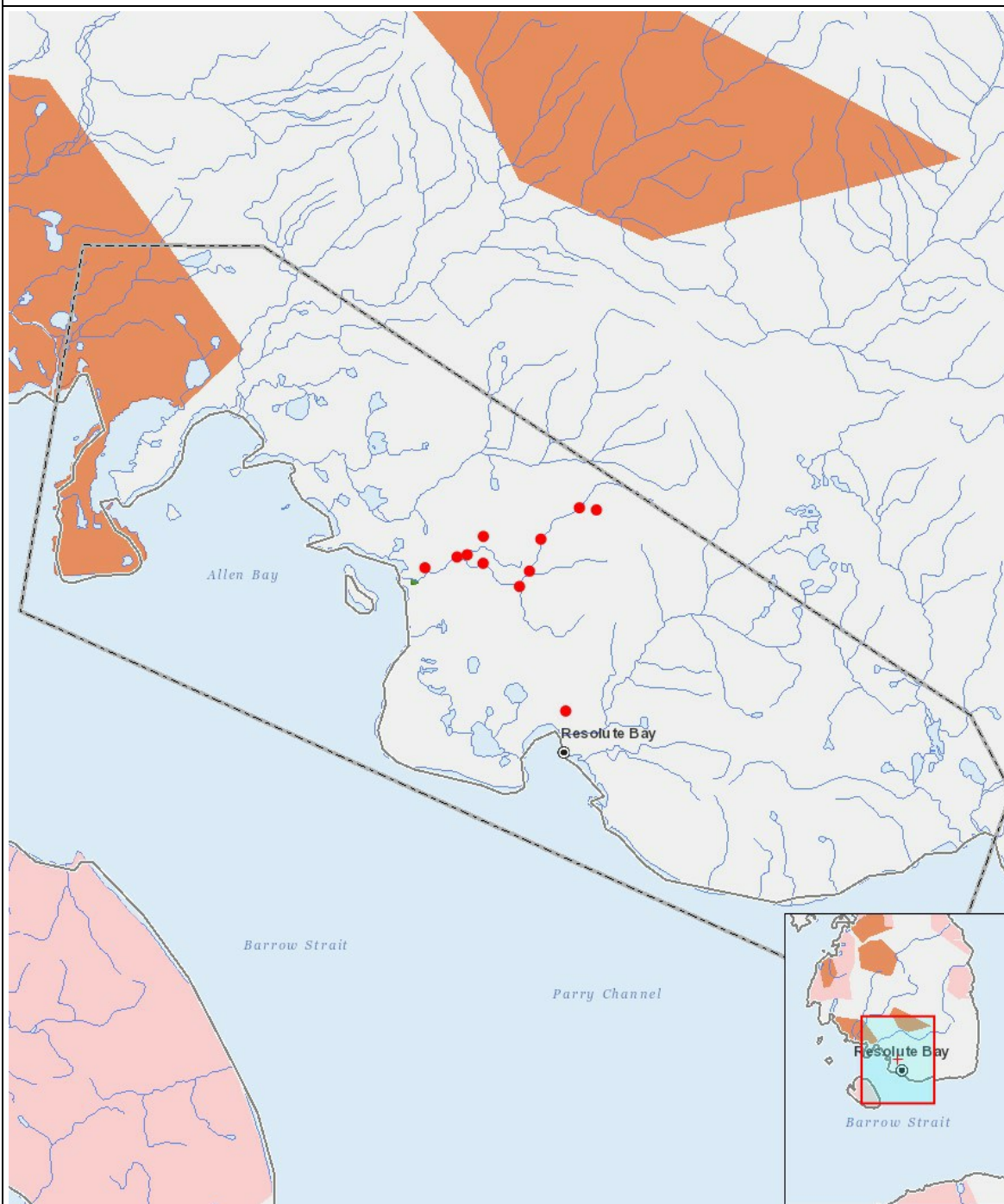
Impacts

Ilitariyauniq Avatiliriniqmut Ayurhautingit

		PHYSICAL	Designated environmental areas	Ground stability	Permafrost	Hydrology / Limnology	Water quality	Climate conditions	Eskers and other unique or fragile landscapes	Surface and bedrock geology	Sediment and soil quality	Tidal processes and bathymetry	Air quality	Noise levels	BIOLOGICAL	Vegetation	Wildlife, including habitat and migration patterns	Birds, including habitat and migration patterns	Aquatic species, incl. habitat and migration/spawning	Wildlife protected areas	SOCIO-ECONOMIC	Archaeological and cultural historic sites	Employment	Community wellness	Community infrastructure	Human health
Havakvinga	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aulapkaininnga	Researching	-	-	-	-	-	-	-	-	-	-	-	M		-	-	-	-	-		-	-	-	-	-	-
Piiqtauniq	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

(P = Nakuuyuq, N = Nakuungittut unalu mikhilimaittuq, M = Nakuungittut unalu mikhittaaqtuq, U = Naluyauyuq)

## PROJECT MAP



### LIST OF PROJECT GEOMETRIES:

1	point	Resolute Bay
2	point	McMaster River sampling site 5
3	point	McMaster River sampling site 2
4	point	McMaster River sampling site 3
5	point	McMaster River sampling site 4
6	point	McMaster River sampling site 1
7	point	Permafrost coring site 1
8	point	Permafrost coring site 2
9	point	Permafrost coring site 3
10	point	Permafrost coring site 4
11	point	Permafrost coring site 5