



NIRB Application for Screening #125539

Access to safe drinking water in a changing Arctic

Application Type: New

Project Type: Scientific Research

Application Date: 6/8/2020 11:08:45 AM

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

Proposed Authorization: from 0001-01-01 to 0001-01-01

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DETAILS

Non-technical project proposal description

English: Global warming is causing large-scale transformations in the Arctic, including rapid reduction in the extent of permafrost, which can threaten drinking water supplies. Increasing transfers of dissolved organic matter (DOM) from permafrost to surface waters results in the 'browning' of water, which can indirectly contribute to the prevalence of cyanobacteria, changes in the nutritional quality of aquatic food resources, and toxin production. Furthermore, contaminants and pathogens trapped in thawing soils are now released to water sources. To insure drinking water safety, chlorine is typically used to inactivate pathogens. However, the practice of chlorinating water has both biomedical and belief-based problems; it can generate unwanted disinfection by-products (DBPs) when DOM is elevated in water, and northern communities have differing understandings of how to ensure purity of water. This transdisciplinary project aims to investigate and measure emerging risks from compounds and microorganisms released from permafrost thawing using a community-based participatory water quality sampling program. This transdisciplinary project led by Jérôme Comte, professor at INRS (Quebec City) brings together experts from different disciplines to work together with the communities. This project also represents a unique capacity-building opportunity allowing the implementation of a water quality monitoring program that will be executed by Northerners and serve as a direct conduit for knowledge dissemination. Specifically, the project aims (1) engage and work with local communities to undertake a drinking water quality monitoring program; (2) characterize the link between DOM properties and DBP formation and the microbial communities in sources of drinking water for indigenous communities, and (3) investigate the fate of microbial communities and chemical contaminants across water purification procedures, delivery and storage. Aquatic ecosystems used by the communities of Pond Inlet, Cambridge Bay and Resolute Bay as drinking water supplies will be sampled during summers between 2020-2023. Communities will be invited to participate in sampling (especially in 2020 given the Covid-19 situation) and to inform where we survey and blend both ecological and traditional knowledge on water and climate change. Their contribution will allow assessing water quality seasonally. Site visits will include measuring basic limnological properties (e.g. temperature, oxygen, pH) of drinking water sources, along with sampling for the measurement of DOM properties, microbial communities and chemical properties (DBPs, cyanotoxins, chlorine demand, contaminants). Water samples will also be collected at other natural sources of high traditional values, as well as at water treatment facilities (after chlorination), in holding tanks and at the tap. This project addresses one of the most important issues for northern communities: access to safe drinking water. This research will help characterize the environmental conditions that may lead to water quality issues, to better predict future changes in drinking water quality in a warming climate. Previous studies have mainly investigated fecal pollution of water by humans or animals in drinking water sources or in household cisterns. This project expands the scope of water quality to also consider Indigenous sciences, knowledge, lived experience, practices and policy preferences. This project will ensure Indigenous access, ownership, and control over data and information that will strengthen their autonomy in the monitoring of water quality. We foresee that the water quality metrics generated through this project will serve to develop new guidelines for water treatment strategies, implement northern community science initiatives, and inform on the accessibility to potable drinking water in the North.

French: Le réchauffement climatique entraîne des transformations à grande échelle dans l'Arctique, notamment une réduction rapide de l'étendue du pergélisol, ce qui peut menacer l'approvisionnement en eau potable. L'augmentation des transferts de matière organique dissoute (MOD) du pergélisol vers les eaux de surface entraîne le brunissement de l'eau, ce qui peut contribuer indirectement à la prévalence des cyanobactéries, aux changements dans la qualité nutritionnelle des ressources alimentaires aquatiques et à la production de toxines. En outre, les contaminants et les agents pathogènes piégés dans le pergélisol en transition sont désormais libérés dans les sources d'eau. Pour assurer la sécurité de l'eau potable, le chlore est généralement utilisé pour inactiver les agents pathogènes. Cependant, la pratique de la chloration de l'eau peut poser des problèmes à la fois de santé et de culture ; elle peut générer des sous-produits de désinfection (SPD) indésirables lorsque la teneur en MOD est élevée dans l'eau, et les communautés du Nord ont des conceptions différentes de la manière de garantir la pureté de l'eau. Ce projet transdisciplinaire vise à étudier et à mesurer les risques émergents liés aux composés et aux microorganismes libérés par le dégel du pergélisol, en utilisant un programme d'échantillonnage participatif des communautés nordiques de la qualité de l'eau. Ce projet transdisciplinaire dirigé par Jérôme Comte, professeur à l'INRS (Québec), réunit des experts de différentes disciplines pour travailler avec les communautés. Ce projet représente également une opportunité unique de renforcement des capacités permettant la mise en place d'un programme de surveillance de la qualité de l'eau qui sera exécuté par les habitants du Nord et servira de canal direct pour la diffusion des connaissances. Plus précisément, le projet vise à (1) engager et travailler avec les communautés locales pour entreprendre un programme de surveillance de la qualité de l'eau potable ; (2) caractériser le lien entre les propriétés du DOM et la formation de DBP et les communautés microbiennes dans les sources d'eau potable pour les communautés, et (3) étudier le devenir des communautés microbiennes et des contaminants chimiques à travers les procédures de purification de l'eau, la livraison et le stockage. Les écosystèmes aquatiques

utilisés par les communautés de Pond Inlet, Cambridge Bay et Resolute Bay comme sources d'eau potable seront échantillonnés pendant les étés entre 2020 et 2023. Les communautés seront invitées à participer à l'échantillonnage (en particulier en 2020 compte tenu de la situation du Covid-19) et à informer sur les lieux où la recherche devrait avoir lieu renforçant ainsi les échanges entre connaissances écologiques et traditionnelles sur l'eau et le changement climatique. La contribution des communautés permettra d'étendre la période d'étude et ainsi de suivre la qualité de l'eau en fonction des saisons. Les visites de sites comprendront la mesure des propriétés limnologiques de base (par exemple, la température, l'oxygène, le pH) des sources d'eau potable, ainsi que l'échantillonnage pour la mesure des propriétés de la DOM, des communautés microbiennes et des propriétés chimiques (DBP, cyanotoxines, demande en chlore, contaminants). Des échantillons d'eau seront également prélevés dans d'autres sources naturelles de grande valeur traditionnelle, ainsi que dans des installations de traitement de l'eau (après chloration), dans des réservoirs de rétention et au robinet. Ce projet aborde l'une des questions les plus importantes pour les communautés du Nord : l'accès à l'eau potable. Cette recherche aidera à caractériser les conditions environnementales qui peuvent entraîner des problèmes de qualité de l'eau, afin de mieux prévoir les changements futurs de la qualité de l'eau potable dans un contexte de réchauffement climatique. Les études précédentes ont principalement porté sur la pollution fécale de l'eau par les humains ou les animaux dans les sources d'eau potable ou dans les citernes des ménages. Ce projet élargit la portée de la qualité de l'eau pour prendre également en compte les connaissances, l'expérience, les pratiques et les préférences des communautés inuites. Ce projet garantira aux communautés l'accès, la propriété et le contrôle des données et des informations, ce qui renforcera leur autonomie dans le contrôle de la qualité de l'eau. Nous prévoyons que les mesures de la qualité de l'eau générées par ce projet serviront à élaborer de nouvelles lignes directrices pour les stratégies de traitement de l'eau, à mettre en œuvre des initiatives scientifiques communautaires dans le Nord et à informer sur l'accessibilité à l'eau potable dans le Nord.

Inuktitut: A short description translated in Inuktitut is attached in the Document tab.

Inuinnaqtun: A short description translated in Inuinnaqtun is attached in the Document tab.

Personnel

Personnel on site: 3

Days on site: 14

Total Person days: 42

Operations Phase: from 2020-09-01 to 2023-03-31

Activities

Location	Activity Type	Land Status	Site history	Site archaeological or paleontological value	Proximity to the nearest communities and any protected areas
Pond Inlet	Scientific/International Polar Year Research	Inuit Owned Surface Lands	NA	NA	The research will take place in the community of Pond Inlet as well as nearby waterbodies that are used by the community as drinking water source.
Resolute Bay	Scientific/International Polar Year Research	Inuit Owned Surface Lands	NA	NA	The research will take place in the community of Resolute Bay as well as nearby waterbodies that are used by the community as drinking water source.
Cambridge Bay	Scientific/International Polar Year Research	Inuit Owned Surface Lands	NA	NA	The research will take place in the community of Cambridge Bay as well as nearby waterbodies that are used by the community as drinking water source.

Community Involvement & Regional Benefits

Community	Name	Organization	Date Contacted
Pond Inlet	David Stockley	SAO	2019-06-06
Resolute Bay	Nancy Amarualik	SAO	2019-08-09
Cambridge Bay	Beverly Maksagak	HTO	2020-06-12

Authorizations

Indicate the areas in which the project is located:

Kitikmeot
North Baffin

Authorizations

Regulatory Authority	Authorization Description	Current Status	Date Issued / Applied	Expiry Date
Nunavut Research Institute	An Authorization application has been submitted on 25 May 2020.	Applied, Decision Pending		
Nunavut Water Board	Application for approval for the use of water or deposit of waste without a licence has been submitted on 12 June 2020	Applied, Decision Pending		

Project transportation types

Transportation Type	Proposed Use	Length of Use
Land	Waterbodies will be accessed by land	

Project accomodation types

Community

Material Use

Equipment to be used (including drills, pumps, aircraft, vehicles, etc)

Equipment Type	Quantity	Size - Dimensions	Proposed Use
Information is not available			

Detail Fuel and Hazardous Material Use

Detail fuel material use:	Fuel Type	Number of containers	Container Capacity	Total Amount	Units	Proposed Use
Information is not available						

Water Consumption

Daily amount (m3)	Proposed water retrieval methods	Proposed water retrieval location
0	Fill containers from municipal facilities and natural aquatic ecosystems	drinking water sources, delivery truck and taps (public, houses)

Waste

Waste Management

Project Activity	Type of Waste	Projected Amount Generated	Method of Disposal	Additional treatment procedures
Information is not available				

Environmental Impacts:

The proposed research will not impact the integrity of natural ecosystems (lakes, rivers) or infrastructure. Visits to alternate traditional drinking water sources on land will be limited in order to minimize disturbances to wildlife. No instrument or waste will be left behind after site visits.

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

Description of Existing Environment: Physical Environment

The study will be mainly conducted within the hamlet of Pond Inlet, Cambridge Bay and Resolute Bay, and will focus on the quality of water from the drinking water source through out the water treatment process at the treatment plant to the delivery by truck and to the tap. Traditional drinking water sources (lakes, streams) used by the communities will also be investigated.

Description of Existing Environment: Biological Environment

Water quality is regularly check at the water treatment plant for E. coli presence, amount of chlorine used.

Description of Existing Environment: Socio-economic Environment

The research will be conducted in the hamlets, representing opportunities for local hiring in order to implement, conduct and inform on the research.

Miscellaneous Project Information

This project aims to implement a community-based water quality program.

Identification of Impacts and Proposed Mitigation Measures

The research will have not direct impact on the environment. Visits to traditional drinking water sources on land will be limited to minimize disturbance to wildlife.

Cumulative Effects

No cumulative impact is related to the proposed research.

Impacts

Identification of Environmental Impacts

	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
Construction																									
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operation																									
Scientific/International Polar Year Research	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	P	-	P	-	-	P	P	-	P
Decommissioning																									
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

(P = Positive, N = Negative and non-mitigatable, M = Negative and mitigatable, U = Unknown)

Project Location



List of Project Geometries

1	point	Pond Inlet
2	point	Resolute Bay
3	point	Cambridge Bay