



NIRB Application for Screening #125469

Evaluation of natural bioremediation potential of Arctic beaches

Application Type: New

Project Type: Scientific Research

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

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

Project Proponent: McGill University, Lyle Whyte
McGill University, Lyle Whyte
21,111, Lakeshore Rd., Ste Anne de Bellevre, QC H9X3V9, Phone: 514-398-7889,
Email: lyle.whyte@mcgill.ca
Sainte Anne-de-Bellevue Quebec H9X 3V9
Canada
Phone Number:: 514-398-7889, Fax Number::

DETAILS

Non-technical project proposal description

English: The warming Arctic climate results in annual reductions of sea-ice. With decrease in Northwest passage ice cover, the amount of shipping traffic is increasing. Unfortunately, a consequence of more shipping is an increased risk that shipping fuel will be accidentally released into the vulnerable Arctic environment. In southern latitudes, naturally occurring bacteria in the environment can consume shipping fuels as food sources. However, it is unknown if naturally occurring bacteria living in Arctic beaches can do this in the colder Arctic conditions. The objective of this research is to determine if naturally occurring Arctic bacteria have the ability to degrade shipping fuels under Arctic conditions. It is important to know this so that in the event of a future accidental shipping fuel spill in the Arctic, we will know exactly how to respond to minimize negative environmental impacts. Research to be conducted in Resolute Bay for this project will involve collecting beach sediment samples for microbial and chemical analysis in our laboratory at McGill University, as well as a field research portion that will take place over a two-month period in summer of 2019. Following consultation with the local Hunter and Trappers association, this field research has been planned so as not to interfere with hunting activities, and to have no negative impacts on environment or wildlife. Sampling chambers will be buried in the sediment of a beach in the Resolute Bay area in early July and will be retrieved in late August. These sampling chambers are approximately the dimensions of a small school ruler (2 cm x 10 cm), and contain an adsorptive material holding 0.1 mL of shipping fuel. The beach will remain fully accessible to the community, as the sampling chambers will be buried. The total volume of fuel will be removed together with the sampling chamber. After the two-month incubation, we will retrieve the sampling chambers and determine which beach bacteria were able to break down the shipping fuel, and how fast they were able to do so. Ultimately, our objective is to produce a catalogue of fuel degrading bacteria that are active on Arctic beaches, and to determine if their activity alone would be enough to clean up a spill, or if additional remediation treatments would be required. Nunavut residents will be employed as wildlife guides (protecting us from bears) and research assistants to guide us with installing the sampling chambers. Their valuable knowledge of local boating practices and beach usage will help us to choose the best locations for sampling. As the Whyte lab research group is in Resolute Bay every year, we look forward to giving annual presentations to the community on the importance and progress of our experiments.

French:

Le réchauffement du climat de l'Arctique cause une réduction annuelle de la banquise. Avec la diminution de la couverture de glace du Passage du Nord-Ouest, le trafic maritime est en augmentation. Malheureusement, l'accroissement du nombre de navires augmente le risque que de l'essence soit accidentellement libéré dans les environnements vulnérables de l'Arctique. Aux latitudes méridionales, des bactéries indigènes des milieux naturels sont capables de consommer l'essence de navire comme source de nourriture. Toutefois, le fait que les bactéries indigènes des plages de l'Arctique peuvent en faire de même en conditions froides reste inconnu. L'objectif de ce projet de recherche est de déterminer si les bactéries indigènes à l'Arctique ont la capacité de dégrader l'essence de navire sous les conditions naturelles de l'Arctique. Il est important de savoir cela afin de répondre de la meilleure façon possible pour réduire les impacts négatifs sur l'environnement, dans le cas où un déversement accidentel d'essence surviendrait dans l'Arctique. Le projet de recherche sera effectué à Resolute Bay et impliquera la collecte d'échantillon de sédiments de plage pour des analyses microbiennes et chimiques dans nos laboratoires de l'Université McGill, ainsi qu'une portion de travail de terrain de deux mois à l'été 2019. Après une consultation avec l'association locale des Chasseurs et Trappeurs, le travail de terrain a été planifié afin de ne pas intervenir avec les activités de chasse et afin d'avoir aucun impact négatif sur l'environnement, la faune et la flore. Des colonnes d'échantillonnage seront enterrées dans les sédiments de place à Resolute Bay au début du mois de juillet et seront collectées à la fin du mois d'août. Ces colonnes d'échantillonnage auront une dimension approximative d'une petite règle d'école (2 cm x 10 cm) et contiendront un matériel adsorbant supportant 0.1 mL d'essence de navire. La plage restera accessible à la communauté locale puisque les colonnes d'échantillonnage seront sous terre. Le volume total d'essence sera enlevé au même moment que les colonnes d'échantillonnage. Après une incubation de 2 mois, nous allons récupérer les colonnes d'échantillonnage et déterminer quelles bactéries de la plage ont été en mesure de dégrader l'essence de navire ainsi que la vitesse à laquelle elles ont été capable de le faire. Finalement, notre objectif est de produire un catalogue des bactéries dégradant l'essence qui sont actives sur les plages arctiques et de déterminer si leur activité à elle seule sera capable de nettoyer le déversement, ou si des traitements de remédiation additionnels seront nécessaires. Des résidents du Nunavut seront employés comme guides naturels (protection contre les ours) et comme assistants de recherche pour nous guider dans l'installations des colonnes d'échantillonnage. Leurs précieuses connaissances des pratiques de navigations locales et des usages des places nous aiderons à choisir les meilleurs endroits pour l'échantillonnage. Puisque le groupe de recherche du laboratoire Whyte est à Resolute Bay à chaque année, nous attendons avec impatience de donner des présentations annuelles sur l'importance et les progrès de notre recherche à la communauté locale.

[illegible]

Post-Closure Phase: from to

Activities

Location	Activity Type	Land Status	Site history	Site archaeological or paleontological value	Proximity to the nearest communities and any protected areas
Possible beach sites for microcosm deployment	Sampling sites	Municipal	n/a	n/a	All proposed sampling sites are within the community of Resolute Bay
PCSP Research facilities	Researching	Municipal	n/a	n/a	Located within Resolute Bay

Community Involvement & Regional Benefits

Community	Name	Organization	Date Contacted
Resolute Bay	Phillip Manik	Hunter and Trappers Association	2019-02-01
Resolute Bay	Uluriak Amarualik	Hunter and Trapper Association	2019-09-22
Iqaluit	Jason Carpenter	Nunavut Arctic College	2019-03-28

Authorizations

Indicate the areas in which the project is located:

North Baffin

Authorizations

Regulatory Authority	Authorization Description	Current Status	Date Issued / Applied	Expiry Date
Nunavut Research Institute	A Physical / Natural Sciences Research Application has been submitted for this project. Decision is pending.	Applied, Decision Pending		

Project transportation types

Transportation Type	Proposed Use	Length of Use
Air	arriving in Resolute Bay with First Air	
Land	Transport around Resolute will be by truck or ATV	

Project accomodation types

Community

Material Use

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

Equipment Type	Quantity	Size - Dimensions	Proposed Use
hand-held spade	6	3x6 inches	bulk sampling of beach material
Wirlpack bags	12	12x12 inches	storage of bulk samples
LiCor CO2 gas analyzer	1	1 m x 20 cm	measure CO2 flux from sediment
salinometer	1	6 x 12 inches	measure salinity of ocean water
15 ml falcon tubes	360	10 cm x 1 cm	sample collection
Truck	1	4 x 2 m	transport to sampling site
ATV	4	2 x 2 m	alternative to truck if necessary
manual corer	6	12 x 1 inch	sampling of beach sediment

Detail Fuel and Hazardous Material Use

Detail fuel material use:	Fuel Type	Number of containers	Container Capacity	Total Amount	Units	Proposed Use
Gasoline	fuel	4	20	80	Liters	Truck or ATV for transportation to sampling sites
Dichloromethane	hazardous	1	1	1	Liters	storage of samples for hydrocarbon analysis

Water Consumption

Daily amount (m3)	Proposed water retrieval methods	Proposed water retrieval location
1	Municipal sources	Water will be retrieved for personal use (drinking, showering) from the PCSP research facilities where we will be stationed.

Waste

Waste Management

Project Activity	Type of Waste	Projected Amount Generated	Method of Disposal	Additional treatment procedures
Researching	Hazardous waste	1 litre	1 litre of dichloromethane will be used to store samples for transport back to McGill University in Montreal. NO hazardous waste will be left behind in Resolute Bay.	none
Sampling sites	Hazardous waste	none	No hazardous waste will be produced at the sampling sites.	none required

Environmental Impacts:

The sampling chambers (“microcosms”) deployed in the beaches will be removed after 6 weeks of incubation. The microcosms are self contained and do not release any hazardous substances or chemicals to the environment. Their presence on the beach will not impact migratory birds or marine mammals in any way. All chemicals for analysis will be used solely within the laboratories of the PCSP research facilities. We will be staying at the PCSP research facilities in Resolute Bay, and will not be camping on the land. We will travel only as far as is easily accessible from the Research facilities by truck or ATV, so our environmental impact in terms of transport will be minimal. Absolutely no waste will be left behind by the research team. Everything we transport to the site can easily be transported away again. There is no possibility of creating a hazardous spill, because no liquid chemicals will be brought to the sampling sites. All chemicals will be used only in the laboratory or the PCSP facilities. Microcosms will be prepared in the lab before transport to the incubation sites. No noise-making equipment will be used, and care will be taken to not interrupt any community activities.

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

Description of Existing Environment: Biological Environment

Description of Existing Environment: Socio-economic Environment

Miscellaneous Project Information

Identification of Impacts and Proposed Mitigation Measures

Cumulative Effects

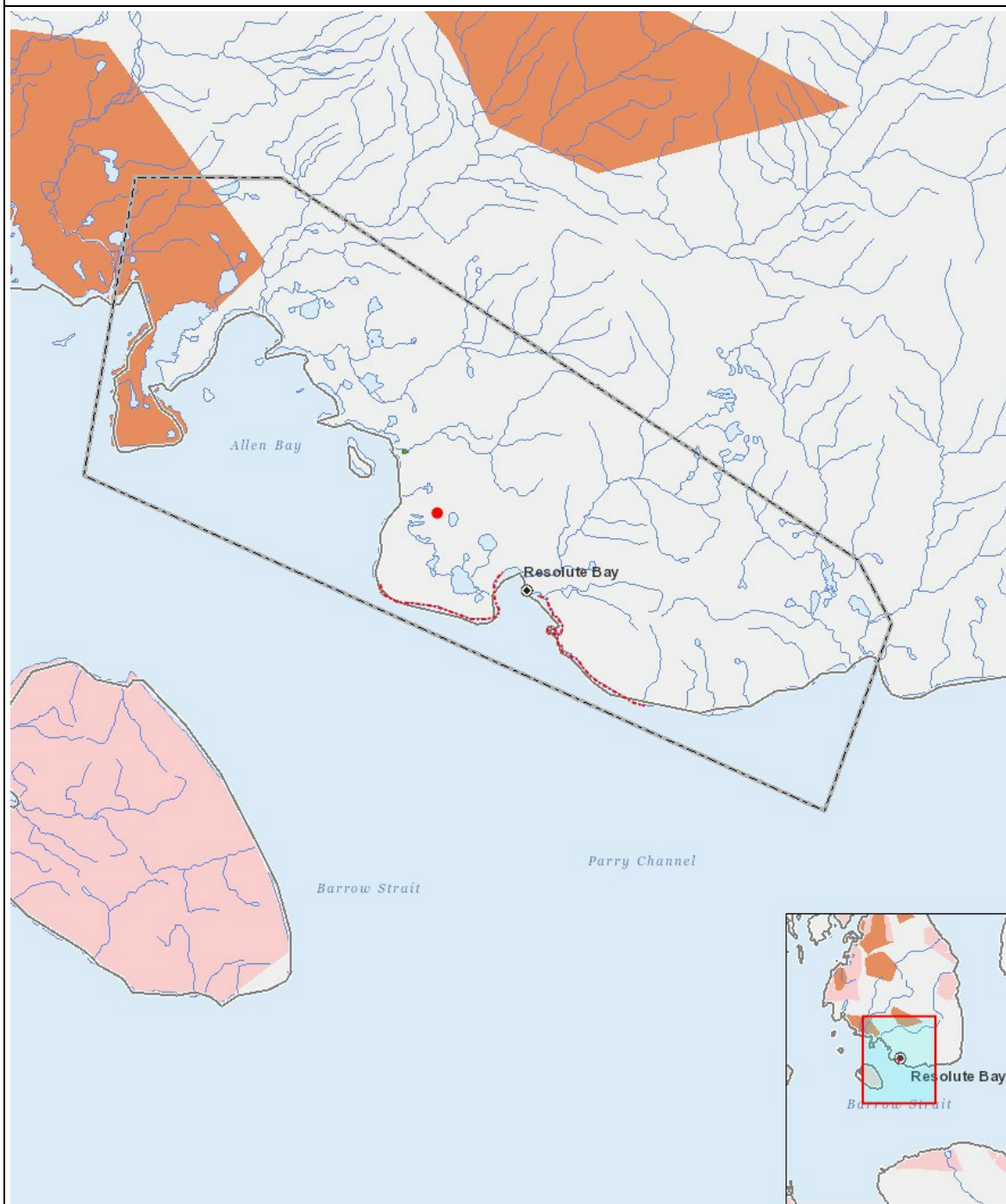
Impacts

Identification of Environmental Impacts

		PHYSICAL																					SOCIO-ECONOMIC																			
		Designated environmental areas																					Archaeological and cultural historic sites																			
		Ground stability																					Employment																			
		Permafrost																					Community wellness																			
		Hydrology / Limnology																					Community infrastructure																			
		Water quality																					Human health																			
		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																																								
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Researching		-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-		P	-	-	-	-																	
Operation																																										
Researching		-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-		P	-	-	-	-																	
Decommissioning																																										
Researching		-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-		P	-	-	-	-																	

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

Project Location



List of Project Geometries

1	polyline	Possible beach sites for microcosm deployment
2	polyline	Possible beach sites for microcosm deployment
3	point	PCSP Research facilities