



## **NIRB Application for Screening #125839**

### **Environmental Behavior of Ammunition Constituents in Arctic Conditions**

**Application Type:** New

**Project Type:** Scientific Research

**Application Date:** 7/6/2023 3:28:35 PM

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

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

**Project Proponent:** Lapointe  
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## DETAILS

### Non-technical project proposal description

English: Current understanding of small-caliber ammunitions transport processes in permafrost-affected soil and the ability to quantify them is inadequate. An improved understanding of the influence of Arctic conditions such as soil characteristics and especially temperature and light, on the transformation and fate of munition constituents (MC), the long-term trends in levels of MC in different ecological compartments, especially in biota, and a better understanding of the toxicological effects of contaminants on Arctic species, to aid in the design and implementation of monitoring and potential management, if required, is needed. The scope of the project is to perform field work to aid in the assessment of the environmental fate and ecological impact of munitions constituents under the environmental conditions specific to Northern Canada. The five main objectives are: 1) to survey evidence of MC usage and measure their concentrations in soil and surface water using new sampling devices to promote efficiency; 2) to test new field sampling methods to enhance MC recovery; 3) to assess transport parameters from observed quaternary deposits and vegetation cover; 4) to determine the biotransformation potential of MC by local Arctic soil microbial communities and assess respective biotic transformation rates as a function of temperature; and 5) to perform aquatic and terrestrial toxicity tests of MC on ecological receptors representative of the Canadian Arctic macro- and micro-flora. Between July 23-29th, 2023, two DRDC personnel will be deployed to characterize the site located 8 km North of Cambridge Bay. Indications of the presence of MC and transformation products in surface water will be assessed using a multiparameter digital water quality meter. Surface water samples will be collected directly from the site and its surrounding for energetic material, metals, ammoniacal nitrogen (N-NH<sub>4</sub><sup>+</sup>), anions and perchlorate analysis. The presence of MC will also be assessed in the soil based on the multi-increment sampling approach. A survey of the site flora will be made to better assess biotransformation potential and enhance relevancy on present laboratory ecotoxicological investigations. A strict assurance/quality control (QA/QC) program will be put in place. VRC is analyzing soil properties as part of a partner agreement study with the National Research Council Canada to make recommendations related to Canadian Armed Force readiness and sustainable training practices in the unique ecological environment of the Arctic. All acquired data will be stored in DRDC's computers and managed only by the technical Lead/authority of this research. The management plan will reflect DND's directives captured from the Defense Administrative Orders and Directives, DAOD-6000-0. DRDC-VRC requested the support from a member of 1 CRPG to JTF(N) to help locate the site taking the best-known itinerary. Upon request, results will be shared to Nunavut governmental authority.

French: La compréhension actuelle des processus de transport des munitions de petits calibres dans les sols affectés par le pergélisol et la capacité de les quantifier sont insuffisantes. Il est nécessaire de mieux comprendre l'influence des conditions arctiques, telles que les caractéristiques du sol et en particulier la température et la lumière, sur la transformation et le devenir des constituants des munitions (CM), les tendances à long terme des niveaux de CM dans différents compartiments écologiques, en particulier dans le biote, et une meilleure compréhension des effets toxicologiques des contaminants sur les espèces arctiques, afin d'aider à la conception et à la mise en œuvre de la surveillance et de la gestion potentielle, si nécessaire. L'objectif du projet est d'effectuer des travaux sur le terrain pour aider à l'évaluation du devenir environnemental et de l'impact écologique des constituants des munitions dans les conditions environnementales propres au Nord du Canada. Les cinq principaux objectifs sont les suivants: 1) recenser les preuves d'utilisation des CM et mesurer leurs concentrations dans le sol et les eaux de surface en utilisant de nouveaux dispositifs d'échantillonnage pour améliorer l'efficacité; 2) tester de nouvelles méthodes d'échantillonnage sur le terrain pour améliorer la récupération des CM; 3) évaluer les paramètres de transport à partir des dépôts quaternaires observés et de la couverture végétale; 4) déterminer le potentiel de biotransformation des CM par les communautés microbiennes locales du sol arctique et évaluer les taux de transformation biotique respectifs en fonction de la température; et 5) effectuer des tests de toxicité aquatique et terrestre des CM sur des récepteurs écologiques représentatifs de la macro- et de la microflore de l'Arctique canadien. Entre le 23 et le 29 juillet 2023, deux membres du personnel de RDDC seront déployés pour caractériser le site situé à 9 km au nord de Cambridge Bay. Les indications de la présence de MC et de produits de transformation dans l'eau de surface seront évaluées à l'aide d'un compteur numérique multiparamétrique de la qualité de l'eau. Des échantillons d'eau de surface seront prélevés directement sur le site et ses environs pour l'analyse des matériaux énergétiques, des métaux, de l'azote ammoniacal (N-NH<sub>4</sub><sup>+</sup>), des anions et du perchlorate. La présence de CM sera également évaluée dans le sol sur la base de l'approche d'échantillonnage à incréments multiples. Une étude de la flore du site sera réalisée afin de mieux évaluer le potentiel de biotransformation et d'améliorer la pertinence des recherches écotoxicologiques actuelles en laboratoire. Un programme strict d'assurance/contrôle de la qualité (AC/AQ) sera mis en place. VRC analyse les propriétés du sol dans le cadre d'un accord de partenariat avec le Conseil national de recherches du Canada afin de formuler des recommandations relatives à l'état de préparation des Forces armées canadiennes et aux pratiques d'entraînement durables dans l'environnement écologique unique de l'Arctique. Toutes les données acquises seront stockées dans les ordinateurs de RDDC et gérées uniquement par le responsable technique/autorité de cette recherche. Le plan de gestion reflétera les directives du MDN tirées des directives et ordonnances administratives de la

défense DOAD-6000-0. RDDC-CRV a demandé le soutien d'un membre du 1 CRPG à JTF(North) pour l'aider à localiser le site en empruntant l'itinéraire le plus connu et sécuritaire. Sur demande, les résultats seront communiqués aux autorités gouvernementales du Nunavut

Inuktitut: N/A

Inuinnaqtun: Ublumi kangikhitjutait mikiyunik kakyuit akyagutait atugutainik kikimayunik-aktukhimayait nunait ovalo pilaagutait naunaiyautainut naamagingitait. Ihuakhimayut kangikhitjutait pipkaitjutainik Ukiuktaktumi, ilaa; nunait kanugitjutait ovalo kanugitjutait hilaa ovalo kaumagaagat, aalanguktigutait ovalo pipkaitjutait kakyuit kanugitjutainut (MC), unghiktumut pikatagutait kanugitjutait MC aalani nunainik ilauyiit, ilaa nunauyautait ovalo kangikhitjutait kaasililigutait nunaat ikpinaguait ihuiyaagutait Ukiuktaktumi hugaat, munagiyaanganik hanauyautikhait ovalo iniktigutikhait kungiagutainut ovalo pilaagutait munagitjutikhainik, pilaagumik piyumayut. Angitjutait hanayakhat havaklugit nunaani ikayugiaganik kimilguugutainik avatiligiyiingit kanuginiagutait ovalo ilaukatingit ikpinagutait kakyuit atugutait ataanik avatiligiyiit kanugitjutainut Ukiuktaktumi Kanataup. Talimat kitkaniit pinahuaktait hapkoa: 1) kimilguulugit takuhimayait MCmi atuktainik ovalo naunaiyaklugit katitigutait nunauyainik ovalo kaangani imait atuklutik nutaanik kimilguugutainik tuhaktiyaaganik kanugitjutait; 2) kimilguulugit nutaat nunainik kimilguukhimayait atukhimaplutik anginikhitigutainik MCmi utiktigutikhainut; 3) kimilguulugit akyagutikhainut ilangit kungialugit katakhiimayunik ovalo nunauyait kaangani; 4) naunaiyagiaganik nunauyautait aalanguktigutaini pilaagutait MC talvani Ukiuktaktumi nunaat nunauyaliugutainut nunaat ovalo kimilguulugit pikagutainik nuutitigutait kayumigutainik ilanganut hilataa; ovalo 5) havagiaganik imainik ovalo nunainik kaasililigutaini kimilguugutainut MCgit nunainik ilauyut Kanatami Ukiuktaktut angiyuutait ovalo mikiyuutait-nunauyait. Kitkanit July 23mit-29mut, 2023, malguuk DRDC havaktiit piniaktut kanugitjutainik nunaat 8mailinik Kanananganit Ikaluktutiamip. Takuhhimatjutait pikataktainik MCnik ovalo aalanguktigutait pihimayut kaangani imait kimilguuktauniaktut atuklutik aalatkiinik kagitauyakut imainik kanugitjutainut naunaiyautainik. Kaangani imait kimilguukhimayut katitikhimaniakatut atuklutik aalatkiinik kagitauyakut imait naunaiyautainik naunaiyagutikaktunik ovalo katitikhimalugit nunaani ovalo ilanganit kanugitjutait nanihimayunit, haviit, kaasililigutait nunaat (N-NH4+), kaligiiktigutait ovalo tagiugutait kimilguukhimayut. Pihimayainut MC kimilguuktauniaktutlu nunauyainit pikangit amigaitunut-ilaatutait kimilguukhimayanit piniaktut. Kimilguukhimayait nunaini nunauyait nakuuhihaniaktut kimilguuktauhimayunit nunauyait nuutitigutainit pilaagutait ovalo pipkaitjutait nakuuhiyaanganik pikaktunik kimilguukvimi nunauyaligutainut kimilguukhimayunit. Akhut pitkuhimayait/nakuutjutainik munagitjutikhainut (QA/QC) pilihimatjutait iliniaktut ilanganut.VRC kimilguukhimayait nunait ilangit ilauplutik ilaukatigiinut angigutainik kimilguukhimayait Kanatami Kimilguuktiit Katimayiit Kanatami pitkuhimaniaktut ilanganut Kanatami Anguyaktiit paknaiyautikhainut ovalo pikagaagutaikhainut ayoikhaitjutikhait pikataniaktainik nutaami nunaanit avatilinga Ukiuktaktuup. Tamamik pihimayut katitigutait tutkukhimaniaktut DRDSmi kagitauyainut ovalo munagiyauniaktut talvatuak kimilguuktiit Hivuliktiulutik/atanguyaulutik hapkoa kimilguukhimayait. Munagitjutikhait paknaiyautikhainik takuniaktut DNDkut pitkutainik pihimayut Anguyaktiit Havakvianik Pitkuhimayunik ovalo Pitkuyaani, DAOD-6000-0.DRDC-VRC apigihimayainut ikayuktakhainik ilaayunut 1 CRPG to JTF(N) ikayuklutik nunaani piyaanganik maligutikhainut. Apigigumik, iniktigutait ilaukatiginiaktait Nunavumi Kavamatkunut Atanguyait.

## Personnel

Personnel on site: 2

Days on site: 5

Total Person days: 10

Operations Phase: from 2023-07-23 to 2023-07-29

# Activities

Location	Activity Type	Land Status	Site history	Site archaeological or paleontological value	Proximity to the nearest communities and any protected areas
1 CRPG Austere range	Sampling sites	Crown	Firing range template for 1 CRPG military training.	N/A	9 km North of Cambridge Bay community

## Community Involvement & Regional Benefits

Community	Name	Organization	Date Contacted
Cambridge Bay	Captain Christ Newman	1st Canadian Range Patrol Group	2023-07-06
Cambridge Bay	Captain Lee Morrissey	Joint Task Force (North)	2023-04-14

# Authorizations

Indicate the areas in which the project is located:

Kitikmeot

## Authorizations

Regulatory Authority	Authorization Description	Current Status	Date Issued / Applied	Expiry Date
Hunters and Trappers Associations/Organizations	Contacted to accelerate the Wildlife Permit application for sampling a maximum of 5kg of surface soil for the analysis of munition residues.	Applied, Decision Pending		
Nunavut Water Board	To conduct water sampling for quantifying munitions residues within the 1 CRPG firing template.	Applied, Decision Pending		
Government of Nunavut, Nunavut Research Institute	To conduct soil, vegetation and water sampling for quantifying munitions residues within the 1 CRPG firing template.	Applied, Decision Pending		
Department of National Defense	To conduct soil, vegetation and water sampling for quantifying munitions residues within the 1 CRPG firing template.	Active		2024-03-31

## Project transportation types

Transportation Type	Proposed Use	Length of Use
Land	AVT and/or 4x4 pick up truck	

## Project accomodation types

Community

## Material Use

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

Equipment Type	Quantity	Size - Dimensions	Proposed Use
vehicles	1	4x4	For movements between CHARS and the site.
XRF	1	(LxWxH): 27 cm x 9 cm x 30 cm	A portable X-ray fluorescence (XRF) spectrometer for non destructive direct soil analysis, elemental analysis of mineral and alloy material identification
YSI	1	8.3 cm width x 21.6 cm length x 5.6 cm depth	The YSI (digital sampling system) is a portable water quality multiparameter instrument for the measurement of several critical parameters - dissolved oxygen, total algae, turbidity, pH, ORP, conductivity, specific conductance, salinity, TDS, resistivity, TSS, ammonium, ammonia, chloride, nitrate, depth, temperature and GPS coordinates.
UV AB light meter	1	7.32 x 27 x 26.67 cm	Direct measurement of UVA and UVB light.

### Detail Fuel and Hazardous Material Use

Detail fuel material use:	Fuel Type	Number of containers	Container Capacity	Total Amount	Units	Proposed Use
Alconox	hazardous	1	1	1	Kg	Concentrated, anionic detergent for manual cleaning of instruments.

### Water Consumption

Daily amount (m3)	Proposed water retrieval methods	Proposed water retrieval location
0	A certified clean bottle attached to a cleaned perch.	Within the following coordinates (Lat, Lon): NW 69.2566776°, -105.2276902°; NE 69.2657881°, -105.0506190°; SE 69.2030029°, -105.0757095°; SW 69.2118693°, -105.2019745°, LOA 6200 mils; ROA 0200 mils.

# Waste

## Waste Management

Project Activity	Type of Waste	Projected Amount Generated	Method of Disposal	Additional treatment procedures
Sampling sites	Greywater	2Liters	To be disposed at CHARS.	N/A
Sampling sites	Other, nitril gloves and kimwipes	1 kg	To be disposed at CHARS	N/A

## Environmental Impacts:

Where evidence of the use of munitions is identified, surface soil and water samples are intended to be collected within the research area.

# **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**

60m a.s.l. Till blanket: massive diamicton; in places interbedded with (or underlain by) sand and gravel; 1–15 m thick; mainly deposited subglacially; ground moraine; flutings present locally where drift is thin (1–2 m ); drumlins and drumlinoids occur where drift is thick (10–15 m ). Presence of surface water

### **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**

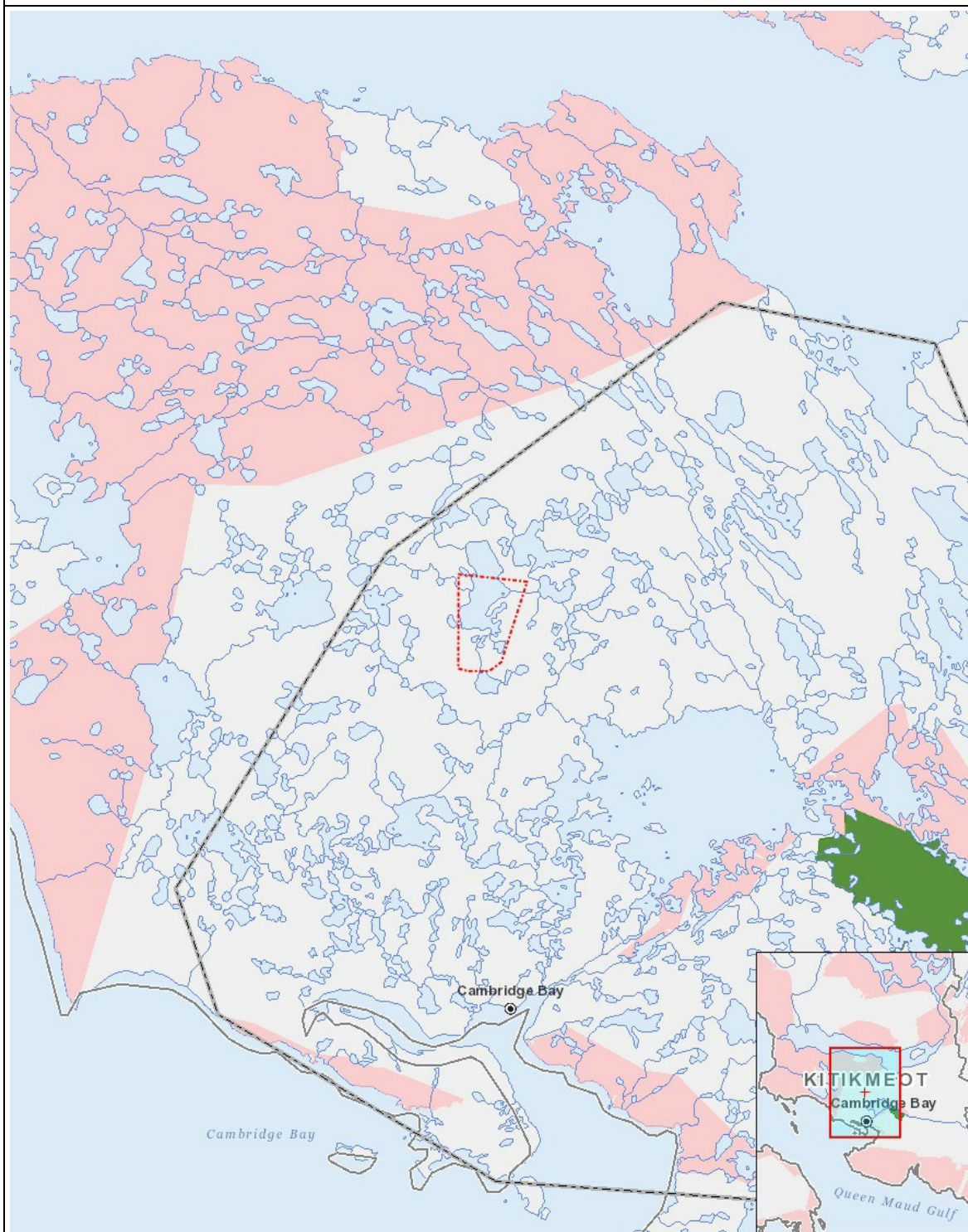
# Impacts

## Identification of Environmental Impacts

		PHYSICAL	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
<b>Construction</b>																										
-		-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-		-	-	-	-	-
<b>Operation</b>																										
Sampling sites		-	-	-	-	-	-	-	-	U	-	-	-	-		U	-	-	-	-		-	-	-	-	-
<b>Decommissioning</b>																										
-		-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-		-	-	-	-	-

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

## Project Location



## List of Project Geometries

1	polyline	1 CRPG Austere range
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