

## SCIENTIFIC RESEARCH LICENCE APPLICATION

### Physical / Natural Sciences RESEARCH

#### SECTION 4: NON-TECHNICAL PROJECT PROPOSAL DESCRIPTION

**Project Title:**

Permafrost dynamics in response to climate change on Victoria Island, Nunavut.

**Lead Researcher's Name and Affiliation:**

Stephanie Coulombe, Polar Knowledge Canada

**Project Description**

Permafrost (frozen ground) is very vulnerable to rapid changes in climate and has the potential to affect many aspects of life for the people that live there. In this project, we are looking at how permafrost landscapes in western Nunavut are changing in a context of climate change. The objective is to study and monitor changes in the permafrost environment, with a focus on the communities of Cambridge Bay and Kugluktuk. This project has three specific objectives: (1) characterize the permafrost conditions; (2) monitor changes in permafrost landscapes; (3) assess the impacts of permafrost disturbances on the ecosystems and (4) investigate the seasonal responses of the tundra soil microbiome. In 2022, we will also study organic soil (peat) accumulation processes in the tundra and assess the role of peat in regional and pan-Arctic carbon budgets at decadal and centennial timescales.

In 2022, the field campaign will take place from the end of June to the end of August. During this next field campaign, field activities will be similar to those of the previous years:

1. Collect soil samples using an auger equipped with a core barrel. All samples will be kept frozen at the Canadian High Arctic Research Station (CHARS) for laboratory analyses (examples: carbon content, amount of ice, carbon, microbial communities, DNA).
2. Measure ground temperature using data loggers and temperature sensors installed at different depths below the ground surface. We will also measure the temperature of the air and snow temperature, the soil moisture and the depth of snow.
3. Measure landscape changes, such as landslides, thermal erosion gullies, and coastal erosion, using high-resolution imagery, aerial photographs and field measurements.
4. Install an autonomous solar-powered video camera system on a 18 m tower (60 ft). The images will allow to measure the changes along the coast near Cambridge Bay (in collaboration with the HTO and Transport Canada).

In 2022, we will add these two non-destructive methods to achieve our objectives: (1) we will use an instrument ("ground-penetrating radar") to map structures and features below the ground surface and (2) we will measure gas emissions using a portable gas analyzer. Throughout this project, there should be no impacts to the environment, wildlife, or people. This project is made possible by the involvement of local field technicians who graduated from the

Environmental Technology Program (ETP). Our research team at Polar Knowledge Canada is still developing our data management plan, but we are committed to facilitate exchange of information and provide accessibility to data. The research results will be communicated during public events taking place at the Canadian High Arctic Research Stations (CHARS) in Cambridge Bay. We will also develop outreach products and activities to present and explain some of the changes happening to the environment in permafrost areas and how they affect people and wildlife, with the general goal of making permafrost science more accessible to the general public.

2022