Public Registry - Project Proposals

NPC 150914: ArcSolution: Arctic Pollution in a One Health Perspective – from Complex Challenges to Sustainable Solutions

Close

Proposal Status: Conformity Determination Issued

Overview Documents

Project Overview

Type of application: New

Proponent name:

Xing Song

Proponent company:

Memorial University

Project Description:

The Arctic is warming at roughly twice the global average, driving permafrost thaw, changing ice regimes, and more extreme weather that together alter contaminant transport, transformation, and persistence. These changes, combined with both long-range inputs and local sources such as fuel handling, shipping activity, and lagoon retention, increase the exposure risk from emerging pollutants in Cambridge Bay. The key contaminants of concern include microplastics (fragmented plastic particles that persist and can transfer through food webs), PFAS (highly stable synthetic chemicals used in firefighting foams and consumer products), oil-derived compounds from fuels and related activities, and flame retardants such as PBDEs that are persistent, bioaccumulative, and linked to endocrine, immune, and developmental effects. Many of these substances travel long distances, resist degradation in cold environments, and magnify in traditional food chains, posing both ecological and human-health risks. Building on prior Northern Contaminants Program (NCP) work that uncovered widespread flame retardants, (PBDEs) in nearby sub-Arctic communities, this project, collaborating with Arctic Research Foundation (ARF), aims to identify which emerging contaminants are present around Cambridge Bay, how seasonal and climate-driven dynamics affect their fate, and whether they accumulate in culturally and nutritionally important species. The objectives are to characterize contamination patterns, pathways of movement and accumulation, assess potential impacts on food security, and jointly develop science-based responses with local

partners. Cambridge Bay's coastal environment is especially vulnerable because climate change amplifies both the mobility and persistence of pollutants. Thawing permafrost and altered hydrology can release legacy and previously deposited contaminants, while lagoons and nearshore zones can act as sinks that concentrate and later remobilize pollution. Emerging contaminants that persist may therefore have longer residence times and greater potential to enter food webs relied upon by Indigenous communities. The lack of detailed understanding of their seasonal behavior, bioaccumulation pathways, and impact on local diets leaves a critical gap in risk awareness and response capacity. This project is The European Union-led and embedded in a global comparative framework, supported by Canada's New Frontiers in Research Fund (NFRF) so that findings from Cambridge Bay can be placed in context with other Arctic regions. That broader perspective strengthens the urgency and relevance, enabling not only locally tailored mitigation and adaptation strategies but also feeding into international efforts to build resilient policies for northern communities facing emerging contaminant threats in a rapidly changing climate. Fieldwork will be concentrated on Cambridge Bay and its adjacent areas, lagoon, and coastal environments, where inputs and accumulation of pollutants are likely to affect community resources. Sampling campaigns are planned three to four times per year, to capture seasonal variability and climate-linked shifts in contaminant behavior. The project is designed with initial community consultations and site planning preceding the first field season to ensure alignment with local priorities and logistics. Vessel support from the ARF, based in Cambridge Bay, will facilitate access to both nearshore and more remote sampling locations. This research combines community-guided field observation and experimental work. Field teams will travel overland and use the ARF R/V Blue Nanuk or Marten Bergman vessel to collect water, sediment/soil, permafrost, and biological samples. Biological sampling will focus on microbial communities and microalgae; culturally important fish will only be obtained from local harvests, and all fish collection and export will follow the DFO scientific-sampling license process used in NWT. In the lab, we will simulate Arctic conditions in the NRPOP low-temperature flow-through reactor to track pollutant transformation, bioaccumulation, and food-web transfer. Integrating these mechanistic results with field data will provide a robust basis for assessing impacts on key Inuit dietary species and informing culturally appropriate response options. Results will be shared throughout the project with Cambridge Bay and territorial stakeholders. In collaboration with local Inuit partners (Kitikmeot Inuit Association, Hunters and Trappers Organization, Hamlet leadership), we will co-interpret findings. After each seasonal campaign, interim results will be delivered via community meetings, plain-language summaries, and feedback sessions with elders, youth, and other knowledge holders. Final outputs, contamination maps, food-web risk assessments, and mitigation recommendations, will be produced jointly to support local

decision-making. We will also report on training and capacity-building achievements and provide reports to territorial and regional authorities to guide environmental stewardship and policy. After each seasonal field campaign, we will convene community workshops where elders, youth, and other knowledge holders jointly review, contextualize, and provide feedback on interim findings. Plain-language summaries will accompany these sessions, with feedback incorporated into subsequent analyses. Annual summary reports for Cambridge Bay and regional stakeholders (including territorial authorities) will highlight contaminant trends, capacity-building milestones, and emerging concerns. Final outputs—contamination maps, risk assessments for key species and food-web pathways, and co-developed mitigation recommendations—will be released with community partners via formats preferred locally (e.g., community meetings, printed briefs, digital packages). Training outcomes (number of trainees, skills acquired, and their roles in ongoing monitoring) will be documented and shared to reinforce sustained local capacity. Policy-relevant findings will be communicated through targeted briefings to Nunavut government agencies to support evidence-based decision-making. Throughout, our strategy emphasizes transparency, timeliness, and reciprocity, ensuring communities act as active partners in validating, interpreting, and applying research results. Throughout, the communication strategy emphasizes transparency, timeliness, and reciprocity, ensuring that research participants and impacted organizations are not just passive recipients but active partners in interpreting and using the knowledge produced.

Project Schedule

Start Date:

2025-09-20

End Date:

2027-03-31

Project Map

List of project geometries:

Id

Geometry

Location Name

18897

point

potential sampling sites for emerging pollutants

18898

point

potential sampling sites for emerging pollutants

18899

point

potential sampling sites for emerging pollutants

18900

point

potential sampling sites for emerging pollutants

18901

point

potential sampling sites for emerging pollutants

18902

point

potential sampling sites for emerging pollutants

18903

point

potential sampling sites for emerging pollutants

18904

point

potential sampling sites for emerging pollutants

18906

point

potential sampling sites for emerging pollutants

18908

point

potential sampling sites for emerging pollutants

18909

point

potential sampling sites for emerging pollutants

18910

point

potential sampling sites for emerging pollutants

18911

point

potential sampling sites for emerging pollutants

18912

point

potential sampling sites for emerging pollutants

18913

point

potential sampling sites for emerging pollutants

18914

point

potential sampling sites for emerging pollutants

18915

point

potential sampling sites for emerging pollutants

NPC Planning regions:

No Approved Plan

Project Land Use and Authorizations

Project Land Use:

Scientific Research

Licensing Agencies:

Government of Canada - Fisheries and Oceans Canada

Nunavut Research Institute

Nunavut Water Board

Material Use

Equipment:

Type

Quantity

Type

Use

Water sampler

1

5 L capacity, 60 cm length × 10 cm diameter

1 water sample will be used to take water samples from the potential sampling sites for contamination analysis.

soil auger

1

1.2 m length × 80 cm diameter

Used to manually drill into frozen ground (permafrost or active layer soils) to obtain soil cores for environmental and contaminant analysis. Suitable for shallow permafrost sampling (typically up to 1–2 m depth).

soil sampler

1

60 cm length × 10 cm diameter

A soil sampler will used to take soil samples from the sampling sites. The residue soil will be filled back to the hole and with appropriate mark.

resaerch vessel

1

30m length

A research vessel provided by Arctic Research Foundation will be used for sampling for marine sampling sites.

a small resaerch vessel

1

5m length

A small research vessel provided by the Arctic Research Foundation will be used for sampling at shallow bay sites.

containers

5

50cm length× 30 cm width × 30cm height

The containers will be used to contain water/soil samples. (Fish samples, only obtained from the local harvest and with permission)

Fuel Use:

Type

Container

Capacity

Use

Diesel

0

0

Diesel is used for research vessel provided by Arctic research foundation. No additional container is needed.

Hazardous Material and Chemical Use:

Type

Container

Capacity

Use

No data found

Water Consumption:

Daily Amount (m^2)

Retrieval Method

Retrieval Location

0

Potential contaminated sites (to be confirmed in consultation with communities)

Water will be sampled using a portable sampler and immediately transferred to clean containers.

Waste and Impacts

Environmental Impacts:

Potential Harm / Disruption •Community anxiety or social disruption: Learning about contaminant presence (especially in traditional food sources or water) could cause concern or changes in behavior if not contextualized. •Perceived misalignment or mistrust: If engagement, data use, or benefit-sharing aren't clear, community members might feel the project is externally driven rather than collaborative. •Interference with subsistence or cultural activities: Fieldwork could overlap with hunting, fishing, gathering, or culturally significant timing unless coordinated. •Burden of participation: Time, travel, or expectations placed on local trainees, guides, and knowledge holders might strain personal or family obligations. •Privacy and knowledge misuse concerns: Sharing traditional ecological knowledge or participating in discussions could raise worries about how that information is stored, interpreted, or disseminated. •Environmental disturbance: Even non-biological sampling (water, sediment, permafrost) can cause minor habitat disruption, especially in sensitive shoreline or lagoon zones. •Logistical risks in the field: Weather exposure, travel hazards, and wildlife encounters during field campaigns present safety considerations. Mitigation Measures •Community co-design and local leadership:

All planning (timing, sites, interpretation) is done in collaboration with Cambridge Bay partners, with local people leading or guiding field efforts to ensure cultural and ecological appropriateness and to minimize disruption. •• Animal sampling: Only culturally significant fish provided by local harvesters (if permitted) will be included; no sampling of other animals. •Scheduling with respect to subsistence/culture: Field campaigns are negotiated to avoid conflict with local hunting/fishing seasons or cultural events. •Transparent communication and consent: Participants receive clear explanations of purpose, use of information, and their rights; culturally adapted informed consent and opt-out mechanisms are in place. •Capacity-aligned participation: Training and employment opportunities are structured to offset burdens, with explicit agreements outlining roles, compensation, and support, reducing unintended strain. •Minimal-impact protocols: Sampling follows “leave-no-trace” principles; equipment is cleaned to avoid cross-site contamination; waste is removed; fuel and materials are managed with spill prevention and response plans. •Data governance: Shared stewardship arrangements protect traditional knowledge and personal data, with community review before broader use. •Safety and adaptive management: We will collaborate with local safety officers—already trained in weather, travel, and wildlife safety—to deliver advanced, scenario-based training and jointly document incidents and feedback for real-time procedure adjustments.

Waste Management:

Waste Type

Quantity Generated

Treatement Method

Disposal Method

Hazardous waste

0-50 mL

N/A

If a motorized soil auger is used, minor risk of fuel/oil leakage may exist. To mitigate this, absorbent pads and spill kits will be prepared on site to contain and clean any potential leaks.

Overburden (organic soil, waste material, tailings)

approximately up to 2 garbage bags of solid waste (e.g., disposable gloves, labels, and other sampling consumables). All waste will be collected and removed from the field site for proper disposal

All waste will be collected after use and either disposed of at the designated municipal landfill in Cambridge Bay, in accordance with local Hamlet guidelines, or transported back to Memorial University for proper disposal, depending on the type of material.

All sampling-related materials, including disposable gloves, labels, and other consumables, will be collected after use and removed from the field site. No such items will be left on the land or water; all waste will be returned for proper disposal.