

NPC 150952: Coastal dynamics in Kugluktuk and Grise Fiord (Ajuittuq), Nunavut.

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Proposal Status: Conformity Determination Issued

[Overview Documents](#)

[Project Overview](#)

Type of application: Amendment

Proponent name:

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Proponent company:

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Project Description:

* amended project description* The Arctic is changing rapidly due to climate change, affecting coastlines, permafrost, glaciers, ocean dynamics and marine ecosystems. In Nunavut, where most communities are along the coast, rising sea levels, stronger storms, and thawing permafrost are accelerating coastal erosion, putting buildings, roads, cultural sites, and essential services at risk. Ausuittuq (Grise Fiord) and Kugluktuk have identified coastal changes as major concerns. In Ausuittuq, the focus is on storm and flooding, while in Kugluktuk, erosion near the Coppermine River Delta is a growing challenge. To help communities respond to these changes, this project brings together local research partners and scientists from several universities. It will study and monitor environmental changes in both communities, focusing on erosion, flooding, permafrost, and ocean conditions. The project has fourteen specific objectives, grouped into four key areas: supporting Nunavut communities in adapting to coastal changes, monitoring coastal and permafrost conditions, studying ocean physics, geochemistry, and marine life, and assessing the risks of rockslides. The objectives are: 1. Co-design research with communities to generate information for adaptation planning to coastal change, identify communication channels for progress and findings, and document community exposure and sensitivity to coastal change. 2. Identify decision-making needs and tools for raising awareness to support adaptation, and work continuously with community members to co-interpret findings and co-create relevant outputs. 3. Collaborate with communities to develop medium-term (30 years) adaptation strategies based on research outcomes. 4. Enhance understanding of coastal erosion processes, wave and current dynamics, and flooding, while monitoring the effects of storms on these processes. 5. Model nearshore

wave and current conditions using historical wind datasets. 6. Develop coastal hazard maps based on numerical and empirical models of total coastal water levels. 7. Characterize permafrost conditions, including thermal state, ice content, physical properties, and thaw-induced landscape changes, with an emphasis on coastal permafrost dynamics. 8. Engage local community members throughout the research process, develop community-based sampling approaches, and provide training and skill-building opportunities to facilitate knowledge exchange. 9. Advance understanding of the morphodynamic evolution of the Coppermine River delta (Kugluktuk). 10. Detect rock instabilities and quantify pre-failure deformation rates (Grise Fiord). 11. Quantify the activity of primary producers at the base of the food web over time and identify factors driving observed variation (Grise Fiord). 12. Assess the nutritional content (nutrients, carbon, vitamins) of seawater that supports the growth of primary producers and other microbes, and test how coastal changes, such as melting glaciers, permafrost thaw, increasing storm intensity, and sea ice loss, impact these processes (Grise Fiord). 13. Investigate physical dynamics of ocean water impacting Grise Fiord, including the stratification, mixing, freshwater and heat content, and biogeochemical properties of the water column to understand the impacts of sea ice loss, atmospheric warming, freshwater runoff, storms, and warming deep water inflows on the marine environment and ecosystem. 14. Monitor the properties of oceanic water masses of Jones Sound and eastern Ellesmere Island to improve numerical modelling of ocean circulation of the region, and obtain Inuit-acquired baseline observations of ocean properties in the Tuvaijuittuq Marine Protected Area.

Methodology: This project combines local knowledge with scientific monitoring to study environmental changes while supporting community decision-making and long-term climate adaptation. For the 2026 field season, methodologies and core study sites will largely align with previous years, with a modest expansion to include additional locations and objectives. This approach maintains continuity with ongoing work while enhancing our understanding of permafrost, coastal, and environmental change through continued integration of local knowledge and community participation.

1. Coastal community resilience and adaptation: Workshops will be held in May in Grise Fiord to share project insights, present decision-support tools, and gather local knowledge on storm impacts, environmental changes, and adaptation strategies. Interviews and surveys will further assess community perceptions of climate risks.
2. Coastal assessment and monitoring: Drone surveys, time-lapse photography, and topographic profiling will track coastal changes, while pressure sensors, buoys, and ADCP/AWAC instruments will monitor sea ice, waves, tides, and currents. Bathymetric surveys using local boats will map nearshore seabed conditions.
3. Permafrost assessment and monitoring: Permafrost cores will be collected to analyze ground ice content, organic matter, sediment, microbes, and geochemical properties. A 15-20m borehole will be installed in Grise Fiord to track

permafrost thermal conditions over time, complemented by geophysical surveys using ground-penetrating radar and electrical resistivity tomography to investigate subsurface features. Remote sensing techniques will document permafrost-related landscape changes such as thaw slumps and thermokarst subsidence. 4. Marine physics and geochemistry: Profiled and moored sensors will be used to measure temperature, salinity, and other properties, at discrete locations and over time, while water samples will be collected for microbial and chemical analysis. Hand-deployed nets will be used to collect zooplankton, and flow-through microscopy will help identify larger ocean microbes. This work will be conducted in Grise Fiord and adjacent waterways only. 5. Slope hazards detection and monitoring: Ground-based radar interferometry and other remote sensing tools will be used to detect rock slope deformations. Weather stations, temperature probes, and extensometers will monitor potential instabilities, while rockfall simulations based on high-resolution terrain models will help assess risks to the community. Preliminary hazard maps will be ready for community presentation by summer 2026, with further analysis refining deformation measurements after the second field season. This work will be conducted in Grise Fiord only.

[Project Schedule](#)

Start Date:

2026-04-01

End Date:

2028-04-30

[Project Map](#)

List of project geometries:

Id

Geometry

Location Name

[19246](#)

point

Jones Sound

[19247](#)

point

Jakeman Glacier

[19248](#)

point

Norwegian Bay

[19249](#)

point

Camp 1

[19250](#)

point

Camp 2

[19251](#)

point

Camp 3

[19252](#)

point

Camp 4

[19253](#)

point

Camp 5

[19254](#)

point

Camp 6

[19255](#)

point

Greely Fiord

[19256](#)

point

Eureka Sound

[19257](#)

point

Nansen Sound

[19258](#)

point

Kugluktuk

[19259](#)

point

Grise Fiord

NPC Planning regions:

No Approved Plan

North Baffin

[Project Land Use and Authorizations](#)

Project Land Use:

Temporary Structures

Scientific Research

Licensing Agencies:

Nunavut Research Institute

Nunavut Impact Review Board

Nunavut Water Board

[Material Use](#)

Equipment:

Type

Quantity

Type

Use

Portable earth auger

1

100 cm x 60 cm x 60 cm

Permafrost drilling with sampling

GNSS system

1

100 cm x 30 cm

High-precision mapping

Small fixed-wing drone

1

116 cm (wingspan)

High-precision mapping (Aerial surveys of the coastal zone)

Buoys

1

42 cm x 31 cm

Measure wave and water levels (ice-free season). The instrument will be retrieved before freeze-up.

Bottom-mounted sensors

3

3 cm x 10 cm

Measure wave and water levels in the intertidal zone during low tide. All the sensors will be retrieved before freeze-up

Automatic time-lapsed cameras

3

10 cm x 10 cm x 10cm

Monitor and quantify coastal erosion in relations to storms.

ATVs

2

2.5 m x 1.2m x 1.4 m

Access study sites

ERT

1

1 m x 1 m x 1 m

Non-invasive, subsurface investigation technique to map near-surface permafrost structures.

Snowmobile

2

1 m x 1 m x 3 m

Travel to study sites

Ocean profiler

2

0.5m x 0.5m x 0.75m

Measure ocean properties

Fuel Use:

Type

Container

Capacity

Use

Gasoline

1

20

Portable earth auger refuelling.

Gasoline

10

200

Snowmobile refueling

Other

20

4

Naphtha (stove fuel)

Other

20

4

Kerosene (heater fuel)

Hazardous Material and Chemical Use:

Type

Container

Capacity

Use

No data found

Water Consumption:

Daily Amount (m²)

Retrieval Method

Retrieval Location

0

at study sites

sourced by melting snow or other natural freshwater sources

Waste and Impacts

Environmental Impacts:

No significant or lasting environmental effects are expected from this project. Field activities are carefully planned to reduce disturbance to land, water, wildlife, and nearby communities. The overall environmental impact will be minimal, localized, and temporary, with all activities, such as drilling, mapping, and sensor deployment, designed to be low-impact and fully reversible. The project will be carried out in close collaboration with northern communities, ensuring that research methods respect local priorities, traditional knowledge, and environmental stewardship practices. Ongoing communication and coordination with community partners will remain central to the project, promoting transparency and minimizing potential disturbance to people, wildlife, and the environment. Potential risks primarily relate to the use of off-road vehicles (e.g., ATVs, snowmobiles) and boats to access study sites, the operation of small hand-held power tools (e.g., augers), and the loading and unloading of equipment near water. These activities will follow established safety and environmental protocols to prevent spills, soil compaction, or vegetation damage. Field activities such as mapping (GNSS, drone surveys), geophysical surveys (GPR, ERT), and sensor deployment are non-invasive and expected to have no measurable environmental impact. Permafrost drilling will occur in localized areas (~15 m² per site) and is designed to have a limited and non-permanent footprint. Coring will be conducted with care to prevent contamination or excessive ground disturbance. Drilling sites will be restored following sampling, and a portable spill response kit will be available on-site at all times to address any potential fuel or lubricant leaks. Sensitive active-layer zones will be avoided whenever possible. Electronic ocean profiling instruments are temporarily lowered through the sea ice to depth and immediately recovered, causing negligible environmental impact. Augered ten-inch holes in the sea ice will quickly re-freeze during early spring conditions, leaving no trace. The planned deployment of an ocean mooring near Grise Fiord, comprising a buoyed line anchored to the seabed with multiple sensors attached, will be recovered annually, leaving only a small anchor (~200 lbs) on the seabed. The moored instruments are battery-powered electronics that passively record properties like temperature and salinity; they do not emit sound or chemicals, thus having minimal impact on surrounding waters. The deployment and location of the mooring will be determined in consultation with the community of Grise Fiord to ensure minimal disturbance to the marine ecosystem. Small volumes of ocean water (<2L) will be collected at approximately 20 locations for laboratory analysis of nutrients and microbial communities. A single ocean mooring is proposed near Grise Fiord, consisting of a buoyed line anchored to the seabed with multiple passive sensors to record ocean properties such as temperature and salinity. The mooring will be recovered annually,

leaving only a small anchor (~200 lbs) on the seabed. Instruments are battery-powered, emit no sound or chemicals, and therefore have minimal environmental impact. The deployment location will be selected in consultation with the community of Grise Fiord to avoid sensitive habitats and ensure minimal disturbance to the marine environment. Small volumes of ocean water (<2 L) will be collected at approximately 20 locations for laboratory analyses of nutrients and microbial communities. These low-volume samples pose no environmental risk. Multibeam sonar will be used for underwater mapping. While sonar produces short-duration acoustic pulses that may temporarily disturb fish or marine mammals, surveys will adhere to best-practice protocols and maintain acoustic energy levels within regulatory limits. When appropriate, timing and survey routes will be adjusted to avoid sensitive biological periods (e.g., migration or breeding). Instruments deployed nearshore will be securely anchored to prevent drift and will be removed promptly after data collection. All work will be conducted in close collaboration with local community members to ensure that research activities are consistent with local land-use practices and do not interfere with daily life or wildlife.

Waste Management:

Waste Type

Quantity Generated

Treatment Method

Disposal Method

Sewage (human waste)

100 L

NA

Waste material will be disposed of through or onto the sea ice, where it will undergo natural microbial degradation once released into marine waters.