Aria EIR <eir@aria.org.uk>

Environmental Information Regulations request - ARIA Geoengineering Programme - Substances, Safety Assessments and UK Atmospheric Experiments

1 message

[redacted] 24 March 2026 at 12:13
To: EIR requests at ARIA <EIR@aria.org.uk>

Dear Advanced Research and Invention Agency,
Under the Freedom of Information Act 2000, I request the following information relating to ARIA's funded geoengineering and solar radiation management programme:
1. A full list of all substances, compounds and materials being used or proposed for use in any ARIA-funded atmospheric experiments, including stratospheric aerosol injection and marine cloud brightening trials.
2. Copies of any safety assessments, environmental impact assessments or health risk evaluations conducted in relation to these substances.
3. Details of any experiments that have taken place, are ongoing, or are planned over UK airspace or UK territorial waters, including dates, locations and altitudes.
4. Details of any public consultation carried out prior to funding approval for these programmes.
5. Any correspondence between ARIA and the Civil Aviation Authority regarding authorisation of atmospheric experiments.

Yours faithfully,

[redacted]

Please use this email address for all replies to this request:
[redacted]

Is EIR@aria.org.uk the wrong address for Environmental Information Regulations requests to Advanced Research and Invention Agency? If so, please contact us using this form:
https://www.whatdotheyknow.com/change_request/new?body=aria

[redacted]

21 April 2026

Dear [redacted],

Environmental Information Regulations 2004 ("EIR") Request

We are writing in response to your recent request for information to the Advanced Research + Invention Agency ("**ARIA**") dated 24 March 2026 in which you asked:

> *"Under the Freedom of Information Act 2000, I request the following information relating to ARIA's funded geoengineering and solar radiation management programme:*
>
> *1. A full list of all substances, compounds and materials being used or proposed for use in any ARIA-funded atmospheric experiments, including stratospheric aerosol injection and marine cloud brightening trials.*
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> *3. Details of any experiments that have taken place, are ongoing, or are planned over UK airspace or UK territorial waters, including dates, locations and altitudes.*
>
> *4. Details of any public consultation carried out prior to funding approval for these programmes.*
>
> *5. Any correspondence between ARIA and the Civil Aviation Authority regarding authorisation of atmospheric experiments."*

Please note that ARIA is not subject to the Freedom of Information Act 2000. However, we have provided a response to your specific queries under the EIR.

Response to EIR request

1. *"A full list of all substances, compounds and materials being used or proposed for use in any ARIA-funded atmospheric experiments, including stratospheric aerosol injection and marine cloud brightening trials."*

Details of the outdoor experiments being funded by ARIA's Exploring Climate Cooling programme can be found on ARIA's website: Exploring Climate Cooling | Funded Projects | Controlled, small-scale outdoor experiments. For your convenience, we have included a screenshot of the relevant extract at **Annex 1**. This includes details of the "*substances, compounds and materials being used*" as part of the experiments.

As you will see, two experiments (UK and Australia) will spray natural seawater into the sky to measure its effect on cloud reflectivity. Any cloud effect will be tiny, brief (dissipating within 24 hours), and should not be noticeable to the human eye.

Another experiment will attach tiny (milligram) quantities of non-toxic mineral dusts (such as limestone, dolomite, and corundum) into a specialised container which is transported into the stratosphere by a solar-powered high-altitude glider. No materials are released, and the vehicle remains in place for a period of days to weeks. The glider is then piloted back to Earth and the samples are examined in a laboratory.

Any outdoor experiment will only go ahead once an independent environmental impact assessment has been made, and if the results of this suggest that the experiments will be safe (the impact assessment will also be made publicly available before experiments start). These experiments will only go ahead after a period of meaningful public engagement with local communities, and will all be subject to oversight by the programme's independent Oversight Committee.

2. *"Copies of any safety assessments, environmental impact assessments or health risk evaluations conducted in relation to these substances."*

At present, assessments have been finalised for one outdoor experiment: Re-thickening Arctic Sea Ice (RASI). Further details about this project (including the community engagement survey, research licences and the Nunavut Impact Review Board's screening reports) can be found on ARIA's website: Exploring Climate Cooling | Re-thickening Arctic Sea Ice. Relevant extracts of ARIA's website can be found at **Annex 2**. For your convenience, we have provided copies of the community engagement summaries, Nunavut Impact Review Board's screening reports, scientific research licences and letters from the project teams confirming their completion of ARIA's CEO conditions at **Annex**

3 to **Annex 10**. Please find enclosed at **Annex 11** a copy of an Environmental Impact Assessment conducted in relation to this project.

The preparations for other outdoor experiments being funded by the Exploring Climate Cooling programme are only in preliminary stages, and no other outdoor experiments have yet been approved by ARIA in relation to this programme. As such, ARIA does not hold any other documents relating to this element of the request. When finalised, Environmental Impact Assessments, community engagement summaries and other governance documents relating to each project will be placed on ARIA's website: ARIA | Exploring Climate Cooling.

3. *"Details of any experiments that have taken place, are ongoing, or are planned over UK airspace or UK territorial waters, including dates, locations and altitudes."*

The programme is funding up to three small, controlled, outdoor experiments planned to take place in the UK. The specific locations have not yet been decided.

All experiments are designed to be safe for humans, animals and the environment. Their effects will dissipate within 24 hours, or be fully reversible. No toxic material will be released into the atmosphere.

The three small, controlled experiments that may take place in the UK are:

- An experiment to explore the effects of seawater spray on cloud reflectivity.
- An experiment to explore the effects of electric charge on cloud reflectivity.
- An experiment to study how milligram quantities of mineral dusts age in the stratosphere. In this controlled experiment, none of these materials will be released; all are returned to the ground for analysis by scientists.

4. *"Details of any public consultation carried out prior to funding approval for these programmes."*

Public consultation has only occurred in relation to one project: RASI. As described above, the other projects being funded by ARIA's Exploring Climate Cooling programme are only in preliminary stages, and public consultation has not yet occurred in relation to these projects.

Details of the community engagement which took place in relation to RASI can be found at **Annex 3** and **Annex 7**. Details of the community engagement process to which all

outdoor experiments will be subject is available on ARIA's website: Exploring Climate Cooling | Community Engagement. For your convenience, we have included the relevant extracts of this page at **Annex 12**. As you will see, Phase 1 includes the requirement that teams identify required permits and permissions, and Phase 2 requires that teams will obtain and publish all necessary permits and permissions.

5. "Any correspondence between ARIA and the Civil Aviation Authority regarding authorisation of atmospheric experiments."

There has been no correspondence between ARIA and the Civil Aviation Authority regarding authorisation for outdoor experiments. As explained above, the planning for the experiments which may take place in the UK is only in preliminary stages.

The specific permissions and approvals applicable to a given outdoor experiment depend on the nature and location of the project. It is a requirement of ARIA funding that the Exploring Climate Cooling outdoor experiments comply with local, national, and international regulations and, before any outdoor experiment takes place, that an independent environmental and legal assessment will be conducted and made publicly available.

Yours sincerely,

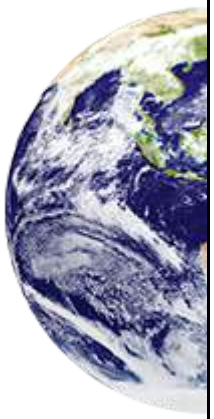
ARIA

You can ask us to review our response. If you want us to carry out a review, please let us know within 40 working days by emailing eir@aria.org.uk.

If you are still dissatisfied after our internal review, you may complain to the Information Commissioner's Office (ICO) for further investigation who can be contacted at: Information Commissioner's Office, Wycliffe House, Water Lane, Wilmslow, Cheshire, SK9 5AF.

Advanced Research + Invention Agency ARIA

Annex 1: Exploring Climate Cooling - Funded Projects



Opportunity space: Future Proofing Our Climate and Weather

Programme: Exploring Climate Cooling

Exploring Climate Cooling

This £56.8m programme aims to build a robust evidence base to explore – with independent oversight – if climate cooling approaches could ever be feasible, scalable, safe, and governable.

Funded projects

Our 22 funded research teams unite specialists across diverse disciplines – from atmospheric physics, chemistry, and climate modelling to chemical engineering, systems analysis, oceanography, and radiative transfer, alongside crucial expertise in governance and ethics – reflecting the programme's holistic approach. This group shares a deep commitment to objective research conducted transparently and responsibly, aiming to navigate the complex ethical dimensions and establish best practices within this field.

Projects will utilise a range of methodologies, including modelling, observations and monitoring, indoor testing and – where strictly necessary and in accordance with our oversight and governance principles – small scale, controlled outdoor experiments.

The programme will also fund projects exploring the broader societal aspects of this scientific research, including methods for public engagement, public attitudes to the field, and governance.

In cases where essential scientific questions cannot be answered by modelling or indoor experiments alone, these five projects will undertake carefully controlled outdoor experiments, allowing crucial real-world data to be gathered responsibly. These experiments will only proceed if ARIA's stringent governance requirements are met in full. An environmental impact assessment will be performed and made publicly available before any experiment starts, and experiments will have to be developed through engagement with local communities. All funded experiments will be time-bound and limited in size, scale so their effects dissipate within 24 hours or are fully reversible.

Our planned outdoor experiments are at different stages of development. The first RASI ice-thickening experiment is already underway in northern Canada, and the marine cloud brightening project in the Great Barrier Reef is building upon pre-existing site requirements and community relationship.

The remaining three teams are in the very early stages of planning – technical design and pre-site selection. This means they are scoping a range of potential locations to understand technical feasibility, defining logistical requirements, and beginning initial outreach to key stakeholders like landowners and local authorities. No locations have yet been agreed for any outdoor experiments in the UK.

You can read more about the process of experiment development and engagement here.

Project Lead: Shaun Fitzgerald, Centre for Climate Repair

Award: £9.9m over 42 months

Key team members and approximate budget breakdown: Shaun Fitzgerald, University of Cambridge (£1.4m) | Geoff Evatt, University of Manchester (£0.63m) | Michel Tsamados, University College London (£0.63m) | Einar Ólason, Nansen Environmental and Remote Sensing Center (£0.4m) | Andrea Ceccolini, Real Ice (£3.5m) | Fonger Ypma, Arctic Reflections (£3.3m) | Edward Blanchard, University of Washington (£90k) | Steven Desch, Arizona State University (~£10k travel costs funded from Real Ice's share)

Engagement progress: Phase 4 (First experiment in progress)

The Arctic is warming much faster than the global average, leading to dangerous sea ice loss with far-reaching consequences. This project investigates whether deliberately thickening sea ice during winter could be a viable way to slow summer melt, reduce Arctic warming, and mitigate further ice loss. The research aims to provide critical data on the feasibility, scalability, potential ecological impacts, and overall effectiveness of this approach, which involves accelerating natural freezing processes using seawater from underneath the ice.

The RASI project is led by the University of Cambridge and includes a number of collaborating sub-teams looking at computer modelling, laboratory studies on ice mechanics, ecological studies and small, controlled outdoor experiments. Two separate sub-teams of researchers (Real Ice, Arctic Reflections) will conduct controlled, small-scale experiments in two locations in Canada. These experiments have been designed in close collaboration with local communities and in compliance with ARIA's stringent governance framework. The goal is to gather essential real-world data to rigorously assess if this intervention warrants further consideration.

View the full grant agreement for this project, which outlines its objectives, milestones, and deliverables here.

Marine Cloud Brightening in a Complex World

Project lead: Daniel Harrison, Southern Cross University

Award: £1m (potentially rising to £5m with matched funding) over 5 years, contingent upon security an additional £10m of funding from other sources

Key team members: Southern Cross University | Commonwealth Science and Industrial Research Organisation | University of New South Wales | Freie Universität Berlin | Queensland University of Technology | Shaun Fitzgerald, University of Cambridge (contributing and funded via the REFLECT project)

Engagement progress: Phase 2 (Engagement + impact assessment)

This project investigates Marine Cloud Brightening (MCB), a potential way to cool specific areas by enhancing cloud reflectivity using a spray of seawater. Building on their experience conducting previous small-scale outdoor experiments in partnership with local communities around the Great Barrier Reef, Australia, this team seeks to deepen our understanding of MCB. While the concept could potentially protect vulnerable ecosystems like coral reefs from heat stress, its real-world effectiveness remains uncertain. This research aims to address this critical knowledge gap by investigating the complex atmospheric dynamics and microphysical processes involved, moving beyond basic principles to assess if, and how, MCB could work safely and effectively.

The research combines advanced computer modelling with the development and indoor testing of sea salt sprayers. If these findings suggest promise, and subject to meeting ARIA's governance requirements, the project plans to conduct small-scale, controlled outdoor experiments over the Great Barrier Reef in years 3 and 4 of the 5-year project. These outdoor experiments are strictly

determine the effectiveness and risks of MCB, and its potential for protecting vulnerable ecosystems at a regional scale.

View the full grant agreement for this project, which outlines its objectives, milestones, and deliverables here.

A REsponsible innovation Framework for assessing noveL spray tEChnology research To examine local albedo changes from marine brightening and its multi-scale impacts (REFLECT)

Project Lead: Hugh Coe, University of Manchester

Award: £6.1m over 3 years (initial phase)

Key team members and approximate budget breakdown: Hugh Coe, Robert Bellamy, University of Manchester (£2.1m) | Shaun Fitzgerald, University of Cambridge (£1.8m) | Dan Mace, Archipelago Technology (£0.9m) | James Haywood, University of Exeter (£1.1m) | Lindsay Bennett, University of Leeds (£22k) | Sami Romakkaniemi, Finnish Meteorological Institute* (£160k) *Finnish Meteorological Institute are contributing to the modelling exercises in this proposal and are not involved in any outdoor experimentation

Engagement progress: Phase 1 (Technical design + pre-site selection)

Marine Cloud Brightening (MCB) and Marine Sky Brightening (MSB) are ideas for cooling the Earth by increasing the reflectivity of clouds using tiny droplets of seawater. These methods are based on the concept of increasing the number (and hence reflectivity) of the water droplets that make up clouds. There currently is a knowledge gap as to the best method of altering the droplet size in a consistent, controlled, predictable way and we are reliant on computer models for prediction, the results of which need to be verified

design potential future outdoor experiments. Any small-scale, controlled outdoor experiments to test sprayer performance would only occur after this initial phase (and therefore not before 2028), contingent on further funding, successful co-design demonstrating community engagement and support, and strict adherence to ARIA's safety and governance protocols. These potential tests are expected to be undertaken in the UK (location to be determined). Initial tests, if approved, would be very limited, and would consist of producing short (5-10 minute) bursts of seawater spray, which would then be monitored as they drift out over the sea. Only if these initial tests prove successful and safe, later experiments may explore if there is any detectable effect on clouds (still in compliance with ARIA's technical requirements on area and scale threshold).

These tests are inherently benign, replicating natural processes that generate sea spray over the ocean, and developing spray systems such as those that are already employed to cool crowds with fine mists of water and dampen construction sites to suppress pollution. The overall goal is to establish a robust and responsible experimental framework to assess the technical feasibility and optimal methods for MCB and MSB.

View the full grant agreement for this project, which outlines its objectives, milestones, and deliverables here.

BrightSpark – Cloud brightening with electric charge

Project Lead: Giles Harrison, University of Reading

Award: £2m over 36 months

Key team members and approximate budget breakdown: Giles Harrison, Maarten Ambaum, Keri Nicoll, University of Reading (£1.75m) | John Mooney, Menapia Ltd (£170k)

influencing water droplets in fogs and clouds to increase reflectivity. The project will also develop new tools for computational modelling of charge in fogs and clouds.

The team will begin by testing equipment and gathering monitoring data in winter 2026. If approved, very small-scale, controlled outdoor experiments would take place in the UK in winter 2027, and would involve artificially charging a small region of fog (roughly the size of a football field) using electrodes attached to small drones, similar to those used in light displays. The electrodes will emit positive or negative charge, and the team will measure the effects on droplet properties, mapping this to changes in reflectivity. During the experiment, it's unlikely changes in the fog will be visible to the unaided eye, so the team will use specialist meteorological sensors to measure and detect any change in the fog's thickness. Effects of charge persist in air for up to a few minutes and will not be of a level to create sparks or present electrical hazards. No materials or chemicals will be emitted.

These experiments are strictly conditional on demonstrating appropriate levels of community engagement, co-design, and adherence to ARIA's rigorous safety and ethical governance framework. The core goal is to gather foundational data to assess if this method is viable and safe enough to warrant further investigation.

View the full grant agreement for this project, which outlines its objectives, milestones, and deliverables here.

Natural Materials for Stratospheric Aerosol Injection

Project Lead: Hugh Hunt, University of Cambridge

ward: £5.5m over 36 months

Engagement progress: Phase 1 (Technical design + pre-site selection)

Stratospheric Aerosol Injection (SAI) is an increasingly discussed potential climate cooling method, but the most commonly proposed materials (based on sulfur) carry hazards in this context, including potential ozone depletion, toxicity, and altered atmospheric circulation patterns. Alternative, safer materials have been proposed for use in SAI, but little is currently understood about how they would behave in the stratosphere. This project will undertake fundamental research to investigate the properties and behaviour of non-toxic, non-sulfate materials for this purpose.

The research combines laboratory studies and computational modelling with highly controlled material exposure experiments. In these experiments, tiny (milligram) amounts of non-toxic materials (such as limestone, dolomite, and corundum) will be placed inside a specialised container. This container will be transported to the stratosphere by a solar-powered high-altitude glider. This uncrewed vehicle is remotely piloted from the ground and capable of remaining aloft and in place for periods ranging from days to weeks. This method allows for precise flight control, far exceeding the capabilities of traditional high-altitude balloons.

The materials will be exposed within the stratosphere for periods ranging from hours to weeks. **Crucially, the materials will remain entirely confined; nothing is released into the atmosphere**. The glider is then piloted back to Earth and the samples are examined in a laboratory. Studying these materials will reveal how stratospheric conditions affect their properties over time. This foundational science is essential to advance our understanding of the potential impacts of SAI and to determine if any of these alternative materials warrant further study.

View the full grant agreement for this project, which outlines its objectives, milestones, and deliverables here.

The projects we are funding have been selected from teams and individuals who applied to our previous programme. You can read more about these calls below.

Exploring Climate Cooling: Full proposals

Oversight + Governance

Meet the Oversight Committee and understand how we ensure rigorous governance across the programme.

Learn more

FAQs

Check out the most frequently asked questions around this programme.

Find out more

Advanced Research + Invention Agency ARIA

Annex 2: Exploring Climate Cooling - Re-thickening Arctic Sea Ice (RASI)

Re-thickening Arctic Sea Ice (RASI)

The Arctic is warming much faster than the global average, driving sea ice loss that threatens local ecosystems and accelerates global climate change.

Overview

Led by Shaun Fitzgerald at the Centre for Climate Repair (University of Cambridge), the RASI project is supported by a £9.9m grant over 42 months. The consortium unites specialised field teams — Real Ice and Arctic Reflections — with a global network of research partners including the University of Manchester, UCL, the University of Washington, and NERSC, to combine rigorous scientific modelling with real-world Arctic experimentation.

Two separate sub-teams of researchers (Real Ice, Arctic Reflections) will conduct controlled, small-scale experiments in two locations in Canada. These experiments have been designed in close collaboration with local communities and in compliance with ARIA's stringent governance framework. The goal is to gather essential real-world data to rigorously assess if this intervention warrants further consideration.

Methodology

The outdoor experiments will take place in Nunavut, Canada, across three winter seasons (2026 to 2028). Using both above-ice and submersible pumps, the team will try to create thickened ice patches by pumping seawater from beneath existing ice and spreading it on top, where the frigid air freezes it quickly. Over the course of the project – and only if the early experiments suggest the approach is ecologically sound – later experiments will aim to cover areas up to 1 km^2 per experiment site. In the process, the RASI team will generate real-world data on variables that theory cannot yet predict – including whether this thicker ice lasts longer into the summer, how ice movement might be affected, and what the local ecological impacts of thickening might be.

By collecting ice cores and water samples for study, the teams will look to improve our current understanding of whether sea ice thickening is ecologically sound. This real world environmental data will contribute to the wider programme, as scientists working on ecological modelling will then be able to simulate any ripple effects on the marine ecosystem, ensuring that the ecological cost-benefit analysis is understood before any large-scale activity is ever considered.

Research

The first phase of ARIA funded outdoor research begins in early 2026 at two locations in Nunavut, Canada. In both locations, the teams have secured Free, Prior and Informed Consent from the communities where this research will take place, ensuring engagement is meaningful, respectful and continuous. The researchers have secured the support and cooperation of municipal authorities, local Elders, and Hunters and Trappers Organizations (HTOs). Local residents have not only provided input into the experimental design but will also work alongside the researchers as part of the team.

In Cambridge Bay, Nunavut, the Real Ice sub-team will commence work in mid-January. Building on two years of engagement with local residents, and subsequent iterations of the experimental design, the team has been

(Real Ice team members in Cambridge Bay, Winter 2024-25, courtesy of Elise Imbeau)

In Qikiqtarjuaq, the Arctic Reflections sub-team will commence work in early February. They have the support of key local stakeholders and have been granted the formal permit to operate. Following a pivotal consultation with the local community in September 2025, the team moved their proposed experiment site to a new location to avoid disturbing seal birthing areas, acting directly on the advice of local Elders and the Hunters & Trappers Organization.

(Real Ice research site in Cambridge Bay, Winter 2024-25, courtesy of Centre for Climate Repair)

Committee and subsequently approved to proceed by ARIA's CEO. You can read the Committee's full recommendation here and the CEO's formal decision letter here.

Research is proceeding under Nunavut's well-established research permitting framework, which ensures research is ethical, responsible, and incorporates traditional knowledge.

Resources

Real Ice

- Community engagement summary, Winter 2025/26 [PDF - 484.73Kb]
- Nunavut Impact Review Board's screening report [PDF - 379.95Kb]
- Scientific research licence for experiments from the Nunavut Research Institute [PDF - 908.81Kb]
- Letter to ECC programme team confirming completion of CEO conditions [PDF - 172.41Kb]
- ependent legal assessment and

Arctic Reflections

- Community engagement summary, Winter 2025/6 [PDF - 1.12Mb]
- Nunavut Impact Review Board's screening report [PDF - 534.29Kb]
- Scientific research licence for experiments from the Nunavut Research Institute [PDF - 851.53Kb]
- Letter to ECC programme team confirming completion of CEO conditions [PDF - 175.08Kb]
- Independent legal assessment and

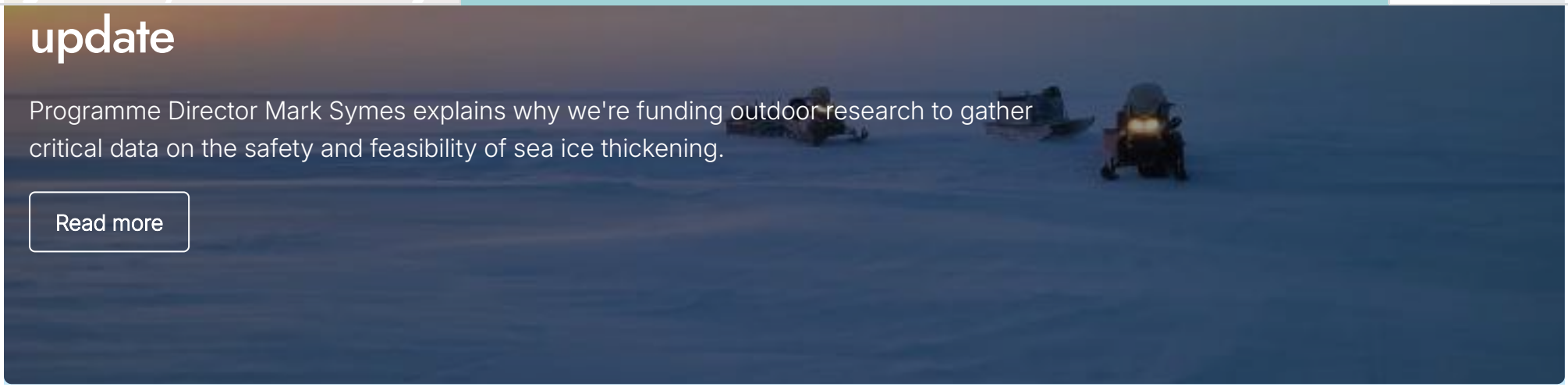
Oversight + scrutiny

- RASI: Oversight Committee's full recommendation (9 December 2025) [PDF - 151.07Kb]
- RASI: Reply from and the CEO's formal decision letter (18 December 2025) [PDF - 94.91Kb]

Our goal is to build the open scientific knowledge base the world needs to make better informed decisions.

We're committed to responsible stewardship, transparency, accountability + meaningful community engagement. Find out more about our governance principles, the programme's independent Oversight Committee, and the process by which outdoor experiments are scrutinised.

Learn more



FAQs for RASI

How does ice re-thickening work?

Doesn't the salty water melt or damage the ice that's already there?

Who is doing the research?

Where and when will the experiments happen? Why were these locations chosen for the experiments?

How are local communities, and local knowledge, incorporated into this research?

Will these experiments impact the local environment and wildlife?

Who gave permission for these experiments?

How are you ensuring these experiments are ethical and safe?

How are these experiments different from deployment?

How do you measure the impacts of these experiments?

Why does Arctic sea ice matter for the global climate?

How does losing Arctic Sea Ice impact local communities?

Can re-thickening sea ice solve climate change on its own?

Is the plan to scale these experiments up in the future?

What can these small scale experiments tell us about larger-scale impacts?

Advanced Research + Invention Agency ARIA

Annex 3: Real Ice - Community engagement summary

Real Ice

Winter 2025/26

Community Engagement and Permitting: Cambridge Bay, Nunavut

Introduction

Plans for field tests in the winter 2025/26

Real Ice has undertaken a series of small-scale sea ice thickening field studies beginning in January 2023 in Nome, Alaska (Real Ice project: T1), followed by subsequent campaigns in Cambridge Bay, Nunavut, on Canada's Victoria Island, in January 2024 (T2) and from December 2024 to July 2025 (T3). These studies have been designed to advance understanding in several key areas: the enthusiasm, interest and engagement of local communities with the research, the logistical and operational challenges of conducting research on the ice, the engineering feasibility of thickening sea ice through water pumping from beneath the ice surface, and the scientific dynamics associated with snow flooding in the winter and, more recently, melt pond drainage during the spring season.

Beginning in January 2026, Real Ice plans to resume work in Cambridge Bay, collaborating with the same local partners and within the same geographic area, while refining the study design in light of insights gained from the previous three winters of research. For this forthcoming season, the project will focus on thickening a single designated section equivalent to one quarter of the 1 km² area identified in collaboration with the local Hunters and Trappers Organisation, and employing more efficient pumping methods and improved measurement techniques. We expect to complete the core ice thickening operations by March 2026, then to monitor and measure the target area until the onset of the melt season (May to July 2026), when we will complete the observations and perform smaller-scale operations to test the effectiveness of melt pond drainage.

Research Protocol

Real Ice is dedicated to upholding the principle of Free, Prior, and Informed Consent (FPIC) in all research activities, placing particular emphasis on authentic and sustained engagement with local communities at the grassroots level. Recognising that much of the Arctic falls under the shared stewardship of Indigenous peoples, Real Ice acknowledges their central role in the governance and decision-making processes that affect their traditional lands and waters. Environmental preservation is a fundamental concern for these communities, who consistently advocate for the protection of the Arctic's fragile ecosystem.

The ability of Real Ice to conduct research in the region rests upon the willingness of local permitting authorities, civic organisations, and Indigenous hunting and trapping bodies to grant access and to collaborate in research design, implementation, and knowledge exchange. Such collaborations foster research that is respectful, inclusive, and attentive to community values while explicitly supporting the rights of Indigenous partners.

To guide these interactions, Real Ice follows the Inuit Circumpolar Council's Protocols for Equitable and Ethical Engagement (ICC EEE Protocols), hereafter referred to as "Protocols", which serve as a comprehensive framework for ethical research. These protocols require that Inuit be integrally involved in all decisions affecting them and that their knowledge systems are regarded as equally valid as Western scientific approaches. The protocols promote good governance through transparency, mutual accountability, and trust-building, and call for partnerships based on respect, shared data stewardship, and equitable distribution of any benefits arising from research activities within Inuit communities. Real Ice is committed to the thorough incorporation of these protocols in all aspects of its work.

A fundamental principle underpinning all of Real Ice's engagements and activities with local communities is the establishment of realistic expectations regarding the outcomes achievable through small-scale testing. We do not advocate for, promise, project, or discuss any potential deployment of the technology in Cambridge Bay or elsewhere; our focus remains firmly on the scientific and engineering insights derived from this limited research. Should questions arise about the ultimate aim of successful research, we may reference the longer-term aspiration of fostering an indigenous-owned industry capable of scaling up the technology. However, we emphasize that any actual deployment would be contingent upon overcoming numerous regulatory, security, economic, and technical challenges—most of which are beyond Real Ice's influence.

Summary of our technical and operational plans

Location

The winter 2026 research study location, selected with the collaboration of members of the local hunters and trappers organisation, is approximately 7km from the hamlet of Cambridge Bay on the sea ice. The water in this location is >20m deep.

Method

During the study, we will thicken a sea ice area of approximately 0.25 km^2 as part of the designated 1 km^2target area. The ice thickening operations will start in January 2026 when the ice is safe and stable, and continue until the end of March. Ice and snow thickness, temperatures and salinity measurements will be taken actively (drilling holes and collecting ice cores) and passively (through embedded ice thickness measurement devices) throughout the winter and melt season. In the spring, we will also perform melt pond drainage by making small holes in the ice. Aerial and satellite images will also be used to assess and record the conditions of the target area.

Past Community Engagement in Cambridge Bay

Formal Nunavut and Cambridge Bay Permissioning Timeline

The organisations that manage the permissions for research in Cambridge Bay, Nunavut, are as follows:

1. Nunavut Planning Commission (**NPC**) - a multi-year license may be granted
2. Nunavut Impact Review Board (**NIRB**) - required upfront and applies as long as the multi-year NPC agreement is in place
3. Nunavut Research Institute (**NRI**) - a multi-year license may be granted
4. Local Hunters and Trappers Organisations - in the case of Cambridge Bay, this is Ekaluktutiak Hunters and Trappers Organisation (**EHTO**) - annual approval
5. Research facility support from Polar Knowledge's Canadian High Arctic Research Station (**CHARS**) (if facilities are being used) - annual approval

Descriptions of each of the above organisations can be found in Appendix A

January 2024 (T2)

August 2023: EHTO initial briefing and operating permission request August 2023: NPC initial research license application
August 2023: CHARS research support application
September 2023 NIRB initial research license application
September 2023 NRI initial research license application
November 2023 NPC multi-year research license granted {2023 - 2026}
*November 2023 NIRB research approval granted**
November 2023 NRI multi-year research license granted {2023 - 2026}
November 2023 CHARS research support for T2 granted
November 2023 EHTO permission for T2 granted

December 2024-June 2025 (T3)

August 2024 : EHTO T2 briefing and operating permission for T3 request
October 2024 NPC 2nd year of the multi-year license confirmed
October 2024 EHTO permission for T3 granted
November 2024 NRI 2nd year of the multi-year license confirmed
November 2024 CHARS research support for T3 granted

** NIRB does not issue a new annual research license approval in the case of multi-year grants by NPC and NRI provided that the research has not changed substantially year to year.*

Community Engagement History

Real Ice's engagement in the Arctic is inspired by the principle of "Nothing About Us Without Us" (Protocol 1), ensuring that all research and operational decisions are made in close partnership with local communities and stakeholders. Initial engagement began in January 2022 with meetings in Iqaluit and subsequently in Nome, Alaska, where approval was received from Nome tribal and city authorities to conduct preliminary field tests.

Since 2023, collaboration with the Cambridge Bay Hunters and Trappers Organisation (EHTO) has been central to project planning, including the co-design of research methods, field site selection, research results briefings and annual securing of formal letters of support (Protocols 1,6 & 7). Members of EHTO have been involved in daily research activities, contributing their traditional knowledge and skills in crucial activities such as setting up and maintaining a safe camp out at sea, travelling on the sea ice in all weather conditions, performing key operations such as drilling through ice, securing, transporting and recovering equipment, measuring results, and actively making sure team members are safe from weather, environment and wildlife.

This deliberate, grassroots approach has established a foundation of mutual respect and shared interest in addressing sea ice loss (Protocol 2). The members of EHTO that contributed to the research studies over the last two winters will be named as contributors in a peer-reviewed paper from the University of Washington's Prof Edward Blanchard-Wrigglesworth, expected in pre-print in Q4 2025.

Active and ongoing dialogue with Cambridge Bay Elders is a core aspect of Real Ice's approach. Regular briefings at the Heritage Society, designed explicitly for Elders, reflect the project's commitment to recognising and integrating Indigenous knowledge (Protocol 2). Wider trust-building has been accomplished through open discussions with the Hamlet Council, Mayor, and other civic leaders. Additionally, hiring local Inuit guides and consultants and joining the Kitikmeot Chamber of Commerce have further invested in local capacity (Protocol 5).

Critical to Real Ice's effectiveness is sustained community presence in Cambridge Bay. Maintaining a multi-month base in the community each ice season enables formal and informal dialogue with hunters, trappers, guides, Elders, teachers, and other residents. Engagement activities include public Q&A sessions in community halls and CHARS, briefings at EHTO board and council meetings, and one-to-one meetings with local community members, Elders and leaders. This embedded approach facilitates EHTO team members' traditional knowledge sharing, fosters trust, ensures project transparency, and allows research operations to respond to local needs and feedback directly.

A central aspect of our work is our collaboration with the Cambridge Bay Hunters and Trappers Organisation (EHTO), who are the primary holders of traditional knowledge about the ecosystem in the region. The community as a whole and this group in particular relies on hunting and fishing for sustenance. Our collaboration with EHTO is essential to ensuring that our research adopts a holistic approach that respects and acknowledges Traditional Inuit Knowledge. EHTO members, as active hunters, trappers and fishers who frequently operate on the sea ice during the hunting & fishing seasons, possess unmatched expertise in navigating and understanding the ecology of the region and how the ice behaves under varying conditions. They are, in many ways, on the front lines of climate change adaptation within their

communities. Each time we seek permission to conduct research, we engage in detailed discussions with EHTO representatives about our plans and share results from previous research periods. Their feedback is integral, and we work collaboratively to refine ideas and methodologies. This process has been followed consistently over the past two years in Cambridge Bay, and again in the current field season. EHTO has played a significant role in shaping experiment design—including in the selection of research sites—drawing on local ecological understanding, wildlife patterns, hunting routes, ice conditions and history and local geography. During our January 2024 field test, limited consultation with EHTO led to the selection of a site that proved too shallow and near the coast, compromising the success of the trial—an outcome that reinforced the value of their involvement. Site selection encompasses layers of local and traditional knowledge, from wildlife movement patterns, safety aspects, shipping routes, snowmobile pathways, availability of nearby land trails, hunting, fishing and other economic or recreational activities in the area. In-depth discussions with EHTO during the 2024 spring about our specific research requirements led to an improved site selection for the 2024/25 winter that incorporated aspects such as travel times for optimal daylight pumping time during the key research months, distance from shore for reduced boundary effects, minimum sea depth for more realistic water temperature patterns, and ability to fly an aerial drone from shore over the selected site during the melt season.

At the beginning of the 2024/25 ice thickening tests, we discovered that we didn't have enough of a key tool used for our pumping sessions to stop the backflow of water after pumping: the "cofferdams". After discussing the issue with a local EHTO member, the secondary school carpentry lab came to support our activities by producing a number of additional wooden cofferdams that allowed us to continue our operations as planned over the following months giving us the opportunity to interact with the next generation of hunters and trappers.

Several Inuit members of the Cambridge Bay EHTO are also acknowledged as named contributors to the Real Ice and University of Washington academic paper scheduled for pre-print publication in December 2025, as they actively contributed to research aspects such as setting up test areas, taking ice and snow measurements and running aerial drone surveys.

An evolving partnership with the Canadian High Arctic Research Station (CHARS) has led to opportunities for Real Ice to present at open community evenings and participate in knowledge exchange with elder hunters and trappers, reinforcing Indigenous expertise as essential to responsible research.

Youth engagement is also a growing priority: at Kiilinik High School, engineering demonstrations, collaboration on sled building for field tests, classroom visits, and joint presentations with Real Ice scientific collaborators and local partners have built student awareness of and interest in the research (Protocol 4).

The project's collaborative approach has drawn international attention, with media and documentary crews visiting Cambridge Bay to document the science and local reactions to climate-driven sea ice changes. This exposure has amplified Inuit voices in discussions about the region's environmental challenges and underscores the broader impact of meaningful, community-led research engagement: The Narwhal: July 2025

Engagement Diary

[A montage of photos showing Real Ice meeting community members and key stakeholders, which has been redacted. The image showed a timeline of engagement and meetings from 2022 to 2025].

Community Engagement Q&A

The following are questions that we have been asked during some of the engagement events we organised.

Stakeholder Group	Examples of Stakeholder Questions	Type of Engagement	Real Ice Responses
EHTO	*How long before this could be rolled out to help save the hunting routes - caribou are disappearing through the thin ice*	*Board meeting*	*We are only in research mode at the moment. We hope that positive research results may lead to a larger-scale test, but it would be years before any potential rollout that would help mitigate the effects of thinner ice between Victoria Island and the mainland, so that fewer caribou are lost.*
Mayor & The Council	*Do you intend to run your research for multiple years*	*Formal update at the council chamber*	*Yes, as part of the Climate Cooling program, we have a 3-year research plan, which we intend to carry on in Cambridge Bay, in collaboration with the local community*
Elders	*How thin is the ice this year?*	*Listening meeting at Heritage Society*	*We explained that we were seeing a maximum of 1.8m. They were shocked and explained that when they were younger, the ice was 9ft thick in the bay.*
Wider Community Members	*Is the new ice that you create strong?*	*Informal open community meeting at Elders Palace*	*The new ice from flooding is on the surface of the ice stack, and it was about 30cm thick last winter. This sits on top of the existing 1.5m of ice that was created naturally, from the bottom.* *We don't know whether the top stack is stronger or weaker than the ice at the bottom, but in principle, we want to test the idea that thicker ice should survive longer during the summer, which would hopefully benefit communities and wildlife.*

CHARS	*How long is it taking for the ponds to turn into hard new ice.*	*Part of daily operations discussion*	*We explained that in typical cases it takes 12-48 hours for the water to freeze, and this depends on weather conditions and the depth of the pond. As an example, with temperatures in the -30C range and ponds around 10-15cm deep (very typical in our experience), we usually see a full freeze in under 24 hours.* *We also explained an edge condition where, in early December 2024, when the sea ice was only around 40cm thick, we observed some bending of the sea ice layer under the weight of the pumped water. This created deeper ponds, which took around 48 hours to freeze completely.* *This opened up a conversation about how much later the freezing of the sea was observed over the last couple of years and how this delay had created issues at the start of our testing operations. For this reason, we have changed our plans for next winter to only start ice thickening in January.* *{please see section at the bottom of this table for tracker}*

Local secondary school	*If there are seal breathing holes in the area you are covering, will you block them?*	*Field demo to students*	*We don't believe so, because the water we pump would flow back into the sea if there was a hole in the ice, and it would not block it, but it is something we will keep in mind in our research. We constantly monitor our pumping activities and the test area, and we will check and consult with our guides if we observe any seal breathing holes. The test area was selected with the help of HTO in a place where seal activity in the winter hasn't been observed for many years. {please see section at the bottom of this table for tracker}*

Local secondary school	*Will you drain all the water of the bay if you keep pumping sea water on top of the ice?*	*Field demo to students*	*In the specific tests we are conducting we are covering a very small area and pumping a tiny amount of water, when compared with the sea water under the sea ice. If and when this method was scaled to larger areas, a way to think about this, is that we would pump enough water to recreate the ice thickness that already existed a few decades ago - in practice we would pump perhaps 1 or 2 ft of sea water on top of ice, where we have hundreds if not thousands of ft of sea water underneath.* *{please see section at the bottom of this table for tracker}*

Community hypotheses tracker for 2026 testing

The following are questions from stakeholders that Real Ice will actively track and report on to the community for additional feedback:

1. Does the thicker ice created by pumping last longer in the summer?
2. Is the new ice that we create strong?
3. How long does it take for ponds to freeze?
4. Are there seal holes in the bay? Are seals using the newly drilled holes?

Free, Prior and Informed Consent

In Nunavut, we engage fully with the formal annual renewal process through the Nunavut Planning Commission (NPC), the Nunavut Impact Review Board (NIRB), and the Nunavut Research Institute (NRI). This process ensures that our work in Cambridge Bay aligns with the regulatory frameworks respected by both local and territorial authorities, providing the community with confidence that our activities meet the appropriate Nunavut research standards.

Within the hamlet, community-level consent and support are expressed primarily through the elected leadership—namely, the Mayor, Council, HTO, and Elders. We maintain ongoing engagement with these representatives throughout the year, particularly in winter and spring, through regular formal and informal meetings and updates. These engagements allow us to explain research objectives, share results, answer questions, and listen to guidance or concerns.

Each year, as part of the formal approval and reporting cycle, the following federal, territorial, and local organisations receive copies of our NRI annual report and associated permits:

- NIRB Environmental Administrator
- NPC Senior Planner

- Kitikmeot Inuit Association (KitIA) Lands Department
- CIRNAC Lands Department (Crown-Indigenous Relations and Northern Affairs Canada)
- Mayor and Senior Administrative Officer, Cambridge Bay
- Chairperson, Cambridge Bay Hunters and Trappers Organisation (HTO)
- Nunavut Tunngavik Incorporated (NTI) Department of Research, Monitoring & Evaluation
- Nunavut Climate Change Centre

These bodies provide the foundational permissions for research activities conducted outdoors in and around Cambridge Bay.

Process of Consent and Community Engagement
Our approach to FPIC in Cambridge Bay emphasises openness, accessibility, and continuous relationship-building rather than one-time written consent. We communicate our project plans and findings through in-person community meetings, both formal and informal. For example:

- Public forums and town hall-style discussions are held at the Elders Palace and the Canadian High Arctic Research Station (CHARS). Notices are posted in public spaces, such as at the two supermarkets and in community spaces, and shared on social media to ensure broad awareness.
- Engagement through traditional leadership—the Elders, Mayor, and HTO representatives—ensures that our activities are reviewed and discussed with those most trusted by the community to represent collective interests.
- Indicators of consent are evidenced through continued participation, verbal support during meetings, and community collaboration—for instance, sharing local knowledge, providing logistical support, attending our presentations, and inviting us to participate in community events.

Consent, in this context, functions as an ongoing relationship of trust. While formal approval is renewed annually through NRI and related bodies, community permission is reaffirmed through regular, transparent engagement and dialogue with experts in the community, particularly the hunters and trappers - who are the holders of traditional knowledge of the sea ice ecosystem and the community's adaptation to reduced/delayed/thinner sea ice. Should concerns arise, the hamlet leadership or HTO could communicate these directly to us or withdraw their endorsement through established local channels, at which point research would be paused pending further discussion and resolution.

Our approach was strongly informed by early experiences in Nome, Alaska, where community members emphasised the fatigue caused by extractive research practices. We are mindful of these lessons and strive to ensure that participation in Cambridge Bay is voluntary, respectful, and grounded in local priorities.

Sustainability and Renewal of Consent
Community consent is sustained through our commitment to returning each year, sharing results, and involving local hunters and Elders in the ongoing development of the ice-thickening research. The recurring invitation to continue our work, along with tangible support from residents—such as assistance during fieldwork and warm hospitality—indicates active, informed acceptance.

We are currently developing an internal process to formalise how withdrawn consent would be recognised and addressed, ensuring that both formal permit structures and community-derived permissions remain aligned and respected. Our goal is to ensure that research in Cambridge Bay continues to advance scientific understanding while strengthening mutual trust and

collaboration with the community.

Feedback Loops

Our sustained presence in Cambridge Bay—where we maintain a multi-month base each ice season—enables regular, often daily, formal and informal dialogue with hunters, trappers, guides, Elders, teachers, and other residents. This constant presence and the active involvement of community members in our operations help us remain responsive to the community's evolving insights and needs throughout each research season.

Community Interaction and Feedback Mechanisms
Engagement occurs through multiple channels designed to support a continuous feedback loop:

- Public forums and information sessions: We hold open Q&A sessions at community halls and the Canadian High Arctic Research Station (CHARS), where residents can discuss the research, raise concerns, or offer suggestions.
- Governance meetings: We participate in briefings with the Hunters and Trappers Organisation (EHTO) Board, the local Council, and other community leadership bodies to update them and formally collect their input on the design and execution of tests.
- Day-to-day informal exchanges: Because our researchers live within the community, we are readily available in everyday settings—at the café, shops, or local offices—which encourages casual conversations that often yield valuable feedback.
- School engagement: Our team and visiting scientists conduct demonstrations and presentations for students, creating an open space for younger community members and educators to ask questions and share perspectives.
- Active involvement of community members in our research: local guides, technical operators and a number of local companies take part in our operations, from managing the logistics (receiving, storing, fixing, transporting, lending our equipment), to actively enabling and participating in daily ice thickening and measurement operations, helping us build and deploy field equipment (e.g. cofferdams, sleds, measurement tools) and driving the safety and rescue operations within CHARS and EHTO.

This embedded, responsive structure fosters trust and ensures a transparent two-way communication flow, allowing feedback to immediately inform adjustments to our operations.

Community Collaboration in Research Design
The selection of the 2024/25 research site in Cambridge Bay was a collaborative effort between members of the EHTO and our field team. Together, they identified a location that balanced Real Ice's research objectives with community priorities by ensuring:

- No interference with hunters' regular transit routes,
- Reasonable proximity to the hamlet,
- Adequate water depth for research accuracy, and
- Maintain a distance from the coastline to minimise disruption during the spring melt.

Structured and Responsive Feedback Loops

- EHTO Daily Collaboration: Hunters and guides from the EHTO work alongside our team each day, advising on weather, ice conditions, and local best practices. Their input

repeatedly shapes our day-to-day methods and data collection.

- EHTO Formal Meetings: In February 2025, our team was invited to present at an EHTO evening board meeting—an important sign of trust and community endorsement. We shared progress updates and fielded direct questions from board members. We will return in October 2025 to present our 2024/25 results and seek guidance and approval for the 2026 research season.
- Mayor and Council Engagement: Between February and June 2025, we held three direct meetings with the Mayor and Council, including a formal presentation in the council chamber. In these sessions, we shared interim findings, discussed long-term plans, and invited feedback. We will return in October 2025 to present the full results and collect any formal feedback or recommendations.

Ongoing Feedback and Responsive Action
Feedback operates as a circular and renewable process:

- Immediate comments or concerns raised during fieldwork or public meetings are addressed directly by the research leads in Cambridge Bay.
- Formal updates are provided at fixed intervals (winter, spring, and post-season) to all key bodies, including EHTO and the Hamlet Council.
- Adjustments to our research methods or sites are discussed publicly, ensuring transparency and reaffirming local consent.
- If substantial concerns were raised, the same local channels—EHTO, Mayor, or Council—would serve as the formal routes for dialogue and potential recalibration of our activities.

This multi-layered feedback loop—daily, seasonal, and annual—ensures that our work remains community-driven, inclusive, and adaptive to local perspectives.

Contributions to the local economy in Cambridge Bay

Employment
Real Ice contracted with EHTO for four Inuit research participants. These Inuit acted as guides and as collaborators/research participants for the daily operations out on the ice. During the melt season, these Inuit research participants assisted us with monitoring and measuring the ice thickness.

Equipment & Facilities: We rented vehicles for the extended periods of the winter and spring (trucks, snowmobiles and an ATV) from local outfitters. We rented a venue (The Elders Palace in Cambridge Bay) twice to host our community consultations. We used the local hardware shop (Kitikmeot Supplies) for equipment purchases.

Travel and Food: Over the course of winter & spring 2024/25, 23 individuals travelled to Cambridge Bay to participate in the Real Ice field study, including scientists from the University of Cambridge, the University of Washington, Arizona State University and the University of Oslo. In addition, 3 film crews and 2 journalists made the journey to Cambridge Bay to spend time

with the project and with the local community. We shopped in the local supermarkets and ate at the local cafe throughout our stays.

Economics Summary

In total, the Real Ice T2 & T3 projects have resulted in spending of over C$250,000 on services and supplies in Cambridge Bay, the majority of which was spent during the winter months when tourism and visitor numbers are at their lowest in the hamlet.

Progress with Community Engagement:

Winter 2025/26

Permissioning Status for research period Jan 2026 - Jul 2026 (T4)

Approvals required: 4
Approvals secured up to 20 November 2025: 4

15 August 2025 Nunavut Planning Commission
3rd year of the multi-year **license confirmed** {ends Dec 2026}
File # 150891, Associated NIRB File No.: 23YN044

27 August 2025 Nunavut Research Institute
3rd year of the multi-year **license confirmed** {ends Dec 2026}
License#: 04 001 26R-M

04 September 2025: Canadian High Arctic Research Station
3-year research support **agreement signed** {2026-2028}

6th November 2025: EHTO support letter **signed** covering the period (Jan-Jun 2026)

POLAR Knowledge/ CHARS research support & collaboration

In 2024 and 2025, Real Ice's research activities benefited from both in-kind and direct financial support from the Canadian High Arctic Research Station (CHARS), including accommodations, laboratory access, and fees for local guides. However, due to recent budget constraints within POLAR Knowledge Canada, CHARS will no longer be able to provide such support moving forward. Consequently, Real Ice will transition to covering costs independently, paying negotiated fees for CHARS accommodation and workshop access each winter, and engaging local guides through direct contracts with the Ekaluktutiak Hunters and Trappers Organisation (EHTO).

A three-year research support partnership, established through a negotiated agreement in September 2025 with POLAR/CHARS, now secures Real Ice access to CHARS facilities for the duration of the RASI field test program without the need to reapply annually. This agreement also promotes multi-year collaboration opportunities with other POLAR programs. It provides discounted rates for essential equipment, such as snowmobiles, further supporting the continuity and effectiveness of Real Ice's Arctic research operations.

Community Engagement Plans Winter 2025/6

Building on the trust relationships developed with local hunters and trappers, Indigenous leaders, and Elders, Real Ice will prioritise several core components of community engagement in the coming year:

Recognition of Indigenous Knowledge (Protocol 2).
Traditional knowledge is fundamental to the preservation of sea ice ecosystems. Real Ice will collaborate closely with EHTO and other community members throughout the winter and spring, drawing on their expertise to both guide operations safely across the ice and actively participate in ice thickening research design & operations. By foregrounding the contributions of Indigenous knowledge holders, the research aims to deepen understanding of local ecological dynamics and ensure that the value of traditional perspectives is made explicit within project outcomes.

Continued Elder Engagement (Protocol 2)**.**
Regular briefings for Elders at the Heritage Centre will continue, reaffirming the project's commitment to inclusive participation and the transmission of knowledge across generations. These briefings, which have been very well received, provide an essential forum for sharing findings, gaining guidance, and honouring the perspectives of community Elders.

Communication with Intent (Protocol 4).
A series of public meetings will be held in Cambridge Bay's community spaces and with the hamlet's civil leadership to present findings from the previous year's study and to facilitate open discussion about ongoing research. These sessions will be documented to capture feedback, questions, and insights from community members and leaders, ensuring that the project remains transparent and responsive to local input. We will not collect data outside of the direct scope of the Real Ice project.

Building Meaningful Partnerships (Protocol 6).
Real Ice seeks to strengthen existing collaborations by contracting directly with EHTO as full research team members and guides for the coming winter. Through these embedded research team members from EHTO, we seek to enhance partnership both individually and collectively with those who serve as stewards of Inuit hunting traditions. Additionally, Real Ice has commissioned, from one of the members of EHTO, three custom sleds to be built for field operations this coming winter. These were co-designed with this team member. Further, the partnership with Kiilinik High School will be deepened through outreach activities such as an art competition, site visits, and presentations by visiting scientists.

Planned Activities

Real Ice has a track record of holding multiple community events in Cambridge Bay each winter & spring. **We are committed to holding a similar number of events in 2026.**

Project

Date	Individual/ Group	Real Ice contributors	Topic	Targeted Outcome	Protocol
Oct-Dec' 25	[Name redacted]	Arctic Operations	Sled design	Collaborative design for sleds for winter '26 research	1,2,6,8
Nov '25	EHTO	Simon Woods & remote support where feasible	Briefing Q&A on '24/'25 results	Provide copy of the results of last winter's testing. Respond to questions. Document Q&A **{Completed}**	1,2,6
Nov '25	EHTO	Simon Woods & remote support where feasible	Briefing & discussion on '26 plan	Solicit feedback on coming winter's technical and engagement plan. Document Q&A. **{Completed}** Discuss and agree terms for team participation of EHTO members **{Completed}**	1,2,3,6,8
Jan-Jun' 26	EHTO	On site team	Continuous learning	Daily collaboration out on the ice with EHTO members as fully participating team members bringing their traditional knowledge to the research, in addition to guiding the team across the ice.	1,2,3,4,5,6

Wider Community in Cambridge Bay

Date	Individual/ Group	Real Ice contributors	Topic	Targeted Outcome	Protocol
Nov '25	Mayor of Cambridge Bay	Simon Woods	Briefing on R&D and community engagement plans for '26	Solicit feedback on coming winter's engagement plans. Document Q&A **{Completed}**	1,2,3,4,5,6
Jan '26	Community at Large	On site teams	Community Feedback at Elders Palace	Present the project and its history in Cambridge Bay. Ask our indigenous partners to be part of those presentations. Solicit Q&A both in the meeting and in the informal gathering around tea & cake afterwards	1,2,3,4,5,7
Feb '26	School Students	On site teams	Youth understanding of the Real Ice research	Hold an art competition to portray the Real Ice research at the Secondary School with art supplies prizes for the school and the student.	1,4,6

Feb ‘26	Mayor, council members and community at large	On site teams	Information on the research captured as audio	Audio interviews/discussion when members of the Council and the Mayor visit the Real Ice research site. Package up in podcast format. The Mayor has agreed to broadcast these materials on the local radio.	1,2,4,6
Mar ‘26	Community at Large	On site teams	Community Feedback at Elders Palace	Present the project with an update on progress for winter ‘26. Recap the history of the project in Cambridge Bay. Ask our indigenous partners to be part of those presentations. Solicit Q&A both in the meeting and in the informal gathering around tea & cake afterwards	1,2,3,4,5,7
Jan - Jun ‘26	Secondary School Students	On site teams	Presentations by visiting scientists	Scientists joining the Real Ice research present their areas of expertise/interest to classes at the Secondary School and answer questions from the children.	1,4,6

Unfunded But Potentially Impactful Additional Scope

Date	Individual/ Group	Real Ice contributors	Topic	Targeted Outcome	Protocol
Jan - Jun ‘26	Cambridge Bay Elders and EHTO	On site teams + professional videographers	Ice history	Continue to document the history of the sea ice in Cambridge Bay as told on video by the Elders, at the Heritage Center. The documentary to be owned by the community. Take additional footage of the Real Ice work in order to produce a short documentary explaining the research, the rationale behind the research and the collaboration with the local community that makes it possible.	1,2,6

Next Steps and Gaps

While Real Ice has demonstrated positive intent and compliance with Inuit engagement protocols, gaps remain in co-development, data sharing and ownership, Inuit-led governance, and long-term capacity-building.

We place the highest priority on adhering to formal permitting requirements together with consistent alignment of our engagement activities with the principles outlined in the Protocol. Our approach has been grounded in grassroots collaboration, built through direct dialogue with local communities, fostering partnerships, and conducting work jointly.

We commit to keeping the ARIA team updated on project level engagement planning, activities, inputs and feedback.

Looking ahead, we recognise the need to deepen engagement with senior levels of Inuit and Canadian national institutions to advance the broader guiding protocols for this type of research in Canada, which will become increasingly significant as we operate within the ARIA/RASi program framework. We request that ARIA engage with organisations such as ECCC, ICC and ITK through its British Government connections.

Additional resources would strengthen our capacity to employ Inuit advisors, translators, and trainers, while also providing essential support for governance structures and monitoring mechanisms. ARIA's facilitation with both national and supra-national Inuit organisations would further enable alignment with all eight protocols, ensuring that future work is genuinely Inuit-led and co-developed.

APPENDIX A

Research Permitting Organisations for Cambridge Bay, Nunavut

- **Nunavut Planning Commission (NPC)**
  The NPC is responsible for the development, implementation and monitoring of land use plans that guide and direct resource use and development in the Nunavut Settlement Area.
- **Nunavut Impact Review Board (NIRB)**
  The Nunavut Impact Review Board (NIRB) is an institution of public government created by the Nunavut Agreement (NA) to assess the potential impacts of proposed development in the Nunavut Settlement Area prior to approval of the required project authorisations. Using both traditional knowledge and recognised scientific methods, the NIRB assesses the potential biophysical and socio-economic impact of proposals and will make recommendations and decisions about which projects may proceed. The Board may also establish monitoring programs for projects that have been assessed and approved to proceed.
- **Nunavut Research Institute (NRI)**
  The Nunavut Research Institute is a Division of Nunavut Arctic College (NAC) and is responsible for administering the Scientists Act, which applies across the entire territory of Nunavut. The Act requires that anyone conducting research in the health, social sciences, or natural/physical sciences disciplines must first obtain a license from the NRI.
- **Ekaluktutiak Hunters and Trappers Organisation (EHTO)**
  The EHTO manages sustainable harvesting, oversees wildlife management, and creates economic development opportunities. It primarily focuses on regulating hunting and trapping practices to ensure the long-term health of wildlife and benefit the local Cambridge Bay Inuit community. HTOs are non-government organisations that play a crucial role in representing Nunavut Inuit residents in these areas.
- **Polar Knowledge, Canadian High Arctic Research Station (CHARS)** A state-of-the-art research facility located in the vibrant Canadian Arctic community of Cambridge Bay, Nunavut. The Canadian High Arctic Research Station (CHARS) operated by Polar Knowledge Canada, has been designed and built to optimise innovation in Arctic science and technology, to welcome visitors, and to provide researchers with the accommodation and technical services they need. It's an innovative facility that can support a wide range of research needs – from ecosystem monitoring to DNA analysis – and where Indigenous Knowledge is recognised as fundamentally necessary to the co-creation of new knowledge.

Advanced Research + Invention Agency ARIA

Annex 4: Real Ice - Nunavut Impact Review Board's screening report

SCREENING DECISION REPORT
NIRB FILE No.: 23YN044

NPC File No.: 150112

October 31, 2023

Following the Nunavut Impact Review Board's (NIRB or Board) assessment of all materials provided, the NIRB is recommending that a review of the screen Real Ice Development Company Limited's (Real Ice) "Real Ice-November Field Test in Cambridge Bay, Canada" is not required pursuant to Article 12, Section 12.4.4(a) of the *Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada* (*Nunavut Agreement*) and s. 92(1)(a) of the *Nunavut Planning and Project Assessment Act*, S.C. 2013, c. 14, s. 2 (*NuPPAA*).

Subject to the Proponent's compliance with the terms and conditions as set out in below, the NIRB is of the view that the project proposal is not likely to cause significant public concerns, and it is unlikely to result in significant adverse environmental and social impacts. The NIRB therefore recommends that the responsible Minister accepts this Screening Decision Report.

OUTLINE OF SCREENING DECISION REPORT

REGULATORY FRAMEWORK 2
PROJECT OVERVIEW & THE NIRB ASSESSMENT PROCESS 3
ASSESSMENT OF THE PROJECT PROPOSAL IN ACCORDANCE WITH PART 3 OF *NUPPAA* 5
VIEWS OF THE BOARD 6
RECOMMENDED PROJECT-SPECIFIC TERMS AND CONDITIONS 9
OTHER NIRB CONCERNS AND RECOMMENDATIONS 12
CONCLUSION 12

APPENDICES

APPENDIX A: SPECIES AT RISK IN NUNAVUT 13

REGULATORY FRAMEWORK

The primary objectives of the NIRB are set out in Article 12, Section 12.2.5 of the *Nunavut Agreement* and are confirmed by s. 23 of the *NuPPAA*:

> *Nunavut Agreement*, Article 12, Section 12.2.5: In carrying out its functions, the primary objectives of NIRB shall be, at all times to protect and promote the existing and future well-being of the residents and communities of the Nunavut Settlement Area, and to protect the ecosystemic integrity of the Nunavut Settlement Area. NIRB shall take into account the well-being of the residents of Canada outside the Nunavut Settlement Area.

The purpose of screening is provided for under Article 12, Section 12.4.1 of the *Nunavut Agreement* and s. 88 of the *NuPPAA* which states:

> *NuPPAA*, s. 88: The purpose of screening a project is to determine whether the project has the potential to result in significant ecosystemic or socio-economic impacts and, accordingly, whether it requires a review by the Board…

To determine whether a review of a project is required, the NIRB is guided by the considerations as set out under Article 12, Section12.4.2(a) and (b) of the *Nunavut Agreement* and s. 89(1) of *NuPPAA* which states:

> *NuPPAA*, s. 89(1): The Board must be guided by the following considerations when it is called on to determine, on the completion of a screening, whether a review of the project is required:
>
> (a) a review is required if, in the Board's opinion,
>
> i. the project may have significant adverse ecosystemic or socio-economic impacts or significant adverse impacts on wildlife habitat or Inuit harvest activities,
> ii. the project will cause significant public concern, or
> iii. the project involves technological innovations, the effects of which are unknown; and
>
> (b) a review is not required if, in the Board's opinion,
>
> i. the project is unlikely to cause significant public concern, and
> ii. its adverse ecosystemic and socioeconomic impacts are unlikely to be significant or are highly predictable and can be adequately mitigated by known technologies.

It is noted that under Article 12, Section 12.4.2(c) and s. 89(2) of the *NuPPAA* that the considerations set out in s.89(1)(a) prevail over the considerations set out in s. 89(1)(b) of the *NuPPAA.*

As set out under Article 12, Section 12.4.4 of the *Nunavut Agreement* and s. 92(1) of the *NuPPAA,* upon conclusion of the screening process, the Board must provide its written report to the Minister. The contents of the NIRB's report are specified under *NuPPAA*:

NuPPAA, s. 92(1): The Board must submit a written report to the responsible Minister containing a description of the project that specifies its scope and indicating that:

(a) a review of the project is not required;

(b) a review of the project is required; or

(c) the project should be modified or abandoned.

Where the NIRB determines that a project may be carried out without a review, the NIRB has the discretion to recommend specific terms and conditions to be attached to any approval of the project proposal pursuant to paragraph 92(2)(a) of *NuPPAA* as follows:

NuPPAA, s. 92(2) In its report, the Board may also

(a) recommend specific terms and conditions to apply in respect of a project that it determines may be carried out without a review.

PROJECT OVERVIEW & THE NIRB ASSESSMENT PROCESS

1. Project Referral

On July 5, 2023, the NIRB received a referral to screen Real Ice Development Company Limited's (Real Ice) "Real Ice-November Field Test in Cambridge Bay, Canada" project proposal from the Nunavut Planning Commission (Commission), which noted that the project proposal is outside the area of an applicable regional land use plan. Pursuant to Article 12, Sections 12.4.1 and 12.4.4 of the *Nunavut Agreemen*t and s. 87 of the *NuPPAA*, the NIRB commenced screening this project proposal and assigned it file number **23YN044**.

All documents received and pertaining to this project proposal can be accessed from the NIRB's online Public Registry at www.nirb.ca/project/125838.

2. Screening Process Timelines

The following key stages were completed for the screening process:

Date	Stage
July 5, 2023	Receipt of project proposal and referral from the Commission.
July 5, 2023	Request to complete public registry online and provide information pursuant to s. 144(1) of the *NuPPAA*
September 14, 2023	Receipt of online application from Proponent
September 23, 2023	Scoping pursuant to s. 86(1) of the *NuPPAA*
October 13, 2023	Public engagement and comment request
October 24, 2023	Receipt of public comments
October 31, 2023	Issuance of Screening Decision Report

3. Project Scope

Project:	Real Ice-November Field Test in Cambridge Bay, Canada				
Region:	Kitikmeot				
Location:	Cambridge Bay				
Closest Community:	Cambridge Bay	**Distance (approximate)**	Within 10 kilometres (km)	**Direction**	South
Summary of Project Description:	The Proponent intends to pump ocean water on top of forming ice to determine if this will increase ice formation.				
Project Proposed Timeline:	November 2023				

As required under s. 86(1) of the *NuPPAA*, the Board accepts the scope of the project as set out by the Real Ice in the proposal. The scope of the project proposal includes the following undertakings, works, or activities:

- Use of a hydrogen fuel cell powered pump to pump seawater on top of sea ice over an area of approximately 1 hectare;
- Monitoring of ice thickness; and
- Use of snowmobiles to access test site

4. Inclusion or Exclusion to Scoping List

The NIRB has identified no additional works or activities in relation to the project proposal. As a result, the NIRB proceeded with screening the project based on the scope as described above.

5. Public Comments and Concerns

Notice regarding the NIRB's screening of this project proposal was distributed on October 13, 2023, to community organizations in Cambridge Bay, as well as to relevant federal and territorial government agencies, Inuit organizations, and other parties. The NIRB requested that interested parties review the proposal and the NIRB's proposed project-specific terms and conditions, and provide the Board with any comments or concerns by October 23, 2023, regarding:

- Whether the project proposal is likely to arouse significant public concern; and if so, why;
- Whether the project proposal is likely to cause significant adverse eco-systemic or socio-economic effects; and if so, why;
- Whether the project proposal is likely to cause significant adverse impacts on wildlife habitat or Inuit harvest activities; and if so, why;
- Whether the project proposal is of a type where the potential adverse effects are highly predictable and mitigable with known technology, (and providing any recommended mitigation measures); and
- Any matter of importance to the Party related to the project proposal.

On or before October 24, 2023, the NIRB received comments from the following interested parties:

- **Crown-Indigenous Relations and Northern Affairs Canada**
- **Transport Canada**

a. Summary of Public Comments and Concerns Received during the Public comment period of this file.

The following provides a summary of the comments and concerns received by the NIRB:

- **Crown-Indigenous Relations and Northern Affairs Canada**
  - Recommended standard terms and conditions regarding refueling of snowmobiles.
  - Recommended standard terms and conditions regarding consultation.
  - Recommended Proponent clarify potential impacts on water quality.
  - Recommended Proponent provide further information on hydrogen fuel used by the pump.

- **Transport Canada**
  - No comments.

b. Comments and Concerns with respect to Inuit Qaujimaningit and Traditional and Community Knowledge

No concerns or comments were received with respect to Inuit Qaujimaningit and traditional and community knowledge in relation to the proposed project. However, Inuit Qaujimaningit and traditional and community knowledge is incorporated into the terms and conditions recommended below based on information collected from prior and similar projects, data collected and mapped by the Commission, and other available sources.

ASSESSMENT OF THE PROJECT PROPOSAL IN ACCORDANCE WITH PART 3 OF *NUPPAA*

In deciding whether a review of the project is required, the Board considered whether the project proposal may result in significant ecosystemic or social impacts. As per s. 90 of the NuPPAA, the Board completed its assessment and determined significance of impacts considering Inuit Qaujimaningit as well as traditional and community knowledge.

The following is a summary of the Board's assessment of the factors that inform the determination of significant impacts with respect of this project proposal:

Factor	Comment
The size of the geographic area, including the size of wildlife habitats, likely to be affected by the impacts.	▪ The physical footprint of the proposed project components will cover approximately 1 hectare on the sea ice within 20 kilometers of Cambridge Bay. ▪ The proposed project would take place within habitats of far-ranging wildlife species such as migratory and non-migratory birds, Arctic fox, Arctic hare and Species at Risk.

Factor	Comment
The ecosystemic sensitivity of that area.	▪ No specific areas of ecosystemic sensitivity have been identified by the Proponent within the physical footprint of the proposed project.
The historical, cultural and archaeological significance of that area.	▪ No specific areas of historical, cultural and archaeological significance have been identified by the Proponent within the physical footprint of the proposed project. As the project activities will be carried out on the sea ice, impacts are highly unlikely.
The size of the human and the animal populations likely to be affected by the impacts.	▪ The proposed project is unlikely to result in impacts to local human and animal populations.
The nature, magnitude and complexity of the impacts; the probability of the impacts occurring; the frequency and duration of the impacts; and the reversibility or irreversibility of the impacts.	▪ A zone of influence of up to 10 km from the most potentially disruptive project activities was selected for the NIRB's assessment. ▪ With adherence to the relevant regulatory requirements and application of the mitigation measures recommended by the NIRB, no significant residual effects are expected to occur.
The cumulative impacts that could result from the impacts of the project combined with those of any other project that has been carried out, is being carried out or is likely to be carried out.	▪ The NIRB has not identified any past, present, and reasonably foreseeable projects at this time; however, the mitigation measures recommended by the NIRB have been designed to reduce cumulative effects should projects occur in the area in the future.
Any other factor that the Board considers relevant to the assessment of the significance of impacts.	▪ No other relevant factors were identified.

VIEWS OF THE BOARD

Based on the information in the previous section, the NIRB has identified several concerns and provides the following views about whether or not the proposed project may result in significant impacts. Additionally, the NIRB proposes terms and conditions that would mitigate the potential adverse impacts identified.

The NIRB has also listed specific Acts and Regulations that may be applicable to the project proposal, but these should not be considered as a complete list and the Proponent is responsible to ensure that it follows all Acts and Regulations that may be applicable to the project proposal.

Ecosystem, wildlife habitat and Inuit harvesting activities:

Valued Component	Wildlife such as caribou, muskox, migratory and non-migratory birds, Arctic fox, Arctic hare and Species at Risk.
Potential effects:	Potential adverse effects to muskox, migratory and non-migratory birds, Arctic fox, Arctic hare and Species at Risk from noise and visual disturbance generated from the daily transportation of personnel via snowmobile to the proposed research sites, research activities, and use of drones.
Nature of Impacts:	The probability of impacts occurring is considered to be low in magnitude, infrequent in occurrence, and reversible.
Mitigating Factors:	The proposed project is located on sea ice in the vicinity of Cambridge Bay with minimal physical footprint in areas regularly travelled by residents. Therefore, the proposed project is unlikely to result in impacts on local human and animal populations.
Proposed Terms and Conditions:	Water Courses/Water Bodies – 6 and 7 Waste Management – 8 and 9 Wildlife General – 18 through 20 Caribou and Muskoxen Disturbance – 21 through 23 Land Use and Restoration of Disturbed Areas – 25 through 29
Related Acts and/or Regulations:	1. The *Species at Risk Act* (http://laws-lois.justice.gc.ca/eng/acts/S-15.3/index.html). Attached in **Appendix A** is a list of Species at Risk in Nunavut. 2. The *Wildlife Act (Nunavut)* and its corresponding regulations (http://www.canlii.org/en/nu/laws/stat/snu-2003-c-26/latest/snu-2003-c-26.html).

Valued Component	Potential negative impacts to water quality
Potential effects:	There is potential for negative impacts to water quality due to snowmobile travel and research activities carried out on the sea ice.
Nature of Impacts:	The probability of impacts occurring is considered to be low in magnitude, infrequent in occurrence, and reversible.
Mitigating Factors:	The proposed project is located in the vicinity of Cambridge Bay with minimal activities and physical footprint in areas regularly travelled by residents. The water pumping activities are unlikely to have long-term negative effects.
Proposed Terms and Conditions:	Water Courses/Water Bodies – 6 and 7 Waste Management: 8 and 9 Fuel and Chemical Storage: 10 through 17
Related Acts and/or Regulations:	The *Nunavut Act* (http://laws-lois.justice.gc.ca/eng/acts/N-28.6/).

Valued Component	Potential adverse affects to public and traditional land use activities in the area from the research activities.
Potential effects:	No specific concerns or impacts to public and traditional land use activities in the area have been identified, however, the Board is

	recommending terms and conditions to ensure project activities are informed by available Inuit Qaujimaningit and that project activities do not interfere with Inuit wildlife harvesting or traditional land use activities.
Nature of Impacts:	
Mitigating Factors:	The proposed project is located in the vicinity of Cambridge Bay with minimal activities and physical footprint. Therefore, the proposed project is unlikely to result in impacts on local human and animal populations.
Proposed Terms and Conditions:	Other: 30 and 31
Related Acts and/or Regulations:	1. The *Nunavut Act* (http://laws-lois.justice.gc.ca/eng/acts/N-28.6/).

Socio-economic effects on northerners:

Valued Component	Local Economic Benefits
Potential effects:	The Proponent will be based out of Cambridge Bay and may provide positive economic effects through local purchasing, hiring locals, and use of accommodations.
Nature of Impacts:	The potential for impacts is considered positive to Cambridge Bay.
Mitigating Factors:	N/A
Proposed Terms and Conditions:	Other – 32
Related Acts and/or Regulations:	N/A

Significant public concern:

Valued Component	Public concern
Potential effects:	No significant public concern was expressed during the public commenting period for this file; however, the Board is recommending terms and conditions to ensure that to the extent possible hire local people and access local services where possible, and to ensure planned activities in the area utilizes available Inuit Qaujimaningit.
Nature of Impacts:	The potential for impacts is considered to be minimal as long as the Proponent follow the recommended terms and conditions.
Mitigating Factors:	Recommended terms and conditions
Proposed Terms and Conditions:	Other – 30 and 31
Related Acts and/or Regulations:	N/A

Technological innovations for which the effects are unknown:

- No specific issues have been identified associated with this project proposal.

Administrative Conditions:

Responsible authorities or the Proponent shall notify the Nunavut Planning Commission and the NIRB of any changes in operating plans or conditions, including phase advancement, associated with this project prior to any such change.

To encourage compliance with applicable regulatory requirements and assist the Board and responsible authorities with compliance and effects monitoring for project activities, the following project-specific terms and conditions have been recommended: 1-5.

In considering the above factors and subject to the Proponent's compliance with the terms and conditions necessary to mitigate against the potential adverse environmental and social effects, the Board is of the view that the proposed project is unlikely to cause significant public concern and its adverse ecosystemic and socioeconomic impacts are unlikely to be significant or are highly predictable and can be adequately mitigated by known technologies.

RECOMMENDED PROJECT-SPECIFIC TERMS AND CONDITIONS

The Board is recommending the following specific terms and conditions to apply in respect of the project:

General

1. Real Ice Development Company Limited (the Proponent) shall maintain a copy of the Project Terms and Conditions at the site of operation at all times and make it accessible to enforcement officers upon request.
2. The Proponent shall operate in accordance with all commitments stated in correspondence provided to the Nunavut Planning Commission (NPC File No.: 150112), and the NIRB (Online Application Form, September 14, 2023). This information should be accessible to enforcement officers upon request.
3. The Proponent shall operate the site in accordance with all applicable Acts, Regulations and Guidelines.
4. The Proponent shall ensure that it meets the standards and/or limits as set out in the authorizing agencies' permits or licences as required for this project.
5. The Proponent shall ensure that all personnel, staff and contractors are adequately trained prior to commencement of all project activities, and shall be made aware of all operational plans, management plans, guidelines and Proponent commitments relating to the project.

Water courses/Water bodies (including fresh and marine waters)

6. The Proponent shall ensure that water extraction from any fish-bearing waterbody is done with appropriate care and caution.
7. The Proponent shall not deposit, nor permit the deposit of any fuel, chemicals, wastes (including wastewater) or sediment into any water body. The Proponent should have in place an Emergency Spill Response Plan that is approved by the appropriate authorizing agency(ies).

Waste Management

8. The Proponent shall manage all hazardous and non-hazardous waste including food, domestic wastes, debris and petroleum-based chemicals (e.g., greases, gasoline, glycol-based antifreeze) in such a manner to avoid release into the environment and access to wildlife at all times until disposed of appropriately or at an approved facility.
9. The Proponent shall dispose of all combustible wastes as required by the appropriate authorizing agencies. All non-combustible wastes from the project site shall be removed to an approved facility for disposal.

Fuel and Chemical Storage

10. The Proponent shall locate all fuel and other hazardous materials a minimum distance away from the high-water mark of any water body and environmentally sensitive areas as required by the appropriate authorizing agencies. The materials shall be stored in such a manner as to prevent their release into the environment.
11. The Proponent shall use adequate secondary containment or a surface liner (e.g., self-supporting insta-berms and fold-a-tanks) when storing barreled fuel and chemicals at all locations.
12. The Proponent shall ensure that re-fuelling of all equipment occurs a minimum distance away from the high-water mark of any water body as required by the appropriate authorizing agencies.
13. All fuel and chemical storage containers must be clearly marked with the Proponent's name for ease of identification.
14. The Proponent shall have a Spill Contingency Plan in place at all fuel storage or transfer locations and shall ensure that appropriate spill response equipment and clean-up materials (e.g., shovels, pumps, barrels, drip pans, and absorbents) are readily available.
15. The Proponent shall follow the authorizing agencies' direction for management and removal of hazardous materials and wastes (e.g., contaminated soils, sediment and waste oil).
16. The Proponent shall ensure that wildlife deterrent systems are utilized at the time of a spill incident in order to avoid wildlife (terrestrial or marine) and migratory birds from being contaminated.
17. The Proponent shall ensure that all spills of fuel or other deleterious materials of 100 litres or more must be reported immediately to the 24-hour Spill Line at (867) 920-8130.

Wildlife – General

18. The Proponent shall not substantially alter or damage or destroy any wildlife habitat in conducting this operation unless otherwise authorized by the appropriate authorizing agencies.
19. The Proponent shall not chase, weary, harass or molest wildlife. This includes persistently circling, chasing, hovering over, pursuing or in any other way harass wildlife, or disturbing large groups of animals.
20. The Proponent shall not hunt or fish, unless proper Nunavut authorizations have been acquired.

Caribou and Muskoxen Disturbance

21. The Proponent shall avoid interfering with any paths or crossings known to be frequented by caribou during periods of migration as identified by current land use plans in place and/or by Inuit Qaujimaningit.
22. The Proponent shall not locate any operation or undertake activities that could block or cause any diversion to migration of caribou or muskoxen.
23. The Proponent shall immediately cease activities likely to interfere with the migration or calving of caribou or muskoxen until such time as the caribou or muskox have passed.

Road and Ground Disturbance

24. The Proponent shall not move any equipment or vehicles without prior testing the thickness of the ice to ensure the ice is in a state capable of fully supporting the equipment or vehicles.

Land Use and Restoration of Disturbed Areas

25. The Proponent shall remove all garbage, fuel and equipment at the end of each field season and/or upon completion of work and/or upon abandonment.
26. The Proponent shall ensure that all disturbed areas are restored to a stable or pre-disturbed state using Best Available Technology Economically Achievable (BATEA) upon completion of work and/or abandonment.
27. The Proponent shall suspend all project activities should any dead fish or wildlife (both marine and terrestrial), or any injured wildlife be observed during any works or activities in and around the marine waters. Activities may only be resumed on the recommendation of the authorizing agencies.
28. The Proponent shall report all incidents, injuries or sightings of marine mammals to the appropriate authorizing agencies.
29. The Proponent shall implement measures designed to minimize disturbance to seabed sediments and benthic communities and marine wildlife when carrying out project activities within the marine environment.

Other

30. The Proponent should engage with local residents regarding planned activities in the area and should solicit available Inuit Qaujimaningit and information regarding current recreational and traditional usage of the project area which may inform project activities. Posting of translated public notices and direct engagement with potentially interested groups and individuals prior to undertaking project activities is strongly encouraged.
31. The Proponent shall ensure that project activities do not interfere with Inuit wildlife harvesting or traditional land use activities.
32. The Proponent should, to the extent possible, hire local people and access local services where possible.

OTHER NIRB CONCERNS AND RECOMMENDATIONS

In addition to the project-specific terms and conditions, the Board is recommending the following:

Copy of licences, etc. to the Board and Commission

1. The NIRB respectfully requests that responsible authorities submit a copy of each licence, permit or other authorization issued for the Project to the NIRB to assist in enabling possible project monitoring that may be required. Please forward a copy of the licences, permits and/or other authorizations to the NIRB directly at info@nirb.ca or upload a copy to the NIRB's online registry at www.nirb.ca.

Use of Inuit Qaujimaningit

2. The Proponent is encouraged to work with local communities and knowledge holders to inform project design, to carry out the project, and to confirm or validate the perspectives represented in publications produced as part of the project. Care should be taken to ensure that Inuit Qaujimaningit and local knowledge collected for the project is used with permission and is accurately represented.

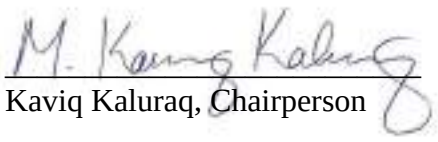
Species at Risk

3. The Proponent review Environment and Climate Change Canada's "Environment Assessment Best Practice Guide for Wildlife at Risk in Canada", available at the following link: http://www.sararegistry.gc.ca/virtual_sara/files/policies/EA%20Best%20Practices%202004.pdf. The guide provides information to the Proponent on what is required when Wildlife at Risk, including *Species at Risk*, are encountered or affected by the project.

CONCLUSION

The foregoing constitutes the Board's screening decision with respect to the Real Ice Development Company Limited's (Real Ice) "Real Ice-November Field Test in Cambridge Bay, Canada". The NIRB remains available for consultation with the Minister regarding this report as necessary.

Dated October 31, 2023, at Baker Lake, NU.



Kaviq Kaluraq, Chairperson

Attachments: Appendix A: Species at Risk in Nunavut

APPENDIX A: SPECIES AT RISK IN NUNAVUT

Due to the requirements of Section 79(2) of the Species at Risk Act (SARA), and the potential for project-specific adverse effects on listed wildlife species and its critical habitat, measures should be taken as appropriate to avoid or lessen those effects, and the effects need to be monitored. Project effects could include species disturbance, attraction to operations and destruction of habitat. This section applies to all species listed on Schedule 1 of SARA, as listed in the table below, or have been assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), which may be encountered in the project area. This list may not include all species identified as at risk by the Territorial Government. The following points provide clarification on the applicability of the species outlined in the table.

- Schedule 1 is the official legal list of Species at Risk for SARA. SARA applies to all species on Schedule 1. The term "listed" species refers to species on Schedule 1.
- Schedule 2 and 3 of SARA identify species that were designated at risk by the COSEWIC prior to October 1999 and must be reassessed using revised criteria before they can be considered for addition to Schedule 1.
- Some species identified at risk by COSEWIC are "pending" addition to Schedule 1 of SARA. These species are under consideration for addition to Schedule 1, subject to further consultation or assessment.

If species at risk are encountered or affected, the primary mitigation measure should be avoidance. The Proponent should avoid contact with or disturbance to each species, its habitat and/or its residence. All direct, indirect, and cumulative effects should be considered. Refer to species status reports and other information on the species at risk Registry at http://www.sararegistry.gc.ca for information on specific species.

Monitoring should be undertaken by the Proponent to determine the effectiveness of mitigation and/or identify where further mitigation is required. As a minimum, this monitoring should include recording the locations and dates of any observations of species at risk, behaviour or actions taken by the animals when project activities were encountered, and any actions taken by the proponent to avoid contact or disturbance to the species, its habitat, and/or its residence. This information should be submitted to the appropriate regulators and organizations with management responsibility for that species, as requested.

For species primarily managed by the Territorial Government, the Territorial Government should be consulted to identify other appropriate mitigation and/or monitoring measures to minimize effects to these species from the project.

Mitigation and monitoring measures must be undertaken in a way that is consistent with applicable recovery strategies and action/management plans.

Schedules of SARA are amended on a regular basis, so it is important to check the SARA registry (www.sararegistry.gc.ca) to get the current status of a species.

Updated: September 2019

Terrestrial Species at Risk[1]	COSEWIC Designation	Schedule of SARA	Government Organization with Primary Management Responsibility[2]
Migratory Birds			
Buff-breasted Sandpiper	Special Concern	Schedule 1	Environment and Climate Change Canada (ECCC)
Common Nighthawk	Threatened	Schedule 1	ECCC
Eskimo Curlew	Endangered	Schedule 1	ECCC
Harlequin Duck	Special Concern	Schedule 1	ECCC
Harris's Sparrow	Special Concern	Schedule 1	ECCC
Horned Grebe	Special Concern	Schedule 1	ECCC
Ivory Gull	Endangered	Schedule 1	ECCC
Olive-sided Flycatcher	Threatened	Schedule 1	ECCC
Peregrine Falcon	Special Concern	Schedule 1	ECCC
Red Knot Islandica Subspecies	Special Concern	Schedule 1	ECCC
Red-necked Phalarope	Special Concern	Schedule 1	ECCC
Ross's Gull	Threatened	Schedule 1	ECCC
Rusty Blackbird	Special Concern	Schedule 1	ECCC
Short-eared Owl	Special Concern	Schedule 1	ECCC
Vegetation			
Porsild's Bryum	Threatened	Schedule 1	Government of Nunavut (GN)
Arthropods			
Transverse Lady Beetle	Special Concern	No Schedule	GN
Terrestrial Wildlife			
Caribou (Dolphin and Union Population)	Endangered	Schedule 1	GN
Caribou (Barren-ground Population)	Threatened	No Schedule	GN
Caribou (Torngat Mountains Population)	Endangered	No Schedule	GN
Grizzly Bear (Western Population)	Special Concern	Schedule 1	ECCC
Peary Caribou	Endangered	Schedule 1	GN
Polar Bear	Special Concern	Schedule 1	ECCC
Wolverine	Special Concern	Schedule 1	GN
Marine Wildlife			
Atlantic Walrus (High Arctic Population)	Special Concern	No Schedule	Fisheries and Oceans Canada (DFO)
Atlantic Walrus (Central/Low Arctic Population)	Special Concern	No Schedule	DFO
Beluga Whale (Cumberland Sound Population)	Threatened	Schedule 1	DFO
Beluga Whale (Eastern Hudson Bay Population)	Endangered	No Schedule	DFO

1 The Department of Fisheries and Oceans has responsibility for aquatic species.

2 Environment and Climate Change Canada (ECCC) has a national role to play in the conservation and recovery of Species at Risk in Canada, as well as responsibility for management of birds described in the Migratory Birds Convention Act (MBCA). Day-to-day management of terrestrial species not covered in the MBCA is the responsibility of the Territorial Government. Populations that exist in National Parks are also managed under the authority of the Parks Canada Agency.

Terrestrial Species at Risk[1]	COSEWIC Designation	Schedule of SARA	Government Organization with Primary Management Responsibility[2]
Beluga Whale (Eastern High Arctic-Baffin Bay Population)	Special Concern	No Schedule	DFO
Beluga Whale (Western Hudson Bay Population)	Special Concern	No Schedule	DFO
Fish			
Atlantic Cod (Arctic Lakes Population)	Special Concern	No Schedule	DFO
Fourhorn Sculpin (Freshwater Form)	Data Deficient	Schedule 3	DFO
Lumpfish	Threatened	No Schedule	DFO
Thorny Skate	Special Concern	No Schedule	DFO

Advanced Research + Invention Agency ARIA

Annex 5: Real Ice - Scientific research licence for experiments from the Nunavut Research Institute

Nunavut Research Institute / ᓄᓇᕗᑦ ᖃᐅᔨᓴᖅᑐᓕᕆᔨᒃᑯᑦ
959A Nunavut Dr. Iqaluit, NU X0A 3H0 phone:(867) 979-7279 email:mosha.cote@arcticcollege.ca

SCIENTIFIC RESEARCH LICENSE

LICENSE NUMBER 04 001 26R-M

ISSUED TO: Cian Sherwin
Real Ice Development Company LTD.
29 Lon Ogwen
Bangor, Gwynedd
LL57 2UD United Kingdom

TEAM MEMBERS: A.Ceccolini,A.Smith,A.Woods,S.Woods,P.M-Daguet

TITLE: Real Ice-January Field Test in Cambridge Bay, Canada

OBJECTIVES OF RESEARCH:
The project explores scientific and engineering methods to preserve and restore Arctic Sea ice, which is vital for both global climate regulation and local community life. In partnership with community members in Cambridge Bay, the research focuses on sea ice thickening using simple, zero-emission devices. The system employs a submersible pump lowered through an auger-drilled hole, drawing seawater to the surface. In the extreme cold, this water freezes rapidly, thickening the ice and flooding surface snow. This increases heat transfer between air and ice, supporting further natural growth. This will be our third Cambridge Bay field study, following the successful completion of our second in July 2025. For the 2026 season, operations will take place on a 1 km² site about 7 km from the hamlet, chosen in consultation with the local HTO and previously used during the 2024/25 trials. Approximately one-quarter of the site will be dedicated to experiments, with the remainder maintained as a control. Key data collected will include water displacement, ice thickness and salinity, and the temperatures of air, snow, and ice. Monitoring will continue until spring breakup to assess the long-term impacts of thickening operations.

TERMS & CONDITIONS:
The holder of the license will be bound by the terms and conditions of the Nunavut Impact Review Board Screening Decision Report (NIRB File #25YN033)and the Department of Culture & Heritage archaeological sites terms and conditions. These terms and conditions will form part of this license.

DATA COLLECTION IN NU:
DATES: January 10,2026 to August 1,2026
LOCATION: Bay of Iqaluktutiak

Scientific Research License 04 001 26R-M expires on December 31,2026
Issued at Iqaluit, NU on August 26,2025

PER
James Shirley
Science Advisor

SCIENTIFIC RESEARCH LICENCE

Advanced Research + Invention Agency ARIA

Annex 6: Real Ice - Letter to ECC programme team confirming completion of CEO conditions

UNIVERSITY OF CAMBRIDGE | Centre for Climate Repair

ARIA

mark.symes@aria.org.uk

7 January 2026

Dear Exploring Climate Cooling programme team,

In his decision letter for Real Ice's outdoor experiments in January-July 2026 as part of the ARIA-funded Re-thickening Arctic Sea Ice (RASI) project, ARIA's CEO asked for the following as conditions 2b(i) and 2b(ii):

That the RASI team documents and shares with local communities the following before the experiments start, in a manner that is accessible for those communities:

i. Information on their process(es) for achieving consent, for confirming continued consent, and for discerning/accepting withdrawal of consent. This information should include in particular how any dissent within the community and from Elders will be documented and handled.

ii. Information on practices related to community benefit, including the approach to co-authorship that will be followed and the approach that they will take to other forms of recognition of contributions (including, for example: instruments, guidance on experiments, and insights from Elders and others).

I am writing to confirm that Real Ice believe that they have met these conditions as follows:

On condition 2b(i): Achieving and Withdrawal of Consent

Over the 2.5 years that Real Ice has been engaged with the community at Cambridge Bay the team has looked to secure consent for research through consistent engagement locally. In total the Real Ice team has spent more than 8 months in the community over this period engaging with stakeholder groups in structured board meetings and presentations and informal Q&A and social gatherings.

These consistent interactions allow the team to check in constantly with Cambridge Bay community members on the buy-in for the Real Ice research. This has been documented by Real Ice (the Elders video they shot in May 2025 is a good example), by independent journalists (e.g. the Narwhal articles) and by the participation of members of the community at events showcasing the Real Ice research such as at the Vatican in July 2024 with Real Ice's CEO.

Real Ice has explicitly asked community members how they would know if consent is withdrawn. This is a summary of what Real Ice heard:

If the community decides that they no longer want to contribute to, participate in or host the Real Ice research in Cambridge Bay, Real Ice would receive a letter from either the Mayor and Hamlet Council or the Elders, and Hunters and Trappers Organizations (EHTO) formally asking Real Ice to leave the community. Before such a drastic occurrence (this has never happened in the memory of any community members interviewed) there would be opportunities to address whatever concerns have been raised.

Concerns would be raised directly by the community members with whom Real Ice interacts most frequently – the members of the EHTO that are out on the sea ice every day with the Real Ice team.

On condition 2b(ii): Recognition of research contributions by local community members

Real Ice is committed to recognising the contributions of their co-researchers in the Cambridge Bay community, specifically the members of EHTO that contribute to the planning, design and execution of the research out on the sea ice. Evidence of this commitment is the recently published pre-print of the 2024/5 research results in which the local community co-researchers are named: see Real Ice's recent preprint of results from 2024/25.

Yours sincerely

Professor Shaun Fitzgerald OBE FREng (Director)

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Advanced Research + Invention Agency ARIA

Annex 7: Arctic Reflections - Community engagement summary

COMMUNITY ENGAGEMENT AND PERMITTING UPDATE FOR WINTER 25'/'26 FIELD TESTS ARCTIC REFLECTIONS – NOVEMBER 14th, 2025

A. Introduction

As part of the ARIA-funded RASi project, Arctic Reflections is planning to undertake sea ice thickening field testing in coming winters in the Baffin Bay / Qikiqtani region, Nunavut, Canada. These field tests are informed by previous field tests in winter 2024 in Svalbard and in winter 2025 in Newfoundland, Canada, both of which have involved extensive cooperation and engagement with local community representatives as well as formal permit procedures.

What is new for the upcoming field test is that this is planned to take place in the Inuit self governed region of Nunavut. Arctic Reflections recognizes the vital importance of engaging Inuit communities ethically and equitably in our work, for mutual benefit. As we explore sea ice thickening as a climate intervention, we are committed to aligning our practices with the Circumpolar Inuit Protocols for Equitable and Ethical Engagement, developed by the Inuit Circumpolar Council. These protocols, such as the adherence to Free, Prior, Informed Consent (FPIC) are a foundational guide for collaboration based on respect, mutual benefit, and the recognition of Inuit sovereignty and knowledge. Note that on our website, following the feedback of an Inuit representative, we explicitly state as guidelines the 8 Inuit Qaujimajatuqangit Principles that are being used in Nunavut. Public participation is also one of the principles of the American Geophysical Union's (2024) ethical framework for climate intervention research.

Within the Canadian Arctic context, community consultation is also an integral and essential part of the permitting process. In this document, we will briefly outline our field test plans, give a status update on our community engagement so far and our plans on this going forward, and give a status update on the permitting process.

B. Field test plan 2026/2027

The field test is planned on the sea ice around Broughton Island, near Qikiqtarjuaq. This is a community of about 600 inhabitants, predominantly Inuit, and is a suitable location for a field test because it has a research center, there is operational capacity, access to a workshop (for repair and maintenance), relevant ice conditions in an area protected from the drift ice, and a generally welcoming, engaged community. The exact spot of the field test will be chosen in collaboration with the Hunters & Trappers Organization, staying away from areas where animals are known to gather.

The objective is to thicken sea ice by pumping water from underneath on top of it, within an area of at most 1 km2. Scientifically, we aim to show that this ice lasts longer and reflects more sunlight than ice that is not thickened. We plan to do most of the work in February 2026 (as well as 2027), when there is enough daylight and the sea ice is thick and safe. The work will take about 4–5 weeks each year, including setup, pumping, and cleanup. Monitoring of the ice will continue until summer, using equipment that can float and be tracked by GPS.

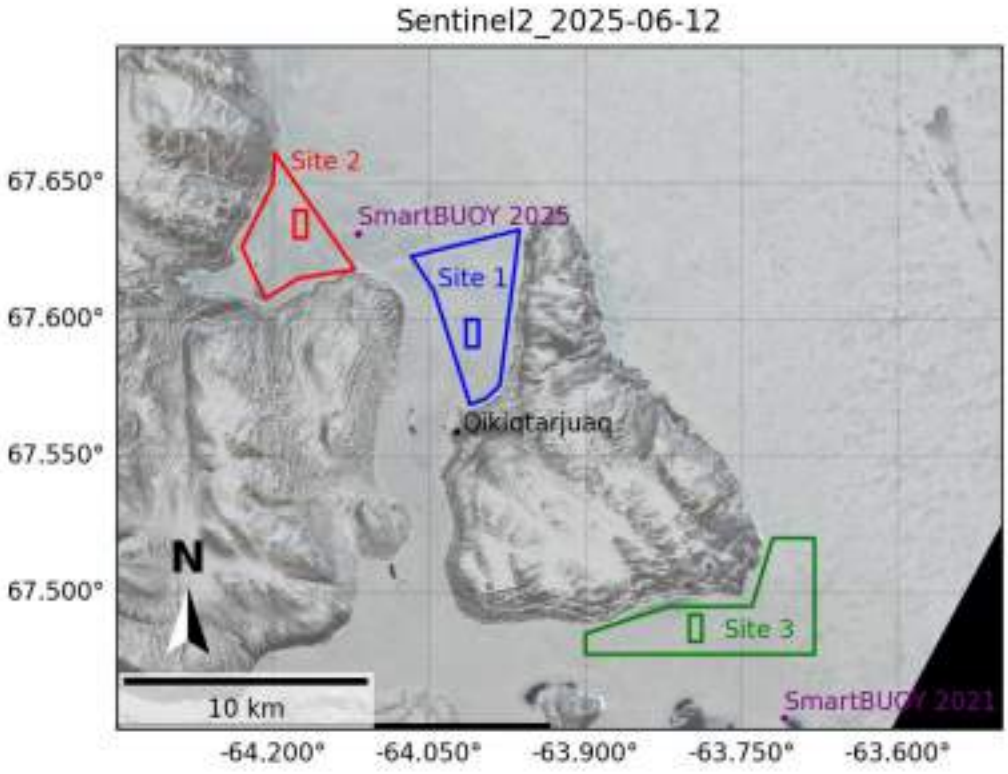

Figure 1: Overview of potential field test locations – initially we only had site 1 and site 2, after the community consultation site 3 was added

Our team (4-7 people at any one time, with the crews consisting of Arctic Reflections personnel, personnel from academic partners within the RASi projects, and local hires) will:

- Use snowmobiles and sleds to carry pumps and equipment
- Drill holes in the ice and pump seawater onto the surface
- Repeat this over an area of at most 1 km2
- Monitor ice thickness using smart sensors, weather stations, and visual checks, both of the thickened area as for non-thickened ice for comparison reasons

- Work only during the day, to avoid disturbing wildlife. All travel to and from the site will use the same marked path. Waste will be brought back each day. Refueling of snowmobiles will only happen in Qikiqtarjuaq, not on the ice. For the pumps we will only have to replace jerrycans to refuel to avoid spills.

We are committed to working closely with the Qikiqtarjuaq community. Besides hiring local wildlife monitors/guides and field ice observers during the operational phase of the field test as well as the monitoring phase, we are committed to:

- Share our results with the Qikiqtarjuaq Hunters & Trappers Organization
- Provide summaries in plain, local language and visual formats
- Visit Qikiqtarjuaq before the start of the field test for further community consultation (done) and afterwards to present findings and hear community feedback
- Have an ongoing public engagement process, planned in collaboration with the Hamlet council and the HTO Qikiqtarjuaq. We are committed to offer that this will include a school presentation, and a public event on sea ice thickening including offering soup lunch
- Co-investigate local ideas on sea ice thickening, with the local community members.
- Make our data available to Nunavut researchers and decision-makers and investigate if we can make all ice thickness data available via the Siku platform to the local community.

C. Community Consultation

After an introductory call with the Manager Research Licensing at the Nunavut Research Institute (NRI) in Iqaluit, we reached out to the Hunters & Trappers Organizations (HTOs) of 2 different communities in the Baffin Bay area, since they have an important say in (and could be affected by) field research: Pond Inlet and Qikiqtarjuaq. These are both communities with some research infrastructure and operational capacity, access to a workshop, relevant ice conditions and a generally welcoming community. Both communities are part of another field programme of RASi-participant Michel Tsamados from UCL, who has given valuable input in the context, and with him, we have identified ways about how the 2 research projects could potentially strengthen each other. Next to this, we contacted the research station in Qikiqtarjuaq from Laval University, and contacted SmartICE, a Canadian social enterprise working with Inuits from over 30 communities on ice safety and measurements.

After initial conversations, the Laval University contact person helped facilitate a digital meeting with the Qikiqtarjuaq Hunters & Trappers, in which we explained our project plans and asked for their feedback. The feedback in the meeting was very positive, which led us to start the formal permit applications, and plan for a trip to Qikiqtarjuaq in September. Next

to this, we talked to a representative of the Pond Inlet HTO, who also invited us to come give a presentation in September. We decided to combine this with broader community consultation on ice thickening and also on the ice arch project, to create synergy for ourselves and at the same time avoid overwhelming them with many different individual meetings. In the same trip, we also visited the Nunavut Trade Show in Iqaluit, to meet more local organizations, and present our approach in order to get more feedback.

Tom Meijeraan and Fonger Ypma from Arctic Reflections led the broader community consultation trip. We also invited Dr Geoff Evatt, collaborator from University of Manchester, to join us, specifically for the ice arch community consultation. Next to this, we decided to temporarily employ Ilona Mettiäinen, an environmental social scientist from the Arctic Centre of the University of Lapland with a lot of expertise in engagement and participatory research with Arctic communities (indigenous and non-indigenous) on climate interventions and climate adaptation related topics (in Greenland and Scandinavia), to assist with the community consultation and preparations.

Where When What		
Qikiqtarjuaq	8-12 September	Community consultation meetings, trust building, and field test preparation
Pond Inlet	13-16 September	Community consultation and trust building with more focus on ice arch
Iqaluit	16-18 September	Nunavut Trade Fair with opportunities to meet many relevant local Nunavut organizations and present our project

The purpose and goal of the community consultation meetings (in particular in Qikiqtarjuaq) was to ask for community consent, to fulfill the requirements of research permit applications, to receive input from the local communities regarding the potential field experiment sites and other local factors to be considered in designing the field experiments in these locations, and to ensure that the project activities are mutually beneficial as well as aligned with IQ principles and EEE principles and respect Inuit rights. Hence, we organized community consultation meetings and met other local and regional stakeholders and rightsholders and relevant authorities and policymakers at the planned host communities in Nunavut, Qikiqtarjuaq and Pond Inlet (Mittimatalik), and presented at the Iqaluit Trade Fair in September 2025. All of these communities are located in the Qikiqtaaluk or Qikiqtani Region, also known as Baffin Island.

For the purpose of this document, we will focus on the community consultation directly related to the upcoming field test in winter starting early 2026, in Qikiqtarjuaq.

Qikiqtarjuaq

The community consultation meeting in Qikiqtarjuaq took place on 10.9.2025. The meeting was organized at the research center of Laval University as an in-person meeting. Four Arctic Reflections team members were present in person. Consent to take notes was asked and granted orally by all participants by putting up hands. We had also printed consent forms just in case, but these were not needed/used after all. We had also sent out a participant information sheet beforehand to ensure FPIC – see attached document.

Altogether 13 local participants attended the meeting, of which 5 were women. This is a very good number of participants considering the smallness of the community, and a broad representation: the participants were community leaders and elders from the HTO and the Hamlet council including the Senior Administrative Officer and Mayor. Some participants had roles in both. Moreover, the representative of SmartICE and the manager of the research center (a younger Inuit woman) actively participated in the meeting. Some of the visiting scientists at the research center observed the meeting but did not actively participate.

We had prepared a presentation for introducing the project and for asking about local observations of changes in sea ice, as well as local preferences, interest and advise on testing the method in a mutually beneficial way, including in terms of the test site. After

introducing ourselves and hearing the participants introduce themselves, we continued by introducing the project including the funding source and the objectives of the project (including the intent to research climate cooling), explaining the method, and by showing videos of the earlier field experiments in Newfoundland and Svalbard. We also asked for the participants' views on the locally observed changes in sea ice. They openly discussed the observed impacts in their use of the sea ice. We presented a map of potential field experiment sites (drawn based on earlier dialogue), and the participants commented on that and suggested a new, more suitable location for the field experiments on the southern side of the island.

Moreover, it was discussed what the project would need from / in the community, and the employment opportunities in the project. The field experiments were welcomed, and we have since received a formal support letter from the Qikiqtarjuaq Hamlet. The HTO and Hamlet council will be our contact points in the community and will inform the community more widely about the project.

Both the HTO and Hamlet Council suggested ways to engage with the community in the interim (between the consultation and the actual field experiment in February 2026). The recommended channels include using the local radio channel for informing the community about the project in Inuktitut, for which we provided a translated project description, and the local Facebook group. The community also brought up their own ideas on how to improve the ice conditions locally, and we received valuable practical advice on preparing for the field experiments and who could be hired. During the meeting, two people already indicated enthusiasm to participate in the field tests.

We offered delicacies from the Netherlands and Finland and locally purchased delicacies. Hosted by the University of Laval research center, and enabled by the kelp research team, we got to taste kelp, a local delicacy. We believe this cultural exchange also helped create contacts to the local community.

The results of the meeting

Beyond gaining local acceptance and meeting the requirements of the research permit applications, the meeting was successful in a number of other ways as well.

1. The community welcomes the project and field experiment to Qikiqtarjuaq

As a key result of the meeting, the field experiments were welcomed to Qikiqtarjuaq in February 2026 by the community leaders and elders. The representative of the hamlet/municipality has signed a support letter, and the HTO has verbally indicated their support, to be formalized in their response as contact person for the NIRB permit application.

It was stated that ice thickening could be a well-liked climate change adaptation measure in the community. For instance, the locals wished that they could safely go ice fishing for longer. Hence there is a clear local demand for solutions like sea ice thickening on the community level (substantive engagement). For the avoidance of doubt, we did however make clear that they shouldn't expect any of these potential positive benefits in the near term from the research itself (which was clear to the community, since the field testing is on purpose scheduled in a remote area where limited travel takes place).

Wider applications of the ice thickening method were also discussed at the meeting, and there was one question on what the ultimate objective of the research was, to which we have answered that we are researching whether this could work to preserve Arctic sea ice at scale and help cool the climate, while also providing local benefits. All in all, this raised less attention than the immediate local needs during and soon after the field experiment phase. A meeting participant also wanted to discuss their idea of spurring sea ice growth, which we look forward to co-creating further on with him - since the meeting, we exchanged already several emails with this meeting participant on a potential research experiment.

In addition to the actual consultation meeting with the HTO, Hamlet Council and SmartICE, we also built trust by meeting local community members such as Parks Canada, the Co-op shopkeeper, municipality office workers, the Royal Canadian Mountain Police, healthcare professionals, staff of the local hotel-restaurant, local handicraft makers and artists, and the other visiting scientists and the permanent staff of the research center of the University of Laval.

2. Choosing a field experiment site together, based on IQ and community preferences

Based on the consultation, the location of the field experiment site was redefined: instead of the preliminarily planned sites north of the island, a site south of the island was selected instead. The preliminarily planned sites were discussed by the meeting participants in Inuktitut and deemed as unsuitable for field experiments, as the sites proved to be seal birthing sites in the spring, and hence not to be disturbed. A location south of the island was suggested by the participants instead. The new location that came out of this co-creation process meets the criteria of the Arctic Reflections team, including enough water depth, no harm to wildlife, outside of community transportation routes and hunting grounds, and preferably within 5-10 km of the community to facilitate transport. The new location meets these criteria and is approved by the community leaders and elders. It was decided that the exact location of the 1 km2 field experiment site will be decided when the team arrives in Qikiqtarjuaq in February 2026, based on the conditions and other observations then.

3. Identifying available community members to work for the project

During the consultation meeting and otherwise during our visit, we were already able to identify some individuals who would like to work with us in February 2026 during the field experiment e.g. as guides and wildlife observers. The consultation meeting participants also had other people in mind that could be hired to the project in various roles, including as technicians and drone pilots.

As we had pleasant discussions with local community members also outside of the community consultation meeting, some expressed their interest towards being hired by the project.

We will primarily follow the recommendations of the HTO and SmartICE on the hirings, but it is good to know that there are active and interested community members that could work for the project.

It can be estimated that the project will bring some welcome economic opportunities for some community members.

Directly and indirectly, already the community consultation meeting benefited the community economically. We made sure to leave money in the community by e.g. using local services (restaurant, grocery store, local tour guide, local hotel and AirBnB accommodation) and buying local handicrafts and art. Several team members bought art and bone carvings from local artists and craftsmen. However, the CITES rules limited our possibilities to buy local handicrafts, as many were made from narwhal or walrus ivory.

4. Practical advice on the field experiment and on the available support in the community

We also received advice on how to prepare for the field experiment. Particularly bringing any necessary spare parts was a key recommendation. There is also a garage available in the village for assembling the equipment in the middle of winter.

5. Guidelines and collaboration on community's wishes on future engagement

The HTO and Hamlet Council participants, the Senior Administrative Officer, and the HTO president and the mayor of Qikiqtarjuaq, promised to spread the word among the community on the project and the upcoming field experiments, including via the local Facebook group and in the local radio. They also promised to inquire on whether the community members would like to have a public meeting on the project when the team returns in February 2026.

Meanwhile, the project can be in touch with the community via Facebook that is a key communications channel at the community. Moreover, local information channels like the local radio can also be used for communications in Inuktitut. The HTO and SAO are now central contact points between the community and the project.

We took a lot of photographs in the community and its environment. We did not take photographs of the consultation meeting out of respect for the participants, but a meeting participant took some photographs and shared these with us with permissions to use them in our work.

Based on our dialogue with and observations of the community and its practices, we also identified the following as potential ways to engage with the local community:

- Public event at the community during field test period; for instance, offering soup lunch at the municipality hall (an on-going practice that depends on the availability of funds for it) and telling people about the project during the lunch event. This will be a key event to solicit further feedback from the broader community on our field experiments.

- Visiting local school and giving presentations there during field test period, which is also a good opportunity to solicit feedback.

- The local research centre (by Laval University) seems to be a well-liked hub and meeting place where local handicraft makers and other locals come to meet scientists; being available at the research centre during the field experiment for any discussions may be a good idea

- Training community members in useful skills such as drone flying, measurements and observation, technical maintenance etc.; all skills that would probably prove essential in further research collaborations

Other potential ways of making research benefit the community, but which are not within the reach of this project or for the upcoming field season:

- Building housing in Qikiqtarjuaq that the research team could use for lodging while on site, also alleviating local housing shortage and lack of hotel accommodation for visitors

- Buying new skidoos and selling them in good condition to local users after the field season or the entire field experiment / project

Further community feedback opportunities

We were very happy with the feedback during the meeting, including the concerns about the location due to the presence of seals when we explicitly mentioned the noise of the operation, and the joint resolution where they proposed a new location. Also, the positive feedback on willingness to be employed as part of this project, as well as practical ice preservation ideas and knowledge about issues with the sea ice (such as the shortening ice fishing season) were welcomed. During the meeting, we have stressed that we would love to come, but we would of course respect their decision, and we feel that this was appreciated.

In order to give the community members ample opportunity to provide feedback on our field experiments, the townhall meeting and the school visit in February will be excellent opportunities, as mentioned above. This would enable to incorporate this feedback in further iterations of our approach. In the meantime, we will coordinate with the hamlet to

provide information about the project including our contact details via social media groups and the local radio station.

Next to this, as part of the formal permitting process (see below), there is an open process by the Nunavut Impact Review Board (NIRB) where stakeholders within Nunavut (and in particular within the community) have the opportunity to provide feedback on all research proposals that apply for a permit.

Finally, after the field testing, we will plan a visit (around the summer) to have a meeting with HTO and Hamlet to discuss initial results and cooperation, as well as future cooperation, and during that visit, we intend to also hold a broader town hall meeting again.

Other notions from Qikiqtarjuaq

Another research team focusing on studying kelp happened to be visiting Qikiqtarjuaq at the same time with us. This was unforeseen, and they also had community engagement plans and activities going on. To avoid overwhelming the local community, we coordinated with the other researchers to ensure that we both can have our consultation meetings with the hamlet and the HTO. Our public event (possibly in the form of a soup lunch event) and school visit will be scheduled to take place in February when the field experiment team is present.

Trust had already been built during the email correspondence with Qikiqtarjuaq HTO and hamlet council during the spring and summer 2025, including the HTO meeting to which Tom presented and participated online, and which was facilitated by the Laval University research coordinator.

All in all, we felt welcomed by the local community. As we were leaving, several people wanted to ensure we return in February. We believe that the hamlet and the HTO will support our application for the field research permit. We already even discussed coming back in 2027 as well.

We also learned about local ideas on spurring ice growth, which we will look into during the field experiment.

Pond Inlet / Mittimatalik

The consultation meeting at Mittimatalik took place on 15.9.2025. The participants included two members of the HTO board including the vice president who also interpreted, the elder contact person of the HTO, the secretary of the HTO, a representative of SmartICE, and three Arctic Reflections team members.

We again offered delicacies from the Netherlands and Finland.

The focus in this meeting was on the Nares Strait and NOW Polynya, but we talked about aligning issues as in Qikiqtarjuaq. Locally interesting test sites were preliminarily identified also here, some of them very close to the town. This meeting was great as an investment in relation building for the future.

Iqaluit

Participation in the Iqaluit Trade Fair on 15.-18.9.2025 proved very useful in terms of informing Nunavut key organizations about the project and the sea ice thickening method. We met several key people and have plans to engage with them online. Meeting the people face to face was a key to getting in touch with them.

The public feedback from the event was very positive.

Following guidelines related to ethical and equitable research in Arctic communities

In our consultations, we follow the guidelines and principles related to climate intervention research (AGU 2024) and specifically related to ethical and equitable research with Arctic communities, particularly the Inuit. These include the Ethical, Equitable Encounters principles by the Inuit Circumpolar Council (2022) and the Inuit Qaujimajatuqangit principles (https://www.nirb.ca/inuit-qaujimajatuqangit). Moreover, the International Arctic Social Sciences Association's principles on ethical Arctic research (2020) and recent publications on stakeholder engagement in the Arctic (Latola et al. 2020) and decolonial Arctic research (Holmberg et al. 2023, Herrmann et al. 2023) are applied. To conclude, we follow the key recommendations from these documents in the following way:

- Appreciation of Indigenous Knowledge / Inuit Quajimajatuqangit as an equal knowledge system to Western science. We rely on IQ on scoping local motivations and benefits from participating in this research, particularly regarding the observations of changes in sea ice conditions. Moreover, the field experiment site in Qikiqtarjuaq was selected by an integration of the criteria and IQ to a place that is acceptable and desirable for the local community, including regarding no disturbance to wildlife (seals).

- Establishing mutually beneficial research relationships. During the consultation meetings, we were able to identify locally relevant and meaningful uses for sea ice thickening, including for potentially enabling safe fishing during summer months when ice has become unstable due to climate change (for the avoidance of doubt, we clearly indicated that these benefits cannot be expected from doing the research itself). Locally suitable test sites were identified based on IQ. Moreover, local employment opportunities were identified, and locals expressed interest towards working for the project. We also promised to openly share the data with the local community. Moreover, sea ice strengthening methods were suggested by local community members, and we will co-investigate these. We used local services including restaurant and accommodation services, local guide, grocery stores, and bought local art and handicrafts. We compensated the local community members for the time they used towards talking with us (honoraria). We also identified potential ways in which our engagement with the community could be beneficial.
- We had familiarized ourselves with relevant literature on the case study sites and communities beforehand, including the IQ maps on sea ice by SmartICE and the Nunavut Coastal Resources Inventory documents. The existing document and the discussions at the consultation meeting confirmed that the changes in sea ice conditions are a locally relevant topic, and our project was wished welcome.
- We respect Inuit rights by centering asking for their consent and permission to do the study in their lands and by co-designing research operations for also local benefit in establishing research relationship. We co-designed the field experiment sites with the local HTO and Hamlet council. We have funding for local participation and partnership.
- We have contacted the communities in timely manner, which has enabled them to influence the design of the field experiment, particularly choosing the field experiment site. We sought to build trust by continuous communications and by our personal visit. We also shared delicacies from our homelands with the communities and tried their traditional foods.
- We coordinated engagement efforts with the kelp research team in order to avoid research fatigue or overwhelming the community.
- The local HTO and Hamlet Council and SAO and SmartIce are key stakeholders and rightsholders (also contact points and intermediaries) for the project. They will help us with further engagement and recruitment.
- Respecting elders. We talked with community elders and leaders at the HTO and Hamlet Council, to rely on their leadership and IQ. We actively sought to include also women in the dialogue.
- We will communicate about the results of the study in a way that will be later on defined together with the host communities. We will engage with the community in various ways (e.g. school collaboration such as youth science-art workshop; soup lunch; radio; Facebook) that are locally relevant.

D. Permit status

For research in Nunavut, there are different permits that need to be in place, some of which are only for specific types of research. See the overview below as per NRI (Nunavut Research Institute), where we have indicated which ones are relevant for us.

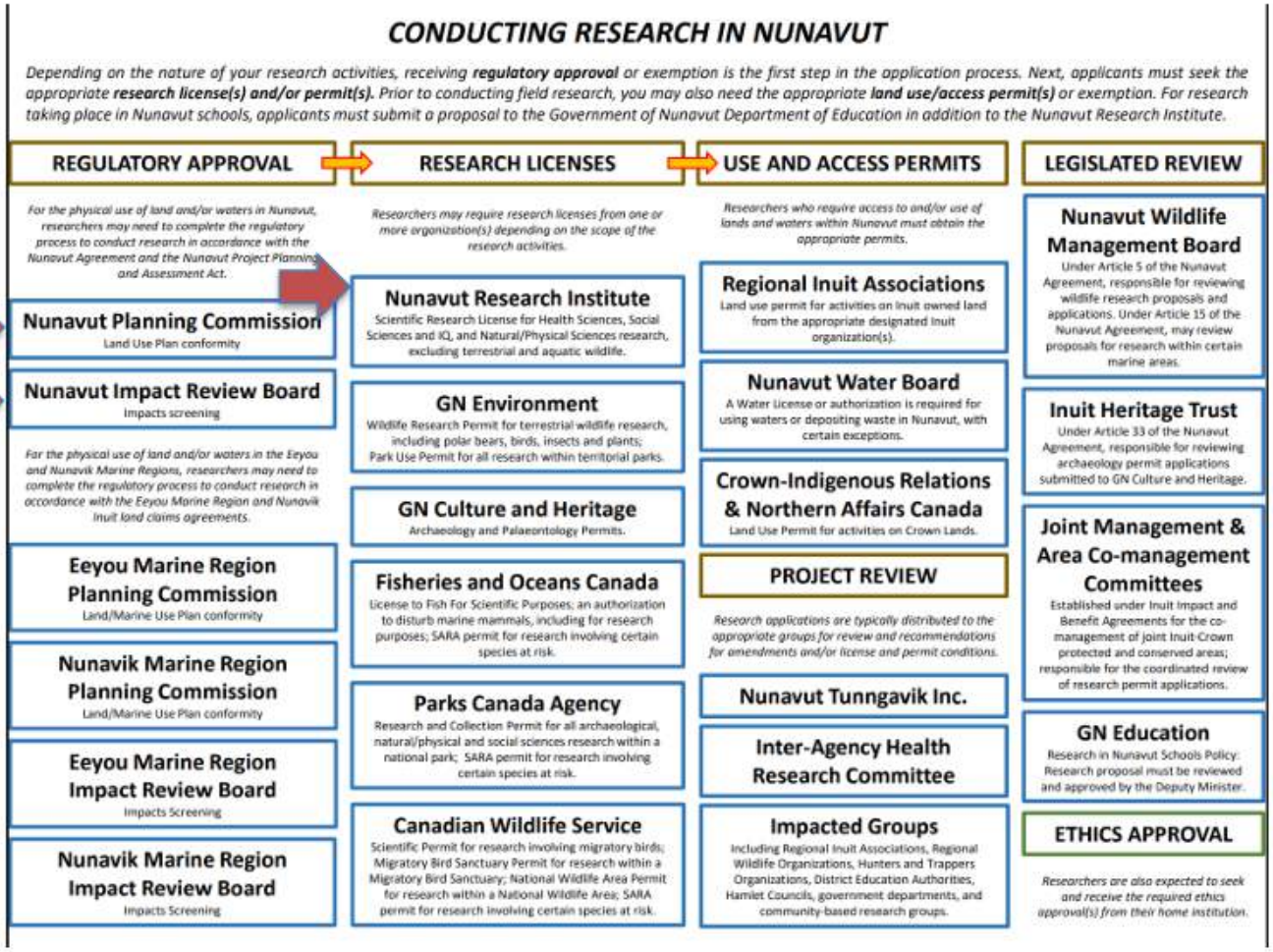

Figure 2: Overview of required permissions for research, from https://www.nri.nu.ca/sites/default/files/Research_Authorizations_Nunavut.pdf

For all permits, having community support is a pre-requisite. This can be in the form of a formal letter of support, but that is not necessary. The authorities will contact local communities (Hamlet and HTO) during the permit application process.

Required approval bodies	Status per Nov 14th	Comments
Nunavut Planning Commission (NPC)	Start: NPC File #150895. 12-08-2025: NPC determined that the project proposal is outside the area of an applicable regional land use plan. After changing location (due to input of local	NPC checks for regional Inuit lands use. For us this is not the case. After this decision the project proposal was forwarded to the NIRB.

	community), we amended the application. New NPC File # 150932. 17-10-2025: NPC again determined this proposal is outside the area of an applicable regional land use plan.	
Nunavut Impact Review Board (NIRB)	Accepted for screening, NIRB file No. 25YN078. 27-10-2025: the NIRB confirmed by email everything was complete, and no changes were required (after the change of location). The application is currently in "active screening" status, and according to their process, they should complete screening within 45 days of receiving referral by NPC (17-10-'25), so by Dec 1st.	Oversees potential environmental and community impacts for projects in Nunavut
Nunavut Research Institute (NRI)	Formally pending, informally agreed upon only subject to receiving the other required licences	Licence to be able do research in Nunavut

To formalize the positive reaction by the local community, we have obtained a formal Letter of Support from a representative of the Hamlet (in the appendix). We have also obtained verbal support by the Hunters & Trappers Organization.

Following a change in the proposed field test location due to the community consultation, our permit application required clarification from the Nunavut Planning Commission (NPC), which is responsible for land use determinations. For this, we have done an amendment to the NPC application, which has led to a new, positive decision, and a new referral to the NIRB. Based on NIRB's timelines, we anticipate that the permit could be obtained within 45 days after the NPC's second referral date (17-10-2025), which would mean NIRB screening should be complete by 1-12-2025 (Dec 1st).

Finally, informally we have already heard that the Research permit (NRI) would be granted once the other permits have been obtained.

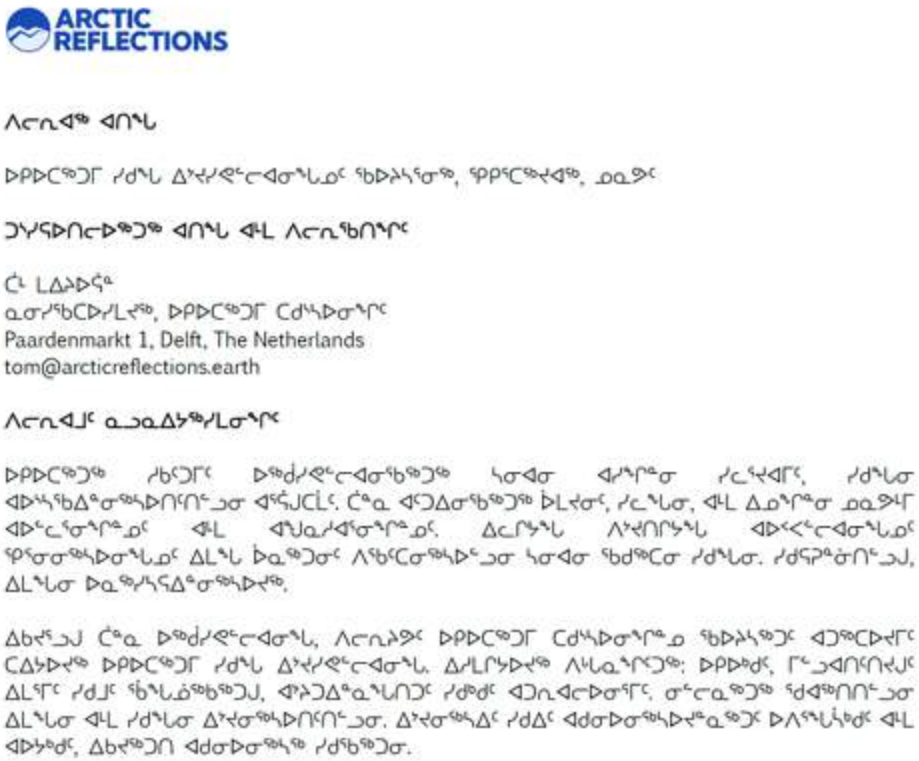
ARCTIC REFLECTIONS

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Figure 3: Excerpt from our Non-Technical Project Description in Inuktitut, as required for NIRB

E. Environmental Impact & mitigation during the field test

As part of the permit application, it is required to investigate potential impacts and mitigation measures, which are outlined in the following. Due to the limited area (1km2) where we plan to thicken the ice, the impact on the physical environment is expected to be minimal, and can in nature be compared to the creation of ice roads. A hole is drilled through the ice, after which a pump is placed into the hole to pump water on top of the ice, which will freeze rapidly and leads to thicker ice. Both drilling and pumping will make noise, which could disturb local wildlife and thus also local hunting and trapping activities. To avoid such disruption, we took into account local input on the optimal field test area, and agreed that the exact field test location will be determined in close collaboration with the Hunters & Trappers Organization just before the beginning of the test. Wildlife monitors will continuously assess the site during operations, and all activities will pause if wildlife is observed nearby, resuming only after they've left. Operations are planned for February to avoid disturbance due to artificial light in the polar night. High-flow pumps and electric drills will minimize operational time and noise. Snowmobile traffic will be limited to a single, marked route to reduce disturbance. All waste will be collected and returned to Qikiqtarjuaq daily. Any measurement equipment left on the ice will be properly secured, floatable, GPS-trackable, and clearly marked with our contact information to ensure safe recovery after the test period. Snowmobile refueling will only occur in the village, eliminating spill risks on the sea ice. The gasoline-powered pumps, designed for ice thickening, hold 20 liters of fuel and require at most one refueling per day. This will be done by swapping full 20-liter steel jerrycans, avoiding the need to pour fuel on the ice. At the end of the season, we will recover all remaining buoys and floating monitoring platforms to ensure minimal environmental impact. We have prepared our own more elaborate EIA (as a separate document).

F. Next steps

In further preparation of the field test, we will continue engagement with Qikiqtarjuaq local community, see above for some ideas; further contacts with the Qik SAO and HTO and asking them to put us in contact e.g. with the school, and planning the public event; producing posters in Inuktitut on the project; presence on social media and local radio.

For the preparation of the field test, we will continue with the engineering of our system with our engineering partners, and do an equipment test in December on a frozen lake in Canada (for which we have also acquired the required permits, and have liaised with the relevant municipality representatives on how to best engage the local community), to ensure everything works properly during the field test, and we have the right spare parts with us. We are furthermore organizing the logistics for the field test, preparing the operational plan, including updating our safety policy.

For the execution of the field test, we have agreed that we will employ local people as part of the team, specifically for safety (wildlife monitoring, ice & weather conditions) during the field test itself, and for measurements and monitoring during the period until the ice has melted. For this, we will provide training on the job. We are in the process of hiring the required people via SmartICE, to handle liabilities, and ensure they are properly trained and equipped (this was also separately recommended to us by the Laval Research Centre representative). This may evolve in a broader partnership where we can further co-develop our ice-thickening methods together with the local community representatives – the aim is to discuss this after the joint field test cycle evaluation, next summer.

We will periodically update the ARIA team on engagement activities and community inputs in our quarterly project check-ins, to ensure that ARIA's role in facilitating conversations with both national and supra-national Inuit organizations are closely coordinated, and to minimize inconsistencies or misunderstandings.

Appendix

Documents informing our consultation meetings

- Nunavut research strategy mostly underlines local benefit from research - Inuit Circumpolar Council (2022) EEE protocols: nothing about us without us, research benefiting Greenland, respect and appreciation of Indigenous Knowledge and Inuit rights, applying Inuit methodologies including patient listening; co designing projects
- Inuit Qaujimajatuqangit principles
- ITK and NRI (2006) Negotiating Research Relationships with Inuit Communities. Scot Nickels, Jamal Shirley, and Gita Laidler (eds). Inuit Kanatami and Nunavut Research Institute: Ottawa and Iqaluit. 25 pp.
- Publications on decolonial Arctic research: Herrmann et al. 2023, Holmberg et al. 2022, that highlight that indigenous peoples need to be funded and included in project planning as partners and leaders; need to ensure funding for participation (preferably starting from since the funding programmes are planned, but this is not always possible in the present situation)
- Ellam Yua et al. 2022 on knowledge co-production and Indigenous Knowledge
- American Geographical Union (2024) Ethical Framework Principles for Climate Intervention research: justice and public participation

Attachment

Letter of Support by Senior Administrative Officer of the Hamlet of Qikiqtarjuaq

MUNICIPALITY OF QIKIQTARJUAQ
P. O. Box 4
Qikiqtarjuaq, NU X0A 0B0
Tel. (867) 927-8832 Fax (867) 927-8120

September 16, 2025

To Whom It May Concern,

This letter is to confirm that the Hamlet of Qikiqtarjuaq supports the Arctic Ice Thickening research project proposed by Arctic Reflections, scheduled to take place in the winters of 2026 and 2027.

The planned fieldwork will be conducted on the sea ice directly off the coast of Qikiqtarjuaq. For each year, the exact location will be selected in close consultation with and agreement of the Qikiqtarjuaq community.

We welcome Arctic Reflections' plan to work closely with the Qikiqtarjuaq community—using local services like guiding and including Inuit knowledge about the sea ice in their work.

The project will thicken about 1 km² of sea ice by pumping seawater onto the surface. This will take 3 to 4 weeks in winter. After that, small instruments like smart buoys will track how long the ice lasts and how much sunlight it reflects, compared to nearby non-thickened ice. Monitoring will continue through the melting season using local sensors and satellites.

We understand that the project is intended as a scientific field test and monitoring campaign, and we support this effort to better understand how Arctic sea ice preservation could contribute to climate resilience.

Advanced Research + Invention Agency ARIA

Annex 8: Arctic Reflections - Nunavut Impact Review Board's screening report

SCREENING DECISION REPORT
NIRB FILE No.: 25YN078

NPC File No.: 150932

January 12, 2026

Following the Nunavut Impact Review Board's (NIRB or Board) assessment of all materials provided, the NIRB is recommending that a review of Arctic Reflections' "Arctic Ice Thickening Field Test Qikiqtarjuaq" is not required pursuant to Article 12, Section 12.4.4(a) of the *Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada* (*Nunavut Agreement*) and s. 92(1)(a) of the *Nunavut Planning and Project Assessment Act*, S.C. 2013, c. 14, s. 2 (*NuPPAA*).

Subject to the Proponent's compliance with the terms and conditions as set out in below, issued in accordance with s. 92(2)(a) of *NuPPAA*, the NIRB is of the view that the project proposal is not likely to cause significant public concerns, and it is unlikely to result in significant adverse environmental and social impacts. The NIRB therefore recommends that the responsible Minister accepts this Screening Decision Report.

OUTLINE OF SCREENING DECISION REPORT

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PROJECT OVERVIEW & THE NIRB ASSESSMENT PROCESS 2

ASSESSMENT OF THE PROJECT PROPOSAL IN ACCORDANCE WITH PART 3 OF *NUPPAA* 4

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APPENDICES

APPENDIX A: SPECIES AT RISK IN NUNAVUT 12

REGULATORY FRAMEWORK

The primary objectives of the NIRB are set out in Article 12, Section 12.2.5 of the *Nunavut Agreement* and are confirmed by s. 23 of the *NuPPAA*. The purpose of screening is provided for under Article 12, Section 12.4.1 of the *Nunavut Agreement* and s. 88 of the *NuPPAA*.

As set out under Article 12, Section 12.4.4 of the *Nunavut Agreement* and s. 92(1) of the *NuPPAA*, upon conclusion of the screening process, the Board must provide its written report the Minister indicating one of three options:

(a) a review of the project is not required;

(b) a review of the project is required; or

(c) the project should be modified or abandoned.

PROJECT OVERVIEW & THE NIRB ASSESSMENT PROCESS

On October 17, 2025, the NIRB received a referral to screen Arctic Reflections' "Arctic Ice Thickening Field Test Qikiqtarjuaq" project proposal (NIRB File No: 25YN078) from the Nunavut Planning Commission (Commission), which noted that the project proposal is outside the area of an applicable land use plan. All documents received and pertaining to this project proposal can be accessed from the NIRB's Public Registry by using any of the following search criteria or www.nirb.ca/project/126244.

- Project Name: Arctic Ice Thickening Field Test Qikiqtarjuaq
- NIRB File No.: 25YN078
- NIRB Application No.: 126244

Table 1: NIRB's Assessment Process

Date	Stage
October 17, 2025	Receipt of project proposal which noted that the project proposal is outside the area of an applicable land use plan.
October 17, 2025	Pursuant to s. 144(1) of the *NuPPAA* the NIRB requested the Proponent complete an online application to address information required for Screening
October 21, 2025	Receipt of online application from Proponent
November 6, 2025	Scoping pursuant to s. 86(1) of the *NuPPAA*
November 19, 2025	Translated Public engagement and comment request (which included terms and conditions) was issued to the following community of Qikiqtarjuaq
December 1, 2025	Receipt of public comments
January 12, 2026	Issuance of Screening Decision Report

1. Project Scope

Location	Qikiqtani region, within 10 km of Qikiqtarjuaq
Objective	The Proponent intends to conduct a field test of Arctic Ice Thickening by pumping seawater onto the sea ice surface to increase ice thickness, and to

	measure whether the method is effective under Nunavut conditions, how long the thickened ice persists, and whether there are environmental or wildlife impacts.
Timeline	Start: February 1, 2026 End: July 31, 2026

As required under s. 86(1) of the *NuPPAA*, the Board accepted the scope of the project as set out by Arctic Reflections in the proposal. The scope of the project proposal includes the following undertakings, works, or activities:

Transportation & Access
- Three (3) snowmobiles
- Three (3) sleds for transporting equipment

Ice Drilling & Pumping Operations
- Three (3) drills to create holes in the sea ice
- Three (3) gasoline-powered pumps to pump seawater onto the ice surface for thickening

Monitoring & Measurement Equipment
- Two (2) Smart buoys (ice thickness, solar reflection)
- Two (2) SAMS SIMBA sensors (snow/ice thickness, water & air temperatures)
- One (1) anemometer (wind speed, direction, temperature)
- Two (2) radiometers (shortwave & longwave radiation)
- Two (2) data loggers (store/transfer monitoring data)
- Two (2) time-lapse cameras (ice melt and visual validation)
- Two (2) floating platforms to support instruments during melt season

Sampling Equipment
- One (1) Mark II Kovacs Ice Corer (ice thickness, temperature, salinity sampling)

Fuel Requirements
- 2,500 L gasoline for pumps (125 × 20 L jerrycans)
- 200 L gasoline for snowmobiles (10 × 20 L jerrycans)
- **Total: 2,700 L**

2. Inclusion or Exclusion to Scoping List

The NIRB has identified no additional works or activities in relation to the project proposal. As a result, the NIRB will proceed with screening the project based on the scope as described above.

3. Public Comments and Concerns

As outlined in Table 1 above, notices regarding the NIRB's screening of this project proposal were distributed to community organizations as well as to relevant federal and territorial government agencies, Inuit organizations and other parties with a request for interested parties to provide the Board with any comments or concerns regarding:

- Whether the project proposal is likely to arouse significant public concern; and if so, why;
- Whether the project proposal is likely to cause significant adverse eco-systemic or socio-economic effects; and if so, why;
- Whether the project proposal is likely to cause significant adverse impacts on wildlife habitat or Inuit harvest activities; and if so, why;

- Whether the project proposal is of a type where the potential adverse effects are highly predictable and mitigable with known technology, (and providing any recommended mitigation measures); and
- Any matter of importance to the Party related to the project proposal.

Additionally, proposed project-specific terms and conditions, should the project proceed, were attached for consideration and comment.

On or before December 1, 2025, the NIRB received comments from the following interested parties:

Table 2: Comments Received

Commenting Party	**NIRB Doc ID No.**
Transport Canada	358300

a. Summary of Comments and Concerns Received

The following provides a summary of the comments and concerns received by the NIRB in relation to the Arctic Ice Thickening Field Test Qikiqtarjuaq project proposal:

Transport Canada

- The project proposes to use two (2) floating platforms to keep scientific instruments floating when the ice starts to melt in summer. The Arctic Ocean is a navigable waterway and works in navigable waterways are subject to the *Canadian Navigable Waters Act* (CNWA) and in some cases may require an approval under the CNWA.
- Recommended the Proponent should self-assess using the Transport Canda Navigation Protection Program (NPP)'s Project Review Tool (https://npp-submissions-demandes-ppn.tc.canada.ca/projectreview-outildexamenduprojet) to determine if the CNWA applies while the platforms are floating in open, navigable waters.
- Recommended the Proponent should contact the NPP at NPPPNR-PPNRPN@tc.gc.ca directly for further advice.

4. *b.* Comments and Concerns with respect to Inuit Qaujimaningit, Indigenous and Community Knowledge

No concerns or comments were received with respect to Inuit Qaujimaningit or Indigenous and Community knowledge in relation to the proposed project. However, Inuit Qaujimaningit and Indigenous and community knowledge is incorporated into the terms and conditions recommended below based on information collected from prior and similar projects, data collected and mapped by the Commission, and other available sources.

ASSESSMENT OF THE PROJECT PROPOSAL IN ACCORDANCE WITH PART 3 OF *NUPPAA*

In determining whether a review of the project is required, the Board considered whether the project proposal had potential to result in significant ecosystemic or socio-economic impacts. Table 3. The Board took particular care to consider Inuit Qaujimaningit, Indigenous and

Community Knowledge in carrying out its assessment and determination of the significance of impacts.

Table 3: Summary of the Board's Assessment of Factors s. 90 *NuPPAA*

Factor	Comment
The size of the geographic area, including the size of wildlife habitats, likely to be affected by the impacts.	▪ The project footprint is limited to a maximum of 1 km² of seasonal sea ice. ▪ The project is not located within identified or critical wildlife habitat. While far-ranging species (e.g., polar bear, migratory birds) may occur within the broader regional range, any potential interactions are expected to be localized and temporary.
The ecosystemic sensitivity of that area.	▪ No specific areas of ecosystemic sensitivity have been identified by the Proponent within the physical footprint of the proposed project.
The historical, cultural and archaeological significance of that area.	▪ No specific areas of historical, cultural and archaeological significance have been identified by the Proponent within the physical footprint of the proposed project.
The size of the human and the animal populations likely to be affected by the impacts.	▪ The proposed project is unlikely to result in impacts to local human and animal populations.
The nature, magnitude and complexity of the impacts; the probability of the impacts occurring; the frequency and duration of the impacts; and the reversibility or irreversibility of the impacts.	▪ A zone of influence of up to 1 km^2 from the most potentially-disruptive project activities was selected for the NIRB's assessment. ▪ With adherence to the relevant regulatory requirements and application of the mitigation measures recommended by the NIRB, no significant residual effects are expected to occur.
The cumulative impacts that could result from the impacts of the project combined with those of any other project that has been carried out, is being carried out or is likely to be carried out.	▪ Table 4 is a list of past, present and reasonably foreseeable projects. The Board recommended terms and conditions along with mitigation measures designed with consideration for the potential for cumulative effects in the Board Views section.
Any other factor that the Board considers relevant to the assessment of the significance of impacts.	▪ No other relevant factors were identified; however, see below for Regulatory Requirements mandating mitigation and/or reporting.

Regulatory Requirements

The Proponent is also advised that the following legislation may apply to the Project:

Acts and Regulations

1. The *Fisheries Act* (http://laws-lois.justice.gc.ca/eng/acts/F-14/index.html).

2. The *Species at Risk Act* (https://laws-lois.justice.gc.ca/eng/acts/s-15.3/.). Attached in **Appendix A** is a list of Species at Risk in Nunavut.
3. The *Wildlife Act (Nunavut)* and its corresponding regulations (http://www.canlii.org/en/nu/laws/stat/snu-2003-c-26/latest/snu-2003-c-26.html).
4. The *Nunavut Act* (http://laws-lois.justice.gc.ca/eng/acts/N-28.6/). The Proponent must comply with the proposed terms and conditions listed in the attached **Appendix B**.
5. The *Arctic Waters Pollution Prevention Act* (http://laws-lois.justice.gc.ca/eng/acts/A-12/) and the *Arctic Shipping Safety and Pollution Prevention Regulations* (https://laws-lois.justice.gc.ca/eng/regulations/SOR-2017-286/index.html).

Table 4: Past, Present, and Reasonably Foreseeable Projects Considered

NIRB Project Number	Project Title	Project Type
Present Projects – approved or in operation		
25YN018	Physiological response of soft-shell clam Mya truncata to spring microgal blooms	Research
25YN020	Assessing Oil related contaminants in the softshell clam and characterization of invertebrate communities near Qikiqtarjuaq	Research
25YN045	Arctic Coast – Nunavut Community-based Monitoring 2025/2026	Research (*seasonal*)
25YN066	Coastal Baseline Inventory: Benthic community composition and food web structure in waters adjacent to Qikiqtarjuaq, NU 2025	Research

VIEWS OF THE BOARD

In considering the above factors, the Board has identified the following and respectfully provides its views regarding whether or not the proposed project has the potential to result in significant impacts. The NIRB has also proposed terms and conditions that would mitigate the potential adverse impacts identified.

Ecosystem, wildlife habitat and Inuit harvesting activities:

Valued Component	Migratory and non-migratory birds, terrestrial wildlife and Species at Risk
Potential effects:	Minimal potential interaction as the project is offshore and does not overlap with terrestrial habitat or known nesting or staging areas. Temporary disturbance may occur during short deployment of water pumps.
Nature of Impacts:	Low magnitude, short-duration and unlikely to occur. No long-term displacement or habitat alteration expected.

Mitigating Factors:	Small stationary footprint, no lighting, no repeated disturbance, and compliance with SARA and Nunavut Wildlife Act.
Proposed Terms and Conditions:	Fuel and Chemical Storage – 8 through 10 Wildlife – General – 12 through 15

Valued Component	Fish and fish habitat and marine sea ice environment, marine mammal
Potential effects:	Potential adverse impacts to fish, water, the aquatic environment, and marine mammals due to use of water pumps.
Nature of Impacts:	The potential for impacts is considered to be limited and mostly reversible if regulations and best practices for use of fuel are followed.
Mitigating Factors:	The Board is recommending terms and conditions and it is expected that these terms and conditions would mitigate any potential adverse impacts to water quality, fish and fish habitat, and marine mammals in the direct project area and areas adjacent to the proposed project.
Proposed Terms and Conditions:	Water courses/Water bodies – 6

Valued Component	Public and traditional land use activities
Potential effects:	No specific concerns or impacts to public and traditional land use activities in the area have been identified; however, potential adverse impacts to the public and traditional land-use activities may result from proposed project activities such as snowmobile transportation.
Nature of Impacts:	The potential for impacts is considered to be minimal due to the temporary and low-impact nature of the activities, and any resulting impacts would be expected to be reversible.
Mitigating Factors:	Community engagement already initiated with HTA; data generated may improve long-term marine safety and spill response planning.
Proposed Terms and Conditions:	Public Consultation – 16 and 17

Socio-economic effects on northerners:

Valued Component	Economic impact, local business, employment and hiring
Potential effects:	Potential positive impacts to the community of Qikiqtarjuaq resulting from proposed research activities. There is also the potential of non-local workers purchasing arts and crafts from local artisans.
Nature of Impacts:	The potential for positive economic benefits in relation to the research activities are likely but short-term for the duration of activities.
Mitigating Factors:	Board is recommending the Proponent continues to inform the communities of the research activities and ensure potential local hiring opportunities
Proposed Terms and Conditions:	Other - 18

Significant public concern:

Valued Component	Public concern
Potential effects:	No significant public concern was expressed during the public commenting period for this file.
Nature of Impacts:	Each of the potential concerns were discussed in previous sections and the potential for impacts is considered to be minimal as long as the Proponent follow the recommended terms and conditions.
Mitigating Factors:	The Board is recommending terms and conditions to ensure that to the extent possible, the Proponent hire locally and access local services where possible, and to ensure planned activities in the area utilizes available Inuit Qaujimaningit.
Proposed Terms and Conditions:	Other – 16 and 17

Technological innovations for which the effects are unknown:

- No specific issues have been identified associated with this project proposal.

Administrative Conditions:

To encourage compliance with applicable regulatory requirements and assist the Board and responsible authorities with compliance and effects monitoring for project activities, the following project-specific terms and conditions have been recommended: 1-5.

In considering the above factors and subject to the Proponent's compliance with regulatory requirements and the terms and conditions necessary to mitigate against the potential adverse environmental and social effects, the Board is of the view that the proposed project is unlikely to cause significant public concern and its adverse ecosystemic and socioeconomic impacts are unlikely to be significant, or are highly predictable and can be adequately mitigated by known technologies.

RECOMMENDED PROJECT-SPECIFIC TERMS AND CONDITIONS

The Board is recommending the following specific terms and conditions to apply in respect of the project:

General

1. Arctic Reflections (the Proponent) shall maintain a copy of the Project Terms and Conditions at the site of operation at all times and make it accessible to enforcement officers upon request.
2. The Proponent shall operate in accordance with all commitments stated in correspondence provided to the Nunavut Planning Commission (NPC File No.: 150932, and the NIRB (Online Application Form, October 21, 2025. This information should be accessible to enforcement officers upon request.
3. The Proponent shall operate the site in accordance with all applicable Acts, Regulations and Guidelines.

4. The Proponent shall ensure that it meets the standards and/or limits as set out in the authorizing agencies' permits or licences as required for this project.
5. The Proponent shall ensure that all personnel, staff and contractors are adequately trained prior to commencement of all project activities, and shall be made aware of all operational plans, management plans, guidelines and Proponent commitments relating to the project.

Water courses/Water bodies (including fresh and marine waters)

6. The Proponent shall not deposit, nor permit the deposit of any fuel, chemicals, wastes (including wastewater) or sediment into any water body. The Proponent should have in place an Emergency Spill Response Plan that is approved by the appropriate authorizing agency(ies).

Waste Management

7. The Proponent shall manage all hazardous and non-hazardous waste including food, domestic wastes, debris and petroleum-based chemicals (e.g., greases, gasoline, glycol-based antifreeze) in such a manner to avoid release into the environment and access to wildlife at all times until disposed of appropriately or at an approved facility.

Fuel and Chemical Storage

8. The Proponent shall have a Spill Contingency Plan in place at all fuel storage or transfer locations and shall ensure that appropriate spill response equipment and clean-up materials (e.g., shovels, pumps, barrels, drip pans, and absorbents) are readily available.
9. The Proponent shall follow the authorizing agencies' direction for management and removal of hazardous materials and wastes (e.g., contaminated soils, sediment and waste oil).
10. The Proponent shall ensure that all spills of fuel or other deleterious materials of 100 litres or more must be reported immediately to the 24-hour Spill Line at (867) 920-8130.

Air Quality

11. The Proponent shall eliminate unnecessary idling to reduce greenhouse gas emissions as much as possible.

Wildlife – General

12. The Proponent shall not substantially alter or damage or destroy any wildlife habitat in conducting this operation unless otherwise authorized by the appropriate authorizing agencies.
13. The Proponent shall not chase, weary, harass or molest wildlife. This includes persistently circling, chasing, hovering over, pursuing or in any other way harass wildlife, or disturbing large groups of animals.
14. The Proponent shall not hunt or fish, unless proper Nunavut authorizations have been acquired.
15. The Proponent shall ensure that all wildlife have the right-of-way on any roads or trails. Vehicles are required to slow down or stop and wait to permit the free and unrestricted movement of wildlife across roads or trails at any location.

Other

16. The Proponent should engage with local residents regarding planned activities in the area and should solicit available Inuit Qaujimaningit and information regarding current recreational and traditional usage of the project area which may inform project activities. Posting of translated public notices and direct engagement with potentially interested groups and individuals prior to undertaking project activities is strongly encouraged.
17. The Proponent shall ensure that project activities do not interfere with Inuit wildlife harvesting or traditional land use activities.
18. The Proponent should, to the extent possible, hire local people and access local services where possible.

OTHER NIRB CONCERNS AND RECOMMENDATIONS

In addition to the project-specific terms and conditions, the Board is recommending the following:

Change in Project Scope

1. Responsible authorities or Proponent shall notify the Nunavut Planning Commission and/or Parks Canada as appropriate, and the NIRB of any changes in operating plans or conditions, including phase advancement, associated with this project prior to any such change.

Copy of licences, etc. to the Board and Commission

2. The NIRB respectfully requests that responsible authorities submit a copy of each licence, permit or other authorization issued for the Project to the NIRB to assist in enabling possible project monitoring that may be required. Please forward a copy of the licences, permits and/or other authorizations to the NIRB directly at info@nirb.ca or upload a copy to the NIRB's online registry at www.nirb.ca.

Use of Inuit Qaujimaningit

3. The Proponent is encouraged to work with local communities and knowledge holders to inform project design, to carry out the project, and to confirm or validate the perspectives represented in publications, and reports produced as part of the project. Care should be taken to ensure that Inuit Qaujimaningit and local knowledge collected for the project is used with permission and is accurately represented.

Bear and Carnivore Safety

4. The Proponent should review the Government of Nunavut's booklet on Bear Safety, which can be downloaded from this link: http://gov.nu.ca/sites/default/files/bear_safety_-_reducing_bear-people_conflicts_in_nunavut.pdf. Further information on bear/carnivore detection and deterrent techniques can be found in the "*Safety in Grizzly and Black Bear Country*" pamphlet, which can be downloaded from this link: https://www.enr.gov.nt.ca/sites/enr/files/resources/safety_in_grizzly_and_black_bear_country_english.pdf.

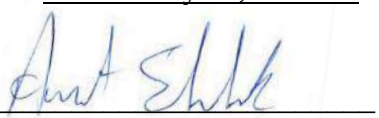
5. There are polar bear and grizzly bear safety resources available from the Bear Smart Society with videos on polar bear safety available in English, French and Inuktitut at http://www.bearsmart.com/play/safety-in-polar-bear-country/. Information can also be obtained from Parks Canada's website on bear safety at the following link: http://www.pc.gc.ca/eng/pn-np/nu/quttinirpaaq/visit/visit6/d.aspx or in reviewing the "*Safety in Polar Bear Country*" pamphlet, which can be downloaded from the following link: http://www.pc.gc.ca/eng/pn-np/nu/quttinirpaaq/visit/visit6/~/media/pn-np/nu/auyuittuq/pdf/shared/PolarBearSafety_English.ashx.

6. Any problem wildlife or any interaction with carnivores should be reported immediately to the local Government of Nunavut, Department of Environment Conservation Office (Conservation Officer of Qikiqtarjuaq, phone: (867) 927-8966.

CONCLUSION

The foregoing constitutes the Board's screening decision with respect to the Arctic Reflections' "Arctic Ice Thickening Field Test Qikiqtarjuaq". The NIRB remains available for consultation with the Minister regarding this report as necessary.

Dated January 12, 2026 at Iqaluit, NU.



Albert Ehaloak, *Acting* Chairperson

Attachments: Appendix A: Species at Risk in Nunavut

APPENDIX A: SPECIES AT RISK IN NUNAVUT

Due to the requirements of Section 79(2) of the *Species at Risk Act*, S.C. 2002, c. 29 *(SARA)*, and the potential for project-specific adverse effects on listed wildlife species and its critical habitat, measures should be taken as appropriate to avoid or lessen those effects, and the effects need to be monitored. Project effects could include species disturbance, attraction to operations and destruction of habitat. This section applies to all species listed on Schedule 1 of *SARA*, as listed in the table below, or have been assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), which may be encountered in the project area. This list may not include all species identified as at risk by the Territorial Government. The following points provide clarification on the applicability of the species outlined in the table.

- Schedule 1 is the official legal list of Species at Risk for *SARA*. *SARA* applies to all species on Schedule 1. The term "listed" species refers to species on Schedule 1.
- Schedule 2 and 3 of *SARA* identify species that were designated at risk by the COSEWIC prior to October 1999 and must be reassessed using revised criteria before they can be considered for addition to Schedule 1.
- Some species identified at risk by COSEWIC are "pending" addition to Schedule 1 of *SARA*. These species are under consideration for addition to Schedule 1, subject to further consultation or assessment.

If species at risk are encountered or affected, the primary mitigation measure should be avoidance. The Proponent should avoid contact with or disturbance to each species, its habitat and/or its residence. All direct, indirect, and cumulative effects should be considered. Refer to species status reports and other information on the Species at Risk Registry at http://www.sararegistry.gc.ca for information on specific species.

Monitoring should be undertaken by the Proponent to determine the effectiveness of mitigation and/or identify where further mitigation is required. As a minimum, this monitoring should include recording the locations and dates of any observations of Species at Risk, behaviour or actions taken by the animals when project activities were encountered, and any actions taken by the proponent to avoid contact or disturbance to the species, its habitat, and/or its residence. This information should be submitted to the appropriate regulators and organizations with management responsibility for that species, as requested.

For species primarily managed by the Territorial Government, the Territorial Government should be consulted to identify other appropriate mitigation and/or monitoring measures to minimize effects to these species from the project.

Mitigation and monitoring measures must be undertaken in a way that is consistent with applicable recovery strategies and action/management plans.

Schedules of *SARA* are amended on a regular basis, so it is important to check the *SARA* registry (www.sararegistry.gc.ca) to get the current status of a species.

Updated: September 2024

Terrestrial Species at Risk[1]	**COSEWIC Designation**	**Schedule of *SARA***	**Government Organization with Primary Management Responsibility**[2]
Buff-breasted Sandpiper	Special Concern	Schedule 1	Environment and Climate Change Canada (ECCC)
Common Nighthawk	Threatened	Schedule 1	ECCC
Eskimo Curlew	Endangered	Schedule 1	ECCC
Harlequin Duck	Special Concern	Schedule 1	ECCC
Harris's Sparrow	Special Concern	Schedule 1	ECCC
Horned Grebe	Special Concern	Schedule 1	ECCC
Ivory Gull	Endangered	Schedule 1	ECCC
Olive-sided Flycatcher	Threatened	Schedule 1	ECCC
Peregrine Falcon	Special Concern	Schedule 1	ECCC
Red Knot Islandica Subspecies	Special Concern	Schedule 1	ECCC
Red-necked Phalarope	Special Concern	Schedule 1	ECCC
Ross's Gull	Threatened	Schedule 1	ECCC
Rusty Blackbird	Special Concern	Schedule 1	ECCC
Short-eared Owl	Special Concern	Schedule 1	ECCC
Porsild's Bryum	Threatened	Schedule 1	Government of Nunavut (GN)
Transverse Lady Beetle	Special Concern	No Schedule	GN
Caribou (Dolphin and Union Population)	Endangered	Schedule 1	GN
Caribou (Barren-ground Population)	Threatened	No Schedule	GN
Caribou (Torngat Mountains Population)	Endangered	No Schedule	GN
Grizzly Bear (Western Population)	Special Concern	Schedule 1	ECCC
Peary Caribou	Endangered	Schedule 1	GN
Polar Bear	Special Concern	Schedule 1	ECCC
Wolverine	Special Concern	Schedule 1	GN
Atlantic Walrus (High Arctic Population)	Special Concern	No Schedule	Fisheries and Oceans Canada (DFO)
Atlantic Walrus (Central/Low Arctic Population)	Special Concern	No Schedule	DFO
Beluga Whale (Cumberland Sound Population)	Threatened	Schedule 1	DFO
Beluga Whale (Eastern Hudson Bay Population)	Endangered	No Schedule	DFO
Beluga Whale (Eastern High Arctic-Baffin Bay Population)	Special Concern	No Schedule	DFO
Beluga Whale (Western Hudson Bay Population)	Special Concern	No Schedule	DFO
Atlantic Cod (Arctic Lakes Population)	Special Concern	No Schedule	DFO
Fourhorn Sculpin (Freshwater Form)	Data Deficient	Schedule 3	DFO
Lumpfish	Threatened	No Schedule	DFO
Thorny Skate	Special Concern	No Schedule	DFO

1 The Department of Fisheries and Oceans has responsibility for aquatic species.

2 Environment and Climate Change Canada (ECCC) has a national role to play in the conservation and recovery of Species at Risk in Canada, as well as responsibility for management of birds described in the Migratory Birds Convention Act (MBCA). Day-to-day management of terrestrial species not covered in the MBCA is the responsibility of the Territorial Government. Populations that exist in National Parks are also managed under the authority of the Parks Canada Agency.

Advanced Research + Invention Agency ARIA

Annex 9: Arctic Reflections - Scientific research licence for experiments from Nunavut Research Institute

Nunavut Research Institute / ᓄᓇᕗᒻᒥ ᖃᐅᔨᓴᖅᑐᓕᕆᔨᒃᑯᑦ
959A Nunavut Dr. Iqaluit, NU X0A 3H0 phone:(867) 979-7279 email:mosha.cote@arcticcollege.ca

SCIENTIFIC RESEARCH LICENSE

LICENSE NUMBER 01 008 26N-M

ISSUED TO: Tom Meijeraan
Arctic Reflections
Paardenmarkt 1
Delft, Zuid Holland
3525VG The Netherlands

TEAM MEMBERS: F.Ypma, C.Owen, S.Afzali, R.Pritchett, W.Schellingerhout

TITLE: Arctic Ice Thickening Field Test, Qikiqtarjuaq, Nunavut

OBJECTIVES OF RESEARCH:

The Arctic is warming faster than other parts of the world, causing sea ice to melt earlier each year. This affects wildlife, the climate, and the way people in Nunavut travel and hunt. One cause of this melting is that darker ocean water absorbs more heat than bright white ice. When sea ice disappears, the ocean warms even faster. To help reduce this warming, our team from Arctic Reflections is testing a method called Arctic Ice Thickening. The idea is simple: in winter, we pump seawater onto the ice surface, just like the way ice roads are constructed. The cold air freezes the water and makes the ice thicker. Thicker ice may last longer in the spring and summer, helping to prolong the sea ice cover. Our research will take place near Qikiqtarjuaq in winter 2026 and 2027.

TERMS & CONDITIONS:
The holder of the license will be bound by the terms and conditions of the Nunavut Impact Review Board Screening Decision Report (NIRB File #25YN078)and the Department of Culture & Heritage archaeological sites terms and conditions. These terms and conditions will form part of this license.

DATA COLLECTION IN NU:
DATES: February 1,2026 to July 31,2026
LOCATION: Qikiqtarjuaq Sea Ice

Scientific Research License 01 008 26N-M expires on December 31,2026
Issued at Iqaluit, NU on January 15,2026

James Shirley
Science Advisor

Advanced Research + Invention Agency ARIA

Annex 10: Arctic Reflections - Letter to ECC programme team confirming completion of CEO conditions

UNIVERSITY OF CAMBRIDGE | Centre for Climate Repair

ARIA

mark.symes@aria.org.uk

26 January 2026

Dear Exploring Climate Cooling programme team,

In his decision letter for the outdoor experiments planned by Arctic Reflections in February-July 2026 as part of the ARIA funded Re-thickening Arctic Sea Ice (RASI) project, ARIA's CEO asked for the following as conditions 2b(i) and 2b(ii):

That the RASI team documents and shares with local communities the following before the experiments start, in a manner that is accessible for those communities:

i. Information on their process(es) for achieving consent, for confirming continued consent, and for discerning/accepting withdrawal of consent. This information should include in particular how any dissent within the community and from Elders will be documented and handled.

ii. Information on practices related to community benefit, including the approach to coauthorship that will be followed and the approach that they will take to other forms of recognition of contributions (including, for example: instruments, guidance on experiments, and insights from Elders and others).

I am writing to confirm that Arctic Reflections believe that they have met these conditions as follows:

On condition 2b(i): Achieving and Withdrawal of Consent

Since engaging with the community at Qikiqtarjuaq in June 2025, after a visit to the community involving meetings with key Hamlet and HTO (Hunters & Trappers Organization) representatives, the team has obtained formal letters of support by the Hamlet and HTO, as well as informal enthusiasm from key community members. In order to further formalize this and also provide a clear & transparent procedure for withdrawal of consent, they have set-up a clear policy outlining such procedures as well as how community members can raise concerns, how progress will be jointly evaluated, and how continued consent and trust by the community will need to be continually "earned". The policy document has been shared with key representatives of the community (see https://arcticreflections.earth/local-communities/). This is a live document which will be updated as feedback continues to be received.

On condition 2b(ii): Recognition of research contributions by local community members

Arctic Reflections is committed to recognising the contributions of their co-researchers in the Qikiqtarjuaq community, specifically the local co-workers that contribute to the research, planning and operation of the field tests. This commitment is also part of the policy document that has been shared with the community.

Department of Applied Mathematics and Theoretical Physics
Wilberforce Road
Cambridge CB3 0WA

info@climaterepair.cam.ac.uk | +44 (0)1223 764 076 www.climaterepair.cam.ac.uk

Yours sincerely

Professor Shaun Fitzgerald OBE FREng (Director)

Principal Investigator of RASI project

Centre for Climate Repair

Department of Applied Mathematics and Theoretical Physics
Wilberforce Road
Cambridge CB3 0WA

info@climaterepair.cam.ac.uk | +44 (0)1223 764 076

Advanced Research + Invention Agency ARIA

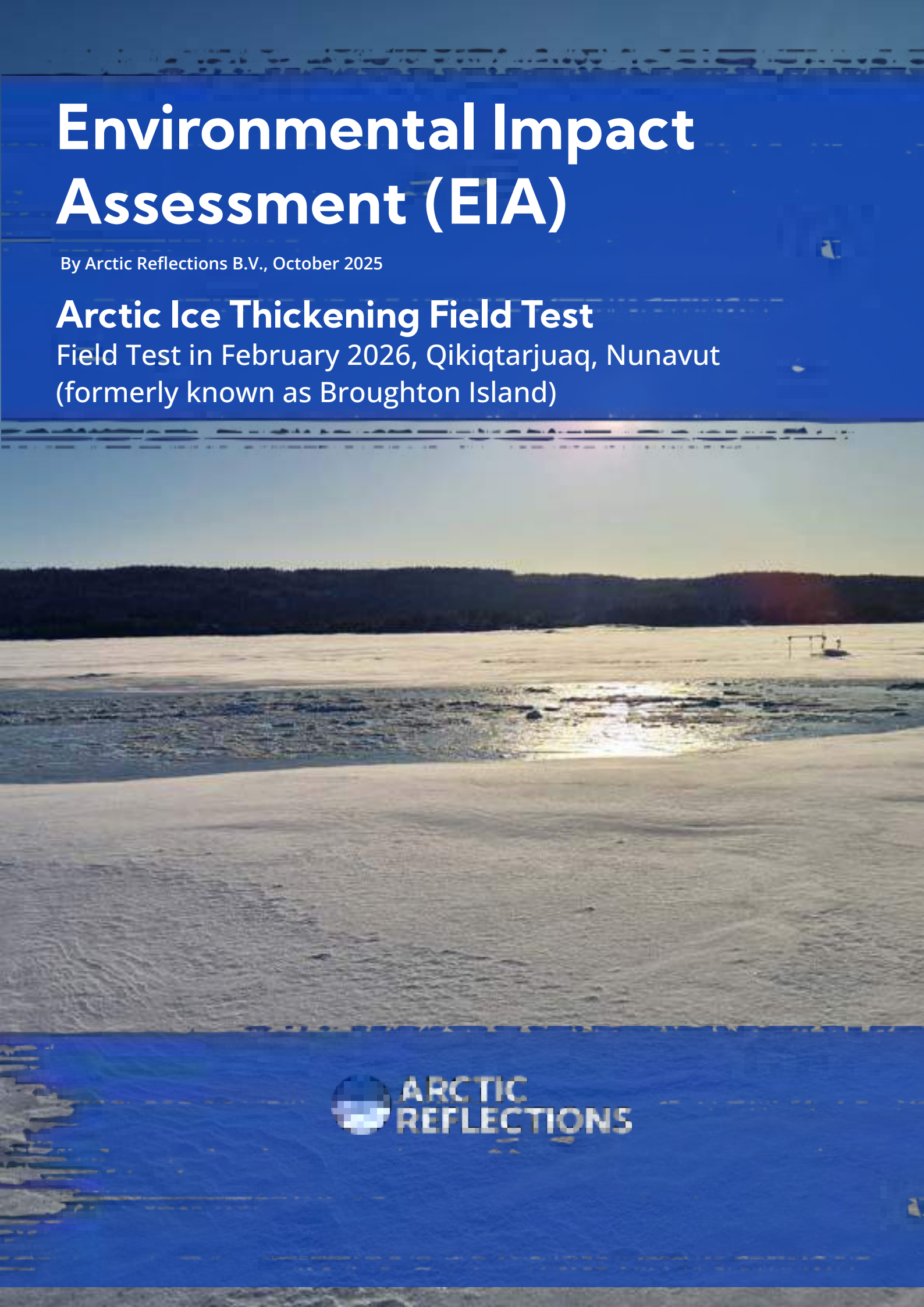
Annex 11: Environmental Impact Assessment - Arctic Ice Thickening Field Test

Environmental Impact Assessment (EIA)

By Arctic Reflections B.V., October 2025

Arctic Ice Thickening Field Test

Field Test in February 2026, Qikiqtarjuaq, Nunavut (formerly known as Broughton Island)



ARCTIC REFLECTIONS

Contact

Arctic Reflections
Paardenmarkt 1
2611 PA Delft
The Netherlands

Email: info@arcticreflections.earth
www.arcticreflections.earth

We contribute to Sustainable Development Goals

1. Introduction and Purpose

This Environmental Impact Assessment (EIA) evaluates the potential environmental effects associated with the Arctic Ice Thickening (AIT) field test to be conducted directly off the southeast coast of Qikiqtarjuaq (Nunavut) in February. The purpose of this field test is to evaluate the scientific and technical feasibility of using AIT to thicken sea ice in order to enhance its seasonal persistence, reflectivity, and potential cooling effect. The overall goal is to assess whether AIT can contribute to mitigating Arctic sea ice loss and related ecosystem impacts caused by global warming.
The main body of this document will provide a summarized overview of potential impact and relevant mitigation measures. Annex I will provide a detailed overview for each species used to compile the summarized overview. This EIA was informed by a broader Environmental Risk Assessment of the Arctic Reflections' sea ice thickening methodology in the Canadian Arctic (M. Teunis, 2023).

2. Project Overview

Three tailor-made skid barges equipped with pumps will be towed to the site by snowmobiles. The pumps, mounted on lifting frames, will extract seawater from below the ice and discharge it onto the surface to promote controlled ice thickening. Two alternating crews of five to eight people each will conduct the operations over approximately four weeks. The first crew will install scientific instruments, commission the pumps, and initiate ice thickening. After 2.5 weeks, the second crew will continue the process, complete the thickening phase, and carry out cleanup and storage of the equipment. Scientific instruments will remain in place to monitor melting throughout the spring and summer seasons, after which they will be recovered.

3. Site Description and Baseline Conditions

The field test will take place off the southeast coast of Qikiqtarjuaq, located on the east coast of Baffin Island in Nunavut. We identified 2 zones within which our field test could take place. Following an in-person joint meeting with the Hunters and Trappers Organization (HTO) and the Hamlet of Qikiqtarjuaq on September 10th, 2025, we jointly decided to designate a new Zone 3 (south-east of Qikiqtarjuaq) as the preferred location for our upcoming field test. Zone 3 has been selected because the likelihood of disturbing wildlife is lower compared to the previously indicated Zones 1 and 2. Zone 2 will not be considered anymore. Zone 1 will remain only as a fallback option, to be considered solely in extraordinary circumstances and only if the HTO determines just before the start of the field test that Zone 1 takes preference over Zone 3. Figure 1 shows these three zones. For reference, we have included a rectangle within each zone to illustrate the size of the final 1 km^2 site relative to the overall zone. The exact location within this zone will be chosen just before the start of the field test in collaboration with the HTO, to avoid areas where animals are known to gather while staying clear of community travel routes.

The Qikiqtarjuaq region is part of the Qikiqtaaluk (Baffin) region and falls within Inuit Nunangat. The area is characterized by landfast sea ice in winter, rugged fjord coastlines, and proximity to the Davis Strait. The local community of Qikiqtarjuaq has a population of approximately 600 people, with livelihoods closely tied to traditional harvesting and marine resources (Kanatami, 2023, pp. 5-6). The area supports species including ringed seals, bearded seals, polar bears, Arctic char, seabirds, and occasionally narwhals and bowhead whales during open-water seasons. The nearest sensitive habitat

features include polynyas and floe-edge ecosystems located farther east, outside the operational area (Copernicus Climate Change Service, 2021). (Qikiqtani Inuit Association, 2018, p. 33)

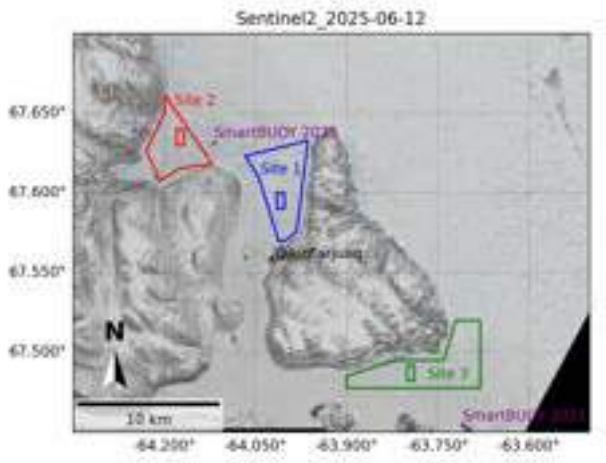


Figure 1: Potential field test sites zones, zone 3 being the preferred location

4. Analysis of Potential Environmental Impacts

4.1 Physical Environment

The physical disturbance from the AIT test will be minimal given its small (1 km^2) footprint. Pumping seawater onto sea ice can be compared to constructing temporary ice roads in terms of physical impact. All activities are conducted during the winter season when the sea ice is stable and thick. No sediment disturbance is expected since pump inlets will be limited to a maximum depth of 50 cm below the ice surface, with local water depths easily exceeding 10 meters. No long-term alteration of the seafloor or hydrodynamic processes is anticipated. The thickened ice will eventually melt during summer, ensuring no lasting physical modification to the environment

Figure 2 Water depth (in meters) at the southern side of Qikiqtarjuaq, the location of our preferred field test zone 3.

4.2 Biological Environment

The biological environment includes ice-dependent mammals (ringed and bearded seals, polar bears), Arctic cod, seabirds, and microorganisms inhabiting the sea ice. Operations are planned for February, prior to the ringed seal pupping season (March–April) and before the peak biological productivity period (April–June). Disturbance to wildlife is expected to be temporary and localized. Noise from pumps and snowmobiles may cause avoidance behavior in nearby seals or polar bears, though mitigation measures will minimize this risk. The impact of artificial light will be minimal, as operations occur primarily under natural daylight conditions. No significant effect on fish populations or plankton communities is anticipated. Arctic char typically winter and spawn in lakes (Fisheries and Oceans Canada, 2023, p. 18) and Arctic cod spawn in deeper ice-covered offshore areas and the site is distant from known spawning grounds (e.g., Franklin and Darney Bays). (Geoffroy, 2023, p. 7).

4.3 Socioeconomic and Cultural Environment

Qikiqtarjuaq is an Inuit community with active subsistence hunting and fishing, primarily targeting seals, Arctic char, occasionally polar bears and seasonally narwhals (Qikiqtani Inuit Association, 2018, p. 29). The field test area lies outside the main local harvesting routes, reducing potential overlap. Noise and human activity could temporarily disturb seals, potentially affecting harvest

opportunities, though this risk is minimal. The project will employ local wildlife monitors and engage community representatives to ensure culturally appropriate and environmentally sensitive operations, consistent with Inuit Tapiriit Kanatami's policy recommendations emphasizing Inuit participation in climate action initiatives (Inuit Tapiriit Kanatami (ITK), 2019, p. 4).

5. Mitigation Measures

- Select field site with input from Inuit wildlife monitors to avoid seal concentrations, denning sites, or key travel routes.
- Use high-flow rate pumps to minimize operational duration and noise.
- Restrict artificial lighting; operate mainly in daylight.
- Cease all operations if polar bears or other wildlife are observed nearby.
- Provide polar bear safety training for personnel.
- Prohibit any approaching or disturbance of wildlife by team members.
- Remove all non-essential equipment and waste after operations to avoid pollution.
- Always take the exact same route to and from the field test location to minimize disturbance caused by snowmobiles

6. Residual Impact Assessment

Due to the limited area and the timing of field test operations in February, no significant impact is expected. The most important mitigation is to minimize the disturbance of seals. Other than that, we think that the impact of our field test can best be compared with the impact of creating an ice road.

Biophysical resource	Potential impact	Proposed Mitigation	Residual impact	Predicted significance
Sea ice	Extended lifetime of sea ice	Limit to max 1 km2	• low magnitude • localized geographic extent • frequent occurrence • short-term duration • fully reversible	Not significant
Sea water	Disturbance of sediment while pumping	Use of pumps with short water inlet pipe (< 0.5m) while water depth > 10m	• low magnitude • localized geographic extent • frequent occurrence • short-term duration • fully reversible	Not significant
Pinnipeds	Disturbance of ringed seals	• Exact field test area to be chosen based on topical information and advice from wildlife monitors, staying away from seal concentrations • Wildlife Monitors will continuously assess the proposed field test area and advise on any wildlife concerns • Avoid resting and foraging areas while travelling to and from field test area and always use the same route • Minimize use of artificial light / operate in February when there is daylight • Minimize use of artificial noise: use high flow rate pumps to reduce pumping time and limit vehicle movements • Operate in February before birthing period • Team will be instructed to stay away from wildlife and not feed, hunt, trap or disturb them	• low magnitude • localized geographic extent • infrequent occurrence • short-term duration • fully reversible	Not significant

Polar bear	Disturbance, negative human-bear encounters	• Exact field test area to be chosen based on topical information and advice from wildlife monitors, staying far away from known dens • Wildlife Monitors will continuously assess the proposed field test area and advise on any wildlife concerns • Activities will cease if polar bear observed in proximity of the field test site and will only resume after the bear has left the area • Team will receive polar bear training • Minimize use of artificial light / operate in February when there is daylight • Minimize use of artificial noise: use high flow rate pumps to reduce pumping time and limit vehicle movements • Team will be instructed to stay away from wildlife and not feed, hunt, trap or disturb them	• low magnitude • localized geographic extent • infrequent occurrence • short-term duration • fully reversible	Not significant
Fish	Disturbance of Arctic Cod	• Avoid pumping near known spawning areas. Known spawning areas in Canadian Arctic are Franklin and Darney Bays • Field test operations in February. By late spring (after operations) juvenile cod can be found in shallower waters	• low magnitude • localized geographic extent • infrequent occurrence • short-term duration • fully reversible	Not significant
Whales	Disturbance of whales	• Field test operations in February when whales are not present	• low magnitude • localized geographic extent • infrequent occurrence • short-term duration • fully reversible	Not significant
Birds	Disturbance of birds	• Field test operations in February when migratory birds are not present on the sea ice	• low magnitude • localized geographic extent • infrequent occurrence • short-term duration • fully reversible	Not significant
Phytoplankton and Zooplankton	Disturbance of algae growth and disturbance of zooplankton	• Operations in February avoid disrupting the critical bloom period • Minimize artificial light • Conduct measurements for future reference	• low magnitude • localized geographic extent • infrequent occurrence • short-term duration • fully reversible	Not significant
Impact on harvesting	Disturbance of seals	• See mitigation to prevent disturbance of seals in this table	• low magnitude • localized geographic extent • infrequent occurrence • short-term duration • fully reversible	Not significant

7. Conclusion

The environmental impact of the proposed Arctic Ice Thickening (AIT) field test off the southeast coast of Qikiqtarjuaq is expected to be minimal. The activity is temporary, small in scale, and conducted during a period of low biological activity. With the mitigation measures in place, no significant adverse effects are anticipated on the physical, biological, or cultural environment. Continued collaboration with local Inuit organizations and wildlife monitors ensures that the project aligns with community values and respects Inuit rights under the Nunavut Agreement and UNDRIP.

8. References

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Annex I: Detailed overview per species

Potential Impacts on Pinnipeds around Qikiqtarjuaq (February – March)

Ringed Seals: Small pinnipeds (~1.5 m, 68 kg in winter) that depend on thick blubber layers for insulation and energy during the breeding season. They are key prey for polar bears and subsistence species for local communities. They primarily feed on arctic cod and crustaceans. Pupping starts at the end of March, but most born in April. To be found mainly to the Northwest of Qikiqtarjuaq year-round (Nunavut department of Environment, 2010, p. 52) (Qikiqtani Inuit Association, 2018, p. 70).

- Bearded Seals: Larger seals (~2.4 m, up to 340 kg in winter) that rely on benthic prey like crabs, shrimp, and clams. They birth pups on moving sea ice later in the year (April-May). Bearded seals can be found to the Northwest and to the South of Qikiqtarjuaq. The latter being the preferred location of our field test, but there they can only be found between August and November (Nunavut department of Environment, 2010, p. 26) (Qikiqtani Inuit Association, 2018, p. 70).
- Harbour Seals: not present in February-March (Qikiqtani Inuit Association, 2018, p. 71)

- Harp Seals: not present in February-March (Qikiqtani Inuit Association, 2018, p. 71)

- Hooded Seal: not present in February-March (Qikiqtani Inuit Association, 2018, p. 71)

- Walrus: not present in February-March (Qikiqtani Inuit Association, 2018, p. 71)

Potential Impacts of Operations:

1. Disturbance from Noise and Human Activity:

• Noise Stress: Seals are highly sensitive to sound. This could cause seals to flee their resting or foraging areas, leading to increased energy expenditure.

• Displacement: Disturbance might force seals away from preferred habitats near Qikiqtarjuaq, affecting their access to prey and increasing competition in less suitable areas.

• Artificial Light:

• Behavioral Disruption: Artificial lighting during winter could disturb seals' natural behavior, such as resting or hunting. Light may also attract or repel prey species, indirectly affecting seals' foraging success.

• Impact on Ice Habitat:

• Habitat Alteration: Pumping water onto sea ice could change ice thickness and dynamics, potentially impacting seal breathing holes and access to sub-ice habitats.

• Breeding Site Risk: February is before the birthing period for bearded seals, but altering ice conditions later in winter could impact future habitat suitability for denning and pupping later in the year.

	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Qikiqtarjuaq												
bearded seal	X	X	X	X	X	X	X	X	X	X	X	X
harbour seal (rare)			X	X								
harp seal	X	X	X	X	X	X						X
hooded seal	X	X	X	X	X							X
ringed seal	X	X	X	X	X	X	X	X	X	X	X	X
walrus	X	X	X	X	X	X						

Figure 3: Observations of seals and walruses Qikiqtarjuaq [5] (Qikiqtani Inuit Association, 2018, p. 64)

Figure 4: Ringed Seal near Qikiqtarjuaq (arrow pointing at Qikiqtarjuaq) (Nunavut department of Environment, 2010, p. 52)

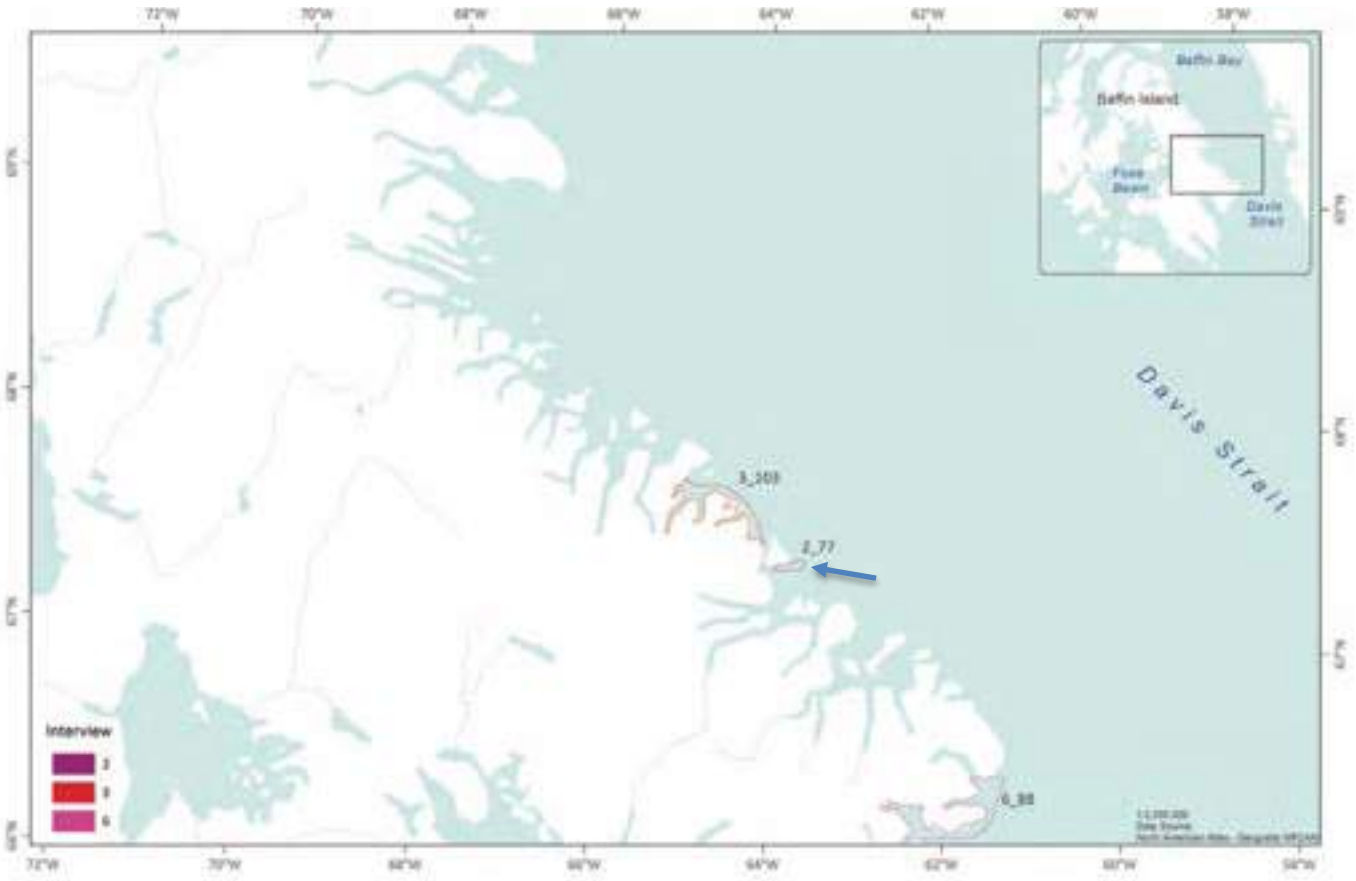

Figure 5: Bearded Seal near Qikiqtarjuaq (arrow pointing at Qikiqtarjuaq) (Nunavut department of Environment, 2010, p. 26)

Table 7: Bearded Seal - Areas of Occupation

LABEL NUMBER	INTERVIEW CODE	SPECIES	MONTHS	COMMENTS
2_77	QIK_2_0310	Bearded Seal	Aug-Nov	
3_103	QIK_3_0310	Bearded Seal	Sep-Oct	
6_88A	QIK_6_0310	Bearded Seal	Aug-Sep	

Figure 6: Table showing presence of Bearded Seal to the south of Qikiqtarjuaq (area 2_77) (Nunavut department of Environment, 2010, p. 27)

Conclusion

Operations near Qikiqtarjuaq in February could potentially affect ringed seals; however, these animals are primarily found northwest of Qikiqtarjuaq and not in the southern area where our preferred field test Zone 3 is located. Other pinniped species are not present near the planned operations site.

To minimize any potential impact, a series of mitigation measures will be implemented, focusing on avoiding known resting and foraging areas. Wildlife monitors will be engaged to provide real-time observations and guidance on selecting the precise field test location. They will continuously monitor the area during operations and promptly alert the team to any seal-related concerns. All team members will be instructed to avoid disturbing seals or other wildlife. Conducting operations in February enables the use of natural daylight—reducing the need for artificial lighting—and ensures that activities take place before the ringed seal birthing season. In addition, the use of high flow rate pumps will help shorten pumping duration, further limiting potential disturbance.

Species	ᐅᑭᐅᖅ Ukiuq January to mid-March	ᐅᐱᕐᖓᓵᖅ Upirngasaaq mid-March to third week of May	ᐅᐱᕐᖓᖅ Upirngaaq end of May to mid-July	ᐊᐅᔭᖅ Aujaq end of July / beginning of August to mid-September	ᐅᑭᐊᔅᓵᖅ Ukiassaaq end of September to November	ᐅᑭᐊᖅ Ukiaq end of November to end of December
Ringed seal	breathing holes (maybe at floe edge but harvesting is not done there. Ice too rough)	breathing hole; birthing lair; pupping starts at the end of March, but most born in April	present	present	present	present
Bearded seal	breathing holes (maybe at floe edge but harvesting is not done there. Ice too rough)	breathing hole; birthing lair; pupping starts at the end of March, but most born in April	floe edge; skins best this time of year for boots	present	present	present

Figure 7: Table showing Ringed and Bearded seal distribution around Qikiqtarjuaq based on IQ (Qikiqtani Inuit Association, 2018, p. 71)

Potential Impacts on Polar Bears around Qikiqtarjuaq (February–March)

Polar Bears (Ursus maritimus): Apex predators of the Arctic that rely on sea ice for hunting, mainly targeting ringed seals. Females den from November to late March/ early April, with average litter sizes of 1-3 cubs, and typically breed in late April or early May. Polar bears can be found along the entire Baffin, Devon, and Ellesmere islands coastlines. They have their cubs in dens before ringed seals give birth. Polar bear hunt ringed seal pups in their dens, or out on the open ice (Qikiqtani Inuit Association, 2018, p. 76).

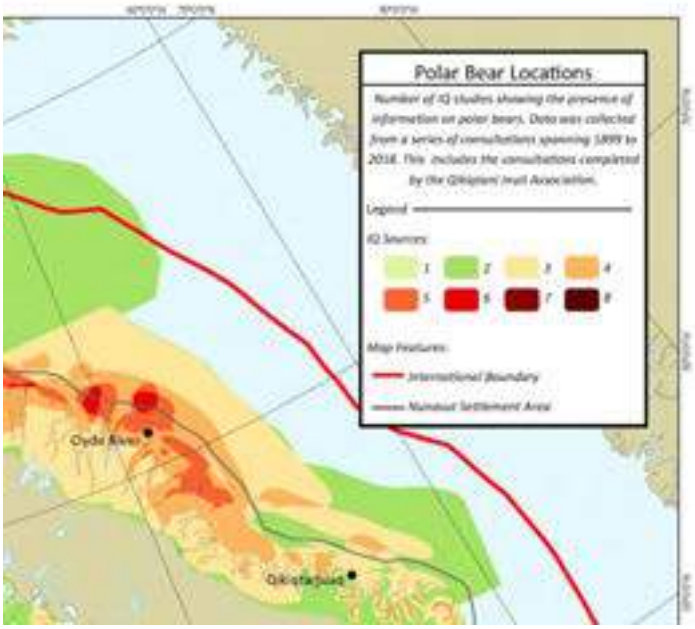

Figure 8 Location of polar bear based on Inuit hunting locations (Qikiqtani Inuit Association, 2018, p. 77)

Potential Impacts of Operations:

1. Disturbance from Noise and Human Activity:

o Denning Females: Noise from pumping and associated activities near denning areas can disturb pregnant females or mothers with cubs, potentially causing den abandonment, which could lead to cub mortality.

o Energetic Stress: Polar bears rely on conserving energy during winter. Human activity that forces movement or alters behavior can increase energy expenditure, reducing survival chances.

2. Artificial Light:

o Behavioral Disruption: Artificial light may disturb nocturnal hunting or resting patterns, potentially disorienting bears or altering their interaction with prey like ringed seals.

o Impact on Hunting: Light may also affect the visibility of prey species, influencing hunting success.

3. Impact on Habitat and Prey Availability:

o Prey Distribution: If ringed seals are displaced or their local populations are reduced due to operations, polar bears may struggle to find sufficient prey, increasing their travel distances and energy use.

4. Impact on Population and Reproduction:

o Den Site Disruption: Operations in or near key denning areas may harm the reproductive success of females by causing abandonment or physical disturbance of dens.

o Stress on Cubs: Disturbed females might fail to provide adequate care to cubs, affecting their survival.

Conclusion

Pumping operations, noise, and artificial light near Qikiqtarjuaq in February could impact polar bears, particularly denning females and hunting adults. The most critical concerns are disturbance to denning sites and disruption of hunting opportunities. Implementing mitigation measures will reduce these risks. The field test area will be selected based on current information and guidance from wildlife monitors, ensuring it remains distant from known dens. Wildlife monitors will continuously evaluate the site and provide advice on any concerns related to wildlife. If a polar bear is observed near the field test site, all activities will pause and only resume once the bear has left the vicinity. Additionally, the team will undergo polar bear safety training to ensure preparedness. We plan our

operations in February, so we can make use of daylight and minimize artificial light.

Potential Impacts on Fish Around Qikiqtarjuaq in February

In February, Arctic cod is the only fish species known to remain active under the sea ice near Qikiqtarjuaq. Arctic cod plays a critical role in the Arctic ecosystem, serving as a key prey species for marine mammals like seals and some seabirds. While Arctic char is a common species in the Arctic, they are not present directly in or under sea ice. They lack the necessary antifreeze proteins to survive the frigid saltwater temperatures and risk freezing. They therefore migrate to fresh water to overwinter or migrate to deep offshore areas. They spawn in September in lakes or rivers or streams connected to lakes.
Potential Impacts of Operations:
1. Direct Removal of Eggs or Larvae
- Risk: Arctic cod spawn during the winter, and their eggs and larvae may be present in the water column under the ice. Pumping seawater onto the ice risks unintentionally removing eggs or larvae from the local environment, which could reduce reproductive success in the immediate area. In general, it can be said that Arctic cod moves to deeper, ice-covered waters to release their eggs. The eggs and larvae then drift with the currents, eventually making their way into shallower coastal areas as they develop. By late spring and summer, juvenile cod can often be found in shallower waters
- Mitigation: Avoid pumping near known spawning areas or at depths where eggs and larvae are most concentrated. In the Canadian Arctic, spawning is suggested to occur near the Franklin and Darney Bays [(Geoffroy, 2023, p. 7).

2. Disturbance from Noise
- Risk: Arctic cod are sensitive to underwater noise, which can alter their behavior. Noise generated by pumping equipment could cause cod to flee, leading to energy loss and potential displacement from optimal foraging grounds.
- Mitigation: limit operating time by using high flow rate pumps

3. Changes in Prey Availability
- Risk: Pumping operations might disturb zooplankton, a primary food source for Arctic cod. Any significant disruption to the local zooplankton population could impact cod feeding opportunities, particularly during the resource-scarce winter months.
- Mitigation: Maintain careful placement of pumping equipment / use short water inlet pipe to reduce the disturbance of zooplankton populations near the sea floor.

Broader Considerations
- Localized Impact: Arctic cod populations are highly adapted to dynamic and harsh conditions, so localized effects are unlikely to significantly impact the broader population.
- Ecosystem Dependency: Since Arctic cod are a cornerstone species, any significant disruption to their lifecycle could cascade through the food web, affecting higher predators like seals and seabirds.

Conclusion

By implementing precautionary measures, the potential risks to Arctic cod during February pumping operations can be minimized, ensuring minimal ecological disruption near Qikiqtarjuaq. Spawning occurs between September and April, and peaks between January and February, when our field test location is planned. We should thus stay away from the known spawning areas in the Canadian Arctic are Franklin and Darney Bays (Geoffroy, 2023, p. 7). By late spring (after our operations) juvenile cod can be found in shallower waters

Potential Impacts on Whales around Qikiqtarjuaq (February–March)

Given the absence of belugas, bowhead whales, and narwhals in the Qikiqtarjuaq region during February and March, the direct impact of Arctic Ice Thickening operations on these species is expected to be negligible.

These whales typically migrate to areas with polynyas or less dense ice during the winter months, avoiding the stable, heavy ice found near Qikiqtarjuaq.

ᐅᑭᐅᖅ Ukiuq	ᐅᐱᕐᓂᖅᓱᖅ Upirngasaaq	ᐅᐱᕐᓂᖅ Upirngaaq	ᐊᔾᔨᖅ Aujaq	ᐅᑭᐊᓱᖅ Ukiassaaq	ᐅᑭᐊᖅ Ukiaq
January to mid-March	Mid-March through third week of May	End of May to mid-July	Mid-End of July to mid-September	End of September to October / November	End of November and December
Not present. In deep water		Moving northward past Qikiqtarjuaq in mid-June	Seldom seen. Maybe be seen in Merchants Bay and Padle Fiord.		Not present

Figure 11 Beluga seasonal distribution near Qikiqtarjuaq (Qikiqtani Inuit Association, 2018, p. 48)

ᐅᑭᐅᖅ Ukiuq	ᐅᐱᕐᓂᖅᓱᖅ Upirngasaaq	ᐅᐱᕐᓂᖅ Upirngaaq	ᐊᔾᔨᖅ Aujaq	ᐅᑭᐊᓱᖅ Ukiassaaq	ᐅᑭᐊᖅ Ukiaq
January to mid-March	Mid-March through third week of May	End of May to mid-July	Mid-End of July to mid-September	End of September to October / November	End of November and December
Not present. In deep water at floe edge in Baffin Bay	Migrating north in April	At floe edge; near Qikiqtarjuaq mid-June migrating northward	Migrating south along with other whales	Migrating south along with other whales; Gone by November	Not present; Offshore northern Davis Strait and southern Baffin Bay

Figure 10 Narwhal seasonal distribution near Qikiqtarjuaq (Qikiqtani Inuit Association, 2018, p. 54)

		ᐅᑭᐅᖅ Ukiuq	ᐅᐱᕐᓂᖅᓱᖅ Upirngasaaq	ᐅᐱᕐᓂᖅ Upirngaaq	ᐊᔾᔨᖅ Aujaq	ᐅᑭᐊᓱᖅ Ukiassaaq	ᐅᑭᐊᖅ Ukiaq
		winter	early spring	late spring	summer	early fall	fall, early winter
	Qikiqtarjuaq	Not present	Not present	Arriving in July	Present	Leave the area in September	Not present

Figure 9 Seasonal location of killer whale based on IQ (Qikiqtani Inuit Association, 2018, p. 58)

	ᐅᑭᐅᖅ Ukiuq	ᐅᐱᕐᓂᖅᓱᖅ Upirngasaaq	ᐅᐱᕐᓂᖅ Upirngaaq	ᐊᔾᔨᖅ Aujaq	ᐅᑭᐊᓱᖅ Ukiassaaq	ᐅᑭᐊᖅ Ukiaq
	winter	early spring	late spring	summer	early fall	fall, early winter
Qikiqtarjuaq	Not present	Not present	Arrive in the area	Abundant in near shore waters, and fiords and inlets	Whales from the north passing by Qikiqtarjuaq. Leave before ice forms	Not present

Figure 12 Seasonal location of bowhead whales based on IQ (Qikiqtani Inuit Association, 2018, p. 60)

Potential Impacts on Birds around Qikiqtarjuaq (February–March)

The majority of marine related birds arrive on Baffin Island during Upirngasaaq (mid-March – beginning of May) and depart towards the end of Aujaq (mid-September).
The exceptions are the Black guillemot and thick-billed murre. They remain in Baffin Bay and Davis Strait year-round, keeping to open waters during the winter (Qikiqtani Inuit Association, 2018, p. 84).

Our operations in February and beginning of March (Ukiuq) will be on sea ice therefore no birds expected to be present.

	Upirngasaaq	Upirngaaq	Aujaq
Arctic Loon			
Arctic Tern		X	X
Black Guillemot*	X	X	X
Brant Goose		X	X
Canada Geese		X	X
Common Loon			
Red breasted Merganser		X	X
Dovekie		X	X
Eider duck*	X	X	X
Greater Snow Geese		X	X
Gulls		X	X
Harlequin duck		X	X
King Eider		X	X
Black-legged Kittiwake		X	X
Long-tailed Jaeger		X	X
Northern Fulmar		X	X
Long-tailed duck (Oldsquaw)		X	X
Red-necked Phalarope		X	X
Plovers		X	X
Razor Bill		X	X
Red knot		X	X
Ruddy Turnstone		X	X
Sandhill Crane		X	X
Sandpiper		X	X
Shorebirds		X	X
Thick-billed murre*	X	X	X
Tundra Swan		X	X
White-fronted goose		X	X
Yellow-billed Loon		X	X

*These birds remain year round wintering in open water areas

Figure 13 Common birds of Baffin Bay and Davis strait (Qikiqtani Inuit Association, 2018, p. 85)

Potential Impacts on Phytoplankton and Zooplankton

Sea ice is a crucial habitat for microorganisms such as phytoplankton and other microbes that form the base of the Arctic food chain. The spring and summer algae bloom, particularly from April to June, marks a vital period for Arctic marine life, with ice algae starting to bloom as early as April, followed by phytoplankton as the ice melts. These organisms support a wide range of species, from fish to marine mammals and birds.
The timing of our operations in February and beginning of March avoids disrupting this critical bloom period, which starts when the sea ice starts thinning.
Artificial light may disturb the natural cycle of zooplankton and krill and invertedly start their diel vertical migration (M. Teunis, 2023, p. 34). Minimizing artificial light will reduce this risk.

Potential Impacts on harvesting

As noted by the Nattivak Hunters & Trappers Organization, field test operations may mainly impact seal harvesting activities. Noise and human activity could potentially disturb seals, causing them to leave the area.
To minimize these impacts, mitigation measures will be implemented, including noise level reduction, avoiding key habitats, and the utilization of low-impact lighting to limit disturbances to seal populations.
To further mitigate risks, local wildlife monitors will be engaged during the flooding phase of the operations. The field test will avoid areas with known wildlife concentrations and key habitats, including seal dens. Additionally, the advice and expertise of wildlife monitors will guide the selection of the exact location for the Arctic Ice Thickening (AIT) field test.

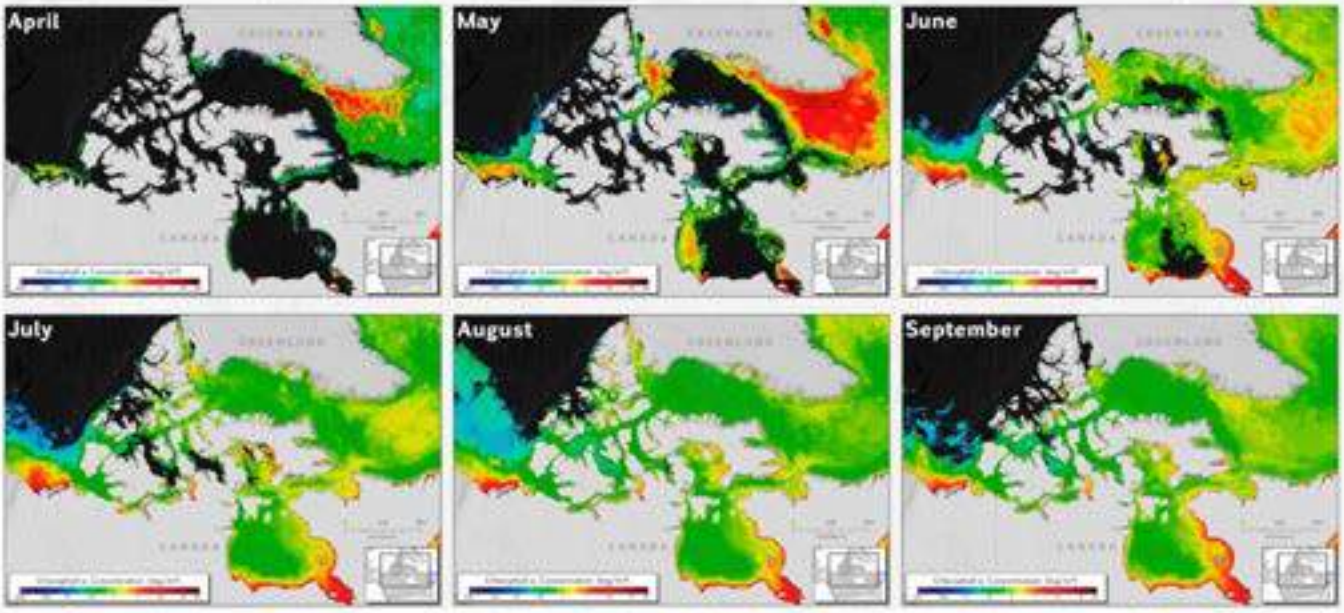

Figure 3.2 *Monthly average chlorophyll-a concentration in the Canadian Arctic based on satellite imagery (pelagic phytoplankton). Chlorophyll is the green pigment in phytoplankton, so areas with high chlorophyll concentrations are places where phytoplankton are growing (Oceans North Conservation Society et al. 2018).*

Advanced Research + Invention Agency ARIA

Annex 12: Exploring Climate Cooling | Community Engagement

Exploring Climate Cooling: Engagement flow

This is an outline for the engagement process. Teams will tailor their approach to the experiment, location and community.

Phase 1: Technical design + pre-site selection

Includes scoping technical details of the experiment and initial outreach to key stakeholders.

- Teams define all technical, scientific and logistical requirements for the experiment.
- They begin initial outreach with key stakeholders in potential sites, including land owners, local authorities and relevant public bodies.
- They identify any permits or permissions required.
- They begin to identify opportunities for co-design and collaboration, and develop materials describing the experiment ready for sharing.

As a result, teams will:

- Update their experiment design.
- Identify required permits or permissions.
- Identify potential experiment sites, but no decision is made yet.

Phase 2: Engagement + Impact Assessment

Includes community engagement + co-design, Environmental Impact Assessment conducted and published.

- Teams deliver in-person events and activities around potential site(s). These may take place in community, educational, civic and third spaces and will be (co-)designed around the needs of the community and with the support of key stakeholders. At these events, teams will:
    - Introduce themselves.
    - Share their plans and research aims.
    - Engage in active and inclusive listening and two-way dialogue.
    - Develop the experiment design collaboratively with the community.
    - Collect and consider public views.
- Teams will undertake an independent Environmental Impact Assessment (EIA) and legal assessment, and share findings with the community for feedback.

- The community will have an opportunity to co-design the experiment in response to previous engagement (including the EIA).
- Teams will apply for and receive all permits and approvals and share them publicly.

As a result teams will:

- Update experiment design to address feedback and developments from the community.
- Publish the EIA.

Phase 3: Dual scrutiny

Includes scrutiny from ARIA and the independent Oversight Committee.

- ARIA's leadership and Oversight Committee review experiment plans, and scrutinise level of community engagement (conducted and ongoing).
- Oversight Committee recommendation and ARIA leadership decision published.
- Teams address any additional requirements or assurances requested during the scrutiny process.
- Summary of community engagement and feedback published.

As a result teams will:

- Seek formal approval for the experiment and location.

Phase 4: Experiment begins

If approved, includes preparation of, conduction of, and communication about the experiment.

- Technical and logistical preparation of the experiment and ongoing community engagement activity is prepared.
- Full details explaining the experiment, research aims and project activity to date are shared with the wider public. These will be in a range of accessible formats, and where possible will invite further response and engagement.
- The experiment begins. The community and wider public have ongoing opportunities to view the experiment and stay informed and involved.
- Ongoing environmental monitoring during the experiment ensures it is halted if any unexpected impacts are observed.

As a result teams will:

- Conduct the experiment and share the process publicly.

Phase 5: Experiment concludes

Includes all findings and data being shared with the community and wider public.

- The team concludes engagement with the community through in-person activities to share findings and answer any further questions.
- Final experiment results and data published, alongside accessible summaries. Results shared in scientific journals, and publicly.

As a result teams will:

- Conclude the experiment, and share the process and results publicly.