



NIRB Uuktuutinga Ihivriuqhikhamut #126079

Sikunnguaq - the likeness or image of ice in maps

Uuktuutinga Qanurittuq:	Amendment
Havaap Qanurittunia:	Scientific Research
Uuktuutinga Ublua:	1/28/2025 8:22:19 PM
Period of operation:	from 2025-03-04 to 2026-05-20
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QANURITTUT

Tukhiannaqtunik havaariyaumayumik uqauhiyun

Qablunaatitut: Project Background and Objective: This project was initiated by the SmartICE community management committee in Mittimatalik, the self-titled "Sikumiut (people of the ice)". The Sikumiut includes Elders and youth from Mittimatalik and members from the Mittimatalik Hunters and Trappers Organization, Hamlet Council, Canadian Rangers, Search and Rescue, and Parks Canada. Our international project team is now made up of co-principal investigators from University of Victoria, SmartICE, University College London in the United Kingdom, and the University of Bremen in Germany. Together with the Sikumiut and SmartICE community management committees in Iqaluktuuttiaq, Uqsuqtuuq, and Qikiqtarjuaq, we have co-designed a Nunavut based research plan to make better maps for identifying sea ice features related to safe travel from images and data collected by satellites. Recent changes in sea ice have led to more unpredictable conditions, leading to increased accidents and adverse effects on food security, health and wellbeing, economy, culture, and identity. Warming air temperatures, along with shifting ocean currents and weather patterns, have shortened the length of time in each year when sea ice is stable, affected ice roughness, and produced new cracks and areas of slush buried under surface snow. New tools are needed to complement local travel practices that are grounded in Inuit Qaujimajatuqangit (IQ), to overcome challenges associated with changing and unpredictable travel risks. Images and data collected by satellites, already used for some travel planning, can potentially provide more detailed information about the aspects of sea ice directly related to safe travel. Our objective is to understand how sea ice features related to safe travel can be identified in new satellite technologies, with a focus on a radar-based satellite technology called synthetic aperture radar (SAR) as a key source of sea ice information. Methods: Together with the community management committees in the four participating communities Mittimatalik, Iqaluktuuttiaq, Uqsuqtuuq, and Qikiqtarjuaq, we have identified ice roughness, slush, and ice thickness as priority sea ice features for monitoring with satellite images and data. Our project will conduct field work on sea ice close by to each of the four communities in late March to late May in 2025 and 2026. All field work will be done in close consultation with the SmartICE community management committees, as they rely on project outcomes for local sea ice mapping efforts. SmartICE community operators, some of whom are co-investigators on this project, will also participate in field data collection. All field research associated with our objectives is non-intrusive and observational. We will measure snow and sea ice properties on areas of sea ice nearby to the four participating communities, making day trips from research stations and other accommodations, travelling by snowmobile when conditions are safe. We will carry a small amount of spare gasoline and oil for the snowmobiles and for powering a 2-stroke ice core barrel drive. Data collection includes the use of ice augers and electromagnetic (EM) sensors for ice thickness, ice core barrels for taking ice cores, equipment for measuring snow properties in snow 'pits', battery operated temperature sensors for measuring snow and sea ice temperatures, and drones for taking photographs and scanning the surface (LiDAR and EM sensors). There will stationary thermistor-based sensors (ice buoys) installed in the sea ice until they can be removed in the spring. The positions of these ice buoys will be determined by members of the community management committees and will be marked for visibility. All EM and scanning (LiDAR) sensors are low power and do not make intrusive sound. We will have a spill response plan and spill kit, and all waste will be transported back to the communities for proper disposal. Communicating Results: The results will be shared with the participating communities as well as other communities across Nunavut where the Inuit-led, IQ-grounded, Sikumik Qaujimajuti ("tools to know how the ice is") system for community ice information sharing has been implemented. Roughness and slush mapping results will be incorporated into the SmartICE Ice Travel Safety Maps, the need for which was first recognized by community management committees. They identified that the ice charts produced by the Canadian Ice Service are primarily designed to support shipping and ice-breaking and are generated at temporal and spatial scales that are inconsistent with on-ice travel. We will use the community management committee meetings in Nunavut communities as the primary means of communicating project results, with other means including our project report to the NRI, and national conferences like ArcticNet. Data will be stored in the Polar Data Catalog and data and results will be made available by request.

Uiviititut: Not applicable.

[illegible]

Inuinnaqtun: Havaaghainut Naunaiyautit Inirumayaillu Havaaghat hapkua aullaqtitauhimayut taapkunannqa SmartICE nunallaarnit atannquyait katimayiralaangit Mittimatalingmi,

inmikkut-attiqhimayut “Sikumiut (inuit hikumiutat)”. Talvani Sikumiut ilauyut Iniqnirit inulrammiillu Mittimatalingmit katimayiniklu Mittimatalingmi Anguniaqtit Naniriaqtuqtillu Katimayit, Haamlakut Katimayit, Kanatami Anguniaqtit Ikayuqtit, Qiniqhiayit Annaktillu, taapkualu Pulaaqtarviit Kanatami. Nunaqyuaqmi havaaptingnit havaqativut tajja ikayuqtigiiktunik-ihivriuqhiyilluanik Ilihaqpaalliqvianit Victoria-mi, SmartICE, Ilihaqpaalliqviat London-mi United Kingdom-mi, Ilihaqpaalliqviallu Bremen, Germany-mit. Havaqatigiighutik taapkualu Sikumiut SmartICE nunallaarnit atannguyait katimayiralaangit Iqaluktuuttiaqmi, Uqhuqtuuq, Qikiqtaryuaq, ikayuqtigiitkumik-hanaqatauhimayut Nunavunmi tunngavilingmik qauyihaiyit parnaiyautainik taimaa nakuutqiyaniq nunaulyaliuriamik ilittuqhariamik taryum hikua qanurininganiinik ilauyughat amirnaittumik aullaqtut piksaluqhimayunit naunaitkutanillu katitiqhimayut qilangmi piksaliurutinit. Qangahaaq aallannguqhimayunit taryum hikuanit naahurinnaiqpalliyuq, talvuuna amigaiqpalliyut irininautit hulyuqaraangat naahurinnaittunik ihuilutiniklu niqighailliurniqmut, aanniaqtailiniqmut inuuhiqattiarniqmullu, manighiurniqmut, ilitquhinut, ilittuqhitinullu. Uquuhivalliyuq anuri, ahiagullu hanguvalliyut taryum harvait hilaplu aallannguqtarniit, naihivaalliutauyuq hivitunianik upluqhiuttikkut ukiuq tamaat taryuq amirnaiqviat, ihuilitauyut piqaluyangnit maniilruit, nutaaniklu ainniqaqtut amiriyaghallu ima q aputim ataani. Nutaat hanalrutit ihariagiyaayut ilauyughat nunallaarmiunut aullaayuktunik maliktuivaktut Inuit Qauhimayatuqainnik (IQ), ayuqnaiqpaalliriamik ayuqhautauvaktut ilauyut aallannguqtaqtumut naahurinnaittumullu aullaqtunut amirnautit. Piksautit naunaitkutallu katitiqhimayut qilangmiittukkut piksaliutikkut, atuqtauliqtut tajja ilanginnut aullaqtut parnaiyautainut, naunaiqpaalliqviunginnaliklu qanurininganiinik taryum hikua ilauyunik amirnaittumik aullaqtunut. Iniqhiyumayugut taimaa ilihimattiariamik qanuq taryum hikua pitquhiit ilauyut amirnaittumik aullaqtunut ilitturiyaulaariaghait nutaanit qilangmiittukkut alruyaqtuqtukkut, ihumagilluaqhugu paqititjutikkut-tunngavilik qilangmiittukkut alruyaqtuqtut taiyauvaktuq hanayauhimayut piksautinik paqititjutik (SAR) hukumut naunaiqviulluangupluni. Havauhiit Havaqatigiplugit taapkua nunallaarni atannguyait katimayiralaat talvani hitamanit ilauyunit nunallaarnit Mittimatalik, Iqaluktuuttiaq, Uqhuqtuuq, Qikiqtaryuaqlu, ilitturihimaliqtaqqut hukum maniilruit, hikuilruit, hikuplu hilingnia irininaqtutut hukum pitquhiinik munariyaaghat qilangmiittukkut piksautikkut naunaitkutakullu. Havaaptingnit hikumi havakpangniaqtut qanilrumi tamangnit hitamanit nunallaarnit Qiqailruq nungutinnagu nungunnaqtumut Qiqaiyaluarviami 2025 2026-milu. Hikumi havaaghait iniqtauvangniat katimatjutauletik taapkualu SmartICE nunallaarni atannguyait katimayiralaangit, naahurivagamigit havaaghainit iniqtauhimayut nunallaarnit taryum hikuanik nunaulyaliuriamik. SmartICE nunallaarnit aulapkaiyit, ilangi ikayuqtiuplutik ihivriuqhiyilluanguyut havaaghanit hapkunani, ilauniaqtullu hikumi naunaitkutanik katitiriyunik. Tamangnik hikumi qauyihaiyut ilauyut havaaptingnut kuinginnautaittut naunaiyautikaffuuplutik. Qauyiharniaqtaqqut hilingnia aputik taryuplu hikuata pitquhit taryum hikuanit haniani tamangnik hitamauyut nunallaat, upluq tamaat aullaqutik qauyiharviit ahinillu nayugainit, aullaqutik sikiitukkut amirnaipat aullaariamik. Mikiyumik kaassiliqmik uhiniqhimayut uqhuqhamiklu sikiituqnut ingilrutituriamiklu 2-stroke-mik hukumik ikuutaqmik. Naunaitkutanik katitiriyut atuqpangniat hukumik ikuutanik alruyaqtuqtuniklu nipitaqtukkut (EM) qauyihautikkut hukum hilingnianik, hukum ikuutarniinik, ingilrutinik qauyihautighat aputim pitquhiinik aputim “hitiinit”, paatulikkut ingilrayut niklamaniqmik qauyihautit qauyihariamik aputim taryuplu hikua niklamaniit, halikaaptanguillu piksaliuriamik ihivriuriamiklu qaanga (LiDAR EM-niklu qauyihautit). Havakviqarniat niklamaniinik-qauyihautinik (SmartBUOY) iliuraqtauyunik taryum hikuanit ahivaqtauletik upinngaghami. Taapkua SmartBUOY-nguyut qakugunnguraangat aullaqtitauvaktut hikumi ataani pitquhimayaitut SmartICE nunallaarnit atannguyait katimayiralaangit naunaitkutaliqhimayughallu takunnariamik. Tamangnik EM-nguyut ihivriuhitillu (LiDAR) qauyihautit huangautituqpallaayuittut kuinginnaqtumiklu nivyaayuittut. Tamangnik iqqakuit upluqmit havaanginnit agyaqtauvangniat nunallaarnut ihuaqtukkut iqqakuqtauyughat.

Personnel

Personnel on site: 6

Days on site: 53

Total Person days: 318

Operations Phase: from 2025-03-04 to 2026-05-20

Hulilukaarutit

Inigiya	Hulilukaarut Qanurittuq	Nunannga Qanurittaakhaanik	Initurlinga qanuritpa	Initurlinga utuqqarnitat unaluuniit Ingilraaqnitat Uyarannguqtut akhuurninnga	Qanitqiyauyuq qanitqiamut nunallaat kitulluuniit ahiruqtaliyainnit nuna
Ikaluktutiak	Scientific/International Polar Year Research	Marine	n/a	n/a	We will be conducting research on the sea ice in Dease Strait off the coast of Cambridge Bay approximately 10 to 50 km from the community. Guidance from local authorities will be needed to avoid known pathways/trails on the sea ice used by residents.
Uqsuqtuuk	Scientific/International Polar Year Research	Marine	n/a	n/a	We will be conducting research on the sea ice in Rasmussen Basin off the coast of Gjoa Haven approximately 10 to 50 km from the community. Guidance from local authorities will be needed to avoid known pathways/trails on the sea ice used by residents.
Mittimatalik	Scientific/International Polar Year Research	Marine	n/a	n/a	We will be conducting research on the sea ice in Eclipse Sound off the coast of Pond Inlet approximately 5 to 50 km from the community. Guidance from local authorities will be needed to avoid known pathways/trails on the sea ice used by residents.
Qikiqtarjuaq	Scientific/International Polar Year Research	Marine	n/a	n/a	We will be conducting

					research on the sea ice south of Qikiqtarjuaq approximately 5 to 30 km from the community. Guidance from local authorities will be needed to avoid known pathways/trails on the sea ice used by residents.
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Nunaliin Ilauyun, Aviktuqhimayuniitunullu Ikayuuhiarunguyun

Nunauyuq	Atia	Timiuyuq	Upluani Uqaqatigiyaungmata
Ikaluktuttiak	Beverly Maksagak	Ekaluktutiak Hunters and Trappers Organization (EHTO)	2024-12-16
Qikiqtarjuaq	David Iqqaqsaq	Ikirmiut (SmartICE Community Management Committee)	2024-12-20
Mittimatalik	Andrew Arreak	Sikumiut (SmartICE Community Management Committee in Mittimatalik)	2024-10-03
Ikaluktuttiak	Angela Gerbrandt	Municipality of Cambridge Bay	2024-12-15

Angiuttauvaktunik

Naunaiqlugu nunanga talvani havauhikhaq ittuq:

Angiuttauvaktunik

Munariniqmut Ayuittiaqtuq	Angirutinga Qanurittuq	Tadja Qanurittaakhaanik	Ublua Tuniyauyuq/Uuktuqtuq	Umikvikhaa Ublua
Nunavunmi Ihivriuqniqmut Timiqutigiyanga	An application for a Nunavut scientific research license was made on 2024-12-19.	Applied, Decision Pending		
Kitikmeot Inuit Katimayiingit	As KIA represents the Inuit people of the Kitikmeot Region of Nunavut, we will meaningfully engage with KIA and Kitikmeot Inuit before, during and after the research has taken place.	Not Yet Applied		
Qikiqtani Inuit Katimayiit	As the regional Inuit association for the Qikiqtani Region of Nunavut, we will meaningfully engage with QIA and Qikiqtani Inuit during all stages of the research.	Not Yet Applied		

Project transportation types

Transportation Type	Qanuq Atuqtauniarmangaa	Length of Use
Air	The project team members located in southern communities will take commercial flights to travel to and from the project communities.	
Water	Field teams will travel on the sea ice by snowmobile, to and from field sites on a daily basis when field based activities are taking place.	

Project accomodation types

Nunauyuq

Ihuaqutivaluin Atuqtauyukhan

Hanalrutit atuqtaunahuat (ukuallu ikuutat, pampiutainnik, tingmitinik, akhaluutinik, hunaluuniit)

Hanalrutit Qanurittuq	Qaffiuyut	Aktikkulaanga – Qanurittullu	Qanuq Atuqtauniarmangaa
Snowmobile	12	2m x 1.5m x 1.5m	Access to field sites from project communities in 2025.
Snowmobile	8	2m x 1.5m x 1.5m	Access to field sites from project communities in 2026.
Surveying drone	4	373mm x 101mm x 298mm (unfolded)	Mapping sea ice surface roughness. Take off weight is less than 250g.
Surveying drone (LiDAR)	1	45cm x 45cm x 25cm	Mapping sea ice surface roughness using LiDAR technology.
EM-31	4	145cm x 38cm x 23cm	Geonics EM-31 electromagnetic induction (EM) device for measuring the apparent conductivity of sea ice and water, for inferring the sea ice thickness. Operates at 9.8 kHz.
GEM-2	2	183cm x 12.5cm x 10cm	Geophex Ltd. multi-frequency eletromagentic sensor for measuring the apparent conductivity of sea ice and water, for inferring sea ice and slush/snow thickness.
Thermistor-based stationary sensor (ice buoy)	4	40cm x 15cm x 240cm	SmartBUOYs that provides vertically spaced measurements of air, snow, sea ice, and water temperature, for monitoring changes in snow and ice thickness over time.
Ice coring system	4	128cm x 23cm x 7cm	Kovacs Mark II coring system to retrieve 9cm diameter sea ice cores up to 1m long.
Ice thickness kit	4	60cm x 40cm x 25cm	2 augur flights (50cm each), a 50cm extension rod, a handbrace, and an ice thickness measuring tape. Dimensions are for the kit when everything is dismantled and packed.
Snow pit kit	4	58cm x 22cm x 35cm	Each kit contains a foldable shovel, ruler, snow grain card, density sampler, battery operated temperature probe, brush, cloth, and notebook. Used for documenting snow grain and snow layer properties.
Engine drive	4	55cm x 38cm x 32cm	Kovacs 2-stroke core barrel engine drive for powering the Kovacs ice coring systems.

GNSS receiver	1	13cm x 13cm x 14cm	Emlid Reach RTK GNSS Receiver for positioning.
Hydraprobe snow sensor	2	38cm x 8cm x 30cm	Battery operated probe for measuring moisture and electrical conductivity of snow for remote sensing studies. Dimensions are for the probe and logger case. Actual sensing probe is 5.7cm long. Made by Stevens.
SLF snow sensor	1	4.5cm x 9cm x 4cm	SLF Snowpro-17 uses a capacitive sensor for measuring snow density in snow pits.

Qanurittuq Urhuqyuaq unalu Qayangnaqtut Hunavaluit Aturninnga

Qanurittuq urhuqyuaq hunavaluit aturninnga:	Urhuqyuaq Qanurittuq	Qaffiuyut qattaryut	Qattaryuk Aktikkulaanga	Atauttimut Qaffiuyut	Ilanga	Qanuq Atuqtauniarmangaa
Gasoline	fuel	4	20	80	Liters	Powering snowmobiles

Imaqmik Aturninnga

Ubluq qanuraaluk (m3)	Aturumayain imavaluin utiqittagaani qanuq	Atulirumayain imavaluin utiqittagani humi
0		

Iqqakuq

Ikkakunik Munakgiyauyunik

Havauhikhaq Hulilukaarut	Qanurittuq Iqqakut	Ihumagiyauyuq Qanuraaluktut Atuqtait	Qanuq Iqqakuurniarmangaa	Halummaqtirarnirutikhan piyutin
Information is not available				

Avatiliriniqmut Ayurhautingit:

Sea ice sites will be visited daily by snowmobile and daily field sampling involves measuring snow and sea ice properties while on the sea ice. There will be trampling around the sites when accessing them and small snow pits and ice core holes. Holes will be drilled in the sea ice to deploy ice buoys and their marking flags. Small snow and sea ice samples will be bagged daily and brought back to the research station or hotel accommodation and melted to measure for salinity. The water amount will be small enough that it will be dumped down the sink when done. Mitigation: The research stations or hotels will be handling all waste removal. Fueling of snowmobiles will take place daily at the research station or at retail services in the community that have their own fuel storage/containment/spill kits available if necessary. Efforts will be made to limit the snowmobile tracks and trampling at sites, and to restore the sites as they were before activities took place.

Additional Information

SECTION A1: Project Info

SECTION A2: Allweather Road

SECTION A3: Winter Road

SECTION B1: Project Info

SECTION B2: Exploration Activity

SECTION B3: Geosciences

SECTION B4: Drilling

SECTION B5: Stripping

SECTION B6: Underground Activity

SECTION B7: Waste Rock

SECTION B8: Stockpiles

SECTION B9: Mine Development

SECTION B10: Geology

SECTION B11: Mine

SECTION B12: Mill

SECTION C1: Pits

SECTION D1: Facility

SECTION D2: Facility Construction

SECTION D3: Facility Operation

SECTION D4: Vessel Use

SECTION E1: Offshore Survey

SECTION E2: Nearshore Survey

SECTION E3: Vessel Use

SECTION F1: Site Cleanup

SECTION G1: Well Authorization

SECTION G2: Onland Exploration

SECTION G3: Offshore Exploration

SECTION G4: Rig

SECTION H1: Vessel Use

SECTION H2: Disposal At Sea

SECTION I1: Municipal Development

Qanurittuq Ittunik Avatinga: Avatingalluanga

Qanurittuq Ittunik Avatinga: Inuuhimayunut Avatinga

Qanurittuq Ittunik Avatinga: Inungit-maniliurutingit Avatinga

Miscellaneous Project Information

Naunaiyainiq ukuninnga Ayurhautingit unalu Piumayaat Ikikliyuumiutinahuarutit

Tamatkiumayunik Ihuikgutivaktunik

Impacts

Ilitariyauniq Avatiliriniqmut Ayurhautingit

	PHYSICAL	Designated environmental areas	Ground stability	Permafrost	Hydrology / Limnology	Water quality	Climate conditions	Eskers and other unique or fragile landscapes	Surface and bedrock geology	Sediment and soil quality	Tidal processes and bathymetry	Air quality	Noise levels	BIOLOGICAL	Vegetation	Wildlife, including habitat and migration patterns	Birds, including habitat and migration patterns	Aquatic species, incl. habitat and migration/spawning	Wildlife protected areas	SOCIO-ECONOMIC	Archaeological and cultural historic sites	Employment	Community wellness	Community infrastructure	Human health
Havakvinga	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aulapkaininnga																									
Scientific/International Polar Year Research		-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-
Piiqtauniq																									
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

(P = Nakuuyuq, N = Nakuungittut unalu mikhilimaittuq, M = Nakuungittut unalu mikhittaaqtuq, U = Naluyauyuq)

Havaariyauyukhamut Nayugaa



List of Project Geometries

1	polygon	Ikaluktutiak
2	polygon	Uqsuqtuuk
3	polygon	Mittimatalik
4	polygon	Qikiqtarjuaq