



NIRB Uuktuutinga Ihivriughikhamut #125674

Reconstructing ancient sea level and seafloor conditions in the 1.9-billion-year-old Rocknest Formation

Uuktuutinga Qanurittuq: New

Havaap Qanurittunia: Scientific Research

Uuktuutinga Ublua: 2/27/2022 11:31:54 AM

Period of operation: from 0001-01-01 to 0001-01-01

Piumayaat Angirutinga: from 0001-01-01 to 0001-01-01

Havauhikhaq Ikayuqtinga: Emily Geyman
California Institute of Technology
446 S Catalina Ave, 303B
Pasadena California 91106
United States
Hivayautit Nampanga:: 2067083486, Kayumiktukkut Nampanga::

QANURITTUT

Tukihiannaqtunik havaariya uyumayumik uqauhiuyun

Qablunaatitut: Reconstructing ancient sea level and seafloor conditions in the 1.9-billion-year-old Rocknest Formation. Who: Emily Geyman, PhD student, California Institute of Technology, plus two other researchers/students who will be assisting in the field work. What: The Rocknest Formation consists of carbonate rocks that formed at the seafloor 1.9 billion years ago. These rocks, superbly exposed in the Kitikmeot Region, provide a rare window into ancient climate and life on Earth. I am requesting permission to carry out a small-scale research project in which myself and two assistants (3 people total) will camp next to Eokuk Lake for approximately 6 weeks. We will be dropped-off and picked-up by floatplane out of Yellowknife. Each day, we will travel by foot 1-10 km from the camp to carry out our research, which involves documenting the properties (e.g., grain size) of every rock layer in the Rocknest Formation. We will sleep in tents and store all food and garbage in sealed, wildlife-proof containers. We will pack out all equipment and garbage and dispose of it in Yellowknife. We will honor the wildlife, landscape, and natural environment. Why: Studying ancient climate and sea level change on Earth can help us make better predictions of future climate change. It is still poorly known when in Earth's 4.5-billion-year history was Earth covered in ice, and when was Earth warm and ice-free. Understanding when Earth had ice, and how it transitioned between cold and warm states, holds important information about Earth's climate system that can inform our mitigation strategies for future climate change. Where: Our proposed camp at Eokuk Lake (67.410072, -112.984692) is located approximately 101 km southeast of Kugluktuk and 550 km north of Yellowknife. When: Our proposed field work is from July-01-2022 to August-15-2022. The exact dates of the field work may change depending on floatplane availability and weather. Many thanks for your time and consideration. Sincerely, Emily Geyman

Uiviititut: Reconstitution des conditions anciennes du niveau de la mer et des fonds marins dans la formation Rocknest (1,9 milliard d'années). Who: Emily Geyman, Doctorante, L'Institut de Technologie de Californie. What: La formation Rocknest est constituée de roches calcaires qui se sont formées au fond de la mer il y a 1,9 milliard d'années. Ces roches, dans superbe affleurements dans la région de Kitikmeot, offrent une fenêtre rare sur le climat et la vie anciens sur Terre. Je demande la permission de mener à bien un projet de recherche à petite échelle dans lequel moi-même et deux assistants (3 personnes au total) camperons à côté du lac Eokuk pendant environ 6 semaines. Nous serons déposés et récupérés par hydravion à partir de Yellowknife. Chaque jour, nous parcourrons à pied 1 à 10 km du camp pour mener à bien nos recherches, qui consistent à documenter les propriétés (par exemple, la taille des grains) de chaque couche rocheuse de la formation Rocknest. Nous dormirons dans des tentes et stockerons toute la nourriture et les ordures dans des conteneurs scellés à l'épreuve de la faune. Nous emballons tout l'équipement et les déchets et nous les éliminons à Yellowknife. Nous honorerons la faune, le paysage et l'environnement naturel. Why: L'étude des changements climatiques anciens et du niveau de la mer sur Terre peut nous aider à mieux prédire les changements climatiques futurs. On ne sait toujours pas quand, au cours des 4,5 milliards d'années d'histoire de la Terre, la Terre a été recouverte de glace, et quand la Terre était-elle chaude et sans glace. Comprendre quand la Terre a eu de la glace, et comment elle est passée d'un état froid à un état chaud, contient des informations importantes sur le système climatique de la Terre qui peuvent éclairer nos stratégies d'atténuation du changement climatique futur. Where: Notre camp proposé au lac Eokuk (67.410072, -112.984692) est situé à environ 101 km au sud-est de Kugluktuk, et à 550 km au nord de Yellowknife. When: Notre travail sur le terrain proposé est du 01-juillet-2022 au 15-août-2022. Les dates exactes des travaux sur le terrain peuvent changer en fonction de la disponibilité des hydravions et des conditions météorologiques. Merci beaucoup pour votre temps et votre considération. Sincèrement, Emily Geyman

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Inuinnaqtun: Ajikuhinugit taimaniraaluk taqyuup immaqaniga taquvlu natqani qanuriniganik 1.9-biliani-ukiuni-utuqaunignik Uyaravaluit Uyaraguqpalianiginik. Kina: Emily Geyman, PhD-nigiamini iliahtuq, California-mi Ilihaqvikiyumi Nutauniqhanik. Hunamik: Uyaravaluit Uyaraguqpalianiginik uyaraliavaluit atautimukpalianigit taqyuup natqani 1.9-bilian ukiuni taimani. Ukua uyaqat, ihuaqtumik hatqitqut Qitiqmiuni Nunami, pipkaiyuq takuukhauqatagitumik kagiqhijutimik igilraat hilagiyaanik inuujuhiuyulu Hilaqyuami. Tuukhiqtuga agirunmik havaaqariamni mikiyumik ilituqhajutimik havaamik uvaga malruuklu ikayuqtikhak (pigahut inuit atautimut) tupiqhimanaiqtut haniani Eokuk-mi Tahiqmi qanituani 6-ni saniuniqni. Akyaqtauniaqtugut aiyaalutalu qayaqaqtukut tikmiamit Yalunaimit. Atuni ublutuaraagat, pihukpakniaqtugut 1-mit kulinut kilaamigamik tupiqaqvikmit havaariyaagani ilituqhautivut, ilaqaqtumik titiraqniginik hunaqaqniginik (ila uyaraliat agitilaaginik) tamaita uyaqat qaliriiktut Uyaravaluit Uyaraguqpalianiginik. Hinikniaqtugut tupiqni tuutquqlugilu tamaita niqit iqaguvaluilu akmalaiqhimayuni, uumayunit pilaiyaqhimayuni puuriyaayuni. Puuqtuqniaqtavut tamaita piqutit iqagulu igilugilu Yalunaimi. Ihumagitiaqniaqaqtut uumayut, nunagiyaayuq, maniqamilu avatigiyaayuq. Huuq: Ilituqhariagani igilraat hilap taquyulu immaqaniganik aalaguqniganik Nunaqyuami ikayuutaulaaqtuq nalautaarutiqatiariaptikni nakuutqiyamik hivunikhami hilaap aalaguqpalianiganik. Qauyimayauvalaagituq Nunaqyuap 4.5-ni biliani-ukiuni qanuriniganik Hilaqyuap qaliqaqniganik hikumik, hunautilugulu Nunaqyuap uunavyakniganik hikuqaginigani. Kagiqhimayaagani Nunaqyuap hikuqaqtulugu, qanuqlu nuugiaqniganik niglaumaniganit uunaqniganut, atuqniqaqtunik hivunihijutiqaqtuq Hilaqyuap hilagiyaanik qauyimajutauniaqtulu ihuaqhautinik atulirumayaayunik hivunikhami hilap aalaguqniganik. Humi: Aturumayaqut tupiqaqvikhaq Eokuk-mi Tahiqmi (67.410072, -112.984692-nunauyami nahauta huminiganik) iniaqtuq qanituani 101-kilaamitanik hivuraata kivaliqhiani Quqluqtuup 550-kilaamiganiklu tunungani Yalunaimit. Qagugu: Atulirumayaqut maniqami havaakhaq July 01-mit 2022-mi August 15-mut 2022-mi. Tahapkuagunigit ubluut aalagulaaqtut pijutauniganit qayalik tikmiap qahakniganit hilaamilu. Quanaqpiaqutit pivikhaqaravit ihumagiyaqniklu. Uvaga, Emily Geyman

Personnel

Personnel on site: 3

Days on site: 42

Total Person days: 126

Operations Phase: from 2022-01-22 to 2022-06-19

Operations Phase: from 2022-06-21 to 2022-08-05

Post-Closure Phase: from to

Hulilukaarutit

Inigiya	Hulilukaarut Qanurittuq	Nunannga Qanurittaakhaanik	Initurlinga qanuritpa	Initurlinga utuqqarnitat unaluuniit Ingilraaqnitat Uyarannguqtut akhuurninnga	Qanitqiyauyuq qanitqiamut nunallaat kitulluuniit ahiruqtaliyainnit nuna
Proposed camp site	Camp	Crown	I used the interactive maps at https://www.nunavut.ca/land-use-plans/interactive-maps to help learn about the site and the land use in the area. Our camp will be located on the boundary of the “mixed use” and the “limited use: wildlife habitat: caribou freshwater crossings” classification zones in the DNLUP Map A Land Use Designations.	We have not found documentation of archeological observations at Eokuk Lake. However, we know that this lake is intricately connected with the surrounding environment--through the land, the surface and ground water, the wildlife, etc.-to places that have sustained communities for thousands of years.	The nearest community is Kugluktuk, approximately 101 km northwest of our camp site and study area. Although Eokuk Lake is remote, we understand that surface water, ground water, wildlife, and environment is all connected. We will make sure not to generate any pollution or garbage that would contaminate the natural environment that is relied on by local communities (e.g., Kugluktuk) for fishing, hunting, etc.
Study area: Rocknest Formation (1.9 billion year old carbonate platform)	Researching	Crown	The rocks we will be looking at for our research are located in the “limited use: wildlife habitat: caribou freshwater crossings” classification zones in the DNLUP Map A Land Use Designations. Our area is outside the “Caribou migration corridors,” “Caribou core range,” and Caribou breeding core range” zones in the “Schedule B Valued Ecosystem and Socio-economic components map. We will make sure not to disturb any caribou (or any other wildlife) that we come across during our research.	See above.	The nearest community is Kugluktuk, approximately 101 km away from our camp site and study area.
Eokuk Lake: proposed floatplane landing site	Other	Crown	Eokuk Lake is our proposed landing spot for a Cessna floatplane out of Yellowknife, carrying our team of researchers/students (3 total). We will have one drop-off and one pick-up, and will be self-sufficient at our camp spot for the 6 weeks of	See above.	See above. The nearest community is Kugluktuk, approximately 101 km away from our camp site and study area.

			work.		
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Nunaliin Ilauyun, Aviktuqhimayuniitunullu Ikayuuhiarunguyun

Nunauyuq	Atia	Timiuyuq	Upluani Uqaqatigiyaungmata
Kugluktuk	Geoff Clark (Director of Lands, Environment, and Resources for the Kitikmeot Inuit Association)	Kitikmeot Inuit Association (KIA)	2022-02-27
Iqaluit	Lorraine Lebeau, Regional Mapping Geologist	Canada-Nunavut Geoscience Office	2022-02-14
Kugluktuk	Tannis Bolt, Project Manager	Kitikmeot Inuit Association	2022-02-28

Angiuttauvaktunik

Naunaiqlugu nunanga talvani havauhikhaq ittuq:

Kitikmeot

Angiuttauvaktunik

Munariniqmut Ayuittiaqtuq	Angirutinga Qanurittuq	Tadja Qanurittaakhaanik	Ublua Tuniyauyuq/Uuktuqtuq	Umikvikhaa Ublua
Alaanut	Nunavut Planning Commission -- Project Proposal submitted to NPC on February 22, 2022 (NPC file 149703) and forwarded to NIRB for screening on February 25, 2022 by senior planner Solomon Amuno.	Active	2022-02-25	
Indigenous and Northern Affairs Canada	Application for Land Use Permit from the Crown-Indigenous Relations and Northern Affairs Canada. I submitted the application on February 27, 2022. The period of the permit is 1.25 years (July 01, 2022 to September 01, 2023).	Applied, Decision Pending		
Kitikmeot Inuit Katimayiingit	I contacted Geoff Clark (Director of Lands, Environment, and Resources at the Kitikmeot Inuit Association) on February 27, 2022 to inquire about what sorts of permissions, authorizations, and communications I should seek out with the Kitikmeot Inuit Association.	Not Yet Applied		
Nunavut Imaligiyyit Katimayit	I am currently working on my application for Approval for the Use of Water or Deposit of Waste Without a License to the Nunavut Water Board (NWB). I plan to submit this application within the next two days.	Not Yet Applied		
Nunavunmi Ihivriunqimut Timiqutigiyanga	I am currently working on my Research Permit application to the	Not Yet Applied		

	Nunavut Research Institute (NRI). I plan to submit this application within the next two days.			
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Project transportation types

Transportation Type	Qanuq Atuqtauniarmangaa	Length of Use
Air	Transportation to the field site is through a Cessna float plane (Air Tindi, from Yellowknife), landing on Eokuk Lake. We will be dropped off in July with all of our equipment for 5 weeks of camping in our remote field camp (tents). Our research will be conducted on foot, walking 0-10 kilometers from our camp to our field area each day. We will be picked up on Eokuk Lake by floatplane in August and return to Yellowknife.	

Project accomodation types

Temporary Camp

Ihuaqutivaluin Atuqtauyukhan

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

Hanalrutit Qanurittuq	Qaffiuyut	Aktikkulaanga – Qanurittullu	Qanuq Atuqtauniarmangaa
Float plane	1	Length: 11.5 m, Wingspan: 15.9 m	Small passenger float plane for drop-off in early July and pick-up in mid-August. Likely a Cessna aircraft from Air Tindi out of Yellowknife (https://www.airtindi.com/our-fleet/cessna-caravan).
Small generator	1	0.3 x 0.3 m	Portable generator (Honda EU2200i) for charging personal electronics (e.g., cameras) and scientific equipment (handheld GPS). We will have very few needs for power, and won't need to run the generator at all most days. We plan to only use 20 liters of gasoline total for the 6-week remote camp (3 people).

Qanurittuq Urhuqyuaq unalu Qayangnaqtut Hunavaluit Aturninnga

Qanurittuq urhuqyuaq hunavaluit aturninnga:	Urhuqyuaq Qanurittuq	Qaffiuyut qattaryut	Qattaryuk Aktikkulaanga	Atauttimut Qaffiuyut	Ilanga	Qanuq Atuqtauniarmangaa
Gasoline	fuel	1	20	20	Liters	Fuel for portable generator (Honda EU2200i) for charging electronics such as cameras.
Propane	fuel	2	5	10	Gallons	Propane for camp stove (Coleman Triton Propane 2-Burner Stove). Use for cooking.

Imaqmik Aturninnga

Ubluq qanuraaluk (m3)	Aturumayain imavaluin utiqittagaani qanuq	Atulirumayain imavaluin utiqittagani humi
0	We will collect water by bucket from Eokuk Lake or a tributary stream, and filter the water through a gravity filter. Our only water needs are for drinking and cooking.	Eokuk Lake or a tributary stream to Eokuk Lake.

Iqqakuq

Ikkakunik Munakgiyauyunik

Havauhikhaq Hulilukaarut	Qanurittuq Iqqakut	Ihumagiyauyuq Qanuraaluktut Atuqtait	Qanuq Iqqakuurniarmangaa	Halummaqtirarnirutikhan piyutin
Camp	Anaagun (inuin anaaguin)	3 people for 6 weeks = 142 person-days of waste.	We will make a hand- dug pit in sandy, well- drained soil at least 50 meters from the high- water line of any water bodies in the area. We will fill the pit following use.	We will have a special garbage container for used toilet paper, which we will pack out during camp clean-up and dispose of in Yellowknife.

Avatiliriniqmut Ayurhautingit:

Our presence in the Eokuk Lake region of Kitikmeot will influence the wildlife around us, from birds to fish to caribou to bears. However, we will work hard to mitigate the influence we have on the surrounding environment. For example, we will be dropped-off and picked-up from the site by float plane (landing on Eokuk Lake). This flight will affect birds and will be noisy. However, we will do all of our research work by foot (no air support by helicopter, etc.). This minimizes our environmental footprint (we will not need to bring fuel to the site) as well as our disturbance to nearby wildlife. Likewise, we will not be hunting or fishing during our stay, so we will not affect the local wildlife populations. We will bring all of our food from Yellowknife in sealed, wildlife- and bear-proof barrels. We will store our trash in the same bear-proof containers and bring it all back with us to Yellowknife. Another environmental impact of our stay in the Eokuk Lake region of Kitikmeot is our impact on local surface water and groundwater. We will obtain our drinking water by bucket from Eokuk Lake and will filter it through a gravity filter. Importantly, we are concerned about making sure that our human waste (feces) does not contaminate the local waterways. We will bury our human waste in a hand-dug pit in sandy, well-drained soil at least 50 meters away from the high-water line of lakes and streams.

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

The Eokuk Lake region of Kitikmeot is a spectacular exposure of some of the oldest and best-preserved rocks in the world. These rocks may hold the key to understanding whether Earth had ice age cycles approximately 2 billion years ago. Meanwhile, the modern landscape is sculpted by the last ice age, just ~20,000 years ago. The glaciers and ice sheets of the last glacial period carved the rocks in this region, polishing and exposing the information encoded in each layer of rock to give geologists a window into what the ancient seafloor looked like 1.9 billion years ago. This remarkable juxtaposition of ancient and modern landscapes is one of the things that makes the Kitikmeot region so remarkable and why we hope to study and learn from the rocks there.

Qanurittuq Ittunik Avatinga: Inuuhimayunut Avatinga

The land in the Eokuk Lake region of Kitikmeot is a mix of glacially carved lakes with connecting streams, polished sedimentary rocks, and low scrub vegetation. There are fish, birds, caribou, and barren land grizzly bears. We may also encounter falcons, hawks, eagles, moose, muskoxen, and foxes. Since this region is dark and cold for much of the year, the vegetation has a short growing season.

Qanurittuq Ittunik Avatinga: Inungit-maniliurutingit Avatinga

The nearest hamlet to our study area next to Eokuk Lake is Kugluktuk, which is approximately 101 km away (to the northwest). Kugluktuk has many visitors in the summer months who come down the Coppermine River. The socioeconomic environment based on this tourism includes expedition outfitters and also support for arts and culture. Although our study area is outside the watershed of the Coppermine River, the natural environment is all connected--through surface water and ground water, through wildlife, through the air, etc. For this reason, we want to make sure our activities do not negatively affect the hunting and fishing activities of people in Kugluktuk or elsewhere in Nunavut. We will not be doing any hunting or fishing ourselves. Also, we will make sure we pack out all of our garbage at the end of the field work, so we do not pollute the land or the waterways. Finally, we have written to the Kitikmeot Inuit Association and offered to travel to Kugluktuk to set up a meeting there in order to discuss the project, learn about the history of the lands, and learn how to live and work responsibly in the Eokuk Lake region during our fieldwork.

Miscellaneous Project Information

Naunaiyainiq ukuninnga Ayurhautingit unalu Piumayaat Ikiikliyuumiutinahuarutit

See the next section for a further description of our predicted impacts and proposed mitigation measures. We will strive to reduce our impact the wildlife, environment, and waterways. For example, we will try to make sure that our human waste (feces) does not contaminate the local groundwater or surface water by burying waste in a hand-dug pit in sandy, well-drained soil at least 50 meters away from the high-water line of lakes and streams. Likewise, we will store all of our food and garbage in sealed, wildlife- and bear-proof containers. We will take away all of our garbage at the end of

the research trip and dispose of it in Yellowknife.

Tamatkiumayunik Ihuikgutivaktunik

We believe we can effectively mitigate the negative effects of our presence in Kitikmeot (e.g., minimize our impact on the land and the environment) and can take actions to have positive impacts, for example through socioeconomic benefits for the outfitting of our field work and our proposed visit to Kugluktuk to meet with a representative from the Kitikmeot Inuit Association so we can learn about the history of the lands and learn how to live and work responsibly in the Eokuk Lake region during our fieldwork.

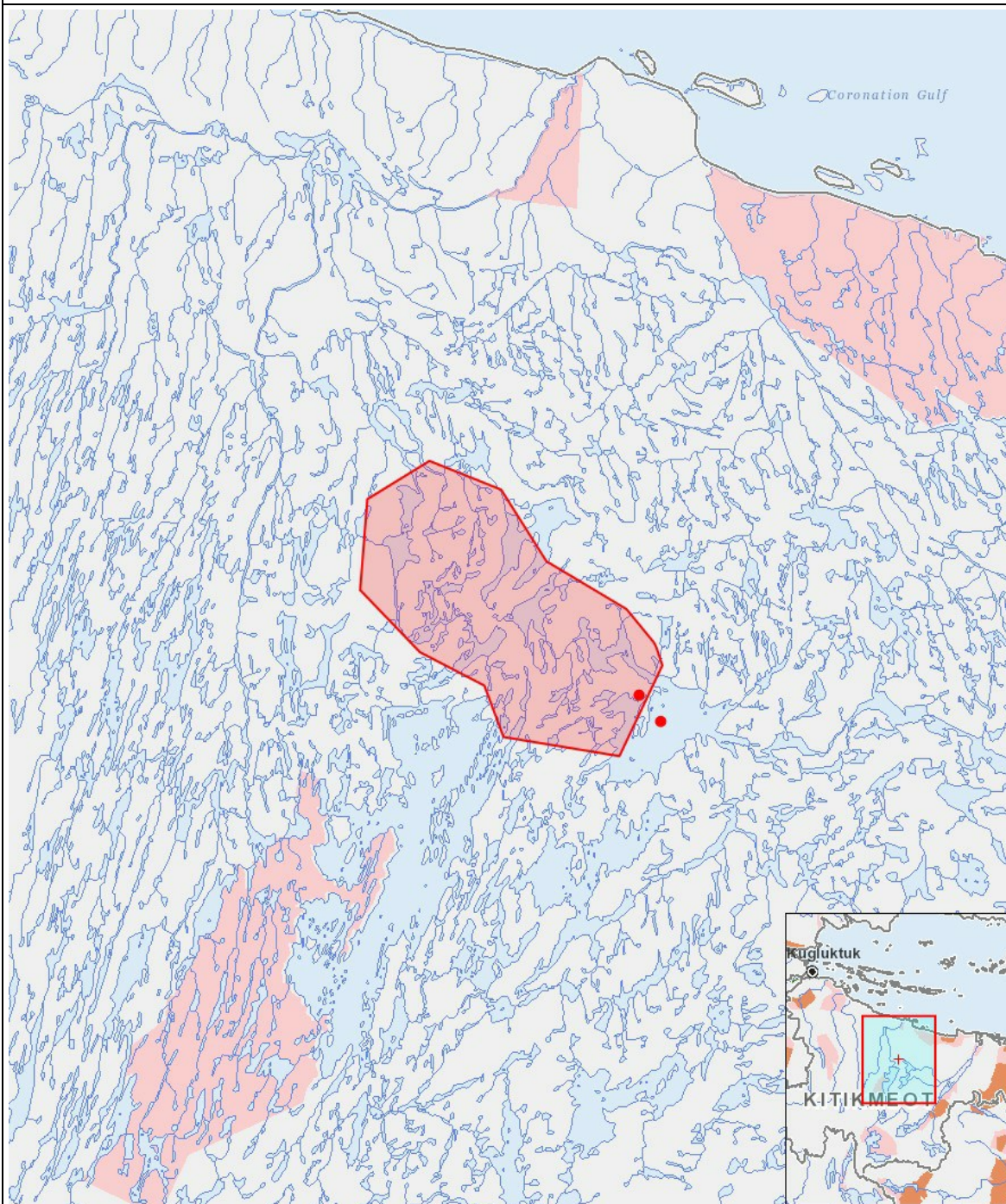
Impacts

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																										
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Aulapkaininnga																										
Camp		M	-	-	-	-	-	-	-	-	-	-	-	-		M	M	M	-	M		P	P	-	P	-
Piiqtauniq																										
-		-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-		-	-	-	-	-

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

Havaariyaayukhamut Nayugaa



List of Project Geometries

- | | | |
|---|---------|--|
| 1 | polygon | Study area: Rocknest Formation (1.9 billion year old carbonate platform) |
| 2 | point | Proposed camp site |
| 3 | point | Eokuk Lake: proposed floatplane landing site |