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Connecting Snow Melt to River Discharge in the Kitikmeot Region and Northwest Territories

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Scientific Research

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

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An increase in temperatures, increased frequency of extreme weather events, and shifts in the timing of freeze-thaw conditions will directly impact the Arctic hydrological cycle. In particular, changes to the timing of snow accumulation and subsequent melt on land will influence the delivery of freshwater to river systems and, ultimately, to the ocean. This project is motivated by a need to better characterize and quantify the impacts of changing snow conditions on river discharge within the Kitikmeot Region and Northwest Territories in order to better understand freshwater contributions to the ocean under a changing climate. This project composes Aspect 4 (Hydrology) of a multi-disciplinary cryospheric monitoring network project lead by Dr. Alex Langlois, Université de Sherbrooke, entitled “Development of a multi-scale cryosphere monitoring network for the Kitikmeot region and Northwest territories using in-situ measurements, modeling and remote sensing”, funded by Polar Knowledge Canada. There are three main objectives to this study: (1) to investigate the geochemical characteristics of winter snow cover and spring snow melt; (2) use observed geochemical values to determine snow melt contributions to spring flow of the Coppermine River and Freshwater Creek, the major river systems associated with the snow sampling sites; and (3) use model outputs to predict the impact of future changes in snow cover to freshwater export to the marine system. Field sampling for the hydrology study will be carried out in collaboration with community and research partners working within the Coppermine River and Freshwater Creek. Weekly river sampling in the spring (snow and ice cover) will be carried out using snowmobiles and no permanent infrastructure will be erected. Once the snow and ice have cleared from the river, water sampling will continue with the use of small boats (operated by local community partners) or directly from the stream-side. River water samples collected are non-destructive and no restoration plans are required. In conjunction with snow sampling that will be carried out by Dr. Langlois’ team, water samples for the determination of snow melt and river geochemistry will be collected from the Coppermine River starting in March until the end of summer and from Freshwater Creek from ice break up (June) until freeze-up (October). Coppermine River sampling will be conducted in collaboration with the Kugluktuk Hunters and Trappers Organization. Results from this project will be shared with the communities of Kugluktuk and Cambridge Bay, as facilitated through local contacts such as the Kugluktuk HTO, Cambridge Bay HTO, and CHARs. Results from the cryospheric monitoring network study will be communicated through pamphlets and posters, and will contribute to the development of a community based-monitoring program of weather observations. Aspect 4 (Hydrology) of the cryospheric monitoring network project has been discussed with the Kugluktuk HTO, who supplied a letter of support for our initial project proposal.

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mut). Qurluqtum Kuugaanik qauyihainahuat havaqatigilugit taapkua Qurluqtum Anguniaqtit Naniriaqtuqtillu katimayit. Iitturihimaliqtait hapkuninnga qauyihaqtainit takupkaqtitauniaqtut nunallaaqnut Qurluqtuqmut Iqaluktuuttiaqmullu, talvuuna nunallaaqni havaktiigut taapkua Qurluqtumi HTO-ngat, Iqaluktuuttiam HTO-ngat, CHARS-kullu. Ilihimaliqtait hapkuninnga hikuinnauyumi munaqhiyunik qauyihaiyut naunaiqhitiyauniaqqut titirakkut naunaitkutakkullu, ikayuutauniaqtuqlu nunallaaqmi munaqhiyunut hilaliqiyunik. Aspect 4 (Imaliqiyit) hikuinnauyumik munaqhiyut havaaghait unipkaaqtahimayut taapkuninnga Qurluqtum HTO-ngat, titiraqhimayut tuniqhihimainnaqhutik havaaghanik hapkuninnga.

Personnel

Personnel on site: 2

Days on site: 15

Total Person days: 30

Operations Phase: from 2018-02-18 to 2019-02-17

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Freshwater Creek Sampling Site	Sampling sites	Municipal	River sampling location next to the Water Survey of Canada water gauge station.	unknown	Within the community of Cambridge Bay
Coppermine River Sampling Site	Sampling sites	Municipal	River sampling location near to the community of Kugluktuk, chosen through collaboration with the Kugluktuk HTO. This site has been used by the Kugluktuk HTO to collect river water samples as part of previous projects conducted from 2014-2016. The site was chosen so as not to interfere with local uses of the river, but also be safely accessible by the community sampler at different times throughout the year.	unknown	The sampling site is located about 9.5 km from the community of Kugluktuk.

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የጥናት ስፔሻል አካባቢ	Amanda Dumond	Kugluktuk Hunters and Trappers' Organization	2017-04-07
የጥናት ስፔሻል አካባቢ	Larry Adjun	Kugluktuk Hunters and Trappers' Organization	2017-04-07
የጥናት ስፔሻል አካባቢ	Donald McLennan	POLAR	2016-12-12

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Kitikmeot

የጥናት ስፔሻል አካባቢ ማረጋገጫ

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Information is not available

Project transportation types

Transportation Type	ᑭᓐᓂᓕᔪᓄᑦ	ᓴᓇᒃ ᐱᑐᓚᓈᓂᐱᓄᑦ	Length of Use
Water	0	Lund Aluminum Boat (Coppermine River)	
Land	0	Snowmobile (snow), ATV (no-snow) to both Coppermine River and Freshwater Creek sites	

Project accomodation types

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snowmobile	1	NA	access to sampling site
ATV	2	NA	access to sampling site
aluminum boat	1	18ft	access to sampling site (open water)
River Geochemistry Sampling Kit	1	6.5x7.5x1.5 inches	Sampling kit used to collect water for the determination of river geochemistry, includes: plastic syringe, plastic filter, sampling bottles, gloves. 1 used per site/per visit. All contents will return to lab post collection.

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0	500mL of river water sampled by hand, using a 50mL syringe from each location (Coppermine River and Freshwater Creek). Water is only collected on sampling days (<15 times at each site over the year)	Sampling locations in the Coppermine River and Freshwater Creek (see map)

 $\triangleleft^b C d^c$
$$\Delta^b C d \leq \rho \sigma \Delta^a \sigma^a$$

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Sampling sites	Other, sampling material plastic waste (50mL syringe)	1x 50mL syringe per sample	All plastic waste will be sent south for recycling.	None needed.

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No negative environmental impacts are anticipated from this project. River sampling in the spring (snow and ice cover present) will be carried out by accessing the sites via snowmobile and no permanent infrastructure will be erected. Once the snow and ice have cleared from the rivers, water sampling will continue with the use of small boats (operated by local community partners in Kuqłuktuk) or directly from the stream-side (Freshwater

Creek). The samples collected are non-destructive, generate no waste to remain on-site, and no restoration plans are required.

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 11: Municipal Development

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Cumulative Effects

Impacts

$\Delta^{\text{fb}} \text{CD} \sigma^{\text{fb}} \Gamma^{\text{C}} \quad \Delta^{\text{C}} \text{N} \Gamma \text{D} \text{C} \dot{\sigma}^{\text{C}} \text{D}^{\text{C}} \quad \Delta^{\text{b}} \text{D}^{\text{fb}} \text{CD} \text{r} \text{L} \text{r}^{\text{C}}$

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$$(P = \mathbb{A}^1_{\mathbb{B}} \times \mathbb{P}^1 \cap \mathcal{L}^a_{\mathbb{B}} \mathcal{L}^b_{\mathbb{B}})^c, N = \mathbb{A}^1_{\mathbb{B}} \times \mathbb{P}^1 \cap (\mathcal{D}^a_{\mathbb{B}} \mathcal{L}^b_{\mathbb{B}})^c \subset \mathcal{L}^a_{\mathbb{B}} \mathbb{P}^1 \times \mathbb{P}^1 \cap (\mathcal{D}^a_{\mathbb{B}} \mathcal{L}^b_{\mathbb{B}})^c \supset, M = \mathbb{A}^1_{\mathbb{B}} \times \mathbb{P}^1 \cap (\mathcal{D}^a_{\mathbb{B}} \mathcal{L}^b_{\mathbb{B}})^c \subset \mathcal{L}^a_{\mathbb{B}} \mathbb{P}^1 \times \mathbb{P}^1 \cap (\mathcal{D}^a_{\mathbb{B}} \mathcal{L}^b_{\mathbb{B}})^c \supset, U = \mathbb{B} \times \mathbb{L}^a_{\mathbb{B}} \mathcal{L}^b_{\mathbb{B}} \cap \mathcal{L}^a_{\mathbb{B}} \mathcal{L}^b_{\mathbb{B}})$$