NIRB Application for Screening #125654

Measuring Glacier and Snow Changes in Grise Fiord

Application Type:	New
Project Type:	Scientific Research
Application Date:	2/4/2022 10:41:51 AM
Period of operation:	from 0001-01-01 to 0001-01-01
Proposed Authorization:	from 0001-01-01 to 0001-01-01
Project Proponent:	Halle, Danielle University of Waterloo 355 MacKay St., Ottawa ON K1M 2B7 Canada Phone Number:: 3434634637, Fax Number::

DETAILS

Non-technical project proposal description

English: Danielle Hallé, a PhD student, from the University of Waterloo, is proposing a project to quantify the amount of water melting from the local snowpack and glaciers that contribute to the local river in the community of Grise Fiord, Nunavut. Motivation for this work comes from the inherent connection of glaciers and local nearby communities that will be affected by fluctuations of future warmings and associated glacier meltwater flowing through them. Previous studies of impacts on increasing glacier meltwater in a high Arctic community have been undertaken in the town of Qaanaaq in Greenland, where landslides have been triggered from increasing precipitation and runoff from Qaanaaq Ice Cap, which has results in blocked access to the local airport for an extended period. Qaanaaq is located at a similar latitude to Grise Fiord yet does not have any studies on the impacts of a warming climate on the local communities' glaciers and snowpack, this demonstrates the need for local studies of community impacts from a warming climate and increased glacial meltwater. Currently, the community of Grise Fiord does not rely on the glacier for a source of potable water, rather it is from the snowpack that accumulates in the nearby gullies and the meltwater from the annual snowpack that is stored in water tanks for use throughout the year. However, in low snow years or when infrastructure breaks down then a shortage in potable water occurs. Therefore, assessing the quantity and variations of the runoff from the partially glaciated watershed would help to inform the community of whether it is reasonable to install infrastructure to extract drinking water infrastructure for the glacier and snow meltwater.The Grise Fiord watershed is 39km2 in area and consists of four different glaciers ranging from 0.12km2 to 5.69 km2 in total area. The glaciers are the ideal size for using smaller uncrewed aerial vehicle (UAV) for surveys to conduct analysis at finer scales. The UAV will be used for creating snow depth products for monitoring snow cover. Some challenges for mapping snow depth with an UAV includes time constraints, inaccessible steep field sites and weather conditions. These challenges are considerations that are integrated into the method of conducting fieldwork and can be overcome through spending longer periods in the field to ensure weather windows for conducting UAV fieldwork and repeat visits. The products developed from drone photography, snow depth measurements, and weather station measurements will be essential for accurately modelling the watershed for current and future melt processes. The proposed work is expected to take place in the late summer (August to September) on an annual basis for the next two years.[Expected Outcomes] The outcomes of this research project will be a comprehensive assessment of the past and future changes within the watershed of Grise Fiord. This is significant for quantifying impacts of climate change at the watershed scale and for determining feasibility of the glacier and snow melt to provide a secondary source of potable water for the Inuit community of Grise Fiord

French: Danielle Hallé, étudiante au doctorat à l'Université de Waterloo, propose un projet visant à quantifier la quantité d'eau qui fond du manteau neigeux local et des glaciers qui contribuent à la rivière locale dans la communauté de Grise Fiord, au Nunavut. La motivation pour ce travail vient de la connexion inhérente des glaciers et des communautés locales voisines qui seront affectées par les fluctuations des futurs réchauffements et les eaux de fonte des glaciers qui les traversent. Des études antérieures des impacts sur l'augmentation de l'eau de fonte des glaciers dans une communauté de l'Extrême-Arctique ont été entreprises dans la ville de Qaanaaq au Groenland, où des glissements de terrain ont été déclenchés par l'augmentation des précipitations et du ruissellement de la calotte glaciaire de Qaanaaq, ce qui a bloqué l'accès à l'aéroport local pour une période prolongée. Qaanaaq est situé à une latitude similaire à Grise Fiord mais ils n'existent pas d'études sur les impacts d'un réchauffement climatique sur les glaciers et le manteau neigeux des communautés locales, cela démontre la nécessité d'études locales des impacts communautaires d'un réchauffement climatique et d'une augmentation de l'eau de fonte des glaciers.Actuellement, la communauté de Grise Fiord ne dépend pas du glacier comme source d'eau potable, mais plutôt de l'accumulation de neige qui s'accumule dans les ravines voisines et de l'eau de fonte de l'accumulation de neige annuelle qui est stockée dans des réservoirs d'eau pour une utilisation tout au long de l'année. Cependant, les années où la neige est faible ou lorsque les infrastructures tombent en panne, une pénurie d'eau potable est fort probable. Ainsi, l'évaluation de la quantité et des variations du ruissellement du bassin versant partiellement glaciaire aiderait à informer la communauté de la pertinence d'installer des infrastructures d'extraction d'eau potable pour le glacier et l'eau de fonte des neiges.Le bassin versant de Grise Fiord a une superficie de 39 km2 et se compose de quatre glaciers différents dont la superficie totale varie de 0,12 km2 à 5,69 km2. Les glaciers ont la taille idéale pour l'utilisation de véhicules aériens sans équipage (UAV - drone) plus petits pour les relevés afin d'effectuer des analyses à des échelles plus fines. Le drone sera utilisé pour créer des produits d'épaisseur de neige pour surveiller la couverture de neige. Certains défis pour cartographier la profondeur de la neige avec un UAV incluent les contraintes de temps, les sites de terrain escarpés inaccessibles et les conditions météorologiques. Ces défis sont des considérations qui sont intégrées dans la méthode de conduite du travail sur le terrain et peuvent être surmontées en passant de plus longues périodes sur le terrain pour garantir des fenêtres météorologiques pour effectuer le travail sur le terrain des UAV et des visites répétées. Les produits développés à partir de la photographie par drone, des mesures de l'épaisseur de la neige et des mesures des stations météorologiques seront essentiels pour modéliser avec précision le bassin versant pour les processus de fonte actuels et futurs. Les travaux proposés devraient avoir lieu à la fin

de l'été (d'août à septembre) sur une base annuelle pendant les deux prochaines années.[Résultats attendus] Les résultats de ce projet de recherche seront une évaluation complète des changements passés et futurs dans le bassin versant de Grise Fiord. Ceci est important pour quantifier les impacts du changement climatique à l'échelle du bassin versant et pour déterminer la faisabilité de la fonte des glaciers et des neiges pour fournir une source secondaire d'eau potable à la communauté inuite de Grise Fiord.

Inuktitut: ᑐᖏᓇᓱᖅᓚ ᑕᒪᑐᒪ ᑐᐹᕐᕋᐅᑎᐅᔪᖅ ᐱᓕᓇᐊᐹᖏᖅᑭᒥᓂᕆᔨᑦ ᖃᐅᔨᕗᑭᒥᓂᕆᔪᑦ ᐊᑐᑎᐅᑦ ᐊᐅᑦᑐᓕᐊᓂᖅᓚᓂᑦ ᓄᓇᓕᖅᑐᓂ ᐊᐅᔪᐃᑦᑐᓂᓗ ᖃᓄᑎᒥ ᐃᒪᒪᑎᖃᑦᑕᒪᖅᑎᑦ ᓄᓇᓕᓂᒋᑦ ᐊᓐᔪᒪᓂᖃᖅᖃᑦ ᐅᖅᑭᐹᓕᕐᓂᖅᓚᓂᑦ ᐊᑐᑦᑕᐹᓕᕐᓂᖅᓚᓂᑦ ᑐᓄᓕᕐᓂᖅᓚᓂᑦ ᑭᓐᓇᖅᑐᑦ ᐊᐅᑦᑐᓕᐊᓂᖅᓚᓂᑦ ᑭᑐᑦᑕᐅᓂᖃᖅᓂᐊᑦᓯᒪᑦ ᐅᖅᑭᐹᓕᕐᓂᖅᓚᓂᑦ ᐊᐅᔪᐃᑦᑐᓂᓗ ᐃᒪᓕᖅᑕᑦᓗᑎᑦ ᑭᑐᑦᑕᐅᓂᖃᖅᓂᐊᑦᓯᒪᑦ ᐊᐅᑦᑐᓕᐊᓂᖅᑎᑦ ᐊᐅᔪᐃᑦᑐᓂᓗ ᖃᐅᔨᓕᖅᑐᑦ ᓄᓇᓕᓂᒋᑦ ᓄᓇᓕᖅᓯᓂᖅᑕᖅᖃᓕᔪᖅ ᓄᓇᓕᖅᓴᓂ ᖃᐅᔨᓕᖅᑐᑦ ᐊᐅᔪᐃᑦᑐᓂᓗ ᐅᑭᐅᖅᑕᐅᑎᒃ ᓄᓇᓕᓂᒋᑦ ᑭᑐᑦᑕᐅᓂᖃᖅᓂᐊᑦᓯᒪᑦ ᐊᐅᔪᐃᑦᑐᓂᓗ ᑭᓐᓇᖅᑐᑦ ᐊᐅᔪᐃᑦᑐᓂᓗ ᓄᓇᓕᓂᒋᑦ ᓄᓇᓕᖅᓴᓂ ᐃᓕᓴᖅᑐᑦ ᐊᐅᔪᐃᑦᑐᓂᓗ

Activities

Location	Activity Type	Land Status	Site history	Site archaeological or paleontological value	Proximity to the nearest communities and any protected areas
Grise Fiord Watershed	Researching	Crown	N/A	N/A	500 metres to Grise Fiord.

Community Involvement & Regional Benefits

Community	Name	Organization	Date Contacted
Grise Fiord	Meeka Kiguktak	Mayor of Grise Fiord	2021-11-16
Grise Fiord	Jimmy Qaapik	Arctic College	2021-10-11

Authorizations

Indicate the areas in which the project is located:

North Baffin

Authorizations

Regulatory Authority	Authorization Description	Current Status	Date Issued / Applied	Expiry Date
Other	Application submitted to Nunavut Planning Comission	Active	2022-02-02	
Nunavut Research Institute	Application will be submitted after approval from NIRB	Not Yet Applied		

Project transportation types

Transportation Type	Proposed Use	Length of Use
Air	Transport to Grise Fiord from Resolute Bay	

Project accomodation types

Community

Material Use

Equipment to be used (including drills, pumps, aircraft, vehicles, etc)

Equipment Type	Quantity	Size - Dimensions	Proposed Use
Uncrewed aerial vehicle	1	116 cm	The uncrewed aerial vechical will be used for obtaining 3-D maps of the watershed through the use of photogrammetry techniques obtained during multiple flights to cover the area.
Hobo Loggers	3	4.2 in x 2.9 in x 0.9 in.	Mesauring air temperature
Timelapse camera	3	15 x 30cm	Capture the changes in melt on the glacier surface

Detail Fuel and Hazardous Material Use

Detail fuel material use:	Fuel Type	Number of containers	Container Capacity	Total Amount	Units	Proposed Use
Information is not available						

Water Consumption

Daily amount (m3)	Proposed water retrieval methods	Proposed water retrieval location
0	Surface water/Municipal water	76.427 -82.653

Waste

Waste Management

Project Activity	Type of Waste	Projected Amount Generated	Method of Disposal	Additional treatment procedures
Information is not available				

Environmental Impacts:

The project will conduct unmanned aerial vehicle surveys of the Grise Fiord watershed and involve the installation of weather stations that will be removed once the project is over. All fieldwork will be conducted by foot and is expected to have minimal environmental impacts. The research will be based out of the community of Grise Fiord and all muncipal waste/sewage will be dealt with through their systems,

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

Description of Existing Environment: Physical Environment

Description of Existing Environment: Biological Environment

Description of Existing Environment: Socio-economic Environment

Miscellaneous Project Information

Identification of Impacts and Proposed Mitigation Measures

Cumulative Effects

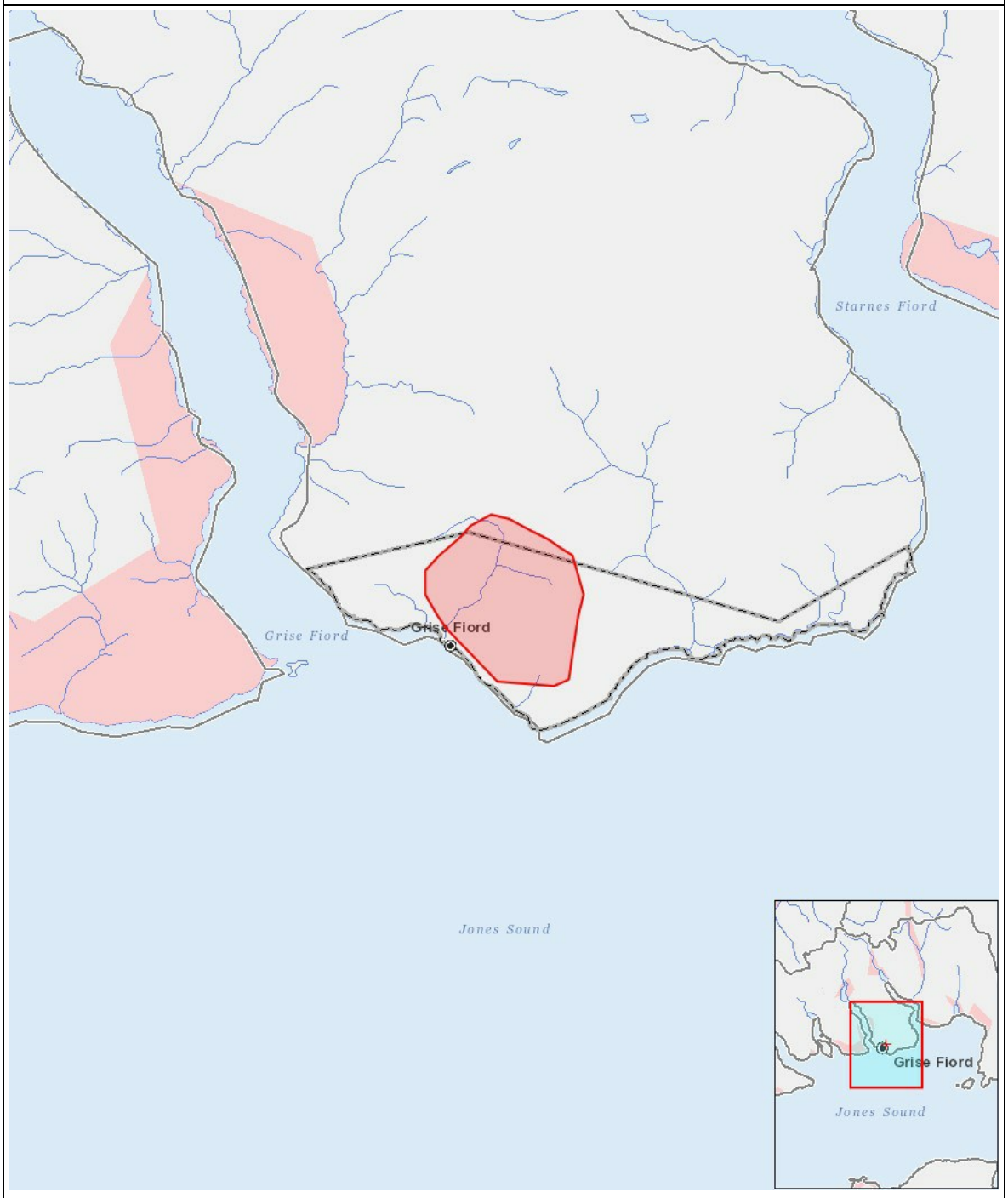
Impacts

Identification of Environmental Impacts

	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
Construction																									
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Operation																									
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Decommissioning																									
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(P = Positive, N = Negative and non-mitigatable, M = Negative and mitigatable, U = Unknown)

Project Location



List of Project Geometries

1	polygon	Grise Fiord Watershed