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$\epsilon_b \Delta^c \dot{\bar{O}}_0 \sigma^b \wedge c_n d\epsilon^f b^g \sigma^d n^a l^e \sigma^b$

PROJECT DESCRIPTION With increased demand on the City of Iqaluit's drinking water supply, the City's Lake Geraldine drinking water reservoir needs more water. The initial plan to pump water from the Apex (Niaqunguk) River to the Lake Geraldine reservoir was cancelled due to a limited amount of water available. This required identification of a new water source, and water intake sites, to be chosen. Nunami completed a desktop study for the City of Iqaluit and identified that the Sylvia Grinnell River had enough water to meet the City's needs while still protecting important Arctic Char habitat in that river. To move forward with preliminary engineering and design of a water intake at the Sylvia Grinnell River, Nunami needs to complete a field study to identify the best possible intake location. Nunami is planning to complete the field study in September 2018 to measure the depth to bedrock on the shoreline where pumping equipment might be located. Two sites along the Sylvia Grinnell River, but outside (north) of the Sylvia Grinnell Territorial Park are to be investigated. These are Site A and Site B on the attached map. At each site, depth to bedrock will be measured on-land, on the shore of the Sylvia Grinnell River, and water depth across the river will also be measured. The two sites will be accessed with a truck or ATVs using existing roads and trails. No structures will be built and very little land disturbance is expected.

METHODS To identify the best intake site on the Sylvia Grinnell River, the following methods will be used:

1. Bathymetry Survey: Nunami will use a small remote-controlled boat to measure the depth of water across the two sites in the Sylvia Grinnell River. The boat is battery-powered and controlled by an operator on shore.
2. Geotechnical Survey: Nunami will measure the depth to bedrock without digging or disturbing the ground. This will be done on the land at each of the two sites along the Sylvia Grinnell River. Nunami will use sound and pressure waves to map the type of material below ground surface. The sound and pressure waves are generated by low-speed blast charges from special array cables laid out on the ground surface. Geophones are installed along the cables to receive the sound and pressure waves bounced-back from the material below ground surface. The data are interpreted by technicians and used to map the material types below ground surface. Depth to bedrock will be mapped over an area up to 100 square metres along the shore, and upgradient, of the Sylvia Grinnell River. No geotechnical survey work will occur within the river and these on-shore low-velocity blast charges are not expected to cause any serious harm to fish in the river.

DATA USE In the short-term, Nunami will use the data to identify the best site for a water intake in the Sylvia Grinnell River for the City of Iqaluit. In the long-term, data will be stored on Nunami's servers and will be given to the City of Iqaluit.

REPORTING Nunami will communicate the results of the study to the City in a report. Results of the study will likely be communicated by the City of Iqaluit through a public meeting. The study will not result in a publication.

DESCRIPTION DU PROJET La ville d'Iqaluit a connu une augmentation de sa demande en eau potable depuis les dernières années et cette augmentation signifie que les réserves du réservoir du lac Géraldine qui alimente la ville d'Iqaluit en eau potable doivent être ajustées à la hausse pour fournir à la demande. Le premier projet visant à remédier à cette situation devait puiser dans les ressources de la rivière Apex (Niaqunguk), mais a été annulé dû à un niveau d'eau insuffisant dans la rivière. Plusieurs autres sources ont été étudiées par la suite et la rivière Sylvia Grinnell a été identifiée par Nunami comme une rivière ayant des ressources suffisantes pour accommoder la demande croissante en eau potable dans la ville d'Iqaluit tout en assurant la protection de la population d'ombles chevaliers et de son habitat naturel. Pour initialiser le processus de conception, Nunami conduira, en septembre 2018, une étude qui déterminera le site idéal pour la prise d'eau à la rivière Sylvia Grinnell. Deux sites ont été identifiés : site A et site B qui sont tout deux situés au nord du parc territorial Sylvia Grinnell et identifiés sur la carte jointe à ce document. L'installation des pompes nécessaires pour la prise d'eau étant prévue d'être

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Inuinnaqtun: Project description not provided in Inuinnaqtun.

Operations Phase: from 2018-09-05 to 2018-09-20

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Site A	Scientific/International Polar Year Research	Municipal	A 2018 feasibility study examined Site A for potential use as a raw water intake	Unknown	Site A is situated within the municipal limits of the City of Iqaluit
Site B1	Scientific/International Polar Year Research	Municipal	A 2018 feasibility study examined Site B1 for potential use as a raw water intake	Unknown	Site B1 is situated within the municipal limits of the City of Iqaluit
Site B2	Scientific/International Polar Year Research	Municipal	A 2018 feasibility study examined Site B2 for potential use as a raw water intake	Unknown	Site B2 is situated within the municipal limits of the City of Iqaluit

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ᐱᕐᑭᑦᑯᐱᕐᑭᑦ	Manasie Mark	Amaruq Hunters and Trappers Association	2018-08-01
ᐱᕐᑭᑦᑯᐱᕐᑭᑦ	Michael	Amaruq Hunters and Trappers Association	2018-08-16

South Baffin

<p>                     ሊደረግ የሚችል                      ምርመራዊና ምርምራዊ                      ሥራዎች                      ለፍጥነትና ለዕቅድ                      ማረጋገጫ                      ለፍጥነትና ለዕቅድ                      ማረጋገጫ                 </p>	<p>                     ፍጥነትና ምርምራዊ                      ሥራዎች                      ለፍጥነትና ለዕቅድ                      ማረጋገጫ                 </p>	<p>                     ለፍጥነትና ለዕቅድ                      ማረጋገጫ                 </p>	<p>                     ምርመራዊና ምርምራዊ                      ሥራዎች                 </p>	<p>                     ምርመራዊና ምርምራዊ                      ሥራዎች                 </p>
<p>                     ምርመራዊና ምርምራዊ                      ሥራዎች                 </p>	<p>                     Scientific Research                      Licence                 </p>	<p>                     Applied, Decision                      Pending                 </p>		

Transportation Type	Access	Length of Use
Air	Access to Iqaluit, by out-of-town field personnel (up to two) will be via commercial scheduled flights	
Land	Access to Site A, Site B1, and Site B2 will be overland on existing roads and trails, via truck and ATV	

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Λ<sup>9</sup>d<sup>c</sup> d<sup>a</sup>b<sup>r</sup>z<sup>s</sup> d<sup>a</sup>b<sup>c</sup>d<sup>a</sup>σ<sup>a</sup>d<sup>a</sup>z<sup>s</sup> Δ<sup>a</sup>c<sup>s</sup>b<sup>a</sup>d<sup>a</sup>n<sup>a</sup>o<sup>a</sup>r<sup>c</sup> ΔjCΔ<sup>c</sup>, Γ<sup>a</sup>→dPñ<sup>c</sup>, s<sup>b</sup><sub>bc</sub>Lc<sup>j</sup><sub>s</sub>, με<sup>a</sup>d<sup>c</sup> d<sup>a</sup>r<sup>b</sup>r<sup>c</sup>→

Inuktitut Name	Quantity	Dimensions	Description
ATV	4	4 x 3 ft	For access to Site A and Site B (1 & 2) along the Sylvia Grinnell River; transportation within the community
Truck	1	15 x 6 ft	Access/transportation within Iqaluit
Geotechnical Equipment	200 lbs	Unk.	Includes sledge hammer, cables, geophones, low-speed blast charges; to complete geotechnical survey at Site A and Site B
Remote-controlled boat	1	3 x 6 ft	Remote-controlled survey boat, battery-powered, equipped with depth sounding and survey equipment; to complete bathymetric surveys at Site A and Site B

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<b>Fuel Type</b>	<b>Description</b>	<b>Quantity</b>	<b>Volume</b>	<b>Cost</b>	<b>Unit</b>	<b>Notes</b>
Diesel	fuel	0	50	0	Liters	Fueling of rental truck (if diesel truck used); only to be completed at in-town fueling stations
Gasoline	fuel	0	40	0	Liters	Fueling of ATVs and rental truck (if gasoline truck used); only to be completed at in-town fueling stations - no re-fueling out near the Sylvia



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Scientific/International Polar Year Research	ᐃᑕᑕᑦ ᐃᑕᑕᑦ ᐱᑕᑕᑦ ᐱᑕᑕᑦ	< 1 cubic metre	Domestic waste, from field personnel lunches and inert blast caps following the geotechnical survey, will be disposed of via Iqaluit's municipal waste collection system.	n/a

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Environmental impacts associated with the field study are expected to be negligible. The sites will be accessed using existing roads and trails via ATV and/or truck. The ATVs will be equipped with small spill kits to manage any small spills or leaks that may occur. The non-intrusive geotechnical survey will not cause any ground or land disturbance and the remote-controlled, battery-powered survey boat, used in the river, will be clean of any potential contaminants before entering the river. Potential fisheries effects from the geotechnical survey are also expected to be minimal and not cause residual serious harm to fish. Erosion and sediment control measures will be used to reduce the risk of erosion of bank sediments into the river, or the potential for run-off from the survey area to enter the river. All geotechnical work will also occur on-land (not in the river) and geotechnical blast charges will be low-speed and, as a result, below known thresholds that cause effects to fish (i.e., Linton et al. 1985, DFO 2010).

# **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**

The Sylvia Grinnell River supports an anadromous population of Arctic char (Gallagher and Dick 2010). Arctic char (*Salvelinus alpinus*) exhibit anadromous and freshwater resident populations and are found in rivers, lakes, estuaries, and marine environments throughout their life cycle (Evan et al. 2002). Anadromous Arctic char that are part of the fishery in the area migrate to marine waters during the summer to feed and return to freshwater habitats to overwinter and spawn. Arctic char use the Sylvia Grinnell River for migration, overwintering, spawning and rearing; however, it is believed that most char likely overwinter and spawn in Sylvia Grinnell Lake. Personal communication with DFO (C. Lewis, 21 August 2017) indicate that large deep pools in the Sylvia Grinnell River are also used for

overwintering. The Arctic char population in the Sylvia Grinnell River is an important resource for subsistence and recreation of people in Iqaluit (DFO 2013). Unfortunately, current stock abundance estimates are not available for the Sylvia Grinnell Arctic char. During a 2009 to 2011 mark-recapture study by DFO, insufficient fish were recaptured and estimates could not be developed (DFO 2013b). DFO is currently completing a five-year study to evaluate stock status of Sylvia Grinnell Arctic char; the study is expected to be complete by 2020 (Ducharme 2016). There has been some concern about the Arctic char population in the Sylvia Grinnell River due to historical exploitation. A commercial fishery was attempted in the late 1940s and late 1950s, at the Sylvia Grinnell estuary (in addition to subsistence and recreational fishing), however the fishery was closed due to declining catch-per-unit-effort (CPUE) and smaller-sized fish (Kristofferson and Sopuck 1983; Gallagher and Dick 2010). An assessment of the stock in the late 1970s indicated that it had not yet recovered from the exploitation in the 1940s and 1950s, based on the size and age composition of the stock, and it was thought that current subsistence and recreational fishing rates were likely preventing recovery (Kristofferson and Sopuck 1983). More recent assessments in 2002 and 2004 suggest some recovery of the stock since the late 1970s, based on increased length-at-age, increased mean weight, longer and older fish, reduced mortality rates, and improved CPUE (Gallagher and Dick 2010). The 2009 to 2011 DFO mark-recapture study found some recovery of the stock from the 1970s/1980s, based on the stock age structure, and estimated age-at-maturity (8 to 9 years) and proportion of reproductive fish (DFO 2013b). However, it is believed that the population has not yet returned to that of the late 1940s when a large portion of the population was estimated between 12 and 23 years of age (DFO 2013b).

**SITE A** Site A has a riffle flowing into a deep run associated with backwater formed from gravel deposits upstream of a bedrock intrusion on the east bank. The river channel is approximately 150 m wide at the bedrock intrusion. Water depth is primarily less than 1 m, with depths exceeding 1 m in the backwater and likely in locations in the main channel. Substrates consist of large coarse material, primarily large cobble and boulders with bedrock intrusions. Substrates in the backwater had a deposition layer of fine sediment. Deep backwater pool habitat along the east bank, upstream of the WSC hydrometric station may provide habitat for downstream migrating young Arctic char and the backwater pool may provide rearing habitat for Arctic char and habitat for small fish, such as stickleback species. Site A is unlikely to provide overwintering habitat to adult Arctic char due to shallow water depths.

**SITE B** Site B is run habitat along the east bank, turning into a riffle, then a rapid formed at the downstream end where a bedrock intrusion narrows the channel. Sub-site B1 and B2 are adjacent, with B2 being upstream at the mid-point of the bend and B1 being at the lower portion of the bend. The channel is approximately 130 m wide. Along the middle and upstream portions of the east bank, substrates consist of cobble and large gravel, with high loose gravel banks. Occasional boulders provide instream cover. Site B is unlikely to provide overwintering habitat due to low water depth, nor act as a holding pool for upstream migratory Arctic char. Nearshore habitat would provide cover for downstream moving fish, but rearing habitat is poor because of the absence of cover.

Site A and Site B (1 and 2) are situated within the municipal limits of the City of Iqaluit. Iqaluit has been ranked as the fastest growing community in Nunavut, and between 2001 and 2006, was among the top 15 fastest growing communities in Canada (City of Iqaluit 2010). The Nunavut Bureau of Statistics (2014) provides population projections, currently based on the 2011 Canadian census, and estimates a 5.5% population increase in Iqaluit over the next five years, from 2018 to 2022 (from 7,881 individuals, to 8,318). However, based on the 2016 Canadian census, Iqaluit has already experienced a 15.5% population increase between 2011 and 2016, from 6,699 individuals (2011) to the current estimate of 7,740 individuals (Statistics Canada 2017). Based on the 2016 Canadian census (Statistics Canada 2017), the unemployment rate in Iqaluit is 9.6%. Of the workforce 15 years of age and older (5,675 individuals), 74% are employed and the primary occupations include those in education, law, social, community and government services (935 individuals), as well as business, finance and administration (915 individuals), and sales and service (795 individuals).

Environmental impacts associated with the field study are expected to be negligible. The sites will be accessed using existing roads and trails via ATV and/or truck. The ATVs will be equipped with small spill kits to manage any small spills or leaks that may occur. The non-intrusive geotechnical survey will not cause any ground or land disturbance and the remote-controlled, battery-powered survey boat, used in the river, will be clean of any potential contaminants before entering the river. Potential fisheries effects from the geotechnical survey are also expected to be minimal and not cause residual serious harm to fish. Erosion and sediment control measures will be used to reduce the risk of erosion of bank sediments into the river, or the potential for run-off from the survey area to enter the river. All geotechnical work will also occur on-land (not in the river) and geotechnical blast charges will be low-speed and, as a result, below known thresholds that cause effects to fish (i.e., Linton et al. 1985, DFO 2010).

## Cumulative Effects

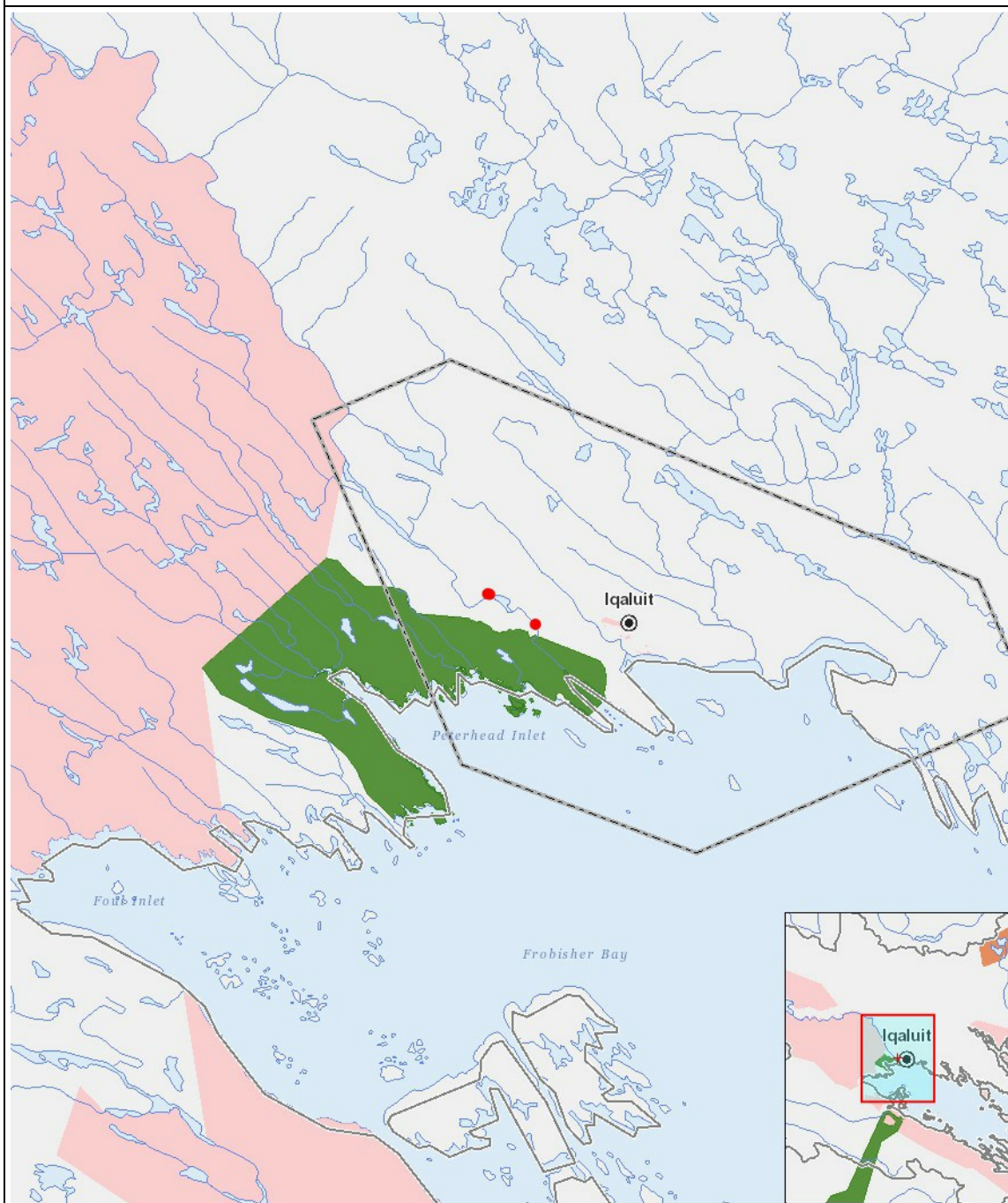
No cumulative effects from the Project are expected given its short duration and negligible environmental impacts

## Impacts

$\mathbb{A}^1_{\mathbb{C}} \times \mathbb{A}^1_{\mathbb{C}} \rightarrow \mathbb{A}^1_{\mathbb{C}}$

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$$(P = \langle b \rangle_{\Delta} p \cap r^{\perp} e^{(b)})^C, N = \langle b \rangle_{\Delta} r^{\perp} \langle D \rangle_{\Delta} e^{(b)})^C \langle C \rangle_{\Gamma} r^{\perp} r^{(b)} \rangle^{(b)} \langle D \rangle_{\Delta} e^{(r)} \rangle^C, M = \langle b \rangle_{\Delta} r^{\perp} \langle D \rangle_{\Delta} e^{(b)} \rangle^C \\ \langle C \rangle_{\Gamma} r^{\perp} r^{(b)} \rangle^{(b)} \langle D \rangle_{\Delta} e^{(b)} \rangle^C, U = {}^{(b)} b \triangleright L^{\perp} e^{(r)} \rangle^{(b)})$$

## PROJECT MAP



### LIST OF PROJECT GEOMETRIES:

1	point	Site A
2	point	Site B1
3	point	Site B2