



$\epsilon_b \Delta^c \dot{\gamma} \Pi \sigma^b \quad \Lambda c_n \nabla^q b^q \sigma \nabla n \nabla^a l^a \sigma^b$

The overall objective of this research program is to understand the impacts of the Baker Lake, NU, wastewater treatment system on environmental and human health, and develop recommendations for improving wastewater management in the community. The current wastewater treatment system in Baker Lake consists of a pond-wetland complex that ultimately discharges into Baker Lake. Baker Lake is important fish habitat and also provides the water supply for the community of Baker Lake. Wastewater accumulates in a small detention pond during the winter months (October – May), and then discharges in an uncontrolled manner into the wetland as it thaws during the spring freshet. This scenario is typical of many wetland treatment areas in Nunavut, and has been documented to contribute to poor levels of wastewater treatment that may pose a risk to both human and environmental health. The research program will involve an interdisciplinary team of researchers and will employ a holistic approach to characterize the impacts of the current wastewater treatment system on environmental and human health.

DΔΛNᵀ: L'objectif global de ce programme de recherche est de comprendre les impacts du système de traitement des eaux usées de Baker Lake (NU) sur l'environnement et la santé humaine, et de formuler des recommandations pour améliorer la gestion des eaux usées dans la communauté. Le système actuel de traitement des eaux usées de Baker Lake consiste en un complexe étang-zone humide qui se déverse finalement dans le lac Baker. Le lac Baker est un habitat important pour les poissons et constitue également une source d'approvisionnement en eau pour la communauté de Baker Lake. Les eaux usées s'accablent dans un petit bassin de rétention pendant les mois d'hiver (d'octobre à mai), puis se déversent de manière incontrôlée dans la zone humide lors du dégel pendant la crue printanière. Ce scénario est typique de nombreuses zones de traitement des zones humides au Nunavut, et il a été prouvé qu'il contribue à des niveaux médiocres de traitement des eaux usées qui peuvent constituer un risque pour la santé humaine et environnementale. Le programme de recherche impliquera une équipe interdisciplinaire de chercheurs et utilisera une approche holistique pour caractériser les impacts du système actuel de traitement des eaux usées sur l'environnement et la santé humaine.

[illegible]

## Personnel

Personnel on site: 2

Days on site: 25

Total Person days: 50

Operations Phase: from 2023-06-01 to 2026-06-02

$\Lambda \subset \mathbb{N} \triangleleft \mathbb{N} \hookrightarrow \mathbb{D}_\sigma \triangleleft^{\text{fb}} \mathbb{D}^c$ 

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Shoreline Baker Lake (near drinking water intake and treatment plant)	Sampling sites	Municipal	Shoreline of Baker Lake	No known archeological value	500 m
Input to Baker Lake (wastewater effluent enters here)	Sampling sites	Municipal	Municipal wastewater discharge location	No known archeological value	500 m
Airplane Lake outflow	Sampling sites	Municipal	Outflow from lake receiving municipal wastewater	No known archeological value	700 m
Upstream background site	Sampling sites	Municipal	Upstream of municipal wastewater lagoon and wetland treatment area	No known archeological value	800 m

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ᑦᐅᓂᓂᐅᓂᐅᓂᑦ	Sheldon Dorey	Hamlet of Baker Lake	2022-11-16

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உதிர்தர<sup>௩</sup>தர<sup>௨</sup>தர<sup>௧</sup> அகலதர<sup>௩</sup>அதர<sup>௨</sup>பதர<sup>௧</sup> பதர<sup>௧</sup>பதர<sup>௨</sup>பதர<sup>௩</sup>:

Kivalliq

$\epsilon \Delta^{\alpha} \dot{r}^{\beta} \wedge J^{\gamma} e_{\beta} \dot{D} \dot{n} \nabla^{\delta} r^{\eta} C D F L \dot{\chi}^{\zeta}$

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### Project transportation types

Transportation Type	Transportation Mode	Length of Use
Air		
Land		

### Project accomodation types

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Λ<sup>9</sup>d<sup>c</sup> d<sup>a</sup>b<sup>r</sup>z<sup>6</sup> d<sup>7</sup><sub>5</sub>CdσD<sup>4</sup>z<sup>6</sup> Δc<sup>9</sup>b<sup>r</sup>Dn<sup>3</sup>r<sup>c</sup> ΔjCΔ<sup>c</sup>, Γ<sup>c</sup>→dPñ<sup>c</sup>, <sup>9</sup>b<sup>a</sup>LCj<sup>6</sup>, με<sup>r</sup>D<sup>c</sup> d<sup>r</sup><sup>a</sup>r<sup>c</sup>→

<b>ᐃᓕᑦᒪᔭ ᐱᓄᑐ ᐋᑐጊᐅᓂ-ᐋᓖᑐᓖ ᓖᓗᐃᑐᓂፎ</b>	<b>ᓖᓕᑯᐅᑦᑐ</b>	<b>ᐋᓕᑦᓂᓖᑦᑦ - &gt;ᓖᓂᓖᑦᑥ</b>	<b>ᑲᐳᑦ ᐋᑐጊᐅᓂ-ᐋᓖᑐ</b>
boat	1	< 20'	A small boat would be used to carry sampling equipment, including samplers, to offshore sites.
passive samplers	9	20 cm diameter x 30 cm length	Passive water samplers will be deployed at sites for up to 3 weeks each, during the sampling season. These require no power to operate, and would be deployed by cable attached to fixed points on shore (e.g., poles or existing structures) or buoys if offshore. All equipment will be removed at the end of the field season.
primary productivity measures	9	1 m <sup>2</sup>	These consist of sealed bottles with known algal and nutrient compositions, and would be deployed on site to measure algal productivity. They would be removed after measurements are done.
current meters	6	10 cm	We will be measuring stream flow downstream of the existing wastewater treatment plant using portable current meters. Water level loggers (10 cm in size) will be deployed in the stream beds in-stream for the season, to monitor water flow continuously, and removed at the end of the summer.
Quadrats	1	1m x 1m	Quadrats will be used to characterize vegetation and wetland presence in the vicinity

			of the existing wastewater treatment system and reference site. This will involve transecting the tundra on foot, placing a temporary 1 m x 1 m PVC quadrat on the ground surface, and taking photographs, and at times collecting small soil samples (<500 g).
truck	1	standard size pickup truck	A pickup truck or similar vehicle would be used to carry sampling equipment to onshore sites.

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Diesel	fuel	1	50	50	Liters	Diesel fuel for the small boat listed above. Estimated maximum amount used for sampling work during the season.
Gasoline	fuel	1	100	100	Liters	Gasoline for the sampling truck listed above. Estimated maximum amount used for sampling work during the season.

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$$\Delta^b C d_C \sim \sigma \Delta^q \sigma^q$$

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Sampling sites	Other, Small amounts of packaging materials for sampling supplies.	Less than 1 kg	We will be taking all waste materials with our samples and equipment back with us to our respective universities.	No additional treatment procedures will be required as we will be removing all wastes.

$$A^{\circ} B \Gamma \Delta C \div^C \supset^C \quad A^b \supset^{fb} C \Delta \Gamma L \downarrow^C$$

The proposed project will involve sampling of water, sediments, microorganisms and fish in a lagoon/wetland/stream system currently receiving municipal wastewater. Up to 10 fish/species/lake will be collected, humanely euthanized following conditions of our animal care license (cervical dislocation and swift blow to the head), and sampled for flesh, liver (contaminant concentrations), and otoliths (fish age).

# **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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The physical environment that will be studied includes the current municipal wastewater lagoon, treatment wetland and receiving environment.

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The current biological environment to be studied includes microorganisms, invertebrates and fish in the wastewater treatment system.

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The work will be conducted in the community of Baker Lake, Nunavut.

### Miscellaneous Project Information

$\Delta^{\text{fb}} \text{CD} \sigma^{\text{ab}} \Gamma^{\text{c}}$   $\Delta^{\text{fb}} \text{CD} \Gamma^{\text{L}} \Gamma^{\text{c}}$   $\Delta^{\text{fb}} \text{CD} \dot{\Gamma}^{\text{c}} \sigma^{\text{ab}} \Gamma^{\text{c}}$   $\langle \text{CD} \Gamma^{\text{f}} \rangle \Gamma^{\text{fb}} \text{CD} \sigma^{\text{af}} \sigma^{\text{bc}} \Gamma^{\text{c}}$

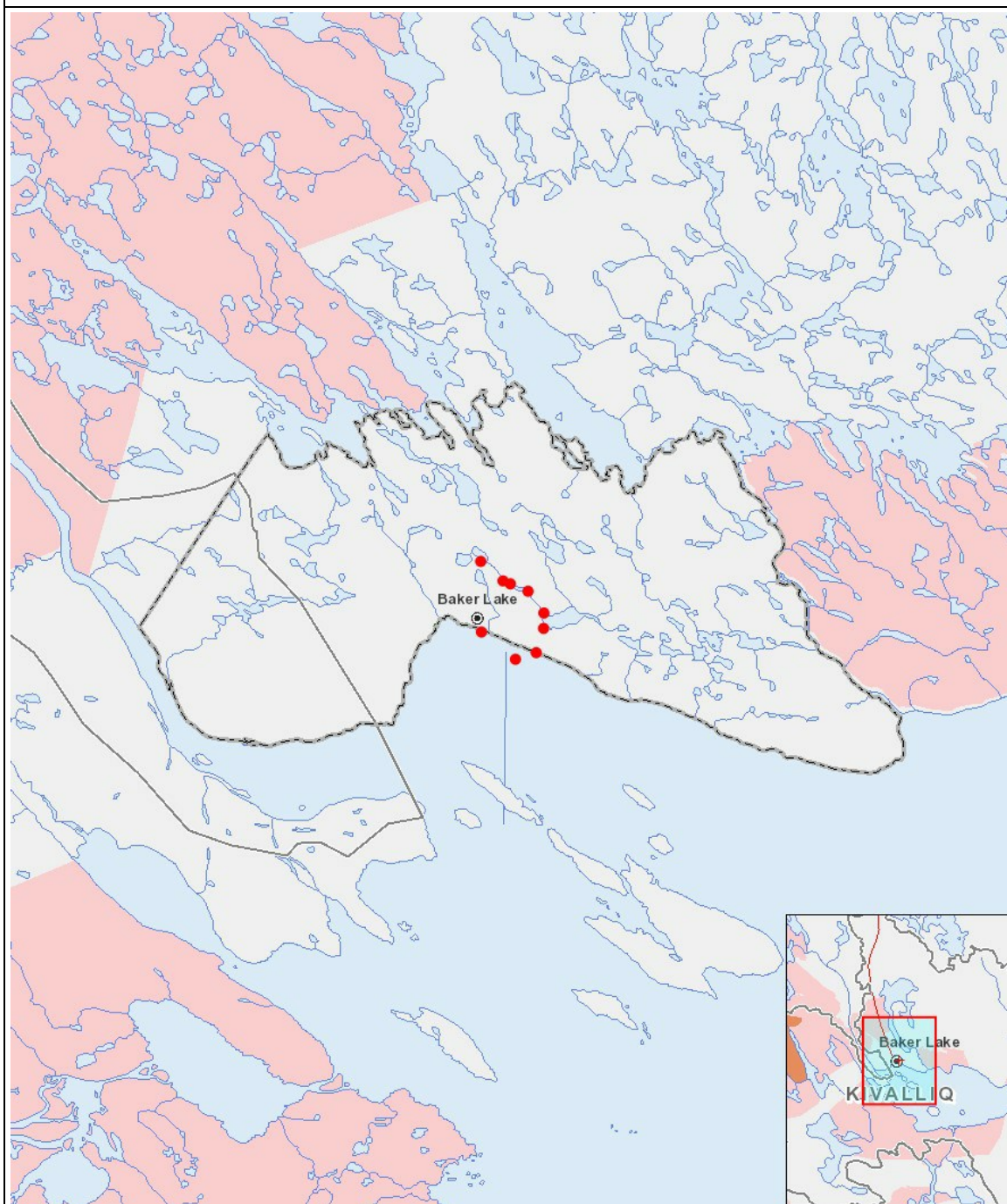
We do not anticipate any negative impacts.

## Cumulative Effects

We do not anticipate any cumulative effects.

## Impacts

[illegible][illegible]
$$(P = \langle b \rangle \dot{\cup} P \cap \langle a \rangle^c, N = \langle b \rangle \cap \langle a \rangle^c \cup \langle a \rangle \cap \langle a \rangle^c, M = \langle b \rangle \cap \langle a \rangle^c \cup \langle a \rangle \cap \langle a \rangle^c, U = \langle b \rangle \cup \langle a \rangle)$$



#### List of Project Geometries

- 1 point Shoreline Baker Lake (near drinking water intake and treatment plant)
- 2 point Baker Lake offshore water
- 3 point Input to Baker Lake (wastewater effluent enters here)
- 4 point Airplane Lake outflow
- 5 point Airplane Lake inflow
- 6 point Finger Lake outflow
- 7 point Finger Lake inflow
- 8 point Lagoon
- 9 point Upstream background site

