

We are a group of University-based researchers: Dr. Charles Wong of the University of Winnipeg, Drs. C.J. Mundy and Mark Hanson of the University of Manitoba, Drs. Brendan McConkey and Joshua Neufeld of the University of Waterloo, and Dr. Rob Jamieson of Dalhousie University. Our proposed project is titled “Impacts of wastewater release at Baker Lake, Nunavut”.

Our project’s goal is to understand impacts of wastewater releases at Baker Lake. This will provide for improved water quality for the community and region, by providing needed information, and to have a baseline for potential future work to improve the community’s treatment facilities (for example, through improving treatment wetlands). Our objectives are to measure the sewage lagoon treatment system’s wastewater, and waters affected by its release, for traditional wastewater contaminants such as nutrients (nitrogen and phosphorus), abundances and composition of algae and bacteria (beneficial and harmful), and chemicals such as over-the-counter and prescription drugs excreted from the body and not removed during lagoon treatment. Sampling will use trucks and small boats hired through the HTO as appropriate to access proposed sampling sites. Buoys or poles may be necessary to secure some samplers to offshore and onshore sites, respectively, and removed once the project is complete. This work is funded by Polar Knowledge Canada, with support from partner Agnico Eagle Mines Ltd. Potential further funding may also be available through the Natural Sciences and Engineering Research Council of Canada via a Collaborative Research and Development proposal being prepared.

For methods, we propose to sample during June (ice melt) and September 2018, and potentially once more in between, with follow-up work over the same periods in 2019 to evaluate year-over-year trends. Sampling work would be done by members of our team, for example, 2-3 undergraduate and graduate students and technicians at any given time, working with individuals hired by the HTO as above. Six sites are directly in the wastewater flow path: the lagoon itself, the water inputs and outputs at Finger Lake and Airplane Lake, and the outfall at Baker Lake. In Baker Lake itself, we will also sample water near the drinking water source and another offshore site to evaluate wastewater impacts to this lake. Two additional lakes near but upstream of the lagoon will be sampled as background; these are labeled as the upstream background site on the map associated with this application. Water samples (approximately 1 L each) will be collected and sent to our laboratories for testing. We will measure algal production, chemical contaminants, and water flow rates using growth meters and passive samplers put in place during the ice-free period, then removed. Given concerns brought up in a 2007 consulting report that wastewater may affect the drinking water source, we can characterize flow direction by adding a small amount (1 L) of non-toxic, water-soluble dye to the lagoon, a standard hydraulic tracer test. Vegetation near the lagoon would be characterized by walking the area on foot, placing a temporary 1 m × 1 m PVC frame on the ground, taking photographs, and at times collecting soil samples (<500 g). This characterization is useful to evaluate compositions and abundances of plants that may inform potential future wastewater facility development, in the form of treatment wetlands.

Baker Lake was chosen given water quality and water treatment concerns by the community and partners. All information from this project will be directly reported via email to the HTO and Hamlet prior to any scientific publications. We will also have in-person meetings with the HTO and Hamlet to report on conclusions of this exploratory work towards the end of our funding period in 2020.