MEMORANDUM

File:	**Sanikiluaq – Improvement of the Existing Wastewater Treatment Facility**
To:	**Government of Nunavut – Department of Community and Government Services**
Attention:	**Mr. Grigor Hope, Project Officer**
Subject:	**General Observations from Initial Site Investigation**
Author:	**Mr. Jason Thorpe**
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Introduction:

The purpose of this memorandum is to provide a brief description of activities performed by ARKTIS PIUSITIPPAA (ARKTIS) during a site investigation performed for the existing wastewater treatment facility for the Hamlet of Sanikiluaq, Nunavut between June 13, 2011 and June 20, 2011. This site visit generally satisfies the ARKTIS commitments set in the Government of Nunavut Department of Community and Government Services (GN-CGS) accepted ARKTIS proposal dated February 17, 2011. This *Memorandum* also serves to address potential changes to scope due to unexpected site investigation findings.

Site Description:

Based on examination of current and historical aerial photographs, the Hamlet of Sanikiluaq's wastewater treatment facility appears to be a naturally occurring body of water located approximately 1.4 km due west of the municipality centre. The airport is located approximately 0.5 km due south of the facility, and the Community's solid waste facility is located immediately east of the facility. Existing and undeveloped known quarries that were outlined in the 1980 Granular Study performed for the GNWT are located approximately 1.5 to 2.0 km due west of the facility, as shown on **Figure 1**. Further discussion regarding the Community's solid waste facility is described further in this memorandum.

As depicted on **Figure 1**, the facility is comprised of a lake (sewage lagoon) that is roughly oval in shape, measuring approximately 200 m in the long dimension (east-west) and approximately 130 m in the short dimension (north-south) that drains into a vegetated wetland area measuring approximately 1.1 km long that subsequently drains into Eskimo Harbour (part of Hudson Bay). An access road from the community that services both the wastewater and solid waste facilities terminates at the eastern end of the lagoon, which is the point of discharge for raw sewage from the community via trucks that were observed to run continuously between the community and the facility during the week. A berm consisting of gravel and cobbles extends from the access roadway along the northern shore of the lagoon and terminates at the western side of the lagoon. The lagoon discharges through the berm along the northwestern shore into the wetland.

Site investigation Activities:
The main objectives of the site investigation were to collect background information and data necessary to assess the existing wastewater treatment facility and perform a design to improve its use for the Hamlet for a minimum of 20 years. Specific tasks included:

- Interviewing key personnel to obtain background information, records, and documentation regarding the facility.
- Collecting water quality samples to aid in the assessment of the facility at the following seven locations:
    - Point of raw sewage discharge.
    - End of the sewage lagoon before discharge into the wetland.
    - Beginning of the wetland after discharge from the sewage lagoon.
    - Mid-wetland before landfill runoff into wetland noted from aerial photographs.
    - Mid-wetland after landfill runoff into wetland noted from aerial photographs.
    - Point of discharge of wetland into Eskimo Harbour.
    - Runoff from landfill directly into the sewage lagoon.
- Performing a geotechnical investigation that included advancing 9 boreholes to depths attainable with hand excavation equipment (augers and shovels) to visually classify the surficial and shallow soils as well as permafrost conditions around the existing sewage lagoon with depth below ground surface. Geotechnical laboratory particle size analyses were also performed on soil samples retained during the geotechnical investigation to verify the visual classifications.
- Performing a bathymetric survey of the sewage lagoon to assess the current storage of the sewage lagoon.
- Conducting a topographical survey for the existing sewage lagoon and supporting infrastructure, and at areas of interaction between the solid waste facility and in critical areas within the wetland that may require design or construction modifications.
- Visually evaluating existing and undeveloped known quarry locations to provide insight into quantities and haul distances to the water treatment facility for construction works associated with the improvement.

A technical evaluation report that documents the current conditions and recommendations for future planning and design will be submitted in the future; however changes to scope regarding this project need to be discussed between ARKTIS and the GN-CGS before this report is finalized as solid waste facility may have negative impacts on the existing wastewater facility. ARKTIS will complete the accepted scope of work identified in the ARKTIS proposal and the above though ARKTIS will also provide additional commentary, opinions, observations and recommendations related to solid waste management which are outside of the scope of work and budget presented by ARKTIS. ARKTIS will present Mr. Hope with the changes in scope officially via electronic mail in the near future.

Site Investigation Observations:
Very little background documentation is available for the wastewater treatment facility, including drawings, specifications, reports, and Operations and Maintenance manuals, as it is not likely an engineered facility. General observations on the operations include no defined discharge point into the lagoon from sewage trucks. The sewage discharge apron, which is located at the terminus of the access roadway, is located at the eastern shore of the sewage lagoon. It was observed during the site

investigation that trucks discharged at several different locations from this discharge apron. Additionally, from interviews of facility personnel, it was discovered that the sewage lagoon overflows the berm located at the northwestern edge of the lagoon during periods of snowmelt. The extent of overflow likely depends on the amount of snow in and around the lagoon that melts.

It was observed that the general topography around the wastewater treatment facility is higher ground towards the south and east of the sewage lagoon that generally slopes towards the north and west into the wetland and into Eskimo Harbour. The area west of the lagoon is typically low-lying and gently slopes to the east and north towards the wetland and Eskimo Harbour.

The surficial soils around the sewage lagoon are mainly comprised of coarse-grained materials consisting of gravels, sands, silts, cobbles, and boulders. Additionally, there are several existing quarry sites located approximately 1.5 km to 2.0 km west of the sewage treatment facility that are accessible by roads, as outlined in the Sanikiluaq Granular Evaluation Study performed for the GNWT in 1980. The majority of the quarry sites outlined in the study have since been developed each to varying extents, however the raised beach area located to the west of the study area has not yet been developed. Preliminary estimates indicate that there adequate amounts of granular material available for the wastewater treatment facility expansion.

Further results and details regarding the site investigation will be included in a technical evaluation report that will document the current conditions and recommendations for future planning and design will be submitted in the future.

Discussion of Landfill and Scope:

The Hamlet solid waste landfill facility appears to be comprised of four different areas, described as, and shown on **Figure 2**:

1. The main landfill facility;
2. The metals landfill area;
3. The secondary landfill area;
4. The drum area.

The main facility is located northeast of the sewage lagoon, and due north of the access roadway within a fenced off area measuring approximately 220 m by 260 m in plan view (**Figure 2**). During the site investigation, it was observed that solid waste is deposited within this facility by municipal garbage trucks on a regular basis, with unattended solid waste burned at regular intervals throughout the week within the fenced-in area. It appears that typical household waste is mainly landfilled and burned in this area by the Hamlet. Construction waste and compromised ATVs and vehicles were also noted within this area. The main landfill is situated due west of a ridge that runs roughly north-south towards Eskimo Harbour. The general topography of the main landfill gently slopes away from this ridge and towards the north-northwest towards the wetland and Eskimo Harbour. Visual runoff from the main landfill can be seen in aerial photographs. Also, several surface watercourses were observed within the main landfill facility that drain towards the north-northwest. While at the time of the inspection they did not directly connect to the wetland, dry flow paths were found that indicate direct connection when sufficient runoff is present. No engineering containment, preventing any leachate or runoff from draining into the wetland

and/or Eskimo Harbour, was observed. The fence around this area measures approximately 2.4 m in height, however towards the northwestern and northern sides of the main landfill area, there is a large gap between the bottom of the fence and the ground that allows waste to blow around the surrounding area.

The metals waste area is located approximately 180 m due north of the sewage lagoon along the western boundary of the main solid waste landfill facility, as shown on **Figure 2**. Waste is comprised of used automotive tires, abandoned cars, vans, trucks, busses, and ATVs, some of which have been piled on top of each other. A faint smell of fuel surrounds this area, as most vehicles abandoned here may not have had fuel and other chemicals and fluids drained from them prior to landfilling. Staining of the ground surface was noted in and around this entire area. Similar to the main landfill, this facility has similar topography that gently slopes towards the north-northwest, with no engineering containment to prevent surface runoff/leachate from flowing into the wetland and Eskimo Harbour.

The secondary waste area is located due east of the sewage lagoon and due south of the access roadway in a surface depression created by the south shoulder of the roadway (see **Figure 2**), measuring approximately 2.0 m deep from the road surface at the edge of the lagoon. The topography generally rises towards the south and east. It was observed during the site investigation that municipal garbage trucks, local businesses, and local community members dispose of waste in this area on a regular basis. The waste landfilled in this area varies from typical household waste to abandoned ATVs, white appliances, construction debris, and dead animals (caribou skins, dogs, birds, etc.). It appears that a berm was once constructed to prevent leachate/runoff from the secondary landfill area from flowing directly into the lagoon, however waste has been subsequently placed on top of, and beyond, this berm. An orange-coloured stream of leachate was observed flowing directly into the sewage lagoon towards the sewage discharge point. Preliminary analysis of the samples taken during the site inspection indicates that this leachate contributes metals and hydrocarbons into the wastewater treatment facility that are not found in the raw effluent entering the facility. ARKTIS believes that a precipitation event will further negatively affect the water quality. There is no fence around this area, and landfilled waste blows around the entire surrounding area.

The drum area is located approximately 180 m southeast of the sewage lagoon, just southeast of the secondary landfill area, as shown on **Figure 2**. It is located on top of a hill that slopes towards the secondary area and subsequently the sewage lagoon. The drum area consists of about 120 55-gallon steel and plastic drums that are mostly filled with unknown liquids, with some drums showing evidence of leaking and bulging. Visual staining of the ground was also observed. A small berm was noted along the northwestern end of this area, however it appeared that surface runoff has eroded areas within the berm that may allow the flow spilled fuels and liquids towards the sewage lagoon. A strong smell of fuel was noted in the air around this area.

ARKTIS noted several possible hydraulic oil spills and staining on the sewage dumping apron at the end of the access road coming from a few sewage trucks throughout the site investigation. These types of spills immediately adjacent to the sewage lagoon may have a further negative impact on the water quality in the sewage lagoon and areas where spills and contaminated soil should be remediated. Additionally ARKTIS believes that a snowmelt or a precipitation event will further negatively affect water quality than what preliminary analyses of water quality samples are showing in the sewage lagoon, wetland, and

possibly Eskimo Harbour since there are no measures currently in place to protect those areas from runoff from the solid waste facility areas.

Due to the impact of the solid waste facility on the wastewater facility in terms of direct leachate runoff into the sewage lagoon, wetland area, and Eskimo Harbour, ARKTIS recommends that the clean-up, rehabilitation, and subsequent operations and maintenance of the solid waste facility be addressed concurrently with the improvement of the wastewater treatment facility. It is ARKTIS' opinion that upgrades and improvements to the existing wastewater facility will not be as optimal in terms of improving the wastewater quality discharged into Eskimo Harbour if they are negatively impacted by the solid waste landfill facility. There is risk that the GN-CGS and Hamlet will not be able to complie with future water license limits. Further, typical passive northern wastewater treatment facilities are not designed to remove water contaminants from solid waste facilities (i.e. metals and hydrocarbons). There are several courses of action ARKTIS believes that can be taken to mitigate this concern. ARKTIS recommends discussing this matter further. ARKTIS will continue in its original design of the wastewater treatment facility.

Recommended ARKTIS Course of Action:

1. Complete deliverables as per the original ARKTIS scope of work related to the wastewater treatment facilities.
2. Provide additional commentary, opinions, observations and recommendations related to solid waste management.
3. Discuss with the GN-CGS on the content and findings of this *Memorandum*.
4. Provide an additional scope of work to remedy issues surrounding solid waste management and impacts to future wastewater treatment facility design in Sanikiluaq.

Figure 1: Overall aerial photograph showing key locations around Sanikiluaq, Nunavut.

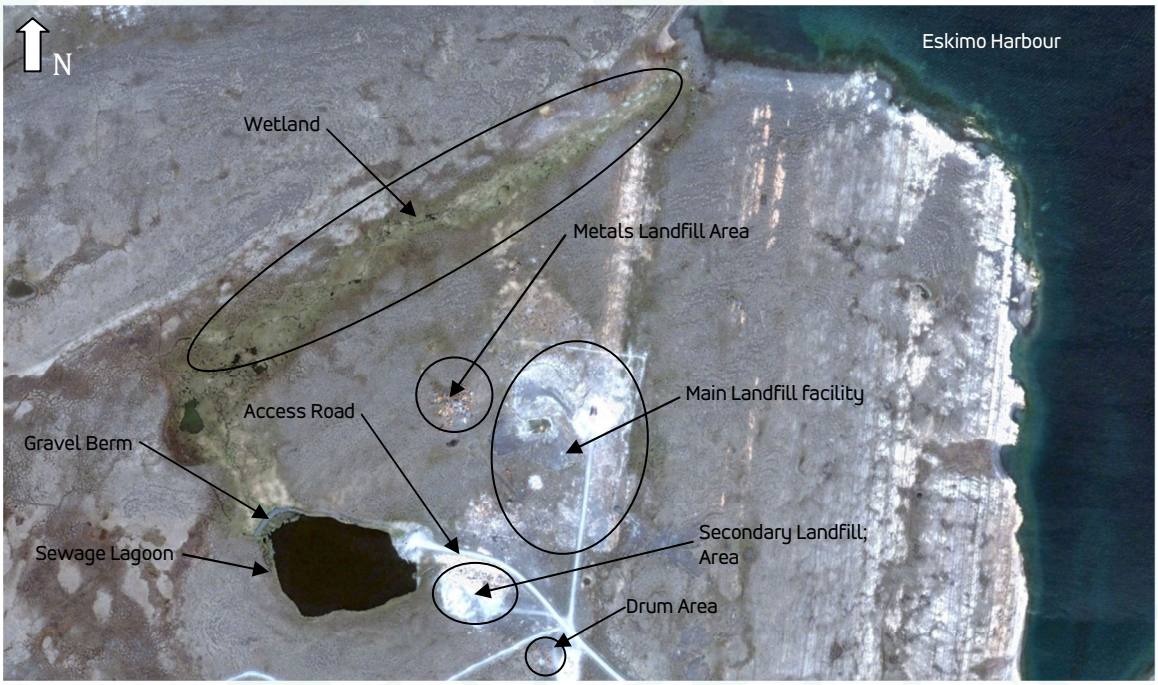

Figure 2: Aerial photograph showing areas within the wastewater and solid waste facility complex.