HAMLET OF ARVIAT
SOLID WASTE MANAGEMENT FACILITY

Operation and Maintenance Plan

Updated By:
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Community & Government Services
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X0C0G0

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1.0 Introduction

1.1 Site Description

The Hamlet of Arviat is located within the Kivalliq Region, Nunavut (61°06'N, 94°3W Figure 1). The community has a population of approximately 2514 (2016 Census). Like the rest of Nunavut, Arviat is only accessible by air and for a limited season by boat.

Figure 1 The Hamlet of Arviat, Google Earth 2019

The topography is relatively flat with a slight rise when moving inland away from Hudson Bay. Local bedrock is generally overlain by glacial fluvial sediments. Arviat is in the physiographic region of the Hudson Bay lowlands, characterized by low topographic relief, occasional bedrock outcrops and glacial and glaciofluvial overburden sediments. Boulder fields and eskers are common. Approximately 20 to 30 % of the land is shallow ponds with depths of 1 m or less. Land between the ponds is marshy, vegetated by grasses and sedges.

1.2 Solid Waste Management Facility

The solid waste management facility (SWMF) includes:

- Landfill
  - Domestic waste
  - Hazardous waste storage area
  - Wood Salvaging area

- Bulky Metal Area

Household waste is collected by truck and transported to the current landfill adjacent to the sewage lagoon and wetland treatment area (Figure 2). The site consists of a non-lined area surrounded by a 3m high containment berm.

Figure 2 Arviat Solid Waste Site, Google Earth 2019

The metal waste site is located north of the landfill (Figure 3). The municipality has purchased a metal shredder to manage the metal waste in recent years and removed all non-metal waste from the metal site and moved it to the landfill.

Figure 3 Arviat Metal Waste Site, Google Earth 2019

1.3 Nunavut Board Water Licence

The Nunavut Water Board (NWB) licence 3AM-ARV1016 authorizes the water withdrawal and waste disposal at the solid waste and sewage facilities. The Hamlet of Arviat holds the water licence and owns and operates the solid waste and sewage assets, and the Government of Nunavut owns and operates the water treatment infrastructure. The licence dated June 16, 2015 expired on February 27, 2016. The Hamlet is currently in the process of renewing and amending the licence to account for changes to the water infrastructure and increased raw water pumping volumes from the water source to account for the 20-year design horizon of water consumption.

2.0 Staff and Safety

Staff training is an important aspect of the operation of a SWMF. Staff must be adequately trained to follow this O&M Plan and operate the facility. This O&M Plan is dependent on sufficient site-specific training to allow staff to understand and operate the facility.

The Senior Administrative Officer (SAO) is responsible for all aspects of municipal infrastructure and programing, as well as fiscal responsibilities. All Hamlet employees report to the SAO, and the SAO reports to the municipal council. The staff that work directly with the SWMF are responsible for sampling and reporting, and work with the Foreman to ensure that municipal waste pickup and disposal occurs as required.

Health and safety of workers and the public is the priority while operating the SWMF. The requirements of the Nunavut Safety Act must be always followed. All actions and operations must be undertaken with safety as the priority.

Close attention should be given to the unique hazards of this site including:

- Scavenging bears and other wildlife
- Open burning
- Moving equipment
- Adverse weather conditions
- Hazardous materials

Staff must be aware of these issues and operate the site in a manner that protects staff and the public. Complaints from the public should be recorded and reported to the Public Works Supervisor. Complaints and the responses to complaints should be documented in the Annual Report for the site.

3.0 Security and Control

The solid waste site is fenced, with an entrance on the north side of the facility with an attendant's shelter. There is signage indicating locations for dumping different types of waste, including domestic solid waste, wood recycling, and used batteries. The metal waste site has signage for metal waste and vehicles.

4.0 Facility Design and Layout

4.1 Landfill

The current solid waste landfill site is located about 2.0 km southeast of Arviat and less than 0.6 km east of the airstrip. It is located along the south esker, less than 1 km north of the Hudson Bay. Waste disposal at the site likely began in the 1970s when the previous "middle-site" was abandoned. Berms were constructed 3 m high around the perimeter of the site to contain the

waste but there is no documentation of the design and no as-built drawings exist. In 2014 a wood recycling area was created within the site to allow for public salvaging. A battery collection seacan was also introduced for ongoing storage until backhaul. Backhauling of hazardous waste began in 2014.

4.2 Metal Waste

Metal waste is stored at a separate site 850 m north from the landfill. Starting in 2014, the municipality began shipping legacy metal waste and batteries south. End of life vehicles were de-polluted prior to being packaged for transport. The hamlet purchased a metal crusher to improve legacy metal processing in 2017. Non-metals were removed from this site and taken to the landfill.

4.3 Leachate Control

The solid waste sites are unlined, therefore only use berms and natural attenuation of landfill leachate. Small amounts contaminate leach from the waste, pond outside of the intended landfill footprint and enter the natural environment. In a natural attenuation landfill the discharge of contaminants is expected to occur at a rate that can be attenuated (broken down & diluted) by the natural environment. The design also relies on permafrost gradually migrating into the waste as it is covered over. Sample location ARV-2a monitors impacts from the solid waste site on the immediate surrounding environment.

5.0 Waste Generation and Site Capacity

Waste is accepted only from within the municipality, including domestic waste, metals, wood, fuel, and batteries (to be contained and sent off site for proper disposal). Commercial and industrial waste that is not considered hazardous is also accepted.

Based on the waste audit that was completed in 2013, it was estimated that 2,858 tonnes of waste were disposed of at the site annually. This is approximately equal to 2.6 kg/capita/day. Since the time of this audit, the Hamlet has implemented metal shredding, shipment south of metals and hazardous waste.

The site has exceeded its useful lifespan and has been considered over capacity for several years. Furthermore, leachate is not captured and may be impacting the surrounding environment. The Hamlet has done considerable work on the organization of the site since the time that this licence

was last renewed, but a new solid waste site will be required to address the capacity and environmental concerns. The new solid waste management facility is currently in the schematic design phase, with expected construction in 2024.

6.0 Facility Operations

The Hamlet operates the landfill by collection and segregation of waste, controlled burning of burnable waste, containment, and shipment of hazardous and bulky items, and providing cover when possible over domestic garbage.

6.1 Accepted Materials

Materials are assessed prior to disposal in the SWMF. If the material is something other than municipal solid waste; it is assessed according to the following criteria:

- Canadian Environmental Quality Guidelines
- Environmental Guideline for Industrial Waste Discharges into Municipal Solid Waste and Sewage Treatment Facilities (2011).

If the material meets the industrial land use criteria for disposal in the landfill, it is landfilled. If not, it must be stored as hazardous waste with additional containment within the landfill. Currently there is no landfarm, and contaminated soils that are not accepted at the SWMF are contained and shipped south for disposal.

The staff records the number of trips to the solid waste site per day and estimate the approximate quantity in cubic meters (based on the volume of the truck). If waste is present on site that has been tipped by others, an estimate of the quantity is made and recorded. Records are to be delivered to the Hamlet office once per week where they will be retained on file.

6.2 Waste Collection

Material arrives at the facility either by a garbage truck owned by the Hamlet or by private individual or company drop-off. After Hamlet staff collects waste, the collection vehicles progress to the landfill. Wastes will be tipped into the landfill. After being tipped (or during collection), staff performs an inspection of the waste to ensure that it does not contain visible hazardous waste or bulky metals. If such waste is noted, it is segregated in the appropriate locations of the approved hazardous waste storage area or the bulky metals area. Members of the community may drop off materials directly at the facility. The public is required to place materials in the appropriate location.

6.3 Bulky Metals

The bulky metals area consists of a segregation area for reuse and recycling of materials such as metals, tires, vehicles, and equipment. The Hamlet operates a metal shredder and over the last 4 years have reduced their bulky metal waste significantly.

Staff should inspect the bulky metals storage area on a regular basis to check for new materials. Fluids (oil, antifreeze) should be drained from vehicles; batteries should be removed and transferred to the Hazardous Waste Storage Area. Vehicles should then be tagged to indicate that they have been inspected and cleaned. Bulky metals should be moved to the appropriate location to maximize segregation of the materials. These groupings can be developed by the operation staff based on needs and materials, but are anticipated to consist of tires, appliances, bicycles, ATV's, snowmobiles, and miscellaneous materials. Appropriate signage will direct the segregation.

6.4 Wood

Wood materials that may have reusable value are placed in the wood pile in the reuse/recycle area that is part of the landfill site. The wood pile should be burned on occasion when quantities build up. Burning should take place when wind and climate conditions are favorable. Burning should only be done when the smoke will not drift towards the community or airport.

6.5 Hazardous Waste Management

Hazardous waste, identified as described above, must be properly contained, and labelled. The Hamlet arranges shipment out of the municipality when possible.

6.6 Landfilling Operations

The following operational procedures are based on continuing to operate the landfill as an "area fill" landfill, with waste being spread over the fill area footprint, compacted, and covered prior to the next lift (layer) being added.

The recommendations made in this report are based on the Municipal and Community Affairs "*Guidelines for the Planning, Design, Operation and Maintenance of Solid Waste Modified Landfill Sites in the N.W.T*".

- Compact the wastes at the landfill.

  Compaction of wastes can significantly reduce the volumes of materials in a landfill. The steps involved in properly compacting wastes along the southern slope of the esker is as followed.

  Step 1 – Allow loose wastes to accumulate.
  Step 2 – Spread the waste for compaction.
  Step 3 – Work the material across the fill area a little at a time, to form compacted layers of waste.
  Step 4 – Cover and compact a layer of fill over the exposed waste.

- Cover the wastes.

  Operations are made easier by stocking cover material close to the landfill. After the garbage has been compacted a layer of fill approximately 0.15 m to 0.2 m should be placed upon the compacted garbage. The fill should be spread over the entire pile and then compacted again to prevent erosion. It is recommended that the landfill in Arviat be compacted and covered with a layer of fill at least four times a year subject to financial ability.

- Minimize the scatter of wastes by maintaining signs and fencing around the waste disposal area.

- Divert hazardous material, bulky metals, and reusable/recyclable materials.

- Drop off waste at the designated area at the end of the access road.

- Close the fill area once final grades (maximum 3:1 slopes) are achieved.

6.6 Surface Water Management

At some point, for a variety of reasons, impacted water may accumulate in SWMF. The water may or may not be impacted by leachate, hazardous wastes, or other contaminants. Given the climate, this is not anticipated to be a significant problem; however, in the event this occurs, the following procedures will be followed:

- Collect samples as outlined in the Environmental Monitoring Program and QA/QC Plan (separate document)

- It is recognized that it may take some time for results to be received from the accredited laboratory

- Analyze samples for parameters of concern and compare the results to the relevant Canadian Water Quality Guidelines

- If waiting for analytical results and the water retention area fills to the top of the culvert, it should be inspected for odours, stain, or signs of visible impact (sheens, floating scum). The culvert may be blocked to facilitate additional water accumulation, until the sampling results are received

- Dispose of the water. Disposal options are dependent on the water quality and could include:
    - Transportation and disposal in the sewage lagoon— direct discharge to the environment is discouraged. Pre-treatment (filter, chemical, etc.) prior to discharge to the sewage lagoon.
    - Containment and storage if deemed to be hazardous waste.
    - Direct discharge, if sampling results indicate no exceedances of discharge criteria Pre-treatment (filter, chemical, etc.) prior to direct discharge providing the discharge meets the water quality guidelines.

8.0 Monitoring Requirements

As outlined in the NWB water license, regular monitoring of runoff from the SWMF is required. Refer to the monitoring program, as described in the Environmental Monitoring Program and QA/QC Plan. Results of analytical testing and monitoring are to be recorded on a regular basis by the staff. Copies of the Certificates of Analysis and Chain of Custody forms are to be kept for future reference and included in the annual report.

The monitoring stations are summarized in Table 2. Monitoring Station ARV-2a is located in the southeast corner of the site in a low area, to monitor discharge towards the ocean and the abandoned sewage lagoon to the east.

The Nunavut Water Board License, Part B: General Conditions, includes the requirement to file an Annual Report with the NWB no later than March 31st of the year following the calendar year reported, which shall include:

- Tabular summaries of all data generated under the "Monitoring Program."
- The monthly and annual quantities in cubic metres of fresh water obtained from all sources.
- The monthly and annual quantities in cubic metres of each and all waste discharged.
- A summary of modifications and/or major maintenance work carried out on the Water.
- Supply and Waste Disposal Facilities, including all associated structures and facilities.
- A list of unauthorized discharges and summary of follow-up action taken.
- A summary of any abandonment and restoration work completed during the year and an outline of any work anticipated for the next year.
- A summary of any studies, reports and plans (i.e. Operation and Maintenance, Abandonment and Restoration, QA/QC) requested by the Board that relate to waste disposal, water use or reclamation, and a brief description of any future studies planned
- Any other details on water use or waste disposal requested by the Board by November 1st of the year being reported.

- The creation of the report can be greatly simplified by regularly filling out the Site Forms included in Appendix A. The forms include:

    - Form 1, Waste Placement Form — describing the day-to-day delivery of waste and site activities.
    - Form 2, Weekly Waste Management Facility Inspection Form, to document the weekly inspection and observation of the site operation and infrastructure.
    - Form 3, Solid Waste Management Facility Planning Form — which provides a list of items to be discussed by the Public Works Supervisor, SAO, and Hamlet Council related to short term and long-term solid waste decision making. In addition to these forms, there would be sampling information and analytical data. Using the forms and following the procedures provided herein should make submitting the NWB Annual Report relatively straight forward.

Table 1 Monitoring Program Stations

Monitoring Station	**Description**	**Frequency**	**Status**
ARV-2a	Effluent from the discharge point of the Solid Waste Disposal Facility.	Quality Monthly during the months of May to August and prior to discharge of accumulated impacted water. Acute Toxicity Annually	Active (Quality and Acute Toxicity)
ARV-2b	Effluent from the discharge point of the New Solid Waste Disposal Facility. *(A new facility has never been constructed)*	Quality Monthly during the months of May to August and prior to discharge of accumulated impacted water. Acute Toxicity Annually	Not Active (Quality and Acute Toxicity)
ARV-5	Discharge from the Bulky Metal Waste Area.	Monthly during periods of observed flow.	New (Quality)
ARV-6	Discharge from the Hazardous Waste Storage Area.	Monthly during periods of observed flow.	New (Quality)
ARV-10	Effluent from the Final Discharge Point of the Hydrocarbon Impacted Soil Storage and Treatment Facility	To be determined in accordance with Part D, Item 10	New (To be determined in accordance with Part D, Item 10)

ARV-11	Effluent discharge from dewatering contaminated soil areas.	To be determined in accordance with Part D, Item 14 (c)	Part D, Item 14 (c) New (To be determined in accordance with Part D, Item 14 (c))

8.0 Closure Plan

Part G of the Water License requires the submission of Abandonment and Restoration Plan at least six months prior to abandoning any facilities and construction of new facilities to replace existing ones.

An extension of the current facility is currently in the schematic design phase with estimated construction in 2024. If the existing SWMF is abandoned in the future, an abandonment and restoration plan is required to be submitted to the NWB as part of this licence.

8.0 Modifications and Upgrades

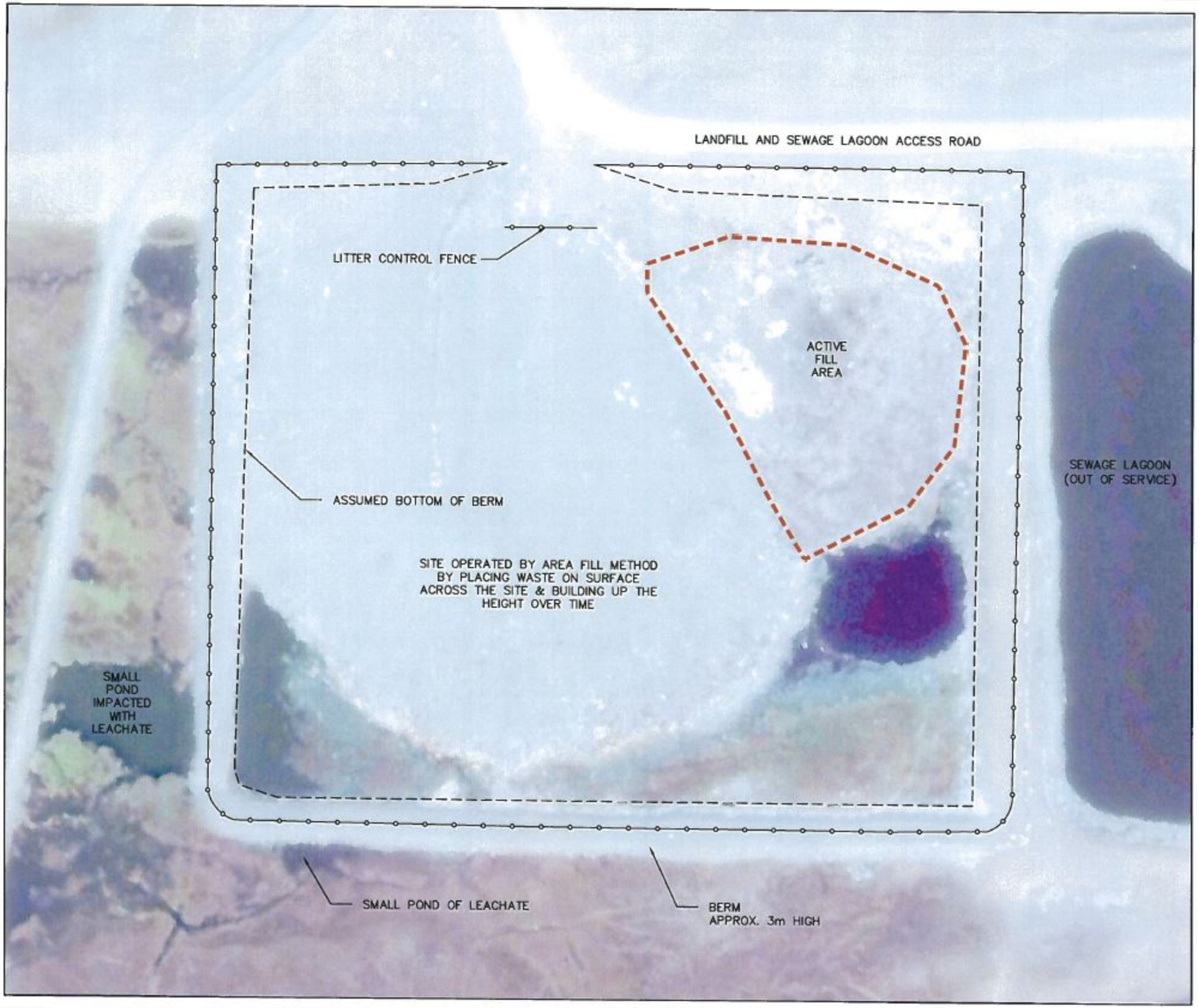
The existing facility has exceeded its capacity and a new facility is the in schematic design phase. All design documents relating to the upgrades site will be made available to the NWB as they are finalized and an amendment to the licence requested. An upgrades O&M plan will be submitted with the design documents for the upgraded infrastructure.

Appendix A: As-Built Drawings

FIGURE 4

HAMLET OF ARVIAT
HAMLET OF ARVIAT, NUNAVUT
SOLID WASTE MANAGEMENT FACILITY O&M PLAN

EXISTING SITE CONDITIONS - FALL 2008



LEGEND

APPROXIMATE LOCATION OF CHAIN LINK FENCE

Notes

- No Design or As Built drawings available
- No previous Operations & Development Plan available
- Site in use from approximately 1977
- Internal area approximately 28,423 m²
- Based on 2m of waste disposal depth, Landfill capacity is approximately 56,846 m³

Satellite Image Source:
Background air photo obtained from Google Earth Pro

0 10 20 30 40 50 60 70 80
Metres

1:1,000
June 2009
Project Number: PIO15746

Projection: UTM Zone 15
Datum: NAD83

Prepared by: C. Sheppard

Verified by: J. Walls

BURNSIDE

N-O15746 EXISTING SWF O&M PLAN EC.dwg

Plot Time: Jun 15, 2009 - 7:55pm