OPERATIONS AND MAINTENANCE MANUAL FOR THE WATER, SEWAGE AND SOLID WASTE FACILTIES

Baker Lake, NU

FINAL

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EXECUTIVE SUMMARY

This Operations and Maintenance (O&M) manual has been developed for use at the water distribution, sewage disposal, and solid waste facilities in the Hamlet of Baker Lake, Nunavut. The purpose of the O&M manual is to establish and describe standard operating and maintenance procedures for proper management of resources and equipment used in water distribution, sewage disposal and solid waste management at Baker Lake. Proper operation and maintenance of these municipal facilities will support:

- Effective treatment and management of water, sewage and solid wastes;
- Successful implementation of the monitoring and sampling program;
- Long-term performance of equipment and engineered structures;
- Compliance with the Hamlet of Baker Lake's Water License; and,
- Appropriate emergency response implementation.

This O&M manual contains the following sections to provide current operations and maintenance procedures:

1. Water Distribution System Operations and Maintenance
2. Sewage Disposal Facility Operations and Maintenance
3. Solid Waste Disposal Facilities Operations and Maintenance
4. Emergency Response (includes a Spill Contingency Plan)

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ABBREVIATIONS

A&R..... Abandonment and Restoration

AEM ..... Agnico-Eagle Mines Ltd.

COC .....Chain of Custody

GN-CGS..... Government of Nunavut Department of Community & Government Services

GN-DOE.....Government of Nunavut Department of Environment

GN-HSS .....Government of Nunavut Department of Health and Social Services

Hamlet.....Hamlet of Baker Lake

HHW ..... Household Hazardous Waste

L .....litres

km .....kilometre

m^3.....cubic metres

Nunami.....Nunami Stantec Ltd.

NWB.....Nunavut Water Board

O&M.....Operations and Maintenance

ODS ..... Ozone Depleting Substances

SAO ..... Senior Administrative Officer

TSS..... Total Suspended Solids

1 INTRODUCTION

1.1 Purpose

This Operations and Maintenance (O&M) manual has been developed for use at the water distribution, sewage disposal, and solid waste facilities in the hamlet of Baker Lake (Qamani'tuaq), Nunavut. The purpose of the O&M manual is to establish and describe standard operating and maintenance procedures for proper management of resources and equipment used in water distribution, sewage disposal and solid waste management in Baker Lake. Proper operation and maintenance of these municipal facilities will support:

- Effective treatment and management of water, sewage and solid wastes;
- Successful implementation of the monitoring and sampling program;
- Long-term performance of equipment and engineered structures;
- Compliance with the Hamlet of Baker Lake's Water License; and,
- Appropriate emergency response implementation.

Preparation and execution of this O&M manual satisfies Item 1 of Part F of the Hamlet of Baker Lake's Water License (No. 3BM-BAK1015), issued by the Nunavut Water Board (NWB) on June 23, 2010; the Water License is included in **Appendix A** of this O&M manual. An Abandonment and Restoration (A&R) plan has also been developed for use by the Hamlet of Baker Lake (the Hamlet). This A&R plan satisfies Item 1 of Part G of the Hamlet's Water License and is to be used as a guide for the abandonment and restoration of any water, sewage or solid waste facilities in the community. The A&R plan is provided under separate cover from the O&M manual.

This O&M manual has been developed using the following guidelines or regulations:

- Hamlet of Baker Lake NWB Water License (No. 3BM-BAK1015) general and specific conditions
- Guidelines for the Preparation of an Operation and Maintenance Manual for Sewage and Solid Waste Disposal Facilities in the Northwest Territories (Duong and Kent 1996)
- Guidelines for the Planning, Design, Operations and Maintenance of Modified Solid Waste Sites in the Northwest Territories (Kent *et al*. 2003)
- Nunavut guidelines for Municipal Solid Wastes Suitable for Open Burning (GN-DOE n.d.)
- Environmental Guidelines for General Management of Hazardous Waste in Nunavut (GN-DOE 2002)
- Contingency Planning and Spill Reporting in Nunavut: A Guide to the New Regulations (GN-DOE n.d.)
- Additional information on water, sewage and solid waste systems in Baker Lake has been obtained through the Government of Nunavut Department of Community and Government

Services (GN-CGS), NWB Public Registry, Nunami Stantec Ltd. (Nunami) Baker Lake project files, and interviews with key GN-CGS and Hamlet personnel.

1.2 Site Description

The hamlet of Baker Lake is situated on the northwest shore of Baker Lake near the mouth of the Thelon River (64 18' N, 96 3' W). The community is situated approximately 283 km inland from the western shore of Hudson Bay in the Kivalliq Region of Nunavut. The community is located approximately 275 km northwest of Rankin Inlet, NU (see inset of Figure 1 in **Appendix B**).

The hamlet is located within the Wager Bay Plateau Ecoregion of the Northern Arctic Ecozone. The region is characterized by broad sloping uplands, plains and valleys. Soils are primarily silty sand and silty clays overlying boulder till, beach deposits and reworked till. Local topography slopes upward from the lake to a ridge approximately two kilometers to the north. A site overview of the existing conditions is provided on Figure 1 in **Appendix B**. Permafrost is present, with the active layer established at up to 1.5 meters in depth. Vegetation in the area is typical tundra vegetation consisting of mosses, lichens, grasses, and dwarf shrubs.

The average annual precipitation in the community consists of 156.7 mm of rainfall and 130.7 mm of snowfall, resulting in an annual total of approximately 270.4 mm of precipitation (EC 2010). The July mean high and low temperatures are 16.7^{o}C and 6.0^{o}C, respectively, with the average daily temperature of 11.4 ^{o}C. The January mean high and low temperatures are -28.7^{o}C and -35.8^{o}C, respectively. The January average daily temperature is -32.3^{o}C (EC 2010). Winds are commonly from the northwest at an average annual speed of 20.4 km/h (EC 2010).

The Hamlet provides daily trucked services for water delivery and sewage collection. Drinking water is drawn from Baker Lake and distributed to water trucks via the pumphouse truck fill. Sewage and wastewater are presently discharged to a holding cell which exfiltrates through an outlet, downslope into Lagoon Lake. The effluent then flows east and south, crossing berms, wetland areas and two lakes until it reaches Baker Lake, approximately 2 km east of the water intake. This sewage disposal and treatment wetland system has been in operation since at least 1980 and upgrades to the system were completed in the fall of 2010.

Domestic solid waste is collected five days a week (Monday through Friday) by the Hamlet and disposed of a the municipal solid waste facility. Locations of the water distribution, sewage disposal, and solid waste disposal facilities are shown in Figure 1 in **Appendix B**.

Based on Canadian Census data, the Nunavut Bureau of Statistics estimated the population of Baker Lake at 1,906 in 2009 (Nunavut Bureau of Statistics 2010). Table 1-1 illustrates population projections for the hamlet for a 20 year period as projected by the Nunavut Bureau of Statistics, equating to an average annual increase of 1.5%.

Table 1-1 Population Projection at Baker Lake, Nunavut – 2011 to 2031 (Nunavut Bureau of Statistics 2010)

Year	Population
2011	1,963
2016	2,120
2021	2,294
2026	2,474
2031	2,657

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2 BACKGROUND

2.1 Water Distribution System

The Baker Lake water distribution system consists of a water intake, pipeline and pumphouse with truck fill. Potable water is obtained from Baker Lake through an intake and pipeline; the water intake is situated approximately 120 m offshore at a depth of 5 to 6 m below surface.

The GN-CGS is responsible for the operation and maintenance of the pumphouse and equipment within. The Hamlet supplies trucked services for scheduled water delivery to all houses and other buildings. Water trucks obtain water from Baker Lake via the submersed intake, which pumps water through the pumphouse. The pumphouse accommodates the water intake system, storage tanks, truck fill system, chlorination system, standby generator and associated heating, electrical and alarm systems. Annual water consumption volumes for Baker Lake were estimated along with annual wastewater volumes for the period 2011 to 2031; these are provided in Table 2-1 of Section 2.2

Water is currently pumped from the intake directly into water distribution trucks. Chlorine solution is pumped into the truckfill line from a 15 gallon chlorine solution tank during truck fills. Originally the system was designed for chlorination to take place before raw water entered storage tanks in the pumphouse and after leaving the tanks, before entering the water trucks. The storage tanks in the pumphouse were originally meant to fill the water trucks and to supply water to the Health Centre, Nurse's Residence, Elders facility and group home via a small pipe distribution system. This aboveground utilidor pipe system was taken off-line after Dillon Consulting Ltd. (2006) observed only batch chlorination occurring for water to the pipe system and the free residual chlorine was below the regulated level (0.2 mg/L).

2.2 Sewage Disposal Facility

The sewage disposal facility is situated approximately 1.2 km north of the community and consists of a large holding cell, several flow attenuation structures and one lake. Upgrades to the sewage disposal facility were completed in the fall of 2010 and included:

- Upgrading of the previous short-term holding cell by strengthening its walls;
- Construction of an additional short-term holding cell to increase the initial retention time of effluent;
- Upgrading of the vacuum truck offloading point into the holding cells;
- Installation of attenuation structures in the wetland area between the holding cells and Lagoon Lake, and between Lagoon Lake and Finger Lake; and,
- Construction of a fence around the sewage and solid waste disposal facilities to keep out wildlife (i.e., caribou).

Sewage is collected from the Hamlet's houses and other buildings by vacuum truck and discharged from one of two built out gravel pads. Effluent flows downslope over constructed corrugated metal and riprap spillways into the large holding cell. The holding cell measures approximately 120 m long by 20 m wide with a maximum depth of 1.7 m. The capacity of the holding cell is approximately 1,000 m^3.

From the holding cell outlet, effluent flows downslope approximately 200 m into Lagoon Lake, through a field of flow attenuation riprap. From Lagoon Lake, effluent flows east approximately 300 m towards Finger Lake; the compliance point for effluent quality monitoring of the sewage treatment wetland has been set immediately prior to Finger Lake. A flow attenuation berm 150 m long with two 600 mm culverts is located within the 300 m stretch between Lagoon and Finger Lakes. This attenuation berm is oriented perpendicular to effluent flow, slowing and widening the flow and allowing for better treatment within the wetland. The sewage treatment wetland is designed for a 10-month storage with decanting over the late summer/early fall into Finger Lake. From Finger Lake, treated effluent then flows an additional 1,000 m southeast into Airplane Lake; Airplane Lake then drains south approximately 1,300 m via Garbage Creek into Baker Lake.

A 2.44 m (8 feet) high by 2.2 km long chain-link fence is also installed around the sewage and solid waste disposal facilities. This fence, completed in 2010, was installed to keep wildlife out of the sewage treatment area and prevent wildlife from feeding within the treatment area.

For information purposes, projected annual sewage generation rates for the period between 2011 and 2031 are provided in Table 2-1.

Table 2-1 Projected Water Consumption and Sewage Generation Volumes From 2011 to 2031 at Baker Lake, NU

Year	Population[a]	Annual Water Consumption (L)[b]	Annual Sewage Volume (m^3)[c]	10-month Sewage Volume (m^3)[d]
2011	1,963	71,649,500	71,650	58,890
2012	1,993	72,744,500	72,745	59,790
2013	2,021	73,876,000	76,876	60,720
2014	2,055	75,007,500	75,008	61,650
2015	2,087	76,175,500	76,176	62,610
2016	2,120	77,380,000	77,380	63,600
2017	2,154	78,621,000	78,621	64,620
2018	2,188	79,862,000	79,862	65,640
2019	2,223	81,139,500	81,140	66,690
2020	2,258	82,417,000	82,417	67,740
2021	2,294	83,731,000	83,731	68,820
2022	2,330	85,045,000	85,045	69,900
2023	2,367	86,395,500	86,396	71,010
2024	2,404	87,746,000	87,746	72,120

Year	Population[a]	Annual Water Consumption (L)[b]	Annual Sewage Volume (m^3)[c]	10-month Sewage Volume (m^3)[d]
2025	2,439	89,023,500	89,024	73,170
2026	2,474	90,301,000	90,301	74,220
2027	2,510	91,615,000	91,615	75,300
2028	2,546	92,929,000	92,929	76,380
2029	2,582	94,243,000	94,243	77,460
2030	2,619	95,593,500	95,594	78,570
2031	2,657	96,980,500	96,981	79,710

NOTES:

[a] Population estimates from Nunavut Bureau of Statistics (2010)

[b] Annual water consumption based on 100 litres per capita per day (100 L/c/d)

[c] Annual sewage volume generated anticipated to be equal to water consumption volumes

[d] The volume of sewage produced during a ten-month (300 day) period each year is included to facilitate annual ice storage

2.3 Solid Waste Disposal Facility

The solid waste disposal facility at Baker Lake is situated near the south shore of Finger Lake and adjacent to the sewage disposal facility. The facility was constructed in 1991 and expanded in 1998 to improve compliance. The facility consists of a fenced disposal area for municipal solid waste (MSW) and a separate storage area for bulk metal, hazardous wastes and waste oil.

The Hamlet collects solid waste from community buildings on a scheduled daily basis (Monday to Friday) with a compactor garbage truck and transports the waste to the MSW disposal area; the size of the MSW disposal area is approximately 25,000 m^2. Open burning typically occurs at the MSW site on a weekly basis (G. Perkins, *pers. comm.*). Residents currently have access to the MSW and hazardous waste disposal areas and can drop items off at any time. The bulk metal/hazardous waste storage area is situated immediately west of the MSW disposal area; both disposal areas are unlined however and runoff from the solid waste disposal facility drains directly into Finger Lake and the sewage treatment wetland.

For information purposes, projected annual solid waste generation rates for the period between 2011 and 2031 are provided in Table 2-2.

Table 2-2 Projected Annual Solid Waste Generation Volumes From 2011 to 2031 in Baker Lake, NU

Year	Population[a]	Annual Solid Waste Generation (m^3)[b]	Annual Compacted Volume of Solid Waste (m^3)[c]
2011	1,963	15,911	7,955
2012	1,993	16,231	8,116
2013	2,021	16,565	8,283
2014	2,055	16,902	8,461
2015	2,087	17,252	8,626

Year	Population[a]	Annual Solid Waste Generation (m^3)[b]	Annual Compacted Volume of Solid Waste (m^3)[c]
2016	2,120	17,615	8,808
2017	2,154	17,993	8,996
2018	2,188	18,373	9,187
2019	2,223	18,768	9,384
2020	2,258	19,166	9,583
2021	2,294	19,579	9,790
2022	2,330	19,995	9,998
2023	2,367	20,426	10,213
2024	2,404	20,861	10,431
2025	2,439	21,276	10,638
2026	2,474	21,693	10,847
2027	2,510	22,126	11,063
2028	2,546	22,563	11,281
2029	2,582	23,002	11,501
2030	2,619	23,458	11,729
2031	2,657	23,929	11,965
Total Volume of Solid Waste Generated and Compacted (m^3)			**222,304**
Total Cover Material Required (m^3)[d]			**44,461**
Total Volume Required for Municipal Solid Waste Disposal (m^3)			**266,765**

NOTES:

[a] Population estimates from Nunavut Bureau of Statistics (2010)

[b] Annual solid waste generation estimated as per Kent *et. al.* (2003) = $365 \times V \times P_i \times (1 + G) + 0.084 \times V \times P_i^2 \times (1 + G)^{2n}$

Where V = average residential solid waste volume; estimated at 0.015 m^3/person/day (FSC 2000)

P_i = population in current year (persons)

G = average community population growth rate (persons/year); estimated from Nunavut Bureau of Statistics (2010) at a 1.5% average annual increase.

[c] Annual compacted volume is equal to 50% of annual solid waste generated

[d] Total volume of cover material estimated at 20% of total compacted volume

Some smaller metal wastes are stored within the MSW disposal area however most large metals wastes are disposed of at the bulk metal/hazardous waste disposal area. The bulk metal wastes typically disposed of by the community include items such as automobiles, heavy equipment, appliances, old fuel tanks, and other bulky metal wastes.

Some hazardous waste management and segregation presently occurs within the solid waste disposal facility. This can be improved upon however to ensure risks to human health and the environment are minimized and the terms of the Hamlet's water license are met. In the community, waste oil is either taken to Baker Lake Contracting and Supplies Ltd. (BLCS) to be burned in their waste oil burners, or is stored in drums at the bulk metal/hazardous waste storage area. Other

household hazardous wastes, including, waste batteries, paint, antifreeze and other wastes are also usually stored at the bulk metal/hazardous waste storage area. In 2010, Agnico-Eagle Mines Ltd. (AEM) personnel assisted the Hamlet with a clean-up of the bulk metal/hazardous waste storage area. All hazardous wastes, including waste oil, antifreeze, batteries, paint, tires, etc, were collected, segregated and stored in seacans for shipment out of the community.

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3 WATER DISTRIBUTION SYSTEM OPERATIONS AND MAINTENANCE

3.1 Equipment

The following equipment is used to operate and maintain the water distribution system at Baker Lake:

- **Baker Lake to Pumphouse:**
  - One (1) permanent intake in Baker Lake, fitted with screen with 2.5 mm effective openings
  - 100 mm diameter by approximately 111 m long pipeline to the pumphouse, fitted with a Thermon® TC 202a SSR3OA intake line heat trace
- **Pumphouse:**
  - Detailed equipment lists for the new pumphouse can be found in the O&M manual for the new pumphouse system (expected in mid-2012 concurrent with upgrades to the pumphouse and truck fill system [W. Thistle, *pers. comm.*]).
- **Water Trucks:**
  - Six (6) water trucks with an approximately capacity of 9,460 L (2,500 gallon) capacity each (G. Perkins, *pers. comm.*).

3.2 Site Personnel

In Baker Lake, overall responsibility and management of the water distribution system lies with the GN-CGS who is responsible to ensure proper operation of the system is carried out, and inspections and drinking water sampling are completed and documented.

The Hamlet's Operations Manager and the Water, Sewage and Solid Waste (WSSW) Foreman are responsible for managing the day-to-day water delivery, ensuring chlorine solution is mixed and available, and chlorine levels are tested. The Hamlet's Senior Administrative Officer (SAO) is responsible to ensure annual reporting to the NWB is accomplished.

The Hamlet typically has fourteen individuals hired that can operate the water trucks (includes permanent and emergency drivers) and distribute water to community buildings on a daily basis (Monday to Sunday). These individuals also operate the Hamlet's sewage and garbage trucks. Water Truck Drivers are responsible for monitoring the volume of water pumped to residences and buildings everyday and reporting these volumes daily at the Hamlet Office. The Water Truck Drivers are also responsible for mixing chlorine solution and testing chlorine levels in the pumphouse.

3.3 Pumphouse and Truck Fill

The GN-CGS is planning to complete upgrades to the pumphouse and truck fill system at Baker Lake in the summer of 2012. These upgrades include a new intake pump, a second pumphouse building housing a new filtration and chlorination system, and two new truck fill lines. As part of this upgrade project, a new O&M manual specific to the new pumphouse and systems will be completed

For operations and maintenance procedures for the new pumphouse systems, please refer to the O&M manual developed for this new system (available in mid-2012). However until this new pumphouse O&M manual is available, the original O&M manual (early 1980s) for the pumphouse and truck fill should be referred to.

3.4 Water Trucks

3.4.1 Operations

Every day, water is delivered to houses and buildings in the community by water trucks. Only trained drivers should operate these trucks, including filling, driving and water delivery.

See the new (2012) O&M manual for operational procedures to fill the water trucks from the new pumphouse system.

3.4.2 Maintenance

Water delivery to residences and buildings in the community is the key component of the water distribution system. It is very important that the water trucks are kept in good condition and any repairs are given top priority and completed immediately.

The water trucks and tanks should be inspected on a daily basis for leaks (water and fuel or oil), proper lighting and hose operation, and basic condition (e.g., rust). The trucks should receive a mechanical inspection at least once per year. Additionally, the water trucks should be parked in a heated garage in winter to prevent the tanks from freezing and full tanks should not be allowed to rest for long periods of time, especially in winter.

The tanks of the water trucks need to be cleaned on a regular basis to maintain the water quality of the drinking water being transported and delivered. The tanks should be thoroughly cleaned at least once every month, or more often if conditions warrant.

3.5 Troubleshooting

See the new (2012) O&M manual for troubleshooting procedures for the new pumphouse systems.

3.6 Monitoring and Sampling

3.6.1 Monitoring Requirement

Monitoring programs are carried out to help ensure all systems are functioning correctly as they collect data on surface water quality to assess impacts to the freshwater aquatic environment, and

provide important feedback to the operators, helping them track progress of the system and provide warning or notice when issues arise. Monitoring programs also ensure any requirements or guidelines for water quantity and/or quality are being met; these requirements are typically provided in the community's water license. Monitoring programs form an integral part of the O&M process for all facilities and it is important to ensure they are being completed successfully. It is important that the Hamlet carry out a monitoring program as part of the daily, monthly and annual operations of the water distribution system.

The water license for the Hamlet of Baker Lake outlines the Monitoring Program for the community and requires only one monitoring station for the water distribution system. This station, BAK-1, is located within the pumphouse and is used to measure and record the volume of water removed from Baker Lake (see Table 3-1).

A second monitoring station, informally referred to as BAK-6, is required under the *Public Health Act* Consolidation of Public Water Supply Regulations (R.R.N.W.T. 1990,c.P-23) and is enforced by the Government of Nunavut Department of Health and Social Services (GN-HSS); this station not licensed under the Hamlet's Water License. The BAK-6 station is actually sampled at more than one location, including the raw water (from within the pumphouse before chlorination), the water trucks, and a few taps within the community. This BAK-6 station is used to collect samples of drinking water for bacterial characteristics.

Table 3-1 Monitoring Stations for the Water Distribution System at Baker Lake, NU

Monitoring Program Station Number	Description	Monitoring Requirement	Frequency	Location
BAK-1	Raw potable water supply from Baker Lake	Volume (m^3)	Monthly and Annually	Within the pumphouse or from water truck delivery volumes
BAK-6 (informal)	Raw water (pumphouse before chlorination), water trucks, and a few taps within the community	Water Quality (Bacterial)	Monthly	Various

BAK-1

At BAK-1 the volume (cubic metres, m^3) of water being removed from Baker Lake should be recorded on a monthly basis. As the Hamlet does not monitor systems within the pumphouse, the total volume of water removed from Baker Lake in the current year can be estimated by tallying the volume of water delivered by the water trucks in the previous year. The Hamlet currently uses a program called *Fluid Manager* to monitor daily volumes of water delivered. Within the water trucks, a flow meter monitors the volume of water distributed to residences and other buildings every day. At the end of each day, the water truck drivers return to the Hamlet office and download water volume data directly to the program from the water trucks. The data connection is located outside the Hamlet office.

At the beginning of each year (e.g., January), all monthly volumes of water distributed to the community will be tallied to estimate the annual volume of water removed from Baker Lake in the previous year. The SAO will report the monthly and annual volumes of water to the NWB in the Hamlet's Annual Water License Report.

BAK-6 (informal)

At BAK-6, a water sample for *Escherichia coli* (*E. coli*) and other bacteria (total coliforms) should be taken during the first week of the month, at a minimum. Water samples should be taken from the pumphouse prior to chlorination (raw water), water trucks, and from two to three buildings in the community (tap water). Treated water being distributed to the community should have zero coliforms (from *E. coli* and total coliform tests). Samples are analysed by GN-HSS in Rankin Inlet and results are communicated to the SAO. The GN-HSS' Environmental Health Officer will review the results of bacterial analyses to monitor the effectiveness of water treatment.

If bacterial tests have failed (e.g., have greater than zero *E. coli* or total coliforms), the Environmental Health Officer will contact the SAO and discuss what should be done next to confirm results. Next steps may include, but not be limited to, re-sampling, increasing chlorine dosage, flushing water lines of the pumphouse, and/or issuing a boil water advisory.

Indian and Northern Affairs Canada (INAC) Water Resource Officers (Inspectors) will also take drinking water samples for chemical characteristics; these samples are taken at least once every two years. INAC Inspectors report the results to the Hamlet and the Environmental Health Officer.

3.6.2 Sampling Procedures

Drinking water samples for bacterial analyses should be taken by the WSSW Foreman, or other trained personnel appointed by the WSSW Foreman, and sent to the Rankin Inlet Wellness Centre for analysis.

Guidelines for the collection of water samples for bacterial analyses are found in **Appendix C**. The sample collection procedures should be followed for all bacterial sampling carried out for drinking water from the water distribution system to ensure the correct sample bottles are obtained, proper sampling procedures are completed, and contamination of samples are minimized.

3.7 Record Keeping

Records of activities, inspections and sampling for the water distribution system should be kept. These records should be stored at the Hamlet Office and kept by the SAO and/or Operations Manager. These records will assist with the planning of annual operations and maintenance of the system, as well as assess how well system components are functioning.

Every year by March 31st, the Hamlet is required to submit an Annual Report to the NWB. The SAO is responsible to ensure the Annual Report is submitted every year. The Annual Report provides the NWB with information pertaining to the results of the Monitoring Program, volumes of water

consumed, volumes of wastewater discharged, and summaries of any modifications, major maintenance work, and spills.

Therefore, at a minimum, the following records should be kept for the water distribution system:

- Number of trips water trucks make per day;
- Volume of water pumped from Baker Lake monthly and annually;
- Volume of water consumed by the community monthly and annually (if different than the volume pumped from Baker Lake);
- Dates any sampling has been completed;
- Results from any sampling;
- Dates and description of any maintenance activities (including inspections) carried out on the system by Hamlet personnel or other Inspectors;
- Dates and description of any modifications and/or major maintenance work, and abandonment and restoration work carried out on the system, including on associated equipment (e.g. water trucks, etc); and,
- Dates, description and clean-up activities of any spills (fuel, oil, etc) related to the water distribution system.

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4 SEWAGE DISPOSAL FACILITY OPERATIONS AND MAINTENANCE

4.1 Equipment

The primary components of the sewage disposal facility at Baker Lake are the holding cell and the sewage treatment wetland. The sewage treatment wetland is inclusive of the area between the holding cell and Lagoon Lake, Lagoon Lake, and the area between Lagoon Lake and Finger Lake. Together, the holding cell and sewage treatment wetland make up the sewage treatment system and have a combined area of approximately 8.3 hectares (83,000 m^2).

The Hamlet also has six sewage vacuum trucks, each with a capacity of approximately 9,460 L (2,500 gallons) (G. Perkins, *pers. comm.*), to transport sewage to the sewage disposal facility:

4.2 Site Personnel

The Operations Manager has overall responsibility for the operation and maintenance of the sewage disposal system. The Operations Manager is responsible to ensure proper operation and maintenance of the system is carried out, including sampling, inspections, and annual reporting to the NWB.

The WSSW Foreman is responsible for day-to-day operation and maintenance of the sewage facility, including managing daily sewage collection, ensuring sewage volumes are recorded, sampling wastewater, and completing inspections and other maintenance activities.

The Hamlet typically has fourteen individuals hired that can operate the sewage vacuum truck (includes permanent and emergency drivers) and collect sewage from residential and community buildings seven days a week. These individuals also operate the Hamlet's water delivery and garbage trucks. The sewage truck drivers are responsible for recording and reporting the volume of sewage released to the holding cell daily, and inspecting the sewage trucks.

4.3 Health and Safety

All personnel working within the sewage disposal facility should be made aware of potential health hazards associated with working around sewage and wastewater. This is imperative so individuals make a conscious effort to perform all necessary safety procedures to protect themselves, their co-workers and family members at home. Safety precautions include:

- Ensuring all equipment is kept as clean as possible
- Assume anything touched by sewage is contaminated
- Protective clothing such as coveralls, gloves, boots and safety glasses are to be provided to personnel and worn at all times when working around sewage

- Workers must always wear protective gloves, especially when hands are chapped, burned, or have a rash or a cut
- Workers work clothing is not worn home, work clothing must be left at work
- Workers wash their hands with soap and water on a regular basis, especially before eating, going home, and delivering drinking water
- Workers should not be permitted to collect sewage and deliver drinking water on the same day
- Workers are prohibited from eating or drinking in and around the sewage vacuum trunks
- Workers keep their vaccinations up to date.

See Section 6 of this O&M Manual for emergency response procedures in the event of a sewage spill at the sewage disposal facility or elsewhere within the community.

4.4 Operations

In Baker Lake, sewage is collected Monday to Sunday every week of the year and is released into the holding cell, located approximately 1.2 km north of the community. Effluent is released from the holding cell via an outlet in the cell's impervious berm. Effluent then flows into the sewage treatment wetland where it receives further treatment. A flow attenuation riprap field and a flow attenuation berm are present within the system to slow and widen the effluent flow and allow for better treatment within the wetland. The attenuation riprap is situated between the holding cell and Lagoon Lake while the attenuation berm is located between Lagoon and Finger Lakes. Sewage effluent typically remains within the sewage treatment system for a period of time to receive primary treatment; this is typically a 10-month storage regime with effluent release into Finger Lake in the late summer.

As little is required in the way of operational procedures for the holding cell and sewage treatment wetland, basic operational procedures for the sewage disposal facility have been developed. Components of the sewage disposal facility are illustrated in Figure 2 in **Appendix B** and in engineered drawings for the sewage wetland improvements in **Appendix D**.

The following procedures should be carried out daily when sewage collection and release to the holding cell occurs:

1. Sewage is collected Monday through Sunday from holding tanks in residences and other buildings in the community. Sewage is collected through the use of the sewage vacuum trucks.
2. The vacuum trucks pump out sewage from the building holding tanks and transport it to the holding cell of the sewage disposal system.
3. Sewage is deposited into the holding cell from the vacuum trucks using the corrugated metal pipe spillways from one of the two offload truck pads (dumping stations), situated immediately south of the holding cell. The sewage truck backs up to the spillways on one of the offload truck pads and the release valve of the truck is opened. Bollards and traffic barrier stop logs have been placed in front of each spillway for safety precautions.

4. The sewage truck driver should record the daily wastewater volumes discharged to the holding cell and the number of trips they make there per day. A logbook or other record form should be kept in each truck for this purpose. An example Sewage Volume Record form is located in **Appendix E** and can be used for this purpose.
5. The holding cell provides primary treatment of sewage as effluent is held within the impervious cell for a period of time.
    - Effluent is automatically released from the holding cell when the volume of effluent reaches a certain height.
    - The top of the holding cell berms are at 69.0 m above sea level (asl) elevation; the berms are impervious except for an installed riprap area (outlet) at 68.7 m asl elevation. Once effluent reaches 68.7 m asl, it flows through the riprap area, downslope through the flow attenuation riprap field, and into Lagoon Lake of the sewage treatment wetland.
6. Once effluent is released to the sewage treatmemt wetland, the effluent flows in an easterly direction, receiving treatment from native vegetation, soil bacteria, Lagoon Lake, and any boggy areas between. Effluent from the sewage treatment wetland flows into Finger Lake then southeast into Airplane Lake and eventually discharges into Baker Lake.

Sewage is discharged into the holding cell year round. In the winter, the sewage freezes within sewage treatment system and will be discharged only when the effluent reaches the height of the attenuation berm or during the spring thaw.

4.5 Maintenance

Maintenance activities for the sewage disposal facility should be performed by the Hamlet on a monthly and/or annual basis, depending on the facility component. The following sections outline procedures for proper maintenance of the holding cell, tundra wetland, flow attention structures (riprap field and berm), sewage trucks, access road, offload truck pads, and spillways.

Inspections are an integral part of the maintenance procedures of the sewage disposal facility as they identify concerns and deficiencies, and recognize areas or components which need improvement, correction, repair, and/or replacement. All maintenance inspections should be completed by the Hamlet Foreman or a licensed engineer, where required, and all inspection records should be filed at the Hamlet Office. Any problems or issues noted during the inspections should be communicated to the Hamlet Foreman and/or SAO as soon as possible. A Sewage Disposal Facility Inspection Form has been included in **Appendix E**.

4.5.1 Holding Cell

The following maintenance activities should be carried out to ensure the holding cell remains in sound condition:

- Monthly inspection of the corrugated metal pipe spillways and riprap for condition and stability.

- Monthly inspection of the holding cell berms for stability. Note: the holding cell has a synthetic liner installed within the berm and should not be disturbed or exposed except as necessary (i.e., under guidance of or by a qualified geotechnical engineer)
- Monthly inspection of the holding cell outlet structure, including addition of riprap, as necessary, and repair of any washed out or eroded areas.
- Annual geotechnical inspection of the holding cell berms by a qualified geotechnical engineer; this inspection is a requirement in the Hamlet's Water License and shall be conducted in July or August.

4.5.2 Sewage Treatment Wetland

Maintenance activities within the sewage treatment wetland should be performed to ensure the wetland effectively treats wastewater and free flow of water and effluent is allowed:

- Monthly inspection of the flow attenuation structures for condition and stability.
- Annual geotechnical inspection of the flow attenuation structures by a qualified geotechnical engineer; this inspection is a requirement in the Hamlet's Water License and shall be conducted in July or August.
- During open water season, bi-weekly inspection of sewage treatment wetland drainage courses (including flow attenuation structures and culverts) to ensure they are unblocked and free flowing, removing any blocking debris if present. Do not disturb the existing and emerging vegetation; this is an important component of the sewage treatment process.
- During early spring and late fall, daily inspections of the drainage courses should be conducted to determine when flow is present. Inspections should take place at each monitoring station. The presence of flow within the tundra wetland (e.g., May/June) will initiate the Monitoring Program while the program will terminate when flow stops (e.g., September/October) (see Section 4.6).
- Sampling at tundra wetland monitoring stations when required (see Section 4.6).

4.5.3 Sewage Trucks

Sewage collection from residences and buildings in the community is one of the main components of the sewage disposal facility. It is very important that the sewage trucks are kept in good condition and any repairs are given top priority and completed immediately to ensure continued collection service.

Sewage trucks and tanks should be inspected on a daily basis for leaks (sewage and fuel/oil), proper lighting, hose and valve operation, and basic condition (e.g., rust). Sewage trucks should be parked in a heated garage in the winter to prevent the tanks from freezing and full tanks should not be allowed to rest for long periods of time, especially in winter.

The trucks should also receive a mechanical inspection by a certified mechanic at least once per year.

4.5.4 Access Road and Offload Truck Pads

To ensure continued access to the sewage disposal facility, the Hamlet should regularly perform basic road maintenance activities on the access road and offload truck pads. The following should be carried out:

- Weekly inspection of the offload truck pad areas should be conducted by the vacuum truck drivers to examine for signs of erosion or other issues. Any issues should be repaired as soon as possible.
- The access road and offload truck pads should be graded and re-shaped at least once per year, or more often as required, ensuring surface drainage is always directed towards the holding cell.
- The access road and truck pads should be cleared of snow regularly in the winter, taking care to not damage fences, berms, spillways, bollards and other areas.
- Any repairs or erosion issues related to the access road or truck pads should be dealt with promptly.
- Any spilled and/or frozen wastewater should be removed and deposited in the holding cell. See Section 6 for sewage spill contingency plans.

4.5.5 Fence and Signs

Maintenance activities should be performed on the 2.44 m high wildlife exclusion fence and on signage within the wetland to ensure they remain in good condition. Signage is posted on the fence within the sewage treatment wetland and the 2.2 km long wildlife exclusion fence is present around the entire sewage treatment wetland and the solid waste facility.

- Monthly inspection of the wildlife exclusion fence around the sewage treatment wetland to ensure the chain-link is in good condition, fence posts and gates are stable (e.g., no evidence of frost heave), debris has not collect around it, and snow drifts are removed.
- Monthly inspection of signage throughout the sewage treatment wetland to ensure it is still present and readable.

4.6 Monitoring and Sampling

4.6.1 Monitoring Requirement

Monitoring programs are carried out to help ensure all systems are functioning correctly as they collect data on surface water quality to assess impacts to the freshwater aquatic environment and provide important feedback to the operators, helping them track progress of the system and provide warning or notice when issues arise. Monitoring programs also ensure any requirements or guidelines for water quantity and/or quality are being met; these requirements are typically provided in the community's water license. Monitoring programs form an integral part of the O&M process for all facilities and it is important to ensure they are being completed successfully. It is important that

the Hamlet carry out a monitoring program as part of the daily, monthly and annual operations of the sewage disposal system.

The Monitoring Program outlined in the Hamlet's Water License requires that three stations are monitored downstream of the sewage disposal facility. These stations will provide water quality information to operators and regulators and help assess the sewage treatment performance of the holding cell and sewage treatment wetland. The three monitoring stations and their locations are provided in Table 4-1 below; monitoring stations are also depicted in Figure 2 in **Appendix B**.

Table 4-1 Monitoring Stations for the Sewage Disposal Facility at Baker Lake, NU

Monitoring Program Station Number	Description	Monitoring Requirement	Frequency	Location
BAK-2	Runoff from the Sewage & Solid Waste Disposal Facilities, prior to Airplane Lake	Water Quality	Monthly, during periods of flow	Prior to the stream culvert: 64° 19' 14.3" N 95° 58' 29.1" W
BAK-3	Outlet of Airplane Lake	Water Quality	Annually, during periods of flow	64° 19' 0.6" N 95° 58' 29.8" W
BAK-5	At the outlet of the sewage treatment tundra wetland, immediately prior to Finger Lake	Water Quality	Annually, during periods of flow	64° 19' 48.5" N 95° 58' 34.2" W

BAK-2, BAK-3 and BAK-5

The effluent at the BAK-2 sampling station should be sampled at monthly intervals when flow is present (potentially May to October, inclusive). The effluent at BAK-3 and BAK-5 sampling stations should be sampled annually when flow is present, typically during the holding cell release period (potentially August/September).

All effluent samples taken from BAK-2, BAK-3 and BAK-5 will be analysed for:

- Biochemical Oxygen Demand (BOD_5)
- Carbonaceous Biochemical Oxygen Demand (cBOD)
- Total Metals (including aluminum, arsenic, cadmium, cobalt, chromium, copper, iron, lead, nickel, manganese, mercury and zinc)
- Total Alkalinity
- Total Suspended Solids (TSS)
- Conductivity
- Total Organic Carbon (TOC)
- Faecal Coliforms
- Ammonia Nitrogen
- Nitrate-Nitrite
- Anions and Cations (including calcium, chloride, magnesium, potassium, sodium and sulphate)
- Total Hardness
- pH
- Total Phenols
- Oil and Grease (visual)

4.6.2 Sampling Procedures

As mentioned previously, during periods of flow, the effluent at the BAK-2 station should be sampled monthly while sampled the effluent at the BAK-3 and BAK-5 stations should be sampled annually. Effluent samples will be taken by the WSSW Foreman, or other trained personnel appointed by the WSSW Foreman, and sent to ALS Laboratories in Winnipeg, MB, for analysis. The parameters listed above will be examined in effluent samples from all sewage disposal facility monitoring stations.

Guidelines for the collection of water/effluent samples from the sewage disposal facility are found in **Appendix F**; example laboratory forms for ALS Laboratories have also been included. The sample collection procedures should be carried out for all sampling within or downstream of the sewage and solid waste facilities to ensure the correct sample bottles are obtained, proper sampling procedures are completed, and contamination of the samples is minimized.

4.7 Sewage Sludge Management

Sewage sludge is generated by the settling of wastewater solids during primary treatment. Sludge produced in Baker Lake would be considered 'lagoon sludge' (FSC 2001) and will be contained within the holding cell. The amount of sludge accumulation in the detention cell needs to be monitored to ensure the accumulation does not exceed a certain percent volume of the cell.

The quality of the effluent will determine when a sludge management program is initiated. Sludge is typically monitored annually to determine its volume and physical and chemical characteristics. The monitoring indicates when the performance of the holding cell starts to degrade. Sludge may need to be removed from the holding cell and disposed of if too much begins to accumulate and/or it becomes contaminated. Sludge contains a great deal of high-value organic matter and nutrients and is used in a lot of places around the world as fertilizer for crops. However sludge contamination can result from mixing of domestic wastes with industrial and household hazardous wastes (e.g., cleaning chemicals, prescriptions, solvents, etc, dumped down the drain), which are then concentrated into the sludge during primary treatment.

Sludge must be sampled and tested to ensure the disposal method selected is appropriate, safe and environmentally responsible. The sludge may be of a quality suitable for land disposal. If the sludge is not suitable for land disposal, it may be disposed of at the solid waste disposal facility if it meets the facility's requirements. The sludge may also require additional treatment before disposal (FSC 2001).

The sewage sludge within the holding cell at Baker Lake has not been sampled. Before an appropriate sludge management plan can be developed, the sludge should be sampled to obtain its chemical and physical characteristics. Additionally, the volume of sludge in the holding cell should be measured. The annual quantity of sewage sludge removed from the holding cell also needs to be measured and reported to the NWB in the Hamlet's Annual Report. As this is a condition of the Hamlet's Water License, procedures to complete these initial steps have been included here.

Once the chemical composition of the sludge is understood, a sludge management plan can be developed to explore the best options for removal and disposal.

4.7.1 Procedures

The sludge at the bottom of the holding cell should be sampled at annual intervals after the holding cell release (potentially August/September). CCME (2010) provides some guidance on the management of wastewater biosolids; all sludge samples taken from the holding cell will be analysed for:

- Biochemical Oxygen Demand (BOD_5)
- Total Metals (including aluminum, arsenic, cadmium, cobalt, chromium, copper, iron, lead, nickel, manganese, mercury and zinc)
- Total Petroleum Hydrocarbons
- Faecal Coliforms

Secondary and tertiary industries in the community may contribute other types of contamination into the sewage effluent stream. As part of the sludge management plan, other analyses may be added to the program if particular contaminants are suspected to be entering the sewage system.

Sludge samples will be taken by the WSSW Foreman, or other trained personnel appointed by the WSSW Foreman, and sent to ALS Laboratories in Winnipeg, MB, for analysis. The parameters listed above will be examined in all sludge samples from the holding cell.

A reusable bailer-type sampling device, such as a Sludge Judge, should be used to sample the solids in the holding cell. The Sludge Judge is a 7/8" inside diameter clear plastic pipe consisting of three threaded joints and having a total length of 15 feet. The total length of pipe is calibrated in one-foot intervals. Use the following sample collection procedure to collect and sample sludge from the bottom of the holding cell:

- Obtain clean 125 mL or 250 mL sampling jars from ALS Laboratories by contacting Christine Herrod (phone [204] 255-9720); inform Christine of the type of samples being collected (i.e., sewage sludge), the parameters to be analysed (see above), and the number of sample stations (i.e., three). Christine will send the correct sample jars to Baker Lake.
- Once at a sample station, put on nitrile or latex gloves for protection and ensure good footing.
- Slowly lower the sampler (i.e., Sludge Judge) to the bottom of the holding cell.
- Withdraw the sampler vertically (i.e., straight up). When being pulled up, a plastic ball will seat in the bottom of the sampler and will prevent the discharge of the captured sludge and water.
- Read the volume or depth of sludge which was removed in the captured column. Also note the total water depth to calculate the depth occupied by the sludge blanket.
- Place the bottom of the Sludge Judge against a firm object and the plastic ball stem will cause the ball to unseat, allowing the sludge to discharge from the pipe.

- Fill the appropriate sampling jars with the sludge. Label sampling jars with sample location code, date and time sampled, and sampler's initials. Place filled sample jars in a cooler and keep cool until shipment to the laboratory.
- Take samples in multiple locations.
- Once all the samples have been collected, fill out the Chain of Custody (COC) form and ship the samples to the laboratory. See the sample collection procedure in **Appendix F** for the address of the laboratory and some additional sampling tips and techniques.

4.8 Record Keeping

Records of activities, inspections and sampling for the sewage disposal system should be kept. These records should be stored at the Hamlet office and kept by the SAO. These records will assist with the planning of annual operations and maintenance of the system, as well as assess how effective the system is operating.

Every year by March 31st, the Hamlet is required to submit an Annual Report to the NWB. The Annual Report provides the NWB with information pertaining to the results of the Monitoring Program, volumes of water consumed, volumes of wastewater discharged, and summaries of any modifications, major maintenance work, and spills.

Therefore, at a minimum, the following records should be kept:

- Number of trips the sewage truck(s) make per day;
- Quantity (volume) of sludge removed from the holding cell and the method of treatment, storage and disposal;
- Dates any sampling has been completed;
- Analytical results from any sampling;
- Dates and description of any maintenance activities (including inspections) carried out on the sewage disposal system by Hamlet personnel or other Inspectors (e.g., INAC Inspectors, geotechnical engineers);
- Dates and description of any modifications and/or major maintenance work, and abandonment and restoration work carried out on the system, including on associated structures, facilities and equipment (e.g. old sewage disposal facility, sewage trucks, etc); and,
- Dates, description and clean-up activities of any spills (sewage, fuel, oil, etc) related to the sewage disposal system.

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5 SOLID WASTE DISPOSAL FACILITY OPERATIONS AND MAINTENANCE

5.1 Equipment

The Hamlet operates one compactor truck for collection of MSW within the community and transfer to the solid waste facility at Baker Lake.

The solid waste disposal facility is inclusive of the fenced MSW disposal area and the adjacent bulk metal/hazardous waste storage area. The MSW disposal area is approximately 23,500 m^2 in size while the bulk metal/hazardous waste storage area is approximately 4,800 m^2 for a total of 28,300 m^2. The solid waste disposal facility is situated adjacent to the sewage disposal facility; see Figure 2 in **Appendix B**. Operations and maintenance procedures for each of the MSW disposal and bulk metal/hazardous waste storage areas are provided in the following sections.

5.2 Site Personnel

The Operations Manager has overall responsibility of the solid waste disposal facility to ensure proper operation and maintenance is carried out, including compacting, burning, covering, inspections, sampling, and annual reporting to the NWB.

The WSSW Foreman is responsible for day-to-day operation and maintenance of the solid waste facility. Day-to-day activities include managing waste collection, proper segregation of waste, compacting and burning of waste, sampling leachate from the facility, completing inspections and other maintenance activities.

The Hamlet typically has one individual hired to operate the compactor truck and collect waste from community buildings five days a week. This Waste Truck Driver is also responsible for ensuring collected waste is properly segregated, and refusing the collection of hazardous waste if present. If properly trained, this individual may also be required to operate heavy equipment within the solid waste disposal facility.

5.3 Health and Safety

The public and all personnel working within the solid waste disposal facility should be made aware of potential health and safety hazards associated with working around municipal solid wastes and hazardous wastes. This is imperative so individuals make a conscious effort to perform all necessary safety procedures to protect themselves, their co-workers and family members at home. The requirements of the Nunavut *Safety Act* will be followed at all times. A site-specific safety plan should be developed by the Hamlet for the solid waste disposal facility and followed once developed. The site-specific safety plans should outline all potential hazards, safe work practices, training requirements, equipment requirements (e.g., fire extinguishers, spill response kits, etc), and emergency procedures.

Public access to the solid waste disposal facility should be restricted to specific areas and/or times to minimize potential hazards to the public. Public access to any hazardous waste storage areas should always be restricted. Additional health and safety precautions for the public and site personnel will be taken during burning of MSW and accidental spills.

See **Section 6** of this O&M Manual for emergency response procedures in the event of a fire or spill at the solid waste disposal facility.

5.4 Municipal Solid Waste Disposal Area

5.4.1 Operations

5.4.1.1 Waste Segregation

The MSW disposal area is fenced and the Hamlet presently does not limit who disposes of waste and where. Proper waste segregation is imperative to the long-term operation of the facility as it helps ensure potential human health and environmental hazards are minimized, un-compactable wastes (e.g., bulky metal wastes) are kept out of the landfill, hazardous wastes are properly managed, and waste re-use and recycling can occur.

The MSW disposal area at Baker Lake was likely designed as a natural attenuation landfill. This means that the landfill is not lined and small amounts of contaminants can enter the surrounding environment to be naturally broken down. In this type of landfill, the rate that contaminants enter the environment is expected to occur at a rate such that contaminants can easily be broken down and the surrounding environment is not overwhelmed. Natural attenuation landfills also rely on permafrost aggrading into the covered waste cells of the landfill and eventually freezing them. However, as contaminants are able to freely enter the environment in this type of landfill, proper waste segregation is important to ensure harmful contaminants are kept out of the landfill.

Initial waste segregation should begin at the community's residences and other buildings, ensuring residents and business are familiar with acceptable wastes for the MSW disposal area. Household hazardous or bulky wastes need to be kept out of the landfill and Burn Area and need to be transported to the appropriate disposal/storage locations.

The Waste Truck Driver should be familiar with operational procedures for the MSW disposal area, acceptable wastes for burning and landfilling (see Section 5.4.1.2 for appropriate burnable waste), and proper waste segregation practices. Ultimately the Operations Manager and WSSW Foreman (site operators) are responsible to ensure proper waste segregation occurs.

The Waste Truck Driver should monitor the waste they collect from community buildings every day, collecting only that which is acceptable for disposal at the MSW disposal area. The Hamlet could provide a 'grace' day once or twice per year to collect residents' household hazardous and/or bulky metal waste. The Hamlet could also provide help to residents who have larger items to dispose of and have no means of transporting them to the correct disposal area.

The MSW disposal area needs to be properly signed to inform operators and residents of the correct location to dispose of or store certain wastes. At a minimum, the MSW disposal area should have disposal/storage areas for:

- Domestic burnable waste (for burning and landfilling) – a selected Burn Area
- Domestic non-burnable waste (for landfilling)
- Treated wood and wood products
- Building/construction materials
- Bulk metal waste – a separate bulk metal waste disposal area
- Re-usable/recyclable material (i.e., salvage area)
- Household hazardous waste (i.e., drop-off hazardous waste disposal area).

Seacans or constructed drum shelters can be used to store specific household hazardous wastes in a designated area before being shipped out of the community. Hazardous waste management is described in Section 5.5.2 below.

5.4.1.2 Burning

Once waste has been properly segregated, burnable waste should be burned at least once per week to keep the volume of waste manageable. Burning should only occur when winds are light and blowing away from the community. Table 5-1 outlines wastes acceptable for burning.

Table 5-1 Examples of Burnable and Non-burnable Wastes

Burnable	Non-Burnable
Domestic waste (e.g., food waste, paper products, paperboard/ cardboard packaging, etc)	Non-wood building/construction materials (e.g., roofing materials, electrical wire, insulation, plastics, asbestos, etc)
Non-treated wood (this may also be recyclable/salvageable)	Treated wood (e.g., telephone poles, pilings, cribbing, foundation wood)
	Asphalt and asphalt products
	Tires
	Hazardous wastes
	Waste paint
	Fuel and lubricant containers
	Aerosol cans and other compressed gas containers (e.g., propane tanks)

The Hamlet presently does not apply for a permit to burn through the Baker Lake Fire Department, though they should. Hamlet personnel (e.g., WSSW Foreman and crew) typically carry out and control burning of waste at the MSW disposal area. Controlling the open burn is extremely important

to reduce the risk of uncontrolled fire and hazards to the public, employees and the surrounding environment. Burning practices at the MSW disposal area should include:

- Confirmation of weather forecasts prior to any burning. If heavy rain is or will be present, burning should be postponed (burning during heavy rain events may result in poor or incomplete combustion and the potential to generate harmful contaminants).
- Confirmation of wind speed and direction prior to any burning. If loose debris can be carried by the wind, burning should be postponed.
- Obtaining a Permit to Burn through the Baker Lake Fire Department.
- Burning in the selected Burn Area only and ensuring burning does not occur in landfill piles.
- Presence of an attendant during initial stages of the burn and periodic inspection of the burn once it has been established.
- Maintaining a minimum of 5 m buffer zone around the burning area and all ensuring attendants or personnel remain upwind of the burn area.
- Closing the MSW disposal facility to the public during burn events.
- Confirmation the MSW is no longer hot or burning prior to the addition of more waste, or covering with granular material. This can be accomplished by moving around the ash and remaining materials to ensure the fire is out and material can cool.

5.4.1.3 Operational Procedure

The MSW disposal area requires daily, weekly and monthly operational procedures to ensure it continues to optimally function as the Hamlet's primary MSW disposal site, and potential public health and environmental hazards are minimized.

Specific information regarding waste segregation and burning were provided in the preceding section. Further information on hazardous waste management at the MSW disposal area is provided in Section 5.5.2 below. The following general procedure should be followed to ensure proper operation of the MSW disposal area:

1. The Waste Truck Driver collects MSW from community buildings five times per week using the compactor garbage truck. The MSW is then transported to the MSW disposal area.
2. The number of trips and estimated weight of every load transported to the MSW disposal area should be recorded in a log book or on a record form kept in the garbage truck (a Solid Waste Quantity Form is included in **Appendix E**). If waste is present at the MSW disposal area that has been brought by others, the Waste Truck Driver should make an estimate of the quantity and record this as well. Trip records should be filed at the Hamlet Office daily. The SAO will include results in the Hamlet's Annual Report to the NWB.
3. At the MSW disposal area, waste from the garbage truck will be tipped into the cold Burn Area. Waste should not be tipped onto the Burn Area if a burn is occurring. An alternate tipping/burning area should be designated.

The Waste Truck Driver should then complete an initial inspection of the waste pile to ensure it does not contain any non-burnable wastes (see Table 5-1). If it does, that specific wastes should be diverted to the appropriate disposal areas:

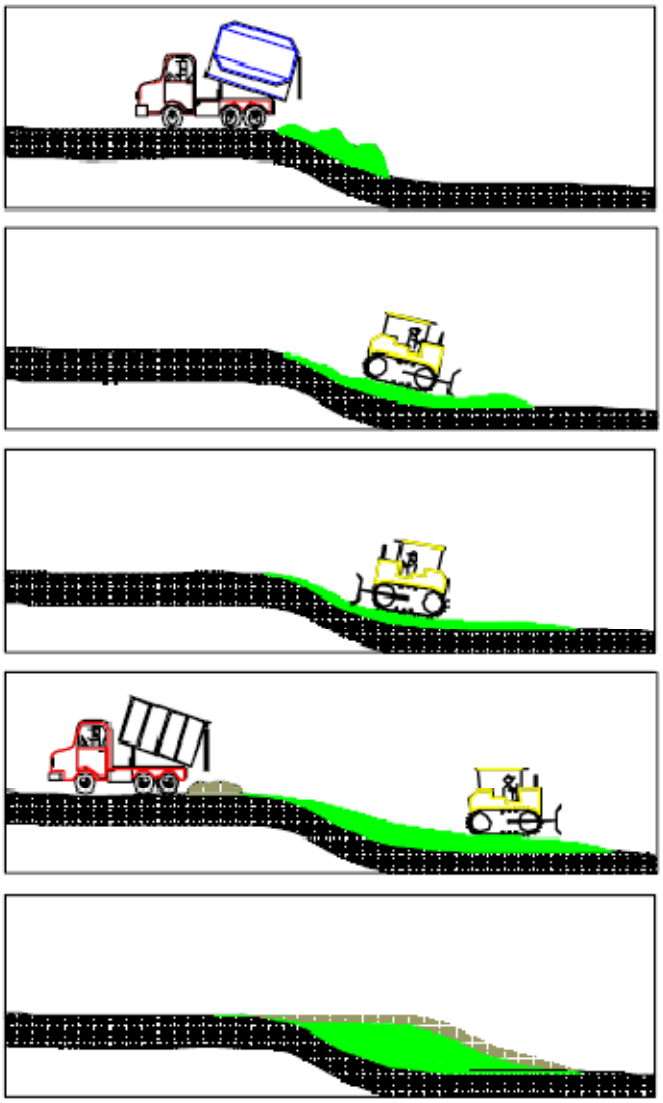
- Household waste is dumped out of the compactor truck in the selected Burn Area of the MSW disposal area. Waste is properly segregated into burnable and non-burnable waste.
- Any non-burnable, non-hazardous waste should be moved to the edge of the covered portion of the MSW disposal area landfill (tipping face).
- Any materials requiring disposal in the bulk metal/hazardous waste disposal area should be transported there.
- Hazardous waste materials need to be transported to their appropriate storage areas and properly stored.
- Reusable/recyclable materials (e.g., wood) should be transported to a Salvage Area of the MSW disposal area. Salvaging of materials will only be supported in the designated Salvage Area due to public health and safety concerns.

4. Burning of combustible waste should only occur in the designated Burn Area(s). Burning should occur at least weekly to ensure materials are burned in manageable volumes. However conditions for open burning depends on weather and burning should only occur when winds are light and blowing away from the community. A permit to burn must be obtained from the Baker Lake Fire Department before any burning occurs. The guideline for *Municipal Solid Wastes Suitable for Open Burning* from the GN Department of Environment (GN-DOE) can be found at their website (http://www.gov.nu.ca/env/environment.shtml).
5. After every burn, once the operator confirms the MSW to be cold and no longer burning, the CAT D6 bulldozer should be used to push the ash and remaining material to the landfill tipping face (presumably downslope, if the depression method for landfilling is used).
6. At least twice per month, the CAT D6 bulldozer should push the collected MSW pile over the edge of the landfill tipping face and spread out the MSW. The waste should be worked upslope gradually, to a maximum 3:1 grade (e.g., 3 m wide by 1 m tall). The CAT D6 bulldozer should drive over the waste pile at least three to five times to ensure it is packed down and the 3:1 grade is achieved.
7. The act of burning (waste reduction) and compaction should result in a manageable waste mound on the landfill tipping face that can be covered annually, or when waste volume requires covering. The waste mound should only be allowed to reach two metres high. Annually, or once the waste mound is approximately three metres wide, the waste mound should be covered with 0.3 m (12 in.) of granular material and packed down to form a covered waste cell.
    - Cover material can be limited and hard to find in Baker Lake. Though dry, sandy material is the preferred cover material for landfilling (Kent e*t. al.* 2003), sand, gravel

and cobbles are also appropriate cover material. Landfilling operations can be made easier by stock piling cover materials close to the MSW disposal area.

8. Landfilling can continue beside and behind the covered waste cell until the landfilling area is full. See Figure 5-1 below for a depiction of the depression method of landfilling. Based on landfill design, it is assumed this method is likely used in Baker Lake.

Once the landfill site is full, the MSW disposal area must be closed out. To close out the site, cover with 0.6 m (24 in.) of granular material and pack. Water must run off waste piles. For more information on closing out the MSW disposal area, see the Hamlet's Abandonment and Restoration Plan.



1. Dump MSW at Burn Area, near slope.
2. Once waste has been properly segregated and then burned, spread ashes, left over burned material and any non-burnable, non-hazardous waste down the slope.
3. Work the waste back upslope a bit at a time. Drive over the waste 3 – 5 times with the CAT loader or a bulldozer to pack it.

   This should be done once per week.
4. Alternate between dumping, spreading and packing waste until waste is 2 m (6.5 ft) high.
5. In the spring or fall, or when waste is approximately 3 m (9.8 ft.) wide, cover waste with 0.3 m (1 ft.) of granular material. Pack with CAT loader or a bulldozer to make a covered waste cell.

   Repeat steps until landfill is full.

Figure 5-1 Depression Method of Landfilling for the MSW Disposal Area at Baker Lake, NU (adapted from Kent *et. al.* 2003).

5.5 Bulk Metal / Hazardous Waste Storage Area

5.5.1 Bulk Metal Waste Management

Any bulk metal waste from the community should be disposed of within the bulk metal/hazardous waste disposal area. Handling of bulk metal waste requires less operational activity than MSW (e.g., will not be burned or covered) however proper waste segregation is still required and only specific bulk metal materials should be disposed of. The following is a list of bulk metal materials acceptable for disposal within the bulk metal/hazardous waste disposal area:

- Large metal wastes (i.e., clean and decommissioned fuel tanks and drums, towers, poles/posts, culverts, etc)
- Tires
- Appliances
- Properly abandoned vehicles, snowmobiles, and all-terrain vehicles (ATVs):
    - *Properly abandoned* implies all vehicles have had their batteries removed and have been drained of fuel, oil, antifreeze, transmission fluid, and other fluids; these wastes should be properly stored in the hazardous waste storage area.
    - Vehicles can also contain ozone-depleting substances (ODS') in their air conditioning systems. These systems should be properly decommissioned by a qualified technician.
    - Once vehicles have been properly abandoned, they should be tagged to indicate they have been inspected and meet these criteria.

All bulk metal waste should be segregated into separate disposal areas for the above listed items (e.g., a vehicle disposal area, an appliance disposal area, etc). Eventually all bulk metal waste should be removed from the community through a back haul program and properly disposed of at appropriate receivers. The Hamlet could work with other communities, the GN and a transportation company to establish a backhaul program to remove and dispose of bulk metal waste materials.

5.5.2 Hazardous Waste Management

Hazardous wastes are those that are known to be dangerous due to their chemical, physical or biological properties, are no longer used for their original purpose, and are intended for recycling, treatment, disposal or storage (GNWT 1998, GN-DOE 2002). All hazardous wastes require special handling, storage and disposal methods to prevent human health and environmental exposure.

The *Environmental Guideline for the General Management of Hazardous Waste* (GN-DOE 2002) provides information regarding the proper management of hazardous waste in Nunavut, and has the intent to establish a monitoring system for hazardous wastes, from generation to final disposal. From the *Guide*, the generator of any hazardous waste is ultimately responsible for ensuring it will be properly managed from is creation to its disposal (GN-DOE 2002). Generators typically use carriers to transport the hazardous waste to appropriate receivers for disposal. Both carriers and receivers need to be registered with GN Environmental Protection Service and follow specific regulations and training.

The bulk metal/hazardous waste storage area is currently used to store hazardous wastes from the community. This area is filled but not bermed or lined and runoff from the facility presently flows into the sewage treatment wetland and/or Finger Lake. If use of this area is to continue for storage of hazardous wastes, it is recommended that an engineered berm and liner system be installed as this will limit the amount of potentially hazardous leachate entering the surrounding environment.

Baker Lake's solid waste disposal facility is only licensed to accept municipal wastes for disposal and shall only accept household hazardous wastes for storage. Industrial hazardous wastes shall not be accepted for storage or disposal at the Baker Lake solid waste disposal facility. Industrial sources (generators) are responsible to manage their own hazardous wastes.

The following hazardous waste operations and maintenance procedures deal with household hazardous wastes (HHW) only. Typical HHW which may be found in Baker Lake include:

- Pesticides and herbicides
- Paint
- Solvents (e.g., paint cleaners)
- Flammable liquids
- Empty contaminant containers (e.g., 205 L fuel drums)
- Batteries (wet and dry cell)
- Used and waste fuel and oil
- Oil filters
- Antifreeze
- Propane tanks and cylinders
- Aerosol cans (not empty)
- Fluorescent light tubes and compact fluorescent light bulbs
- Fire extinguisher
- Corrosive cleaners

Generally, any household items which have the following symbols are considered HHW:


Corrosive


Explosive


Flammable


Poison

However there are certain items considered HHW that cannot be stored within the solid waste facility. These include:

- Ammunition, flares and explosives (including fireworks) – contact the Baker Lake RCMP for proper disposal
- Prescriptions, medications and bio-hazardous wastes (includes syringes) – dispose of these at the Health Care Centre
- Reactive chemicals (e.g., ammonium nitrate) – contact the GN-DOE Environmental Protection Services for disposal options.

Contaminated soil or snow from the Hamlet's own spill clean-up is the only non-HHW that should be accepted by the Hamlet for storage at the Hazardous Waste Storage Area. Contaminated soil or snow should be stored in 205 L steel drums and shipped out of the community every year. Industry, businesses or individuals wishing to store contaminated soil at the Hazardous Waste Storage Area must contact the Operations Manager or WSSW Foreman to discuss storage options and fees for any contaminated soil or snow. The decision to accept contaminated soil or snow for storage from industrial, commercial or private sources rests with the Hamlet.

5.5.2.1 Operations

As the current bulk metal/hazardous waste storage area is used for HHW storage, this area needs to be properly signed as the "Hazardous Waste Storage Area". This area should also be fenced with a lockable gate and have appropriate storage options for expected HHW. Proper signage helps operators of the area properly store the wastes. Fencing around the area will allow only trained personnel access to the bulk metal/hazardous waste storage area and help minimize health and safety risks to the public from hazardous wastes and reduce the potential for vandalism.

The bulk metal/hazardous waste storage area is intended for storage only, not disposal. It is expected that hazardous wastes will be stored for up to five years. This should be sufficient time for the community to build up enough waste to make it economical for a back haul out of the community to a licensed waste receiver.

Additionally, the Hamlet should create a site map of the solid waste disposal facility, detailing disposal and storage locations for various wastes. This site map should be posted at the solid waste disposal facility, the Hamlet Garage and contained within the Spill Contingency Plan. All site personnel should be familiar with the layout and disposal/storage areas.

Collection

Since the entire solid waste disposal facility is generally accessible to the public, residents can come and drop off HHW throughout the year. However the general public should not have direct access to the bulk metal/hazardous waste storage area for health and safety reasons. If the Hamlet does not restrict access to the bulk metal/hazardous waste storage area (i.e., through a fence and locked gate), the public should be discouraged from entering the bulk metal/hazardous waste storage area and a designated public drop-off area for HHW should be used. The public drop-off area could be located within the MSW disposal area and tended to on a daily basis by the WSSW Foreman, Waste Truck Driver, or other designated and trained site personnel, to remove and properly store any deposited HHW into the bulk metal/hazardous waste storage area.

The Hamlet should also hold a 'grace' day for residents, helping them collect and drop off their HHW or bulky metal wastes. This grace day can be held once or twice per year (e.g., in spring and/or fall) and should be advertised in the community up to 30 days before the event. This grace day will encourage residents to drop off their HHW and bulky metals wastes, and provide information pamphlets on HHW, waste disposal, segregation, and recycling. Like many community-based management programs, successful implementation comes from informed and concerned residents.

Providing facts and figures supporting proper disposal, segregation and minimization of hazardous wastes will help sustain hazardous waste management in the community.

Storage

All HHW collected needs to be properly stored in seacans to ensure any environmental and human health hazards are minimized. The GN-DOE provides information on proper storage of specific HHW; these include:

- **Antifreeze** – use original containers where possible, or bulk-store waste antifreeze into good condition 16 gauge or lower gauge steel or plastic 205 L drums.
- **Batteries** – bulk-store waste batteries into good condition 16 gauge or lower gauge steel or plastic 205 L drums, or other form of containment away from weather; wooden pallets should be used to keep batteries and containers off the ground during storage and transport.
- **Fluorescent light tubes/compact fluorescent light bulbs** – use original containers where possible and prevent breakage of light tubes/bulbs; keep away from weather.
- **Ozone Depleting Substances** (ODS') – do not landfill; wastes with ODS' (i.e., refrigerators and refrigeration equipment, vehicle air conditioners, ODS-containing fire extinguishers (typically purchased before 1997) should be diverted to the bulk metal waste disposal area. The Hamlet can hire technicians to remove ODS' from stored equipment.
- **Paint** – use original containers where possible, or bulk-store compatible paints into good condition 16 gauge or lower gauge steel or plastic 205 L drums; do not mix different types of paint (i.e., alkyd and latex).
- **Solvent** – use original containers where possible, or bulk-store compatible waste solvents into good condition 16 gauge or lower gauge steel or plastic 205 L drums.

See the GN-DOE website (http://www.gov.nu.ca/env/environment.shtml) for further information on guidelines for storage and disposal of HHW.

As the Hamlet currently stores waste oil in drums at the bulk metal/hazardous waste storage area (if not burned within BLCS' waste oil burners), it is recommended they register the site as a hazardous waste storage facility with the GN-DOE Environmental Protection Services (R. Eno, *pers. comm.*). Registering the facility will help the GN-DOE monitor and track hazardous wastes, and eventually improve handling and disposal in the territory. To register a facility, contact:

Robert Eno
Manager, Pollution Control
Environmental Protection Services
Government of Nunavut
P.O. Box 1000, Stn 1195
Iqaluit, NU X0A 0H0
Phone: (867) 975 – 7729
Email: reno@gov.nu.ca

When developing and operating the bulk metal/hazardous waste storage area in Baker Lake, several factors also need to be considered. From Phifer and McTigue Jr. (1988) and GN-DOE (2002), these are:

- **Regulatory Compliance**
  - The GN-DOE *Environmental Guideline for the General Management of Hazardous Waste* and hazardous waste minimum storage volumes should be considered when planning and operating the bulk metal/hazardous waste storage area.
- **Compatibility**
  - Compatibility of wastes and their storage containers, and wastes and nearby materials should be considered. For example, some wastes need to be stored in specific containers to minimize the potential for corrosion and leaks (e.g., acids cannot be stored in steel drums due to corrosion, waste fuel should not be stored long-term in plastic drums). Additionally, not all wastes can be stored in the same area (e.g., flammable wastes near ignition sources).
- **Packaging**
  - Storage of HHW in original containers is acceptable. Bulk storage of compatible HHW in 205 L 16 gauge or lower gauge steel or plastic drums is generally acceptable though may depend on the type of waste. All containers need to be in good condition and sealable. Contact the GN-DOE or a licensed waste carrier or receiver for advice on specific wastes. All storage containers also need to be properly labelled, following requirements of WHMIS or *Transportation of Dangerous Goods* regulations, if transport is planned.
- **Segregation**
  - If some HHW can be recovered or recycled at a later time, the HHW should be segregated and stored in a manner to allow this. Final destination of the HHW should be considered during storage.
- **Ventilation**
  - All HHW should be properly ventilated to reduce build up of potentially poisonous or noxious fumes. Most wastes should be stored outside in sheds or under roofs providing free air movement.
- **Climate**
  - Not all HHW can be stored directly outside. Waste containers should be stored with some overhead cover (e.g., roof or tarp) and on an impermeable base to prevent contact with rain, snow and direct sunlight. This also makes clean up of spills and leaks easier and cheaper. Some communities utilise old seacans for storage of some HHW.

- **Handling**
  - All handlers of HHW will have proper training. At a minimum, all handlers should have WHMIS (Workplace Hazardous Materials Information System) training.
- **Security**
  - Certain security precautions may need to be taken to prevent theft, accidental discharge or harm to the public from collected HHW. Only persons authorised and trained to handle HHW should have access to the bulk metal/hazardous waste storage area.

5.5.3 Maintenance

General maintenance procedures for the bulk metal/hazardous waste storage area should occur during daily operations at the solid waste disposal facility. These maintenance procedures involve ensuring proper segregation and storage of wastes, prompt cleaning and reporting of any leaks or spills, and general site tidiness.

Inspections of the bulk metal/hazardous waste storage area should occur with the weekly inspections of the entire solid waste disposal facility by the WSSW Foreman or other trained personnel (see Section 5.6.1).

5.6 Solid Waste Disposal Facility Maintenance

5.6.1 Inspections and Audits

Regular inspections of the solid waste disposal facility will provide the WSSW Foreman, Operations Manager, SAO and other personnel with information on the effectiveness of waste segregation, burning, landfilling, signage, and any remedial activities. Inspections are an integral part of the maintenance procedures at the solid waste disposal facility as they identify any concerns and deficiencies, and recognize areas or items which need improvement, correction, repair, and/or replacement.

The WSSW Foreman, or trained personnel appointed by the WSSW Foreman, should complete weekly inspections of the MSW disposal facility and bulk metal/hazardous waste storage area; monthly or bi-monthly inspections by the Operations Manager could also be performed. Site Inspection Forms will be used to document the findings of the inspections and ensure basic items requiring weekly inspection and/or maintenance are examined. Site Inspection Forms will also document other relevant information, such as weather conditions, health and safety concerns, and follow-up on any incidents which may have occurred (e.g., accident, fires, flooding, spills, etc) or deficiencies noted in previous inspections. The following factors will be inspected:

- Site equipment (including heavy equipment, signage, and any storage containers)
- Site infrastructure (including access road, truck pads, drainage systems, fencing, berms, landfill cover and erosion)

- Waste segregation
- Burn completion and proper burn practices
- Proper landfilling practices
- Health and safety concerns (public and personnel)
- Hazardous waste storage area.

The Site Inspection Forms should be filed at the Hamlet Office and results reported to the SAO monthly. The SAO is required to include inspection results and maintenance activities in the Hamlet's Annual Report to the NWB. A Solid Waste Disposal Facility Inspection Form has been included in **Appendix E**.

Following year end, the Hamlet will undertake a review of the past year's inspection results and follow-ups to determine where improvements to the solid waste disposal facility operations and maintenance are required. These improvements should be documented and the O&M Manual updated.

5.6.2 Maintenance Activities

Specific maintenance activities may need to be completed on portions of the solid waste disposal facility. This will help ensure the facility, including the MSW disposal area and bulk metal/hazardous waste storage area, remain in good condition, appropriate practices are followed, and human health, safety, and environmental hazards are minimized. The following maintenance activities may be required periodically:

- Grading (in summer) or clearing snow (in winter) of all access roads and truck pads used for the solid waste disposal facilities
- Repair of drainage ditches from erosion
- Fence repair
- Repair or replacement of signage
- Litter which has been wind carried to the surrounding area outside the MSW disposal area fence should be removed and deposited back in the MSW disposal area
- Litter which has accumulated against the fence of the MSW disposal area should be removed and deposited back in the MSW disposal area
- Repair of the MSW disposal area landfill cover from erosion or settling.

5.6.2.1 Fence and Signs

The 2.2 km long wildlife exclusion fence also encloses the north, east and south boundaries of the solid waste facility. This 2.44 m high fence serves a dual purpose: it restricts wildlife from entering the facility and prevents the migration of windblown debris out of the MSW disposal area. Maintenance activities should be performed on the fence around the solid waste disposal facility and on signage within the solid waste disposal facility to ensure they remain in good condition. Signage is

posted on the fence and additional signage should be considered. Maintenance activities of the fence and signs include:

- Weekly inspection of the fence around the solid waste disposal facility to remove any windblown material which has accumulated; this can be performed by the Waste Truck Driver(s) and/or WSSW Foreman to reduce loading on the fence and improve site aesthetics.
- Monthly inspection of the fence around the solid waste disposal facility to ensure the chain-link is in good condition, fence posts are stable (e.g., no evidence of frost heave), gates are in good working condition, and snow drifts are removed.
- Monthly inspection of signage throughout the tundra wetland to ensure it is still present and readable.

5.7 Monitoring and Sampling

5.7.1 Monitoring Requirement

Monitoring programs are carried out to help ensure all systems are functioning correctly as they provide important feedback to the operators, helping them track progress of the system and providing warning or notice when issues arise. Monitoring programs also ensure any requirements or guidelines for water quantity and/or quality are being met; these requirements are typically provided in the community's water license. Monitoring programs form an integral part of the O&M process for all facilities and it is important to ensure they are being completed successfully.

The Monitoring Program outlined in the Hamlet's Water License requires that one station is monitored downstream of the solid waste disposal facility. The solid waste disposal facility monitoring station will provide water quality information to operators and regulators and help assess the leachate quality leaving the solid waste disposal facility and entering the sewage treatment wetland and/or Finger Lake. Leachate quality data will also help assess leachate treatment performance of the sewage treatment wetland and Finger Lake and provide an indication of waste segregation success. A description and the location of this station is provided in Table 5-2 below. The BAK-4 monitoring station is depicted in Figure 2 in **Appendix B**.

Table 5-2 Monitoring Station for the Solid Waste Disposal Facility at Baker Lake, NU

Monitoring Program Station Number	Description	Monitoring Requirement	Frequency	Location
BAK-4	Runoff from the solid waste disposal facility prior to Finger Lake	Water Quality	Annually, during periods of flow	

The leachate at the BAK-4 sampling station should be sampled annually when flow is present. All samples taken from BAK-4 will be analysed for:

- Biochemical Oxygen Demand (BOD_5)
- Carbonaceous Biochemical Oxygen Demand (cBOD)
- Total Metals (including aluminum, arsenic, cadmium, cobalt, chromium, copper, iron, lead, nickel, manganese, mercury and zinc)
- Total Alkalinity
- Total Suspended Solids (TSS)
- Conductivity
- Total Organic Carbon (TOC)
- Faecal Coliforms
- Polycyclic Aromatic Hydrocarbons (PAHs)
- Ammonia Nitrogen
- Nitrate-Nitrite
- Anions and Cations (including calcium, chloride, magnesium, potassium, sodium and sulphate)
- Total Hardness
- pH
- Total Phenols
- Oil and Grease (visual)
- Total Petroleum Hydrocarbons (TPHs)
- Benzene, Toluene, Ethylbenzene and Xylene (BTEX)

5.7.2 Sampling Procedures

As mentioned above, the leachate at station BAK-4 should be annually during periods of flow. Water samples will be taken by the WSSW Foreman, or other trained personnel appointed by the WSSW Foreman, and sent to ALS Laboratories in Winnipeg, MB, for analyses. The parameters listed above will be examined in water samples of leachate from the solid waste disposal facility.

Guidelines for the collection of water samples from downstream of the solid waste disposal facility are found in **Appendix F**; example laboratory forms for ALS Laboratories have also been included. The sample collection procedures should be carried out for all sampling within or downstream of the sewage and solid waste facilities to ensure the correct sample bottles are obtained, proper sampling procedures are completed, and contamination of the samples is minimized.

5.8 Record Keeping

Records of activities, inspections, and sampling at the solid waste disposal facility should be kept. These records should be stored at the Hamlet office and kept by the WSSW Foreman, Operations Manager or SAO. These records will assist with the planning of annual operations and maintenance of the solid waste disposal facility, as well as assess how successful facility practices (e.g., waste segregation, HHW storage, etc) are operating.

Every year by March 31st, the Hamlet is required to submit an Annual Report to the NWB. The Annual Report provides the NWB with information pertaining to the results of the Monitoring Program, volumes of water consumed, volumes of wastewater discharged, quantities of solid waste disposed, and summaries of any modifications, major maintenance work, and spills.

Therefore, at a minimum, the following records should be kept:

- Number of trips the garbage truck makes per day;
- Quantity (weight) of MSW disposed of per day (tallied for monthly and annual quantities);
- Quantity (weight and/or volume) and types of HHW stored at the bulk metal/hazardous waste storage area;
- Dates any water sampling has been completed;
- Results from any water sampling;
- Dates and description of any maintenance activities (including inspections) carried out on the disposal facilities by Hamlet personnel or other Inspectors;
- Dates and descriptions of any modifications and/or major maintenance work, and abandonment and restoration work carried out on the disposal facilities, including on associated structures, facilities and equipment (e.g., old waste oil pit, compactor truck, CAT bulldozer, grader, etc); and,
- Dates, description and clean-up activities of any spills (fuel, oil, hazardous waste, etc) related to the MSW disposal area, or bulk metal/hazardous waste storage area.

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6 EMERGENCY RESPONSE

6.1 Fire

Surface Fires

If site personnel discover a surface fire in the solid waste disposal facility, the Baker Lake Fire Department will be called immediately and informed of the situation.

BAKER LAKE FIRE DEPARTMENT: (867) 793-2900

In the event of an uncontrolled fire during routine burning of MSW, the Fire Department will be contacted and should assess the danger of the burn. Depending on the burn severity, the Fire Department may assume control of the MSW disposal area. The MSW disposal area should normally be closed to the public during any controlled open burn of MSW and will remain closed if a burn becomes uncontrolled, until the Fire Department has deemed the site safe.

If site personnel discover a small surface fire, fire extinguishers located at the solid waste disposal facility or in site vehicles can be used to manage small fires. Covering a fire with soil by hand or using the CAT D6 bulldozer may also be used. However, site personnel should not attempt to fight a fire if it cannot be done safely.

The cause of any surface fires will be investigated and necessary steps taken to prevent an uncontrolled surface fire from recurring. The fire incident and all response measures should be documented on the weekly Solid Waste Disposal Facility Inspection Form (**Appendix E**), and reported to the Operations Manager and SAO.

Subsurface Fires

If a subsurface fire is suspected within the MSW disposal area, the Baker Lake Fire Department will be called and informed of the situation. The solid waste disposal facility should be closed to the public whenever a subsurface fire is suspected.

The Fire Department should be called to site to determine if a subsurface fire is present and to assess the danger of the fire. The Fire Department may assume control of the solid waste disposal facility if the subsurface fire is deemed an emergency. Hamlet personnel should not excavate a suspected subsurface as the fire may quickly get worse when exposed to more oxygen, may release toxic or poisonous fumes, or may have caused underground voids causing an unstable surface prone to collapse. The Fire Department should manage the suppression of any subsurface fires.

The cause of any subsurface fires will be investigated and necessary steps taken to prevent a subsurface fire from recurring. The fire incident and all response measures should be documented on the weekly Solid Waste Disposal Facility Inspection Form (**Appendix E**), and reported to the Operations Manager and SAO.

6.2 Spill Contingency Plan

The intent of this Spill Contingency Plan (SCP) is to provide a guide to operators and other Hamlet personnel in the event of an accidental release of fuel, sewage, or other waste at the water, sewage, and solid waste facilities in Baker Lake. The SCP is planned to be protective of the local environment and public and personnel health and safety.

This SCP has been developed for implementation at the water distribution system, sewage disposal facility, and solid waste disposal facility in Baker Lake. At these sites, there may be situations that arise that are beyond the scope of this SCP. In these situations, all activities at the site should stop until a revised procedure or SCP is prepared, reflecting the changing conditions at the site (e.g., operation of a new hazardous waste storage area [if developed] should not continue until this SCP is updated to reflect the new conditions).

All persons involved with operations at the water, sewage and solid waste facilities should read and be familiar with this SCP. To be effective, it is important that all personnel are familiar with their responsibilities and steps to take in the event of a spill. Personnel should not be reading the SCP for the first time during an emergency.

6.2.1 Site Descriptions

The water, sewage and solid waste facilities have been described in the preceding sections of this O&M Manual. The sites are shown on Figures 1 to 2 in **Appendix B**.

6.2.2 Regulations

Under Section 34 of the *Environmental Protection Act*, the Nunavut Consolidation of Spill Contingency Planning and Reporting Regulations was enabled by the Commissioner in 1998. In the Spill Contingency Planning and Reporting Regulations, a SCP is required to include the following:

- The name and address of the owner or person in charge, management or control of the site(s).
- The name, job title and 24-hour telephone number for the person(s) responsible for activating the contingency plan.
- A description of the facility(ies) including location, size, type and amount of contaminants normally stored on the site(s), and site map(s).
- The steps to be taken to report, contain, clean up and dispose of a contaminant in the case of a spill.
- The means by which the contingency plan is activated.
- An inventory and location of the response and clean-up equipment available to implement the plan.
- A description of the training required and provided to employees who respond to a spill.
- The date the plan was prepared.

6.2.3 Contacts and Regulatory Authorities

The SAO has overall responsibility of Hamlet sites, including the water, sewage and solid waste facilities. The Operations Manager and the WSSW Foreman manage the facilities and are to be responsible for initiating the Spill Contingency Plan; the Operations Manager should be contacted when a spill occurs at the water, sewage or solid waste facilities. Contact information for the SAO, Hamlet Maintainer and Hamlet Foreman are in Table 6-1 below.

Table 6-1 Hamlet of Baker Lake Contact Information for Spill Contingency Planning

Senior Administrative Officer	Hamlet Operations Manager	Hamlet Water Sewage & Solid Waste Foreman
Dennis Zettler Hamlet of Baker Lake Office Phone: (867) 793-2874 Fax: (867) 793-2509	Gary Perkins Hamlet of Baker Lake Office Phone: (867) 793-2874 Fax: (867) 793-2509	Hugh Netella Hamlet of Baker Lake Office Phone: (867) 793-2881 Fax: (867) 793-2509

Every time a spill is identified at the water, sewage or solid waste facilities, the Operations Manager and/or WSSW Foreman should be contacted as soon as possible. The 24-hour Emergency Spills Report Line should also be contacted in the event any quantity of contaminant is spilled.

24-HOUR EMERGENCY SPILL REPORT LINE: (867) 920-8130

Any person reporting a spill is required to give as much information as possible, however reporting of a spill should not be delayed if all of the necessary information is not known. Additional information can be provided later. From the Consolidation of Spill Contingency Planning and Reporting Regulations (1998), as much of the following information should be reported during the initial spill report:

- Date and time of spill
- Location of spill
- Direction spill is moving
- Name and phone number of a contact person close to the location of the spill
- Type of contaminant spilled and quantity
- Cause of spill
- Whether spill is continuing or has stopped
- Description of existing contaminant
- Action taken to contain, recover, clean up, and dispose of spilled contaminant
- Name, address and phone number of person reporting the spill
- Name of owner or person in charge, management or control of contaminants at the time of the spill.

Other regulatory agencies which have a legislated (vested) interest in the event of a spill are summarised in Table 6-2 below. These authorities do not need to be immediately contacted if a spill occurs, however may be involved in follow-up or additional clean-up activities.

Table 6-2 Regulatory Agency Contact Information for Spill Contingency Planning

Agency	Legislation	Contact Information
Nunavut Water Board	*Nunavut Waters and Surface Right Tribunal Act*	Phone: (867) 360-6338 Fax: (867) 360-6369
Nunavut Impact Review Board	*Nunavut Land Claims Agreement Act*	Phone: (867) 983-2593
Government of Nunavut Department of Environment	*Nunavut Environmental Protection Act*	Phone: (867) 975-7700 Fax: (867) 975-7740
Environment Canada	*Canadian Environmental Protection Act,* 1999	Phone: (867) 975-4464 Fax: (867) 975-4645
Fisheries and Oceans Canada	*Fisheries Act*	Phone: (867) 979-8000 Fax: (867) 979-8039
Transport Canada (Coast Guard)	*Transportation of Dangerous Goods Act*	Phone: (867) 979-5269 Fax: (867) 979-4260

6.2.4 Potential Contaminants

At the date of this SCP, the Hamlet of Baker Lake had not completed a waste inventory and exact types and quantities of contaminants are unknown. However the following contaminants are anticipated to be used at the facilities, and may be involved in a spill:

- Gasoline
- Diesel
- Hydraulic oil
- Motor oil
- Other lubricating oil
- Antifreeze and other coolants
- Sewage
- Batteries

At the water, sewage and solid waste facilities, spills may result from any of the following occurrences:

- Leaks or ruptures of fuel storage tanks
- Valve or line failure in systems, vehicles or heavy equipment
- Heat expansion due to overfilling or improper storage
- Improper storage of contaminants
- Vehicular accidents
- Spill during transfer of contaminant
- Vandalism.

6.2.5 Spill Response Procedures

The following steps outline the general spill response procedures for reporting, containing, cleaning up and disposing of materials in the event of hydrocarbon (e.g., fuel, oil, etc) and other waste spill, or sewage spill.

6.2.5.1 Hydrocarbon Spills

Three procedures for hydrocarbon spills have been developed depending on the media on which the spill has occurred. The following sections outline procedures for hydrocarbon or other waste spills occurring on land (soil, gravel, sand, rock and vegetation), water, or snow/ice.

Spills on Land

1. Once a spill is identified, all sources of ignition turned off (e.g., no smoking, shut off engines).
2. The spilled material (e.g., gasoline, diesel, antifreeze, etc) should be identified, if possible.
3. The affected area should be secured, ensuring the area is safe for entry and does not represent a threat to human health and safety of the spill responders. Public access of the area should be restricted.
4. If possible, identify where the spill is coming from (the source). Determine if the spill is still occurring (i.e., still leaking) or if the spill has stopped. If the spill has not stopped, determine if it is safe to stop or control the spill (e.g., plug hole, close valve, upright container), or contain the spill (e.g., place a container or tarp with built up edges under the spill source to contain the spill).
5. If the spill is too large to be controlled with the spill materials at hand, contact the Operations Manager and/or WSSW Foreman and report the spill immediately (see Section 6.2.3 for contact information).
6. If the spill is small enough to be controlled with the materials at hand, prevent spilled contaminants from spreading or entering waterways by using sorbent (oil-absorbing) materials or a soil dyke down slope from the spill. This is especially the case with liquid contaminants (e.g., gasoline, diesel).

   If some contaminant has entered a waterway, follow procedures in the next section (***Spills on Water***) to contain and clean-up the contaminant in the water.
7. Once the spill has been controlled and further spreading prevented, contact the Operations Manager and/or WSSW Foreman and report the spill (see Section 6.2.3 for contact information).
8. If possible with spill response materials at hand, clean up the remaining spilled contaminant and store contaminated materials in a secure container for disposal. Do not flush the affected area with water.
9. If possible, remove any contained liquid by pumping into secure drums.

10. If needed, assist the Operations Manager or WSSW Foreman by providing details to complete the Nunavut Spill Report Form with as much information as possible. This form is included in **Appendix G** of this O&M Manual.
11. The Operations Manager or WSSW Foreman will contact the **24-Hour Emergency Spill Report Line (Phone: (867) 920-8130)** to report the spill as soon as possible and obtain additional advice.
12. The Operations Manager or WSSW Foreman will fax the completed Nunavut Spill Report Form to the **24-Hour Emergency Spill Report Line (Fax: (867) 873-6924)**.

Spills in Water

1. Once a spill is identified, all sources of ignition turned off (e.g., no smoking, shut off engines).
2. The spilled material (e.g., gasoline, diesel, antifreeze, etc) should be identified, if possible.
3. The affected area should be secured, ensuring the area is safe for entry and does not represent a threat to human health and safety of the spill responders. Public access of the area should be restricted.
4. If possible, identify where the spill is coming from (the source). Determine if the spill is still occurring (i.e., still leaking) or if the spillage has stopped. If the spill has not stopped, determine if it is safe to stop or control the spill (e.g., plug hole, close valve, upright container).
5. If the spill is too large to be controlled with the spill materials at hand, contact the Operations Manager and/or WSSW Foreman and report the spill immediately (see Section 6.2.3 for contact information).
6. If the spill is small enough to be controlled with the materials at hand, use sorbent (oil absorbing) booms to contain the spill for recovery. Place sorbent sheets on the water within the boomed area to help contain the spill. For narrow waterways, place one or more sorbent booms across the waterway, downstream of the spill location, and anchor the booms on the each bank.
7. Once the spill has been controlled and further spreading prevented, contact the Operations Manager and/or WSSW Foreman and report the spill (see Section 6.2.3 for contact information).
8. If possible with the spill response materials at hand, clean up the remaining spilled contaminant within the boomed area. Store contaminated materials in a secure container for disposal.
9. If needed, assist the Operations Manager or WSSW Foreman by providing details to complete the Nunavut Spill Report Form with as much information as possible. This form is included in **Appendix G** of this O&M Manual.

10. The Operations Manager or WSSW Foreman will contact the **24-Hour Emergency Spill Report Line (Phone: (867) 920-8130)** to report the spill as soon as possible and obtain additional advice.
11. The Operations Manager or WSSW Foreman will fax the completed Nunavut Spill Report Form to the **24-Hour Emergency Spill Report Line (Fax: (867) 873-6924)**.

Spills on Snow/Ice

1. Once a spill is identified, all sources of ignition turned off (e.g., no smoking, shut off engines).
2. The spilled material (e.g., gasoline, diesel, antifreeze, etc) should be identified, if possible.
3. The affected area should be secured, ensuring the area is safe for entry and does not represent a threat to human health and safety of the spill responders. Public access of the area should be restricted.
4. If possible, identify where the spill is coming from (the source). Determine if the spill is still occurring (i.e., still leaking) or if the spillage has stopped. If the spill has not stopped, determine if it is safe to stop or control the spill (e.g., plug hole, close valve, upright container).
5. If the spill is too large to be controlled with the spill materials at hand, contact the Operations Manager and/or WSSW Foreman and report the spill immediately (see Section 6.2.3 above for contact information), particularly since a spill occurring on snow or ice presents the potential for immediate access of contaminants into waterways.
6. If the spill is small enough to be controlled with the spill response materials at hand, prevent spilled contaminants from spreading or entering waterways by using sorbent materials or a snow/soil dyke down slope from the spill. This is especially the case with liquid contaminants (e.g. gasoline, diesel).
7. Once the spill has been controlled and further spreading prevented, contact the Operations Manager and/or WSSW Foreman and report the spill (see Section 6.2.3 for contact information).
8. If possible with the spill response materials at hand, clean up the remaining spilled contaminant and store contaminated materials in a secure container for disposal. Impacted snow should also be stored in drums for disposal.
9. If needed, assist the Operations Manager or WSSW Foreman by providing details to complete the Nunavut Spill Report Form with as much information as possible. This form is included in **Appendix G** of this O&M Manual.
10. The Operations Manager or WSSW Foreman will contact the **24-Hour Emergency Spill Report Line (Phone: (867) 920-8130)** to report the spill as soon as possible and obtain additional advice.
11. The Operations Manager or WSSW Foreman will fax the completed Nunavut Spill Report Form to the **24-Hour Emergency Spill Report Line (Fax: (867) 873-6924)**.

Additional Spill Delineation or Monitoring

In the event of a large spill or a spill in which not all of the spilled contaminant can be readily cleaned up with materials at hand (as described above), delineation of the affected area may be required. This would include subsurface investigation of the area (i.e., digging of test pits, soil sampling, installation of monitoring wells) to determine how large and how deep the contaminant affected the subsurface soil and/or groundwater (horizontal and vertical extent of the spill). The delineation would result in the development of an appropriate remediation plan for the affected area. In this case, a qualified environmental consultant should be retained to provide advice on how to proceed with delineation and remediation of a large spill.

6.2.5.2 Sewage Spills

Raw sewage can contain infectious bacteria, viruses, fungi and parasites that can cause serious human illnesses and even death. A risk of environmental contamination also exists from sewage spills as raw sewage can also contain unknown chemicals from improper chemical disposal. It is imperative to safely and properly clean up all sewage spills to reduce the chance of human infection and environmental contamination.

Spills on Land

1. Once a spill is identified, the affected area should be vacated and secured, ensuring the area is safe for entry and does not represent an immediate threat to human health and safety of the spill responders. Public access of the area should be restricted.
2. If possible, identify where the spill is coming from (the source). Determine if the spill is still occurring (i.e., still leaking) or if the spill has stopped. If the spill has not stopped, determine if it is safe to stop or control the spill (e.g., plug hole, close valve, upright container), or contain the spill (e.g., place a container or tarp with built up edges under the spill source to contain the spill).
3. Ensure all spill responders wear the appropriate personal protective equipment, including waterproof gloves, safety glasses/goggles, rubber boots and disposable protective coveralls.
4. If the spill is too large to be controlled with the spill materials at hand, contact the Operations Manager and/or WSSW Foremen and report the spill immediately (see Section 6.2.3 for contact information).
5. If the spill is small enough to be controlled with the materials at hand, prevent spilled sewage from spreading or entering waterways by constructing an impervious soil dyke, or other impervious barrier.
6. Once the spill has been controlled and further spreading prevented, contact the Operations Manager and/or WSSW Foremen and report the spill (see Section 6.2.3 for contact information).
7. If possible, remove any contained liquids using the sewage vacuum truck(s). Transport and dispose of this in the holding cell of the sewage disposal facility.

8. If possible with spill response or other materials and equipment at hand, clean up the remaining spilled sewage and dispose of contaminated soil in the holding cell of the sewage disposal facility. Do not flush the affected area with water. Other materials used for clean-up of the sewage spill should be burned in the solid waste disposal facility.
9. Any hard surfaces (e.g., paving, concrete, equipment, rubber boots, etc) that have come into contact with spilled sewage should be cleaned with a detergent solution and then disinfected. Use only approved disinfectants.
10. Once the sewage spill has been cleaned up, dispose of disposable PPE (i.e., coveralls, gloves, safety glasses/goggles) by burning in the solid waste disposal facility. Ensure other PPE (i.e., rubber boots) is properly cleaned and disinfected prior to re-use.
11. If needed, assist the Operations Manager or WSSW Foreman by providing details to complete the Nunavut Spill Report Form with as much information as possible. This form is included in **Appendix G** of this O&M Manual.
12. The Operations Manager or WSSW Foreman will contact the **24-Hour Emergency Spill Report Line (Phone: (867) 920-8130)** to report the spill as soon as possible and obtain additional advice.
13. The Operations Manager or WSSW Foreman will fax the completed Nunavut Spill Report Form to the **24-Hour Emergency Spill Report Line (Fax: (867) 873-6924)**.

Spills in Water

1. Once a spill is identified, the affected area should be vacated and secured, ensuring the area is safe for entry and does not represent an immediate threat to human health and safety of the spill responders. Public access of the area should be restricted.
2. If possible, identify where the spill is coming from (the source). Determine if the spill is still occurring (i.e., still leaking) or if the spill has stopped. If the spill has not stopped, determine if it is safe to stop or control the spill (e.g., plug hole, close valve, upright container), or contain the spill (e.g., place a container or tarp with built up edges under the spill source to contain the spill).
3. A sewage spill into a waterway should be immediately reported to the Operations Manager and/or WSSW Foreman (see Section 6.2.3 for contact information).
4. Ensure all spill responders wear the appropriate personal protective equipment, including waterproof gloves, safety glasses/goggles, rubber boots and disposable protective coveralls.
5. If the spill is small enough to be controlled with the materials at hand, prevent spilled sewage from further spreading or entering other waterways by constructing an impervious soil dyke, or other impervious barrier.
6. If the sewage has entered a waterway which could directly impact human health (e.g., Baker Lake), water removal (if any) from that source will be immediately stopped. Immediately contact the **24-Hour Emergency Spill Report Line (Phone: (867) 920-8130)** and GN departments (see table below) to report the sewage spill and obtain additional advice on how

to proceed further. The water should be sampled as soon as possible to determine if and how the sewage spill has impacted the waterway.

GN-CGS 24-Hour Emergency Management	Government of Nunavut Department of Health and Social Services Environmental Health Officers
(867) 645-3625	Kivalliq: (867) 645-2171 Qikiqtaaluk: (867) 975-4817

7. If the sewage has entered a waterway which poses little risk to human health (e.g., into the sewage treatment tundra wetland, non-potable source), the public should be notified and the access to the area restricted. Further action may be required once the spill is reported to the 24-Hour Emergency Spill Report Line.
8. Once the sewage spill has been controlled and further spreading prevented, if possible remove any other contained liquids using the sewage vacuum truck(s). Transport and dispose of this in the holding cell of the sewage disposal facility.
9. If possible with materials and equipment at hand, clean up the any remaining spilled sewage on the land and dispose of contaminated soil in the holding cell of the sewage disposal facility. Do not flush the affected area with water. Other materials used for clean-up of the sewage spill should be burned in the solid waste disposal facility.
10. Any hard surfaces (e.g., paving, concrete, equipment, rubber boots, etc) that having come into contact with spilled sewage should be cleaned with a detergent solution and then disinfected. Use only approved disinfectants.
11. Once the sewage spill has been cleaned up, dispose of disposable PPE (i.e., coveralls, gloves, safety glasses/goggles) by burning in the solid waste disposal facility. Ensure other PPE (i.e., rubber boots) is properly cleaned and disinfected prior to re-use.
12. If needed, assist the Operations Manager or WSSW Foreman by providing details to complete the Nunavut Spill Report Form with as much information as possible. This form is included in **Appendix G** of this O&M Manual.
13. The Operations Manager or WSSW Foreman will contact the **24-Hour Emergency Spill Report Line (Phone: (867) 920-8130)** to report the spill as soon as possible and obtain additional advice.
14. The Operations Manager or WSSW Foreman will fax the completed Nunavut Spill Report Form to the **24-Hour Emergency Spill Report Line (Fax: (867) 873-6924)**.

Spills on Snow/Ice

1. Once a spill is identified, the affected area should be vacated and secured, ensuring the area is safe for entry and does not represent an immediate threat to human health and safety of the spill responders. Public access of the area should be restricted.

2. If possible, identify where the spill is coming from (the source). Determine if the spill is still occurring (i.e., still leaking) or if the spill has stopped. If the spill has not stopped, determine if it is safe to stop or control the spill (e.g., plug hole, close valve, upright container), or contain the spill (e.g., place a container or tarp with built up edges under the spill source to contain the spill).
3. Since a spill occurring on snow or ice presents the potential for immediate access of contaminants into waterways, contact the Operations Manager and/or WSSW Foreman and report the spill immediately (see Section 6.2.3 for contact information).
4. Ensure all spill responders wear the appropriate personal protective equipment, including waterproof gloves, safety glasses/goggles, rubber boots and disposable protective coveralls.
5. If the spill is small enough to be controlled with the materials at hand, prevent spilled sewage from further spreading or entering waterways by constructing an impervious soil/snow dyke, or other impervious barrier.

   If the sewage spill has entered a waterway, follow the procedure in the preceding section (***Spills in Water***).
6. Once the spill has been controlled and further spreading prevented, if any liquid remains (e.g., is not frozen), remove contained liquids using the sewage vacuum truck(s). Transport and dispose of this in the holding cell of the sewage disposal facility.
7. If possible with materials and equipment at hand, clean up the any remaining spilled sewage on the snow/ice and dispose of contaminated snow/ice/soil in the holding cell of the sewage disposal facility. Other materials used for clean-up of the sewage spill should be burned in the solid waste disposal facility.
8. Any hard surfaces (e.g., paving, concrete, equipment, rubber boots, etc) that having come into contact with spilled sewage should be cleaned with a detergent solution and then disinfected. Use only approved disinfectants.
9. Once the sewage spill has been cleaned up, dispose of disposable PPE (i.e., coveralls, gloves, safety glasses/goggles) by burning in the solid waste disposal facility. Ensure other PPE (i.e., rubber boots) is properly cleaned and disinfected prior to re-use.
10. If needed, assist the Operations Manager or WSSW Foreman by providing details to complete the Nunavut Spill Report Form with as much information as possible. This form is included in **Appendix G** of this O&M Manual.
11. The Operations Manager or WSSW Foreman will contact the **24-Hour Emergency Spill Report Line (Phone: (867) 920-8130)** to report the spill as soon as possible and obtain additional advice.
12. The Operations Manager or WSSW Foreman will fax the completed Nunavut Spill Report Form to the **24-Hour Emergency Spill Report Line (Fax: (867) 873-6924)**.

6.2.6 Spill Kit and Training Requirements

The following sections outline the recommended minimum requirements for contents and number of spill kits that should be present at the water, sewage and solid waste facilities. Personnel training requirements are also provided.

6.2.6.1 Spill Kit Contents

Each spill kit should be regularly inspected to ensure it always contains the following, at a minimum (in part from INAC [2007]):

- 1 – 205 L open top steel drum with lid, bolting ring and gasket (spill kit container)
- 4 – 12.5 cm x 3 m (5 in. X 10 ft.) sorbent booms
- 10 kg bag of sorbent particulate
- 1 roll duct tape
- 1 field notebook and pencil
- 1 pick-axe
- 4 Tyvex® splash suits
- 4 pairs of splash protective goggles
- 10 disposable large 5 mil polyethylene bags (dimensions 65 cm x 100 cm) with ties
- 100 sheets (1 bail) of 50 cm x 50 cm sorbent sheets
- 2 large (5 m x 5 m) plastic tarps
- 1 utility knife
- 1 rake
- 3 spark-proof shovels
- 4 pairs chemical resistant gloves
- Instruction binder, including Spill Contingency Plan

The entire spill kit contents, with the exception of the spark-proof shovels, can be stored within the 205 L steel drum. The drum should be sealed securely to protect the spill kit contents though should always be accessible without the use of tools (i.e., finger tight bolt ring). The drum's bolt ring should be inspected regularly during facility inspections to ensure it turns freely and is lubricated.

Extra spill response materials should also be available for use, in addition to the spill kit contents. These include:

- 10 – 205 L open top steel drum with lid, bolting ring and gasket
- 2 spark-proof shovels
- 50 disposable large 5 mil polyethylene bags (dimensions 65 cm x 100 cm)
- 10 – 12.5 cm x 3 m (5 in. X 10 ft) sorbent booms
- 5 – 10 kg bags of sorbent particulate
- 500 sheets (5 bails) of 50 cm x 50 cm sorbent sheets
- 2 Tyvex® splash suits
- 2 pairs of chemical resistant gloves
- 2 pairs of splash protective goggles

6.2.6.2 Spill Kit Locations

At least one spill kit should be clearly marked and present at the sewage disposal facility (truck offload pads) and the solid waste disposal facility (within the facility). One spill kit should also be present within the water distribution facility, located at the pumphouse.

6.2.6.3 Required Training

To ensure the SCP is carried out effectively, the following actions should occur:

- The SCP should be reviewed annually to ensure it is still up-to-date for current conditions.
- When required, the SCP should be revised to reflect current conditions.
- The SCP should be distributed to and read by all personnel who work at the Hamlet's water, sewage and solid waste facilities.
- Personnel at these facilities should be familiar with the location of all HHW and other potentially hazardous materials, and their associated Material Safety Data Sheets (MSDS).
- Personnel at these facilities should be trained to read and use MSDS, and have their WHMIS training, at a minimum.
- Personnel should receive proper spill response training to learn and understand the techniques and materials used to contain, clean up and remediate spills. Trained personnel will be aware of the importance of first response in reducing the impact of spills with respect to protecting human health and safety, the environment, and property.

6.3 Holding Cell Berm Failure

1. Once a berm failure occurs and is identified, the affected area should be vacated and secured, ensuring the area is safe for entry and does not represent an immediate threat to human health and safety of the workers. Public access of the area should be restricted. Sewage discharge to the detention cell has to cease.
2. Determine if the failure has stabilized/equalized or if failure is still occurring (i.e., still eroding). If the degradation has not stopped, determine if it is safe to stop or control the berm failure (e.g., fill in failure area),
3. Ensure all workers wear the appropriate personal protective equipment, including waterproof gloves, safety glasses/goggles, rubber boots and disposable protective coveralls.
4. Contact the Operations Manager and/or WSSW Foreman and report the berm failure immediately (see Section 6.2.3 for contact information).
5. If the berm failure is small enough and can be controlled with materials at hand that will prevent sewage from spreading or entering waterways, that work should be initiated by reconstructing the berm, or other impervious barrier. On a temporary basis, sand bags, a sand source and a synthetic liner can be used.

6. If possible, remove any downstream liquids using the sewage vacuum truck(s). Transport and dispose of this upstream of the holding cell.
7. If possible, increase the downstream flow pathway to the discharge location by berming, damming and restricting flow through the downstream tundra wetland as much as possible.
8. If possible with materials and equipment at hand, clean up the sewage and dispose of contaminated soil in the holding cell of the sewage disposal facility.
9. Once the berm has been reconstructed, dispose of disposable PPE (i.e., coveralls, gloves, safety glasses/goggles) by burning in the solid waste disposal facility. Ensure other PPE (i.e., rubber boots) is properly cleaned and disinfected prior to re-use.
10. If needed, assist the Operations Manager or WSSW Foreman by providing details to complete the Nunavut Spill Report Form with as much information as possible. This form is included in **Appendix G** of this O&M Manual.
11. The Operations Manager or WSSW Foreman will contact the **24-Hour Emergency Spill Report Line (Phone: (867) 920-8130)** to report the spill as soon as possible and obtain additional advice.
12. The Operations Manager or WSSW Foreman will fax the completed Nunavut Spill Report Form to the **24-Hour Emergency Spill Report Line (Fax: (867) 873-6924)**.

In the event of a holding cell berm failure, further investigation of the area may be required. The investigation would result in the development of an appropriate remediation plan for the affected area. In this case, a qualified environmental engineer should be retained to provide advice on how to proceed with the investigation of a failure and the re-building of the holding cell berm.

6.4 Record Keeping

Records of any spills, spill response activities, follow-up inspections, monitoring, and any additional remedial work must be kept. These records should be stored at the Hamlet office and kept by the Operations Manager or SAO. These records will assist with the annual review of the SCP, operations and maintenance practices at all facilities, and spill response requirements.

Every year by March 31st, the Hamlet is required to submit an Annual Report to the NWB. The Hamlet is required to provide a list of all spills and a summary of follow-up action taken for each spill. Therefore, at a minimum, the following records should be kept:

- Reports of all spills and spill reports submitted to the 24-Hour Emergency Spill Report Line;
- Types and quantities of spill contaminants;
- All spill follow-up activities;
- Inspections of spill kit contents and replacement records for any items; and,
- Records of spill response training for all Hamlet spill responder personnel.

7 REFERENCES

7.1 Literature Cited

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7.2 Personal Communications

Eno, R. Manager, Pollution Control. Government of Nunavut Department of Environment. Personal interview. 19 November 2009

Perkins, G. Operations Manager. Hamlet of Baker Lake. Personal interview. 22 February 2011.

Thistle, W. Regional Projects Manager. Government of Nunavut Department of Community and Government Services. Email. 22 February 2011.

APPENDIX A

Hamlet of Baker Lake Water License

P.O. Box 119
Gjoa Haven, NU X0B 1J0
Tel: (867) 360-6338
Fax: (867) 360-6369

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NUNAVUT WATER BOARD
NUNAVUT IMALIRIYIN KATIMAYINGI
OFFICE DES EAUX DU NUNAVUT

File No.: 3BM-BAK1015

June 25, 2010

Dennis Zettler
Senior Administrative Officer
Hamlet of Baker Lake
P.O. Box 149
Baker Lake, NU X0C 0A0
E-mail: blsao@qiniq.com

RE: NWB Licence No. 3BM-BAK1015

Dear Mr. Zettler:

Please find attached, the renewal of Licence No. 3BM-BAK1015 for the Hamlet of Baker Lake by the Nunavut Water Board (NWB) pursuant to its authority under Article 13 of the *Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in Right of Canada (Nunavut Land Claims Agreement or NLCA)*. The terms and conditions of the attached Licence related to water use and waste disposal are an integral part of this approval.

If the Licensee contemplates the renewal of this Licence, it is the responsibility of the Licensee to apply to the NWB for its renewal. The past performance of the Licensee, new documentation and information, and issues raised during a public hearing, if the NWB is required to hold one, will be used to determine the terms and conditions of the Licence renewal. Note that if the Licence expires before the NWB issues a new one, then water use and waste disposal must cease, or the Licensee may be in contravention of the *NLCA* and the *Nunavut Waters and Nunavut Surface Rights Tribunal Act (NWNSRTA)*. However, the expiry or cancellation of a licence does not relieve the Licensee from any obligations imposed by the licence. The NWB recommends that an application for the renewal of this Licence be filed at least three months prior to the Licence expiry date.

If the Licensee contemplates or requires an amendment to this licence, the NWB may decide, in the public interest, to hold a public hearing. An application for amendment will be required for the construction of the proposed new solid waste disposal facility. The Licensee should submit applications for amendment as soon as possible to give the NWB sufficient time to go through the amendment process. The process and timing may vary depending on the scope of the amendment, however a minimum of sixty (60) days is required from time of acceptance by the NWB. It is the responsibility of the Licensee to ensure that all application materials have been

received and acknowledged by the Manager of Licensing.

The NWB strongly recommends that the Licensee consult the comments received from interested persons on issues identified. This information is attached for your consideration.[1]

Sincerely,

Lootie Toomasie
Nunavut Water Board, Vice-Chair

LT/dc

Enclosure: Licence No. 3BM-BAK1015
Comments from EC, GN-DOE, GN-CLEY and INAC

cc: Kivalliq Distribution List
Nick Lawson – Nunami Jacques Whitford Limited
Wayne Thistle – Government of Nunavut, Community and Government Services

[1] Indian and Northern Affairs Canada, September 11, 2009; Government of Nunavut – Department of Environment, September 10, 2009; Government of Nunavut – Department of Culture, Language, Elders and Youth, September 10, 2009; and Environment Canada, September 4, 2009.

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NUNAVUT WATER BOARD
NUNAVUT IMALIRIYIN KATIMAYINGI
OFFICE DES EAUX DU NUNAVUT

DECISION

LICENCE NUMBER: 3BM-BAK1015

This is the decision of the Nunavut Water Board (NWB) with respect to an application for a Licence renewal and amendment received September 18, 2008 made by:

HAMLET OF BAKER LAKE

to allow for the use of water and disposal of waste for the Hamlet of Baker Lake, located on the northwest shore of Baker Lake within the Kivalliq region of Nunavut. With respect to this application, the NWB gave notice to the public that the Hamlet had filed an application for a water licence renewal.

DECISION

After having been satisfied that the application was exempt from the requirement for screening by the Nunavut Impact Review Board in accordance with S. 12.3.2 of the *Nunavut Land Claims Agreement* (NLCA), the NWB decided that the application could proceed through the regulatory process. After reviewing the full submission of the Applicant and written comments expressed by interested parties, the NWB, having given due regard to the facts and circumstances, the merits of the submissions made to it and to the purpose, scope and intent of the *NLCA* and of the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* (NWNSRTA), decided to waive the requirement to hold a public hearing and determined that:

Licence No. NWB3BAK9904 be renewed as Licence No. 3BM-BAK1015 subject to the terms and conditions contained therein. (Motion #: 2010-11-L05)

Signed this 23rd day of June, 2010 at Gjoa Haven, NU.

Lootie Toomasie
Nunavut Water Board
Vice-Chair

TABLE OF CONTENTS

I. BACKGROUND

The Hamlet of Baker Lake is a community located north of the mouth of the Thelon River on the northwest tip of Baker Lake, at 64°19'N and 96°02'W within the Kivalliq Region of Nunavut.

Located in the Wager Bay Plateau Ecoregion of the Northern Arctic Ecozone, the region is characterized by broad sloping uplands, plains and valleys. Soils are primarily silty sand and silty clays overlying boulder till, beach deposits and reworked till. Local topography slopes upward from the lake to a ridge approximately 2 km to the north. Historically, the community has been subject to extreme snow drifting. A large snow fence has been installed to the north of the community and more snow drift protection is planned. Permafrost is present, with an active layer of up to 1.5 m depth. Vegetation in the area is typical tundra vegetation consisting of mosses, lichens, grasses and dwarf shrubs.[2]

The average annual precipitation in Baker Lake consists of 156 mm of rainfall and 1,307 mm of snowfall. The July mean high and low temperatures are 16°C and 6°C, respectively. The January mean high and low temperatures are -29.5°C and -36.4°C, respectively. Winds are commonly from the north at an average speed of 23 km/h.

The Hamlet obtains its fresh water directly from Baker Lake, utilizing a single vertically mounted drum screen and inclined shaft casing intake, located approximately 120m off shore at a depth of 5-6 m below surface. Water is currently pumped on demand from the intake to the truckfill station (includes a pump building and overhead truckfill arm). As the trucks are being filled, water is chlorinated (using calcium hypochlorite) before being discharged into distribution trucks. Current water use estimates provided by the Applicant are approximately 66,200 m^3/year, well within the previous licence authorized use of 100,000 m^3/year.

The Hamlet's sewage treatment system currently consists of a single holding cell, where sewage is discharged to directly from the truck. Sewage then exfiltrates from the cell and flows into a natural wetland treatment area, through several small lakes before eventually entering Baker Lake via Garbage Creek from Airplane Lake. The holding cell was noted to have breached during the previous license period. It has been rebuilt; however, engineered improvements (increasing capacity and integrity) are currently in the tender stage with the recent application for renewal. A more comprehensive description of the sewage treatment area can be found in Section 4 of the "*Report of the Environmental Study and Evaluation of the Water and Sewage System*", prepared by Nunami Jacques Whitford Ltd. (NJWL)[3] The tundra wetland area treats both wastewater from the Hamlet and in the lower reaches, leachate from the landfill.

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[2] Report of the Environmental Study and Evaluation of the Water and Sewage System, Qamani'tuaq, Nunavut; prepared by Nunami Jacques Whitford Limited, October 2007; Section 2.0 Facility Overview.

[3] Report of the Environmental Study and Evaluation of the Water and Sewage System, Qamani'tuaq, Nunavut; prepared by Nunami Jacques Whitford Limited, October 2007; Section 4.2, Existing Wetland System.

The Hamlet's solid waste disposal facility is located near the southwest shore of Finger Lake, 10 to 15 m away from the shore at its closest point. Drainage from the solid waste facility enters Finger Lake through three or four culverts installed through the northern berm of the facility. Current plans include the construction of a cell to treat landfill leachate before discharge to the wetland treatment system.

II. PROCEDURAL HISTORY

The NWB issued a municipal water licence to the Hamlet of Baker Lake on October 1, 1999, to allow for the use of water and disposal of waste under Licence NWB3BAK9904. The municipal water licence expired on October 1, 2004. The Hamlet of Baker Lake, with the support of the Government of Nunavut, Community and Government Services (CGS) and NJWL submitted an application for water licence renewal to the NWB on September 18, 2008.

Following a preliminary technical review of the application, the NWB advised the applicant that signed and stamped drawings for the Sewage Disposal Facility Upgrades would be required prior to the thirty (30) day public comment period. On July 31, 2009 the NWB received the requested drawings and on August 11, 2009 posted notice of the application and invited interested persons to comment by September 11, 2009. Below is a list of application documents on file at the time of public notice:

- Site Investigation Report for the Water Supply System In the Hamlet of Baker Lake, NU, November 16, 2005;
- Site Investigations Report for the Sewage Disposal System In the Hamlet of Baker Lake, NU, November 16, 2005;
- Site Investigation Report for the Water & Sewage System In the Hamlet of Baker Lake, NU, November 16, 2005;
- Supplementary Questionnaire, November 16, 2005;
- Letter from Dennis Zettler, Hamlet of Baker Lake to Joe Murdoch, NWB, February 24, 2006;
- Email correspondence pertaining to NWB letter of requirements, June 23, 2006;
- Email from Bryan Purdy, Government of Nunavut, Community and Government Services (CGS) to Sarah Gagne, NWB, September 13, 2006;
- Authorization for NJWL and CGS to assist in the application, September 14, 2006;
- Letter from Bryan Purdy, CGS to Sarah Gagne, NWB, Submitting the Implementation Plan for Baker Lake Water Licence, September 25, 2006;
- Draft Implementation Plan, October 31, 2006;
- Accompanying Letter for Implementation Plan, October 31, 2006;
- Letter from Nick Lawson, NJWL to Joe Murdock, NWB, Action Plan follow-up, January 31, 2007;
- Baker Lake Water Licence Action Plan Response to June 2006 letter from NWB, February 4, 2007

- Interim Report on the Environmental Study and Evaluation of the Water and Sewage System, February 4, 2007;
- Application Cover Letter, September 19, 2008;
- Application Fee Letter, September 19, 2008
- Figure 1, Conceptual Design of Proposed System Improvements, September 19, 2008;
- Figure 2, Conceptual Design of Proposed System Improvements, September 19, 2008;
- English Executive Summary, September 19, 2008;
- Inuktitut Executive Summary, September 19, 2008;
- Report of the Environmental Study and Evaluation of the Water and Sewage System, dated October 15, 2007, received September 19, 2008;
- Supplemental Questionnaire, September 19, 2008;
- Water Licence Application Form, September 19, 2008;
- Schematic Design Report Tundra Wetland Sewage Treatment System Design, December 4, 2008;
- 50% Complete Design Drawings of Sewage System Improvements, File 1, March 23, 2009;
- 50% Complete Design Drawings of Sewage System Improvements, File 2, March 23, 2009;
- 100% Complete Design Drawings of Sewage System Improvements, May 21, 2009; and
- For Tender Drawings of Sewage System Improvements, Signed and Stamped by an Engineer, July 31, 2009.

The scope of the renewal application included water use, and ongoing disposal of sewage and solid waste. No public concern was expressed during this review. Therefore, the NWB waived the requirement to hold a public hearing and proceeded with the application process.

The NWB received comments on the application from interested parties including Environment Canada (EC), Indian and Northern Affairs Canada (INAC), Government of Nunavut, Department of Culture, Language, Elders and Youth (GN-CLEY) and the Government of Nunavut, Department of Environment (GN-DOE) on or prior to September 11, 2009.

Based upon the results of the detailed assessment of the renewal application, including consideration of any potential accidents, malfunctions, or impacts to water that the overall project might have in the area, the Board has approved the application for renewal and has issued Licence 3BM-BAK1015.

III. ISSUES

Term of Licence

In accordance with section 45 of the Act, the NWB may issue, renew or amend a licence for a term not exceeding twenty-five years. In determining an appropriate term of a water licence, the Board considers a number of factors, including the results of INAC site inspections and the compliance record of the Applicant. Inspection Reports were received for 2000 – 2005, an Inspectors Direction in 2008 and an Inspection Report for 2009. The 2008 Inspectors Direction required the following:

- To immediately upon receipt of this Direction make contact Mr. Bernie Mac Isaac, Manager of Field Operations, Indian and Northern Affairs Canada in Iqaluit, Nunavut to make arrangements for an Inspector to attend the community of Baker Lake to conduct the Municipal Inspection.

In the 2009 inspection report dated December 8, 2009, the Inspector noted the following issues:

- Failure to file Annual Reports;
- Failure to take steps to prevent and control the migration off site of runoff from the Solid Waste Management Facility. (installation of ditches or berms);
- Failure to comply with the monitoring program by collecting samples for analysis;
- Failure to segregates wastes in the Municipal Waste Management Area; and
- Failure to properly store and contain Hazardous Wastes.

In the same report, the Inspector identified the following Non-Compliance:
Issues with a known or anticipated human health impacts;

- Sewage is discharged directly to the environment without treatment; and
- Failure to collect and submit for analysis the samples required on the Monitoring Program.

Issues where there is a known or anticipated environmental impairment;

- Failure to undertake such water management to control runoff from the waste management area;
- The Licensee is required to segregate hazardous materials into a lined and controlled area;
- Failure to properly store and contain hazardous wastes;
- Failure to contain and remediate the release of hazardous materials; and
- Failure to maintain and control the Municipal Waste Management Area.

Issues where there is a known or suspected violation of a requirement of the Water License;

- It has been a period of over 4 years since the Municipality has had a Water License. Currently the Municipality is operating in Non-compliance with the Nunavut Waters and Nunavut Surface Rights Tribunal Act; and

- The Municipality failed to follow the terms and conditions contained within the Direction issued on August 12, 2008.

An internal review of administrative compliance for the previous licence revealed that for Part B, Item 1, which required the submission of annual reports and associated monitoring results, identified that no reports were received for the years 2000 through to 2008 with the exception of 2005. The 2005 annual report however, was noted as incomplete. Part H, Item 1 required a Spill Contingency Plan by April of 2000, to date this has not been received. Part I, Item 5 required a report that described all existing abandoned water supply and waste disposal activities by January 31, 2001; this has not been received by the Board.

In the renewal application, the Hamlet requested a licence term of ten years. No concerns were raised by the parties pertaining to the length of the requested renewal Licence. However, taking into account information submitted for the renewal, comments received, previous inspection reports and administrative compliance, the NWB has decided on a Licence term of five (5) years.

Prior to seeking a longer term Licence or seeking an amendment or future renewal, the Board recommends that the Licensee demonstrate they are capable of meeting the terms and conditions of this Licence. As per Part B, Item 11 of the Licence, the Licensee shall submit a Plan for Compliance, within ninety (90) days following issuance of the Licence, that clearly demonstrates how the Hamlet will achieve full compliance with the Licence conditions,. The Board fully expects the Hamlet to take immediate steps towards full compliance with all Licence requirements for its existing facilities.

Annual Report

The NWB has imposed on the Licensee, the requirement to produce an Annual Report. These reports are for the purpose of ensuring that the NWB has an accurate, annual update of municipal activities during a calendar year. This information is maintained on the Public Registry and is available to interested parties upon request. A *"Standardized Form for Annual Reporting"* is available from the NWB file transfer protocol (FTP) site under the Public Registry link at the NWB Website.

Website Public Registry:
(ftp://nunavutwaterboard.org/ADMINISTRATION/Standardized%20Forms/).

This form is to be used when reporting, however additional information may be required of the annual report and can be provided as an appendix.

Operational Plans

Under the previous licence NWB3BAK9904 Part F Item 1, the Licensee was required to submit a Plan for the Operation and Maintenance (O&M) of the Sewage and Solid Waste Facilities. An O&M Plan was received by the Board on November 16, 2005 however the Plan was never approved by the Board. The 2005 O&M Plan was made available as part of the application during the public comment period.

INAC, GN-DOE and EC all noted in their comments to the NWB, that an updated Operations and Maintenance Manual should be provided, and several recommendations were provided for the Licensees consideration. In its submissions both GN-DOE and EC recommended the submission of a Sludge Management Plan as part of the O&M Manual.

The NWB requires the Licensee to resubmit a revised O&M Manual for Board approval within ninety (90) days following issuance of the Licence. The purpose of the revision is to update the plan with changes to the Waste Disposal Facilities and address comments received by interested parties in the renewal process. The updated O&M Manual should demonstrate to the NWB that the Hamlet is capable of operating and maintaining the infrastructure related to water use and waste disposal and to meet the requirements of the Licence. The O&M Manual should be based, at a minimum on the various NWB recognized guidelines available (i.e. *Guidelines for the Preparation of an Operations and Maintenance Manual for Sewage and Solid Waste Disposal Facilities in the Northwest Territories; 1996*) and other regulatory guidelines as deemed appropriate. Also, to remain consistent with similar municipal licences, this Licence requires the submission of an O&M Plan for the Water Supply Facilities as part of the O&M Manual. This requirement is detailed under Part F, Item 1 of the Licence.

Water Use

The Hamlet of Baker Lake currently utilizes water from Baker Lake as a source of potable water for the community. The preceding Licence authorized 100,000 cubic metres of water annually. No concerns were raised with respect to total quantity of water authorized, the manner in which it is obtained or will be used. Therefore, the Board has authorized a water use of one hundred thousand (100,000) cubic metres per annum.

Sewage

The Hamlet of Baker Lake currently discharges its sewage into a short term holding cell which then migrates through a wetland in the area of Lagoon lake and Finger Lake, followed by a small stream through to Airplane Lake and then final discharge from the lake at monitoring point BAK-3 where flow continues through Garbage Creek to Baker Lake. As part of this renewal, for tender plans have been submitted with respect to upgrades the Sewage Disposal Facility and Solid Waste Disposal Facility as follows:

- Upgrade the short term holding cell by strengthening its walls;
- Construct an additional short term holding cell to increase the initial retention time of sewage;
- Upgrade the offloading point into the holding cells;
- Install attenuation berms in the wetland between the holding cells and Lagoon Lake;
- Install attenuation berms in the wetland between Lagoon Lake and Finger Lake;
- Install an attenuation berm between the Solid Waste Disposal Facility and Finger Lake; and
- Construct a fence around the Waste Disposal Facilities to keep out wildlife.

In its submission, INAC identified:

- Breaches in the berms which cause spills of sewage effluent are unacceptable;
- The NWB should impose a condition that requires the Hamlet to engage the services of an Engineer with appropriate expertise to examine the berms, make recommendations for repairs and then certify the structural integrity upon completion of any repairs;
- The repair of the current berms could be thought of as an interim measure until the construction of the new lagoon system is completed; and
- The Board should consider requiring the installation of fencing around the perimeter of the lagoon to prevent access by animals and humans.

In its submission EC included the following:

- The Hamlet must ensure that any effluent discharged must be in compliance with Section 36(3) of the *Fisheries Act*. According to the *Fisheries Act*, Section 36(3), the deposition of deleterious substances of any type in water frequented by fish, or in any place under any conditions where the deleterious substance, or any other deleterious substance that results from the deposit of the deleterious substance, may enter any such water, is prohibited; and
- The retention time in the primary cell is currently only three days (supplementary questionnaire page 19) which may allow for some settling of solids but does not provide enough time for further treatment. EC strongly encourages the Hamlet to expedite the planned system upgrades, and to plan for sufficient retention time in the holding cells to attain some treatment;

The NWB has included a requirement for an inspection of all engineered earthworks related to the management of water and waste shall be carried out annually in July or August by a Geotechnical Engineer. Within sixty (60) days following the inspection, the Licensee shall submit to the Board a report outlining an implementation plan and addressing each of the Engineer's recommendations. This requirement is detailed under Part F, Item 2 of the Licence.

The Board has maintained, for the renewal licence, the effluent quality criteria for the discharge of the Sewage Disposal Facilities, consistent with the *Guidelines for the Discharge of Treated Municipal Wastewater in the Northwest Territories* (Northwest Territories Water Board, 1992).

Solid Waste

The Hamlet's Solid Waste Disposal Facility is located adjacent to the wetland and Finger Lake, immediately north of the community. No changes to the Solid Waste Disposal Facility were proposed in the renewal application, however the Licensee has proposed to construct a wildlife fence around the facility. The 2009 Inspection Report describes Hazardous Waste in both the scrap metal area and the landfill. Hazardous wastes including battery acid, fuel and waste oil were noted leaking within the waste management area where there is no secondary containment provided.

Concerns raised by INAC, GN-DOE and EC have identified that the Hamlet should only store hazardous waste in an approved designated area with secondary containment. As such, the NWB has imposed the requirement to segregate and store all hazardous wastes in appropriate areas utilizing secondary containment prior to disposal offsite at a licensed facility.

Abandonment and Restoration

Comments received during review of the application have various recommendations with respect to the provision of an Abandonment and Restoration (A&R) Plan. INAC recommended an A&R Plan be required by a renewed Licence for the water supply, solid waste landfill and sewage lagoon. GN-DOE would like a preliminary A&R Plan to be submitted for review. EC has requested an A&R Plan be provided for all currently abandoned facilities including details for the previous waste oil pit. Also, Part I, Item 5 of the previous Licence required the submission of a report that described all existing abandoned water supply and waste disposal facilities and activities by January 31, 2001. This submission has not been received by the Board.

The 2009 Inspection Reported noted over 1000 drums of waste oil and other unknown fluids are located in the bulk metals waste are. The Licensee is reminded that all hazardous wastes, waste oil and non-combustible waste generated through the course of the operation shall be backhauled and disposed at a licensed waste disposal site. The Licensee shall maintain records of all waste backhauled and records of confirmation of proper disposal of backhauled waste. These requirements are detailed under Part D, Items 8 and 9.

As a condition of this Licence, the NWB is requiring of the Licensee to submit for approval of the Board, within six (6) months following issuance of the renewal, abandonment and restoration details of the previous waste oil pit and an Abandonment and Restoration Plan for all abandoned water and waste facilities within the Hamlet boundaries.

The Licensee shall submit to the Board for approval in writing, an Abandonment and Restoration Plan at least six (6) months prior to abandoning any facilities or upon submission of the final design drawings for the construction of new facilities to replace existing ones. This requirement is detailed under Part G, Item 2.

Monitoring

The Board has maintained the monitoring stations from the previous Licence including the raw water supply, runoff from Finger Lake prior to entry to Airplane Lake, outlet of Airplane Lake and a discharge point for the Solid Waste Disposal Facility. The Board has included a new Monitoring Program Station; BAK-5 at the outlet of the Wetland prior to entry into Finger Lake where the effluent shall be tested for parameters listed under Part H, Item 4 and achieve compliance with limits set by Part D, Item 2.

EC notes that the CCME Strategy for the Management of Municipal Wastewater has been signed, and that northern jurisdictions can expect performance standards for BOD_5 and TSS to be regulated following a five year period which starts in 2009. We anticipate that the standards for these parameters may be higher than the 25 mg/L for each that is proposed for the southern jurisdictions and the Yukon. Also, it should be noted that carbonaceous Biological Oxygen Demand (cBOD) will be the regulated parameter, and it would be prudent to add this to the list of licence parameters now, in order to gain some idea of the system's track record over the next five years. Although no specific effluent quality limits have been set for cBOD under this Licence, the NWB has included cBOD as a parameter to be sampled for at Monitoring Program Stations BAK-2, BAK-3, BAK-4 and BAK-5.

In addition, the Board has also included the requirement for the preparation and submission of a Quality Assurance/Quality Control (QA/QC) Plan to a laboratory analyst for approval. The purpose of the QA/QC Plan is to ensure that samples obtained in the field, accurately represent the physical and chemical nature of the water being sampled. The Licensee shall provide to the Board within ninety (90) days, a letter of approval from the laboratory, providing confirmation that the Hamlet's QA/QC plan is acceptable. The requirement for this submission is detailed under Part H, Item 8.

NUNAVUT WATER BOARD
WATER LICENCE - RENEWAL

Pursuant to the Nunavut Waters and Nunavut Surface Rights Tribunal Act and the Agreement Between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada, the Nunavut Water Board, hereinafter referred to as the Board, hereby grants to

HAMLET OF BAKER LAKE

(Licensee)

P.O. BOX 149, BAKER LAKE, NU, X0C 0A0

(Mailing Address)

hereinafter called the Licensee, the right to alter, divert or otherwise use water or dispose of waste for a period subject to restrictions and conditions contained within this Licence Renewal:

Licence Number/Type:	3BM-BAK1015 TYPE "B" RENEWAL
Water Management Area:	NUNAVUT 06
Location:	HAMLET OF BAKER LAKE KIVALLIQ REGION, NUNAVUT
Classification:	MUNICIPAL UNDERTAKING
Purpose:	DIRECT WATER USE AND DEPOSIT OF WASTE
Quantity of Water use not to Exceed:	ONE HUNDRED THOUSAND (100,000) CUBIC METRES PER ANNUM
Date of Licence Issuance:	JUNE 23, 2010
Expiry of Licence:	JUNE 30, 2015

This Licence renewal, recorded at Gjoa Haven, Nunavut, includes and is subject to the annexed conditions.

Thomas Kabloona,
Nunavut Water Board
Chair

PART A: SCOPE AND DEFINITIONS

1. Scope

a. This Licence allows for the use of water and the disposal of waste for a municipal undertaking for the Hamlet of Baker Lake, Kivalliq Region, Nunavut (64°19'N and 96°02'W);

b. This Licence is issued subject to the conditions contained herein with respect to the taking of water and the depositing of waste of any type in any waters or in any place under any conditions where such waste or any other waste that results from the deposits of such waste may enter any waters. Whenever new Regulations are made or existing Regulations are amended by the Governor in Council under the Nunavut Waters and Nunavut Surface Rights Tribunal Act, or other statutes imposing more stringent conditions relating to the quantity or type of waste that may be so deposited or under which any such waste may be so deposited, this Licence shall be deemed, upon promulgation of such Regulations, to be subject to such requirements; and

c. Compliance with the terms and conditions of this Licence does not absolve the Licensee from responsibility for compliance with the requirements of all applicable Federal, Territorial and Municipal legislation.

2. Definitions

In this Licence: **3BM-BAK1015**

"Act" means the *Nunavut Waters and Nunavut Surface Rights Tribunal Act;*

"Amendment" means a change to original terms and conditions of this Licence requiring correction, addition or deletion of specific terms and conditions of the Licence; modifications inconsistent with the terms of the set terms and conditions of the Licence;

''Appurtenant undertaking'' means an undertaking in relation to which a use of waters or a deposit of waste is permitted by a licence issued by the Board;

"Board" means the Nunavut Water Board established under the *Nunavut Land Claims Agreement*;

"Effluent" means treated or untreated liquid waste material that is discharged into the environment from a structure such as a settling pond or a treatment plant;

"**Engineer**" means a professional engineer registered to practice in Nunavut in accordance with the *Engineering, Geological and Geophysical Act (Nunavut)* S.N.W.T. 1998, c.38, s.5;

"Final Discharge Point" with respect to effluent means the stream from Finger Lake immediately prior to entry into Airport Lake;

"Freeboard" means the vertical distance between water line and crest on a dam or dyke's upstream slope;

"Geotechnical Engineer" means a professional engineer registered with the Association of Professional Engineers, Geologist and Geophysicists of Nunavut and whose principal field of specialization with the engineering properties of earth materials in dealing with man-made structures and earthworks that will be built on a site. These can include shallow and deep foundations, retaining walls, dams, and embankments;

"Grab Sample" means an undiluted quantity of material collected at a particular time and place that may be representative of the total substance being sampled at the time and place it was collected;

"Greywater" means all liquid wastes from showers, baths, sinks, kitchens and domestic washing facilities, but does not include toilet wastes;

"**Inspector**" means an Inspector designated by the Minister under Section 85 (1) of the *Act*;

"Licensee" means the holder of this Licence;

"Modification" means an alteration to a physical work that introduces new structure or eliminates an existing structure and does not alter the purpose or function of the work, but does not include an expansion, and changes to the operating system that are consistent with the terms of this Licence and do not require amendment;

"Monitoring Program" means a monitoring program established to collect data on surface water and groundwater quality to assess impacts to the freshwater aquatic environment of an appurtenant undertaking;

"Nunavut Land Claims Agreement (*NLCA*)" means the "*Agreement Between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada*", including its preamble and schedules, and any amendments to that agreement made pursuant to it;

"Sewage" means all toilet wastes and greywater;

"Sewage Disposal Facility" comprises the repaired holding cell, new holding cell, upgraded wetland with attenuation berms and other associated sewage treatment structures designed to contain and treat sewage, as described in the Application for Water Licence filed by the Applicant on September 19, 2008 and illustrated in Baker Lake Sewage System Improvements, Drawings C-1, C-2, C-3, C-4, C-5, C-6, C-7 and C-8 received on July 31, 2009;

"Solid Waste Disposal Facility" comprises the area and associated structures (landfill site) designed to contain Solid Waste as described in the Application for Water Licence filed by the Applicant on September 19, 2008;

"Toilet Wastes" means all human excreta and associated products, but does not include greywater;

"Waste" means, as defined in S.4 of the Act, any substance that, by itself or in combination with other substances found in water, would have the effect of altering the quality of any water to which the substance is added to an extent that is detrimental to its use by people or by any animal, fish or plant, or any water that would have that effect because of the quantity or concentration of the substances contained in it or because it has been treated or changed, by heat or other means;

"Waste Disposal Facilities" means all facilities designated for the disposal of waste, and includes the Sewage Disposal Facility and the Solid Waste Disposal Facility;

"Water Supply Facilities" comprises the area and associated intake, treatment and storage infrastructure at Baker Lake, as described in the Application for Water Licence filed by the Licensee on September 19, 2008;

3. Enforcement

a. Failure to comply with this Licence will be a violation of the *Act*, subjecting the Licensee to the enforcement measures and the penalties provided for in the *Act*;

b. All inspection and enforcement services regarding this Licence will be provided by Inspectors appointed under the *Act*;

c. For the purpose of enforcing this Licence and with respect to the use of water and deposit or discharge of waste by the Licensee, Inspectors appointed under the *Act*, hold all powers, privileges and protections that are conferred upon them by the *Act* or by other applicable law; and

d. The Licensee shall have in place, a Plan for Compliance to achieve full compliance with the conditions of this Licence, approved by the Board in writing as per Part B, Item 11.

PART B: GENERAL CONDITIONS

1. The Licensee shall submit an Annual Report to the Board for review, not later than March 31st of the year following the calendar year reported, to include the following information:

   a. tabular summaries of all data generated under the "Monitoring Program" and an indication of wastewater treatment levels upstream and downstream of the Wetland Area;

   b. summary of modifications to the "Monitoring Program" in accordance with Part H, Item 11;

   c. the monthly and annual quantities in cubic metres of fresh water obtained at the Water Supply Facilities;

   d. the annual quantity in cubic metres and tonnes of sludge removed from the Sewage Disposal Facility along with the treatment, storage, and disposal provided as required in Part H Item 5;

   e. 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;

   f. a list of unauthorized discharges and summary of follow-up action taken;

   g. a summary of any abandonment and restoration work completed during the year and an outline of any work anticipated for the next year;

   h. any updates or revisions for manuals and plans (i.e., *Operations and Maintenance Manual*) as required by changes in operation and/or technology, may be subject to Board approval;

   i. detailed minutes of any public consultation and participation with local organizations and the residents of the community regarding licence amendments;

   j. a summary of any studies or reports requested by the Board that relate to water use and waste disposal or restoration, and a brief description of any future studies planned; and

k. any other details on water use or waste disposal requested by the Board by November 1st of the year being reported.

2. The compliance dates specified in the Licence may be modified at the written approval of the Board.

3. The Licensee shall install flow meters or other such devices, or implement suitable methods required for the measuring of water use volumes and waste discharged as required under Part H, Monitoring Program.

4. The Licensee shall, within ninety (90) days after the first visit by the Inspector following issuance of this Licence, post the necessary signs to identify the stations of the "Monitoring Program". All signage postings shall be in the Official Languages of Nunavut.

5. The Licensee shall post signs in the appropriate areas to inform the public of the location of the Water Supply Facilities and the Waste Disposal Facilities. All signage postings shall be in the Official Languages of Nunavut.

6. The Licensee shall immediately report to the 24-Hour Spill Report Line at (867) 920-8130, any spills of Waste, which are reported to, or observed by the Licensee, within the municipal boundaries or in the areas of the Water Supply or Waste Disposal Facilities.

7. The Licensee shall ensure a copy of this Licence is maintained at the Municipal Office at all times. Any communication with respect to this Licence shall be made in writing to the attention of:

(a) Manager of Licensing:
Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU X0B 1J0
Telephone: (867) 360-6338
Fax: (867) 360-6369
Email: licensing@nunavutwaterboard.org

(b) Inspector Contact:
Water Resources Officer
Nunavut District, Nunavut Region
P.O. Box 100
Iqaluit, NU X0A 0H0
Telephone: (867) 975-4295
Fax: (867) 979-6445

8. The Licensee shall submit one paper copy and one electronic copy of all reports, studies, and plans to the Board. Reports or studies submitted to the Board by the Licensee shall include a detailed executive summary in Inuktitut.

9. The Licensee shall ensure that all document(s) and correspondence submitted by the Licensee, to the NWB, are received and acknowledged by the Manager of Licensing.

10. The Licensee shall submit to the Board for approval, within ninety (90) days following renewal of the licence, a Plan for Compliance that clearly demonstrates the measures the Licensee will undertake, including an implementation schedule, to achieve full compliance with the conditions of this Licence, including issues raised in the Inspector's Reports.

11. The Licensee shall, for all Plans submitted under this Licence, include a proposed timetable for implementation. Plans submitted, cannot be undertaken without subsequent written Board approval and direction. The Board may alter or modify a Plan if necessary to achieve the legislative objectives and will notify the Licensee in writing of acceptance, rejection or alteration of the Plan.

12. The Licensee shall, for all Plans submitted under this Licence, implement the Plan as approved by the Board in writing.

13. The Licensee shall review the Plans referred to in this Licence, as required by changes in operation and/or technology, and modify the Plan accordingly. Revisions to the Plans are to be submitted to the Board for review, in the form of an Addendum to be included with the Annual Report.

14. Every Plan to be carried out pursuant to the terms and conditions of this Licence shall become a part of this Licence, and any additional terms and conditions imposed upon approval of a Plan by the Board, become part of this Licence. All terms and conditions of the Licence should be contemplated in the development of a Plan where appropriate.

15. This Licence is assignable as provided for in Section 44 of the *Act*.

PART C: CONDITIONS APPLYING TO WATER USE

1. The Licensee shall obtain, all fresh water from Baker Lake for municipal purposes, using the Water Supply Facilities or as otherwise approved by the Board in writing.

2. The annual quantity of water use for all purposes shall not exceed one hundred thousand (100,000) cubic metres.

3. The Licensee shall equip all water intake hoses with a screen of appropriate mesh size to ensure that fish are not entrained and shall withdraw water at a rate such that fish do not become impinged on the screen.

4. The Licensee shall not remove any material from below the ordinary high water mark of any water body unless approved by the Board in writing.

5. The Licensee shall not cause erosion to the banks of any body of water and shall provide necessary controls to prevent such erosion.

6. Sediment and erosion control measures shall be implemented prior to and maintained as required during Hamlet operations, to prevent entry of sediment into water.

PART D: CONDITIONS APPLYING TO WASTE DISPOSAL

1. The Licensee shall direct all Sewage to the Sewage Disposal Facility.

2. All Effluent discharged from the Sewage Disposal Facility at Monitoring Program Station BAK-5 shall not exceed the following Effluent quality limits:

Parameter	Maximum Concentration of any Grab Sample
BOD_5	80 mg/L
Total Suspended Solids	100 mg/L
Faecal Coliforms	1×10^4 CFU/100mL
Oil and grease	No visible sheen
pH	between 6 and 9

3. A Freeboard limit of 1.0 metre, or as recommended by a qualified geotechnical Engineer and as approved by the Board in writing, shall be maintained at all dams, dykes, or structures intended to contain, withhold, divert or retain water or wastes.

4. The Licensee shall provide at least ten (10) days notification to an Inspector, prior to initiating any decant of the sewage lagoon.

5. The Sewage Disposal Facility shall be maintained and operated, in such a manner as to prevent structural failure.

6. The Licensee shall dispose of and permanently contain all Solid Wastes at the Solid Waste Disposal Facility or as otherwise approved by the Board in writing.

7. The Licensee shall segregate and store all hazardous materials including waste oil, within the Solid Waste Disposal Facility utilizing secondary containment to prevent the deposit of deleterious substances into any water, until such a time as disposal arrangements are made to a licensed facility.

8. The Licensee shall backhaul and dispose of all hazardous wastes, waste oil and non-combustible waste generated through the course of the operation at a licensed waste disposal site.

9. The Licensee shall maintain records of all waste backhauled and records of confirmation of proper disposal of backhauled waste. These records shall be made available to an Inspector upon request

10. The Licensee shall implement measures to control wind-blown litter at the Solid Waste Disposal Facility as required by Part D, Item 6.

11. The Licensee shall implement measures to ensure leachate from the Solid Waste Disposal Facility does not enter water.

12. The Licensee shall use clean material for construction, operation, and maintenance activities that is obtained from an approved source and has been demonstrated not to produce acid rock drainage and to be non-metal leaching.

PART E: CONDITIONS APPLYING TO MODIFICATION AND CONSTRUCTION

1. The Licensee shall submit to the Board for approval, for construction drawings stamped and signed by a qualified engineer registered in Nunavut, sixty (60) days prior to the construction of any dams, dykes or structures intended to contain, withhold, divert or retain water or wastes.

2. The Licensee may, without written approval from the Board, carry out modifications to the Water Supply and Waste Disposal Facilities provided that such modifications are consistent with the terms of this Licence and the following requirements are met:

    a. the Licensee has notified the Board in writing of such proposed modifications at least sixty (60) days prior to beginning the modifications;
    b. these modifications do not place the Licensee in contravention of the Licence or the Act;
    c. the Board has not, during the sixty (60) days following notification of the proposed modifications, informed the Licensee that review of the proposal will require more than sixty (60) days; and
    d. the Board has not rejected the proposed modifications.

3. Modifications for which all of the conditions referred to in Part E, Item 2(a) through (d), have not been met, may only be carried out upon written approval from the Board.

4. The Licensee shall provide as-built plans and drawings of the Modifications or construction referred to in this Part within ninety (90) days of completion of the Modification or construction. These plans and drawings shall be stamped and signed by an Engineer.

5. The Licensee shall submit to the Board for review, as-built drawings signed and stamped by an Engineer, for the upgrades to the Sewage Disposal Facility and the fence around the Waste Disposal Facilities if constructed, within ninety (90) days of the renewal of this Licence, or, within ninety (90) days of completion of the upgrades. These plans and drawings shall be stamped and signed by an Engineer.

6. The Licensee shall submit to the Board for review, as-built drawing signed an stamped by an Engineer for the Solid Waste Disposal Facilities, within ninety (90) days following issuance of the renewal of the Licence.

7. All activities shall be conducted in such a way as to minimize impacts on surface drainage and the Licensee shall immediately undertake any corrective measures in the event of any impacts on surface drainage.

8. The Licensee shall implement and maintain erosion control measures during activities carried out under this Part, to prevent impacts to water resulting from the release of sediment and minimize erosion.

9. The construction or disturbance of any stream/lake bed or banks of any definable water course are not permitted, unless authorized by the Board in writing.

PART F: CONDITIONS APPLYING TO OPERATION AND MAINTENANCE

1. The Licensee shall submit to the Board for approval, within ninety (90) days following the renewal of this Licence, a revised Operation and Maintenance (O&M) Manual. The Manual shall be updated for changes to the Sewage Disposal Facility and Solid Waste Disposal Facility and take into consideration the comments received during the application review process and shall contain the following plans:

    a. Operation and Maintenance Plan for the Water Supply Facilities;
    b. Sewage Operation and Maintenance Plan (including Sludge Management Procedures);
    c. Solid Waste Operation and Maintenance Plan;
    d. Hazardous Waste Management Plan; and
    e. Spill Contingency Plan.

2. An inspection of all engineered earthworks related to the management of water and waste shall be carried out annually in July or August by a Geotechnical Engineer. The engineer's report shall be submitted to the Board within sixty (60) days of the inspection, including a covering letter from the Licensee outlining an implementation plan addressing each of the Engineer's recommendations.

3. If, during the period of this Licence, an unauthorized discharge of waste occurs, or if such a discharge is foreseeable, the Licensee shall:

   a. employ the appropriate spill contingency measures as described in the Spill Contingency Plan of the Operation and Maintenance Manual for the Hamlet of Baker Lake;
   b. report the incident immediately via the 24-Hour Spill Reporting Line at (867) 920-8130 and to the INAC Manager of Field Operations at (867) 975-4295; and
   c. submit to the Inspector, a detailed report on each occurrence, not later than thirty (30) days after initially reporting the event, that provides the necessary information on the location (including the GPS coordinates), initial response action, remediation/clean-up, status of response (ongoing, complete), proposed disposal options for dealing with contaminated materials and any preventative measures to be implemented.

PART G: CONDITIONS APPLYING TO ABANDONMENT AND RESTORATION

1. The Licensee shall submit for approval of the Board, within six (6) months following issuance of the renewal, abandonment and restoration details of the previous waste oil pit and an Abandonment and Restoration Plan for all abandoned water and waste facilities within the Hamlet boundaries.

2. The Licensee shall submit to the Board for approval in writing, an *Abandonment and Restoration Plan* at least six (6) months prior to abandoning any facilities or upon submission of the final design drawings for the construction of new facilities to replace existing ones. Where applicable, the Plan shall include information on the following:

   a. water intake facilities;
   b. the water treatment and waste disposal sites and facilities;
   c. abandoned water and waste facilities;
   d. petroleum and chemical storage areas;
   e. any site affected by waste spills;
   f. leachate prevention;
   g. an implementation schedule;
   h. maps delineating all disturbed areas, and site facilities;
   i. consideration of altered drainage patterns;

j. type and source of cover materials;
k. future area use;
l. hazardous wastes; and
m. a proposal identifying measures by which restoration costs will be financed by the Licensee upon abandonment.

3. The Licensee shall complete the restoration work within the time schedule specified in the Plan, or as subsequently revised and approved by the Board.

4. All disturbed areas shall be stabilized and re-vegetated as required, upon completion of work and restored as practically as possible to a pre-disturbed state.

PART H: CONDITIONS APPLYING TO THE MONITORING PROGRAM

1. The Licensee shall maintain Monitoring Program Stations and implement the program as described in the table below and the conditions under this Part.

Monitoring Program Station Number	Description	Frequency	Status
BAK-1	Raw water supply prior to treatment	Volume Monthly and Annually	Active (Volume)
BAK-2	Runoff from the Waste Disposal Facilities just prior to the inlet to Airplane Lake, prior to the culvert	Water Quality Monthly during periods of flow	Active (Water Quality)
BAK-3	Outlet of Airplane Lake at water's edge	Water Quality Annually during periods of flow	Active (Water Quality)
BAK-4	Runoff from the Solid Waste Disposal Facilities prior to Finger Lake	Water Quality Annually during periods of flow (if present)	Active (Water Quality)
BAK-5	Finger Lake at outlet of Wetland	Water Quality Annually during periods of flow (if present)	Active (Water Quality)

2. The Licensee shall confirm the locations and GPS coordinates for all monitoring stations referred to in Part H Item 1 with an Inspector.

3. The Licensee shall measure and record the monthly and annual quantities of water, in cubic meters, pumped from Monitoring Program Station BAK-1 for all purposes.

4. The Licensee shall collect samples at Monitoring Program Stations BAK-2, BAK-3, BAK-4 and BAK-5, according to the frequency provided in Part H Item 1. Samples shall be analyzed for the following parameters:

Biochemical Oxygen Demand – BOD_5	Faecal Coliforms
Total Suspended Solids	pH
Conductivity	Nitrate-Nitrite
Oil and Grease (visual)	Total Phenols
Magnesium	Calcium
Sodium	Potassium
Chloride	Sulphate
Total Hardness	Total Alkalinity
Ammonia Nitrogen	Total Zinc
Total Cadmium	Total Iron
Total Cobalt	Total Manganese
Total Chromium	Total Nickel
Total Copper	Total Lead
Total Aluminium	Total Arsenic
Total Mercury	Total Organic Carbon (TOC)

Carbonaceous Biochemical Oxygen Demand (cBOD)
Total Petroleum Hydrocarbons (BAK-4 only)
Polycyclic Aromatic Hydrocarbons (BAK-4 only)
Benzene, Toluene, Ethylbenzene, Xylene (BAK-4 only)

5. The Licensee shall measure and record the annual quantities of sludge removed from the Sewage Disposal Facility along with the methods of treatment, storage, and disposal provided.

6. All sampling, sample preservation and analyses shall be conducted in accordance with methods prescribed in the current edition of *Standard Methods for the Examination of Water and Wastewater*, or by such other methods approved by the Board in writing.

7. All analyses shall be performed in a laboratory accredited according to ISO/IEC Standard 17025. The accreditation shall be current and in good standing.

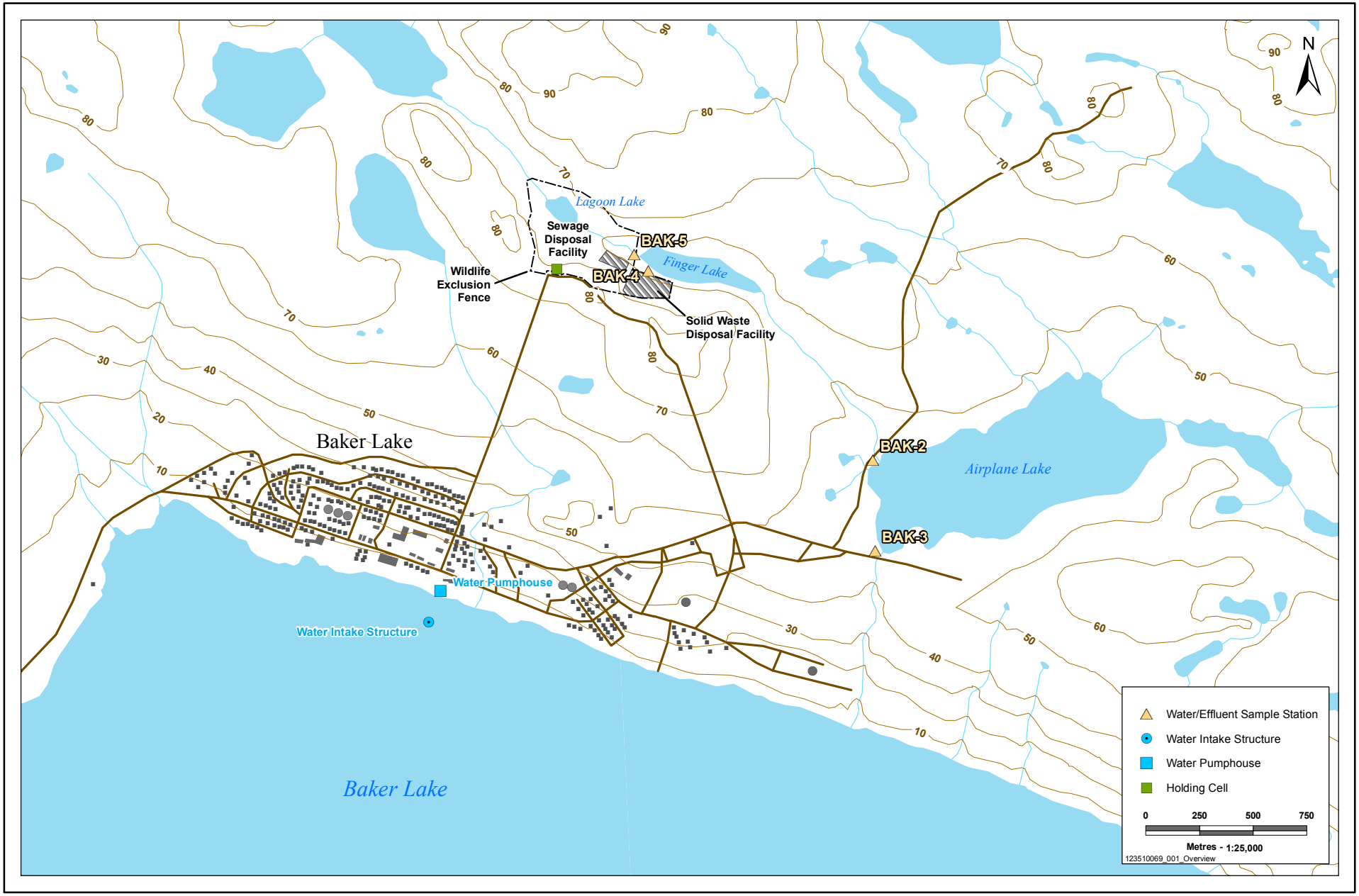
8. The Licensee shall, within ninety (90) days following issuance of the Licence, submit to the Board a Quality Assurance/Quality Control (QA/QC) Plan. The Plan shall be include up to date field sampling methods to all applicable standards, acceptable to an accredited laboratory as required by Part H, Item 6 and Item 7. The Plan shall include a covering letter from an accredited laboratory confirming acceptance of the Plan for analyses to be performed under this Licence.

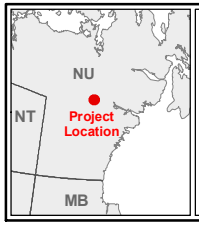
9. The Licensee shall annually review the QA/QC plan submitted under Part H, Item 8 and modify it as necessary. Revised plans shall be submitted to the NWB with an approval letter from an accredited lab that meets standards set in Part H, Item 6 and Item 7.

10. Modifications to the Monitoring Program may be made only upon written approval from the Board. Requests for changes to the Monitoring Program should be forwarded to the NWB in writing, and should include the justification and appropriate evidence to support the change.

APPENDIX B

Water, Sewage and Solid Waste Facilities Figures





Operations and Maintenance Manual for the Water, Sewage and Solid Waste Facilities

Overview of the Water, Sewage and Solid Waste Facilities at Baker Lake, NU

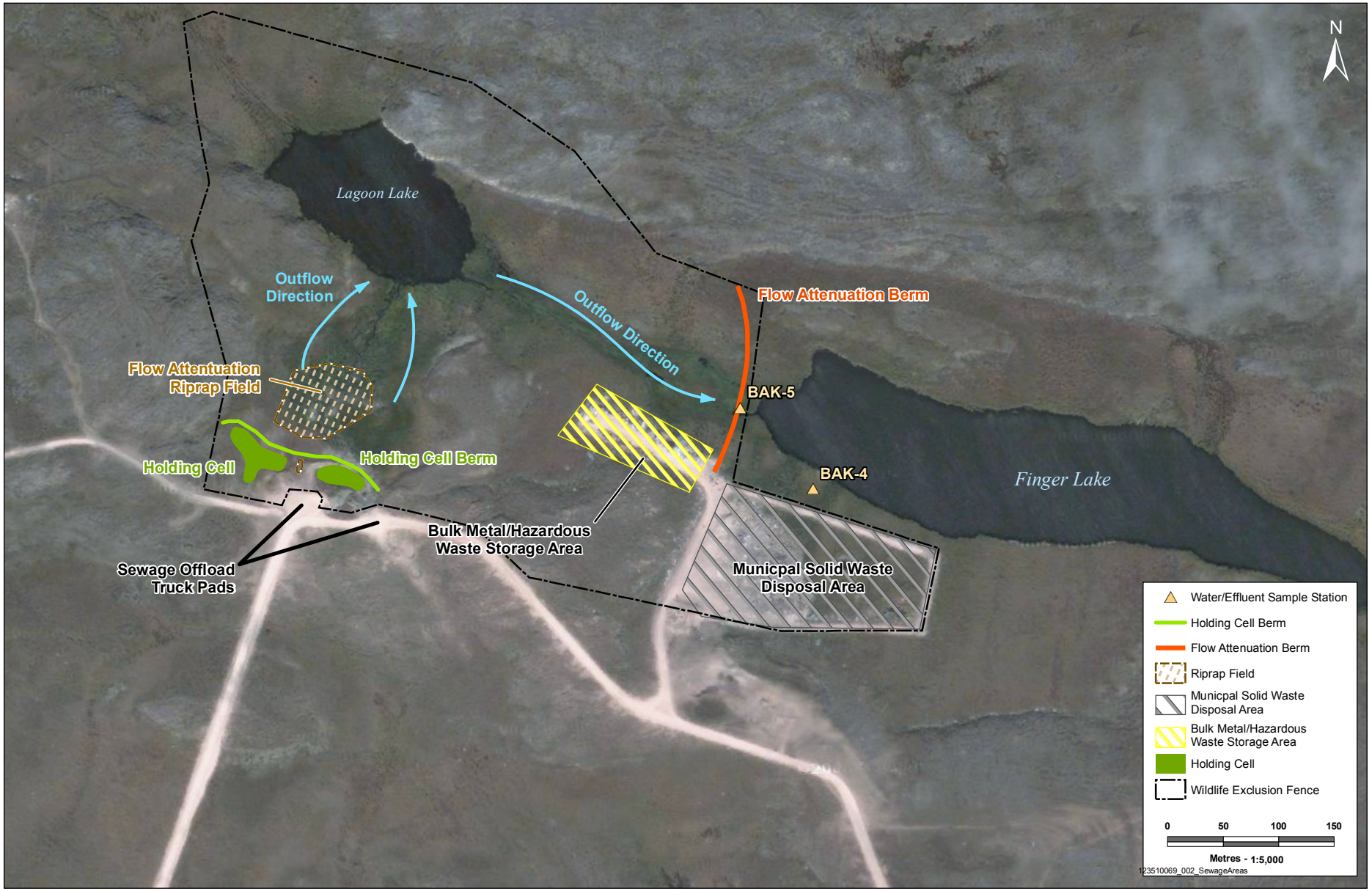
Acknowledgements: Original Drawing by Nunami Stantec

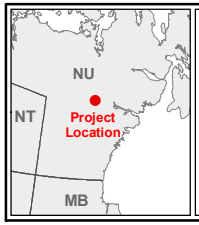
PREPARED FOR NUNAMI STANTEC

PREPARED FOR

FIGURE NO. 1

Last Modified: April 5, 2011 by jastino





Operations and Maintenance Manual for the Water, Sewage and Solid Waste Facilities

Overview of the Sewage and Solid Waste Disposal Facilities at Baker Lake, NU

Acknowledgements: Original Drawing by Nunami Stantec

PREPARED FOR NUNAMI STANTEC

PREPARED FOR

FIGURE NO. 2

Last Modified: April 5, 2011 by jastro

APPENDIX C

Guidelines for Collection Water Samples for Bacterial Analysis at the Water Distribution Facility

GUIDELINES FOR COLLECTION OF WATER SAMPLES FOR BACTERIAL ANALYSIS AT THE WATER DISTRIBUTION FACILITY

Baker Lake, NU

These sample collection procedures should be followed for all bacterial water sampling carried out for drinking water from the water distribution facility in Baker Lake, NU. Following the sample collection procedures will help ensure the correct sample bottles are obtained, proper sampling procedures are completed, and contamination of the samples is minimized.

A. Bottle Order:

1. Clean and sterilised sample bottles must obtained from the laboratory before any water sampling can begin. This is especially important for water samples being analysed for bacteria. Clean and sterilised sample bottles help ensure the water samples are not contaminated during collection, handling, storage and transport.
2. To obtain clean sample bottles, contact the Environmental Health Officer in Rankin Inlet. If the Environmental Health Officer in Rankin Inlet is unavailable, contact the Environmental Health Officer in Iqaluit to send you bottles. You will be sent the correct sample bottles and an Analysis Request form to submit with the water samples. Contact information for the Environmental Health Officers in Rankin Inlet and Iqaluit are provided:

Craig van Lankveld
Environmental Health Officer
Bag 72
Rankin Inlet, NU X0E 0G0
Ph: (867) 645 – 8273
Fax: (867) 645 – 8274
Email: cvanlankveld1@gov.nu.ca

Wanda Joy
Environmental Health Officer
Station 1031, Building 155
Iqaluit, NU X0A 1H0
Ph: (867) 975 – 4817
Fax: (867) 975 – 4833
Email: wjoy@gov.nu.ca

3. Once you receive the sample bottles, they should remain unopened, be kept in the sample cooler they arrived in, and stored in an area away from potential contamination sources (e.g., wastewater, gasoline/diesel, oils, chemicals, etc). DO NOT open the sample bottles you are ready to sample.

B. Preparation:

1. Check local weather forecasts to determine weather conditions when sampling and if there are going to be flight delay or cancellations. Bacterial water samples need to be shipped to the laboratory as soon as possible. Ideally they should make it to the laboratory within 24 to 48 hours of sampling. If there are going to be flight delays or cancellations, collect samples on another day.
2. Double check that you have the required bottles, nitrile or latex gloves, and forms.

C. Sample Collection:

1. Once you arrive at your sampling station, wash your hands thoroughly with soap and water.
2. Turn on the COLD water tap and let the tap run continuously for 2 to 5 minutes. This ensures the water lines are being properly flushed. It is best to run the tap at a medium to slow speed.
3. Put your on nitrile or latex gloves and get the sample bottle ready for sampling. Remove any plastic seal if present. DO NOT OPEN THE SAMPLE BOTTLE.
4. Once the tap has run, remove the lid from the sample bottle and either hold the lid in your hand or place it in a secure location. DO NOT touch the inside of the lid, bottle or neck of the sample bottle.
5. Holding the sample bottle near the base of the bottle, place the sample bottle under the running water and carefully fill the sample bottle to just past the mark on the side of the bottle. DO NOT let the bottle touch the tap at all. DO NOT OVERFILL THE BOTTLE.

   You will notice that there is a white powder already present in the sample bottle. This is a preservative (sodium thiosulphate) and is required to properly preserve the bacterial sample. DO NOT dump this white powder out, rinse the sample bottle or overfill the sample bottle! You will lose some or all of the white powder by doing this and will need to start over with a new sample bottle.
6. When the sample bottle is full, IMMEDIATELY replace the lid of the sample bottle and screw it back on. DO NOT over tighten! DO NOT RE-OPEN THIS BOTTLE.
7. Write the identification information on the label of the sample bottle, including:

   Date and Time of sampling
   Location sampled
   Sampler initials
8. Place the sample back in the cooler.
9. Repeat Steps C.3 to C.8 if taking more than one sample, changing nitrile or latex gloves between each sample.

D. Sample Storage and Transport:

1. Sample Storage – bacterial water samples MUST analysed at the laboratory as soon as possible (within 24 hours) and must be shipped out as soon as they can. Until you are able to ship the sample(s) out, you must ensure they stay cold. Pack the sample cooler with frozen freeze packs or place the samples in a fridge. NEVER FREEZE THE SAMPLE(S).
2. Fill out the Analysis Request form that came with the sample bottles. Before you can send the samples to the laboratory, you must tell them what to analyse the samples for. A completed example and a blank form is included following this procedure.

   It is good practice to put the form in a Ziploc bag to ensure it does not get wet during transport.
3. To properly ship the water samples, ensure sample bottles are wrapped so they do not get broken during transport. Pack the sample coolers with freeze packs so the samples stay cold during transport. You can also fill the remaining space in the cooler with Styrofoam or shredded paper to ensure samples do not move around too much during transport. Make certain the completed Analysis Request form is in the cooler and tape the cooler shut.

4. Label the top of the cooler(s) with the laboratory address and your address. Mark the top of the cooler as URGENT. The address of the laboratory in Rankin Inlet is provided:

   Rankin Inlet Wellness Centre
   Bag 72
   Rankin Inlet, NU
   X0C 0G0

   Attention: Craig van Lankveld
   Ph: (867) 645 – 8273

5. Ship the cooler(s) to the laboratory using Guaranteed or Express service. Ensure the airline delivers the cooler(s) to the Rankin Inlet Wellness Centre. Call the laboratory to ensure they have received the cooler(s) and samples.

Ontario

Ministry of Health and Long-Term Care
Ministère de la Santé et des Soins de longue durée
Public Health Laboratories /
Direction des laboratoires de santé publique

Bacteriological Analysis of Drinking Water for Private Citizen, SINGLE HOUSEHOLD ONLY
Analyse bactériologique de l'eau potable – Particuliers, MÉNAGES UNIFAMILIAUX SEULEMENT

Property owner or resident's name and mailing address/
Nom et adresse postale du propriétaire de la propriété ou du résident

Name/Nom (First/Prénom Last/Nom de famille): John Doe

Street, R.R., Box No./Rue, R.R., casier postal: Hamlet of Baker Lake

City, Town/Ville: Baker Lake

Province: Nunavut

Postal Code/Code postal *: X 0 C 0 A 0

Location of Water Source/Emplacement de la source d'eau

Street address/Adresse municipale: Hamlet office, Nunamiut Lodge, Elementary School

or Lot, Concession/ou lot, concession:

Township/Municipality/Canton, municipalité: Baker Lake

Emergency Locator #/ *:

County/Comté *: Nunavut ON

Postal Code/Code postal *: X 0 C 0 A 0

☐ Location of Water Source same as Property owner or resident's mailing address/
Emplacement de la source d'eau identique à l'adresse postale du propriétaire ou du résident

No Phone / Pas de téléphone ☐

Date collected/Date du prélèvement: 2011 / 08 / 15

Health Unit #/N° du bureau de santé *:

Your Daytime Telephone #/Votre n° tél. le jour: (867) 793-2874

☐ I will pick up report at the laboratory./Je viendrai chercher le rapport au laboratoire.

☑ Please mail to my mailing address above./Veuillez le faire parvenir à mon adresse postale indiquée ci-dessus.

WATER WILL NOT BE TESTED IF THE SHADED AREAS OF THIS FORM ARE NOT COMPLETELY AND ACCURATELY FILLED IN/ NOUS N'ANALYSERONS PAS L'ÉCHANTILLON D'EAU SI LES PARTIES OMBRÉES DE LA FORMULE N'ONT PAS ÉTÉ REMPLIES EN ENTIER ET DE FAÇON EXACTE

Instructions - Please read instructions page carefully before sampling and note information on reverse of this page./Prière de lire la page d'instructions attentivement avant l'échantillonnage et prendre note des renseignements figurant au verso de cette page.

* Please assist the laboratory if possible by also providing this information. List of the 4-digit Health Unit numbers is on the previous page./ Ces renseignements faciliteront le travail du laboratoire. La liste des numéros à 4 chiffres des bureaux de santé se trouve à la page précédente.

EXAMPLE

For Laboratory Use Only/Réservé à l'usage du laboratoire

Interpretation for this water sample/Interprétation de cet échantillon d'eau

This water sample was only tested for the presence of both Total Coliform and *E.coli* bacterial indicators of contamination, by Membrane Filtration. / Cet échantillon d'eau n'a été analysé que pour déceler la présence des coliformes totaux et des bactéries collibacillaires, indicateurs de contamination par filtration sur membrane.

☐ NO SIGNIFICANT EVIDENCE OF BACTERIAL CONTAMINATION
(3 consecutive samples, taken 1 to 3 weeks apart, with this designation are needed to determine the stability of the water supply).
AUCUNE PREUVE DE CONTAMINATION BACTÉRIENNE SIGNIFICATIVE
(cette désignation doit être affectée à 3 échantillons consécutifs, dont le prélèvement aura été espacé de 1 à 3 semaines, pour que la source d'approvisionnement en eau soit jugée stable).

☐ **SIGNIFICANT EVIDENCE OF BACTERIAL CONTAMINATION May be unsafe to drink.** ***(Consult local health unit for information as soon as possible).***
PREUVE DE CONTAMINATION BACTÉRIENNE SIGNIFICATIVE Peut être non potable. ***(Consultez le bureau de santé local le plus tôt possible pour plus de détails).***

Date Reported Stamp/
Date du rapport

☐ **UNSAFE TO DRINK Evidence of sewage contamination.** ***Consult local health unit for appropriate action as soon as possible***
EAU NON POTABLE Preuve de contamination par les égouts. ***Consultez le bureau de santé local le plus tôt possible pour de plus amples renseignements sur les mesures à prendre.***

Total Coliform per 100 mL/Coliformes totaux par 100 mL		*E. coli* per/par 100 mL	
Date of Analysis/ Date de l'analyse	Read by/ Analyse par	Date Read/ Analyse effectuée le	Authorized by (Technologist)/ Autorisé par (Technologiste)

3743-44 (01/07)

These results relate only to the sample tested. / Le résultat obtenu se rapporte seulement à cet échantillon d'eau analysé.

Barcode/Code à barres

Date Received/Reçu le

Laboratory No./N° du laboratoire

Ontario

Ministry of Health and Long-Term Care
Ministère de la Santé et des Soins de longue durée
Public Health Laboratories /
Direction des laboratories de sante publique

Bacteriological Analysis of Drinking Water for Private Citizen, SINGLE HOUSEHOLD ONLY
Analyse bactériologique de l'eau potable – Particuliers, MÉNAGES UNIFAMILIAUX SEULEMENT

Property owner or resident's name and mailing address/
Nom et adresse postale du propriétaire de la propriété ou du résident

Name/Nom (First/Prénom Last/Nom de famille)

Street, R.R., Box No./Rue, R.R., casier postal

City, Town/Ville

Province

Postal Code/Code postal *

Location of Water Source/Emplacement de la source d'eau

Street address/Adresse municipale

or Lot, Concession/ou lot, concession

Township/Municipality/Canton, municipalité

Emergency Locator # *

County/Comté *

ON

Postal Code/Code postal *

☐ Location of Water Source same as Property owner or resident's mailing address/
Emplacement de la source d'eau identique à l'adresse postale du propriétaire ou du résident

No Phone / Pas de téléphone ☐

Date collected/Date du prélèvement yyyy/aaaa/mm/mm/dd/jj

Health Unit #/N° du bureau de santé *

Your Daytime Telephone #/Votre n° tél. le jour ( ) -

☐ I will pick up report at the laboratory./Je viendrai chercher le rapport au laboratoire.

☐ Please mail to my mailing address above./Veuillez le faire parvenir à mon adresse postale indiquée ci-dessus.

WATER WILL NOT BE TESTED IF THE SHADED AREAS OF THIS FORM ARE NOT COMPLETELY AND ACCURATELY FILLED IN/ NOUS N'ANALYSERONS PAS L'ÉCHANTILLON D'EAU SI LES PARTIES OMBRÉES DE LA FORMULE N'ONT PAS ÉTÉ REMPLIES EN ENTIER ET DE FAÇON EXACTE

Instructions - Please read instructions page carefully before sampling and note information on reverse of this page./Prière de lire la page d'instructions attentivement avant l'échantillonnage et prendre note des renseignements figurant au verso de cette page.

* Please assist the laboratory if possible by also providing this information. A List of the 4-digit Health Unit numbers is on the previous page./ Ces renseignements faciliteront le travail du laboratoire. La liste des numéros à quatre chiffres des bureaux de santé se trouve à la page précédente.

For Laboratory Use Only/Réservé à l'usage du laboratoire

Interpretation for this water sample/Interprétation de cet échantillon d'eau

This water sample was only tested for the presence of both Total Coliform and *E.coli* bacterial indicators of contamination, by Membrane Filtration. / Cet échantillon d'eau n'a été analysé que pour déceler la présence des coliformes totaux et des bactéries collibacillaires, indicateurs de contamination par filtration sur membrane.

☐ NO SIGNIFICANT EVIDENCE OF BACTERIAL CONTAMINATION
(3 consecutive samples, taken 1 to 3 weeks apart, with this designation are needed to determine the stability of the water supply).
AUCUNE PREUVE DE CONTAMINATION BACTÉRIENNE SIGNIFICATIVE
(cette désignation doit être affectée à 3 échantillons consécutifs, dont le prélèvement aura été espacé de 1 à 3 semaines, pour que la source d'approvisionnement en eau soit jugée stable).

☐ **SIGNIFICANT EVIDENCE OF BACTERIAL CONTAMINATION May be unsafe to drink.** ***(Consult local health unit for information as soon as possible).***
PREUVE DE CONTAMINATION BACTÉRIENNE SIGNIFICATIVE Peut être non potable. ***(Consultez le bureau de santé local le plus tôt possible pour plus de détails).***

Date Reported Stamp/
Date du rapport

☐ **UNSAFE TO DRINK Evidence of sewage contamination.** ***Consult local health unit for appropriate action as soon as possible***
EAU NON POTABLE Preuve de contamination par les égouts. ***Consultez le bureau de santé local le plus tôt possible pour de plus amples renseignements sur les mesures à prendre.***

Total Coliform per 100 mL/Coliformes totaux par 100 mL	*E. coli* per/par 100 mL

Date of Analysis/ Date de l'analyse	Read by/ Analyse par	Date Read/ Analyse effectuée le	Authorized by (Technologist)/ Autorisé par (Technologiste)

3743-44 (01/07)

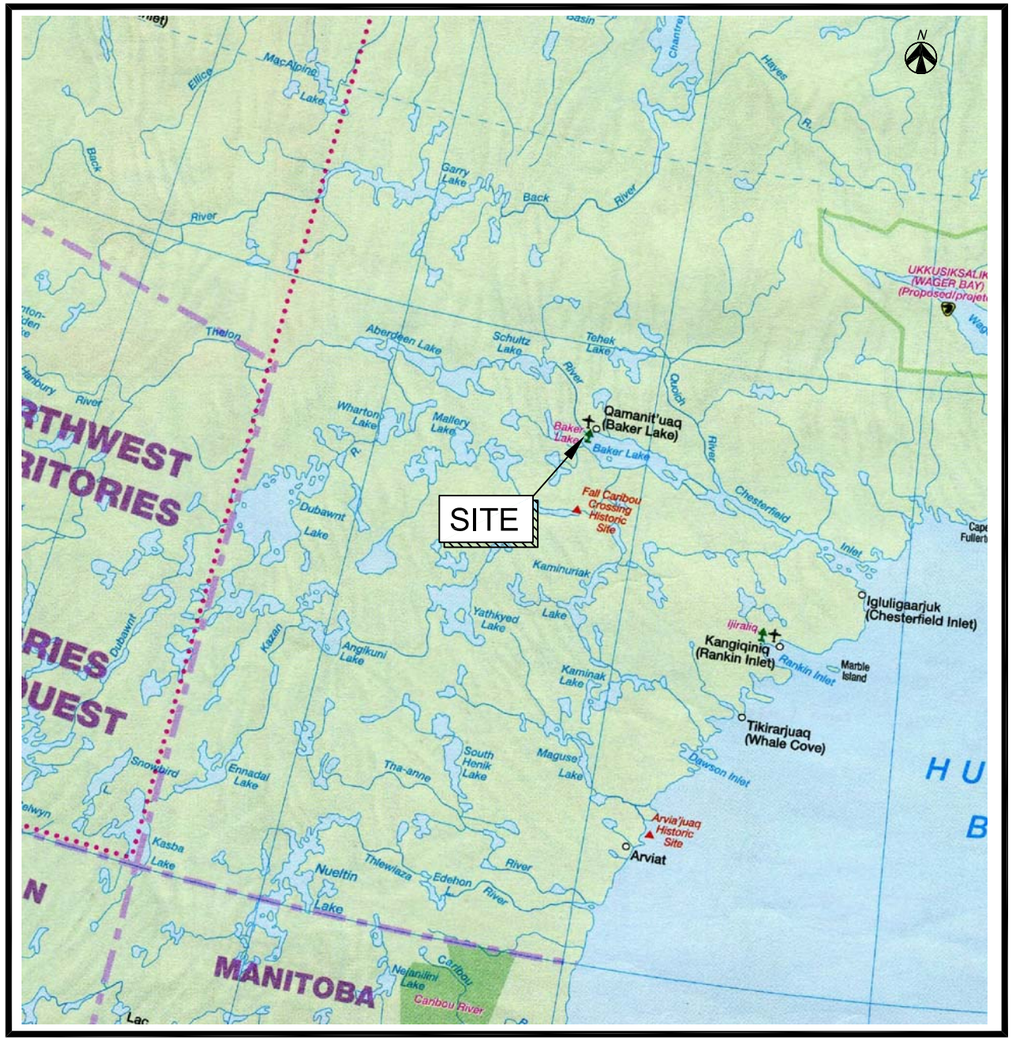
These results relate only to the sample tested. / Le résultat obtenu se rapporte seulement à cet échantillon d'eau analysé.

APPENDIX D

Sewage Treatment Wetland Improvement Design Drawings

GOVERNMENT OF NUNAVUT
DEPARTMENT OF COMMUNITY AND GOVERNMENT SERVICES
BAKER LAKE SEWAGE SYSTEM IMPROVEMENTS
QAMANI'TUAQ, NUNAVUT

Issue for Tender
April 2010



Location Map

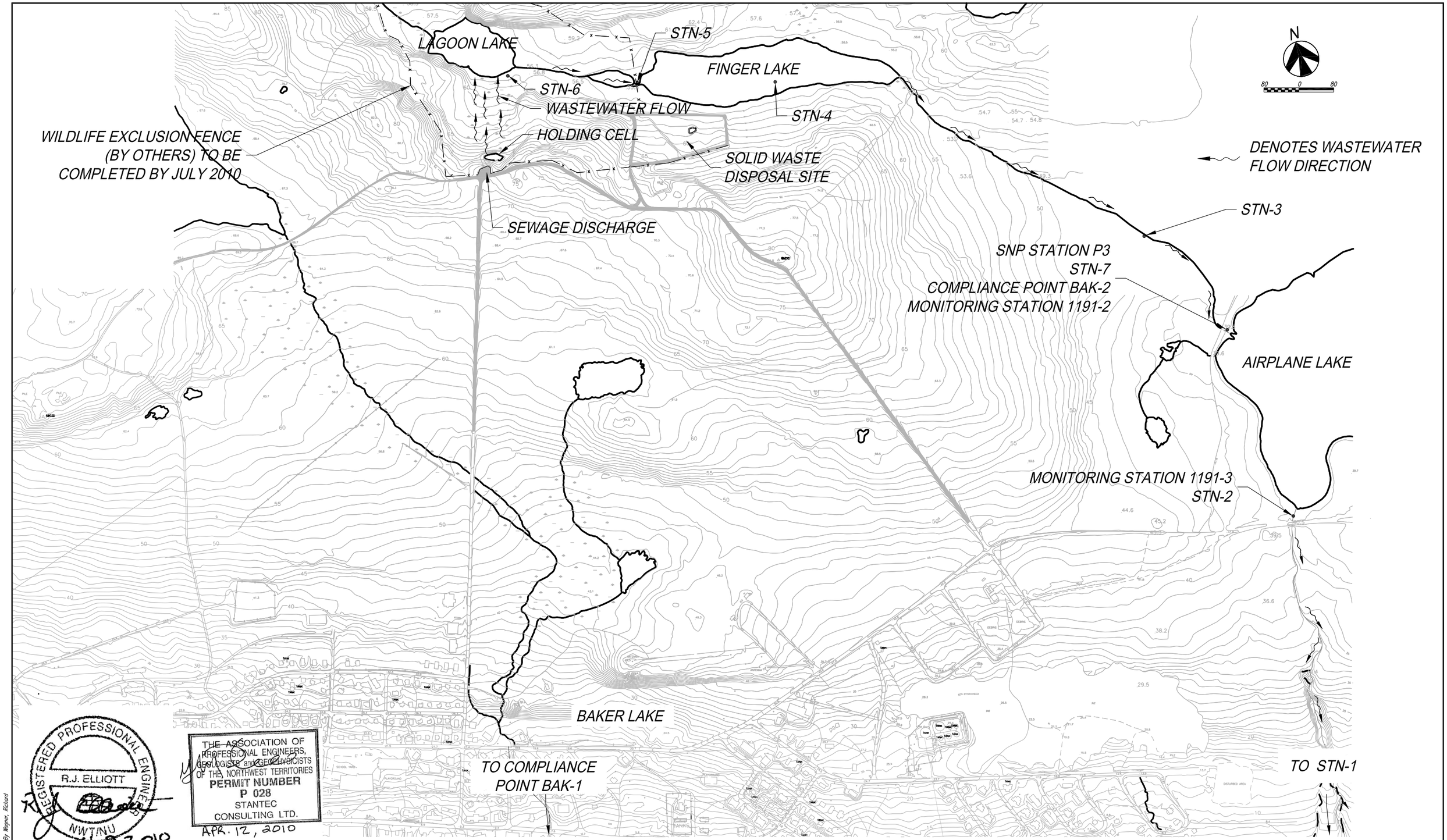
Drawing List

REGISTERED PROFESSIONAL ENGINEER
R.J. ELLIOTT
NWT/NU
April 9, 2010

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER
P 028
STANTEC CONSULTING LTD.
APR. 12, 2010

NUNAMI
JACQUES WHITFORD LIMITED

Stantec NAWE, Inc
4444 Centerville Road, Suite 140
White Bear Lake, MN 55127
651-255-5050
651-255-5060 (fax)



REGISTERED PROFESSIONAL ENGINEER
R.J. ELLIOTT
NWT/NU
April 9, 2010

THE ASSOCIATION OF
PROFESSIONAL ENGINEERS,
GEOLOGISTS and GEOPHYSICISTS
OF THE NORTHWEST TERRITORIES
PERMIT NUMBER
P 028
STANTEC
CONSULTING LTD.
APR. 12, 2010

Plot Date: 12 April 2010 By: Wagner, Richard

Stantec NAWE, Inc
4444 Centerville Road, Suite 140
White Bear Lake, MN 55127
651-255-5050
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NUNAMI
JACQUES WHITFORD LIMITED

Rev	Date	Description
7	4/6/10	Issue for Tender
6	12/18/09	Issue for Tender
5	7/20/09	Issue for Tender

GOVERNMENT OF NUNAVUT
DEPARTMENT OF COMMUNITY AND GOVERNMENT SERVICES
BAKER LAKE SEWAGE SYSTEM IMPROVEMENTS
QAMANI'TUAQ, NUNAVUT

Site Plan
Existing Conditions

C-1
1015263-C001.dwg

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LAGOON LAKE

See Drawing C-5 For Details

See Drawing C-6 For Details

See Drawing C-4 For Details

Lagoon Lake Type 1
Flow Attenuation Berm
(Future, By Others)

FINGER LAKE

Finger Lake Type 1
Flow Attenuation Berm

Existing Holding Cell
(To Be Enlarged)

New Holding Cell

Existing Solid Waste
Disposal Site

Wildlife Exclusion Fence
(By Others)

See Drawing C-3 For Details

REGISTERED PROFESSIONAL ENGINEER
R.J. ELLIOTT
NWT/NU
April 9, 2010

THE ASSOCIATION OF
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Plot Date: 12 April 2010 By Wagner, Richard

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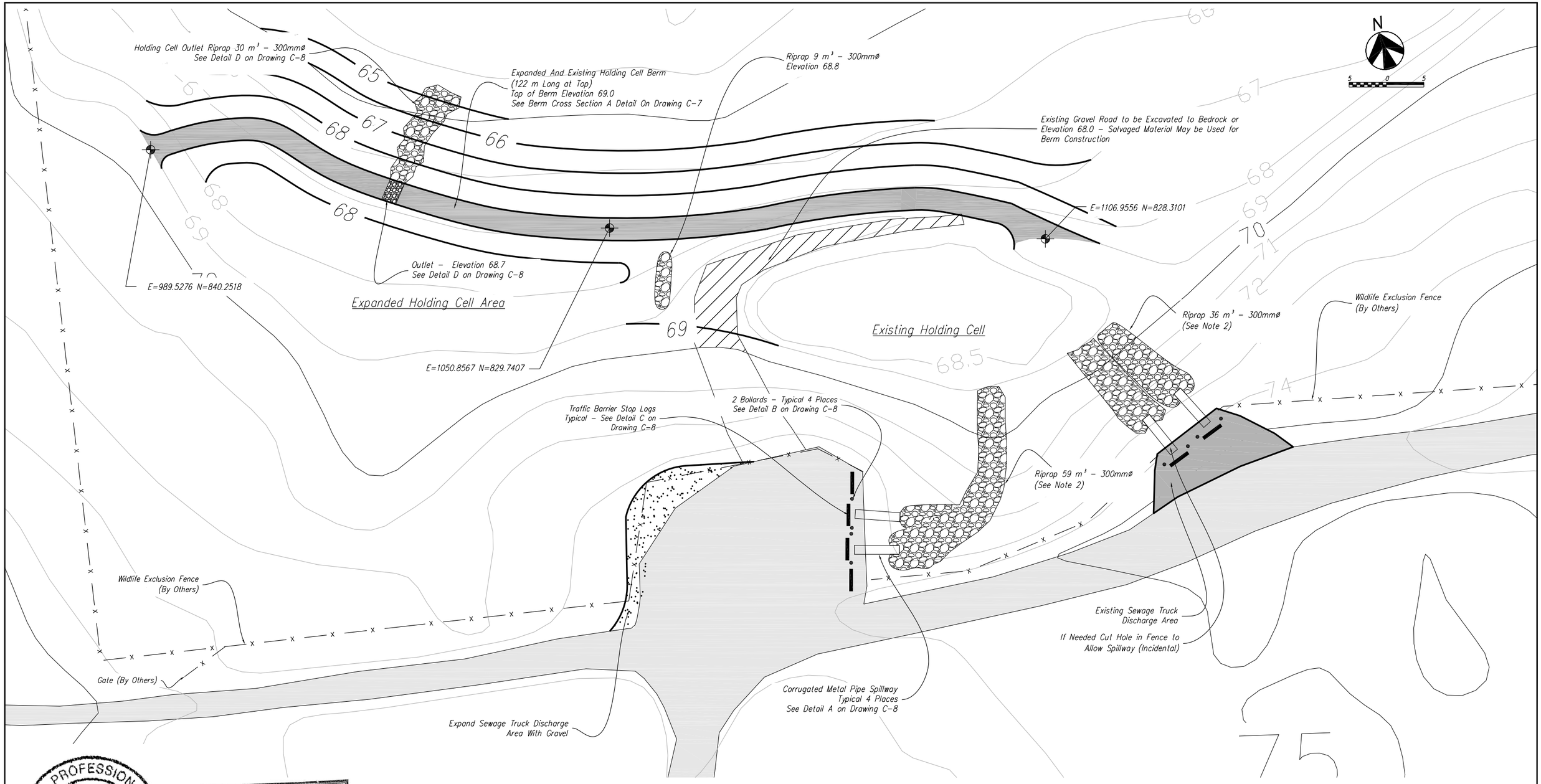
GOVERNMENT OF NUNAVUT
DEPARTMENT OF COMMUNITY AND GOVERNMENT SERVICES
BAKER LAKE SEWAGE SYSTEM IMPROVEMENTS
QAMANI'TUAQ, NUNAVUT

Site Plan
Sewage System Improvements

C-2

1015263-C002-C008.dwg



Notes
1. Construct Expanded Holding Cell Area Prior to Reconstructing Existing Holding Cell Berm.
2. Fill Existing Wastewater Flow Channels (Washouts) With Riprap as Shown.

REGISTERED PROFESSIONAL ENGINEER
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GOVERNMENT OF NUNAVUT
DEPARTMENT OF COMMUNITY AND GOVERNMENT SERVICES
BAKER LAKE SEWAGE SYSTEM IMPROVEMENTS
QAMANI'TUAQ, NUNAVUT

Truck Discharge & Holding Pond Layout

C-3

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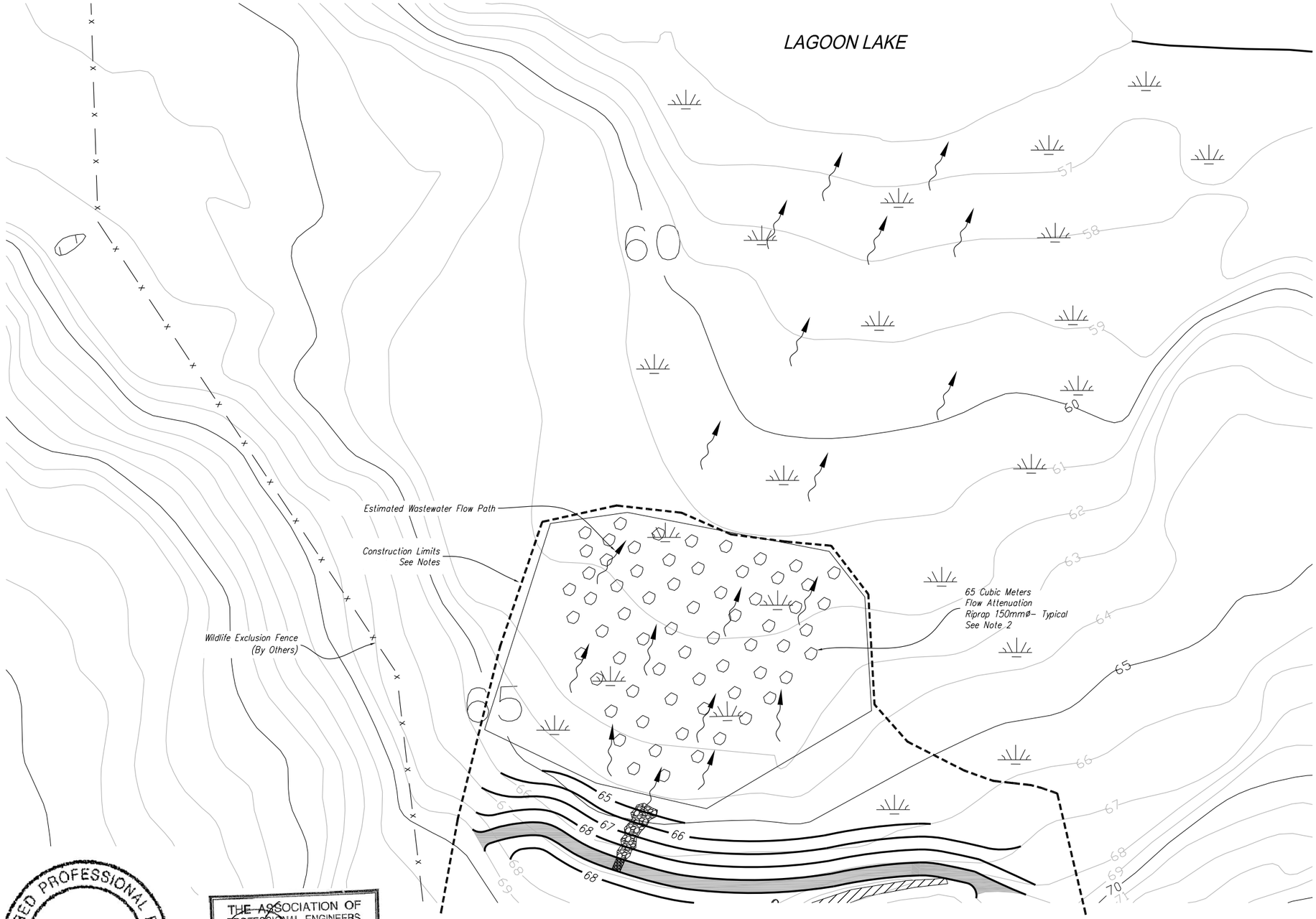

Notes:
1. Contractor Shall Fill in Existing and Any Tire Ruts From Construction Activity Within Tundra Wetland System (Incidental)
2. Place Riprap in Random Locations to Divert Flow Path(s) Within This Area.

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GOVERNMENT OF NUNAVUT
DEPARTMENT OF COMMUNITY AND GOVERNMENT SERVICES
BAKER LAKE SEWAGE SYSTEM IMPROVEMENTS
QAMANI'TUAQ, NUNAVUT

Flow Attenuation Plan

C-4

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N

10 0 10

LAGOON LAKE

59

58

57

E=1241.6990 N=1044.7400

Furnish and Install (2) 600mmØ x 24m Long Corrugated Metal Culverts for Stream Crossing (Approximate Location) (Future, by Others)

Type 1 Flow Attenuation Berm Top of Berm Elevation 58.0
Length 90 m±
See Berm Cross Section B On Drawing C-7
(Future, by Others)

Field Stone (Future, by Others)

Rock Outcrop

Access to Berm

Contractor Shall Coordinate With Hamlet on Access Through Solid Waste Facility (Incidental)

E=1228.7726 N=954.4084

57

58

59

60

61

62

63

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GOVERNMENT OF NUNAVUT
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BAKER LAKE SEWAGE SYSTEM IMPROVEMENTS
QAMANI'TUAQ, NUNAVUT

Type 1 Lagoon Lake Flow Attenuation Berm Plan (Future, By Others)

C-5

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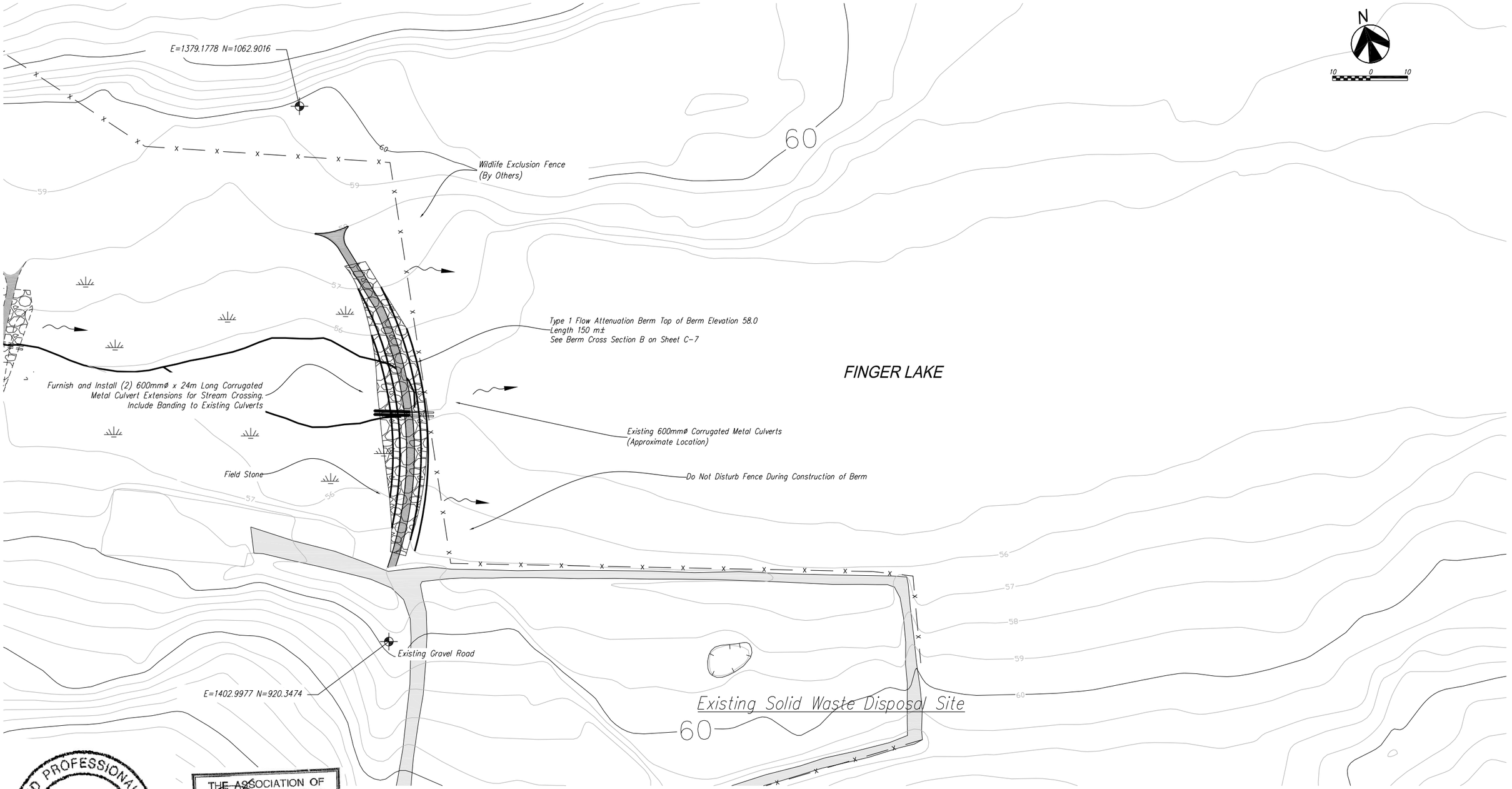

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BAKER LAKE SEWAGE SYSTEM IMPROVEMENTS
QAMANI'TUAQ, NUNAVUT

Type 1 Finger Lake Flow Attenuation Berm Plan

C-6

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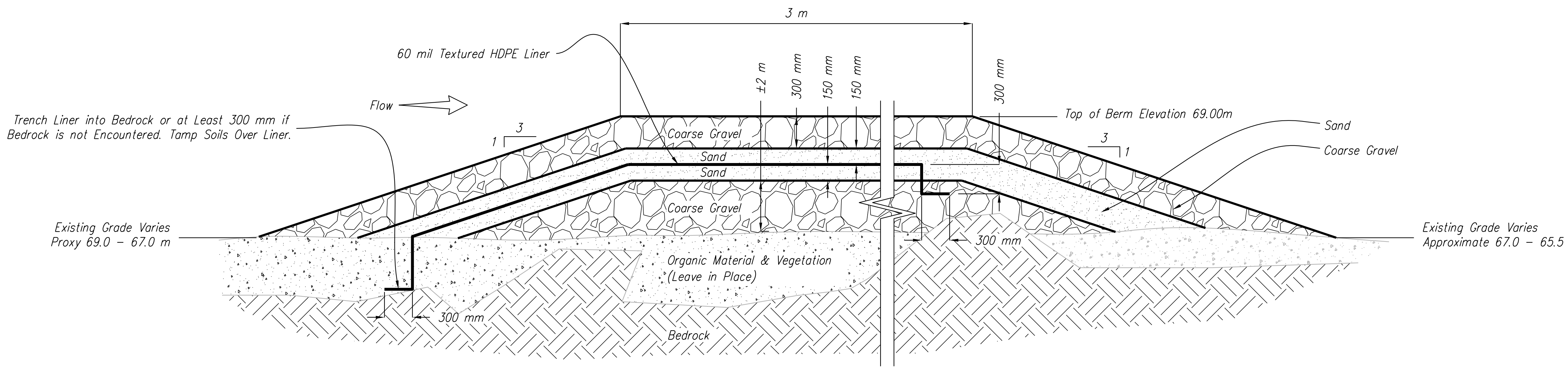
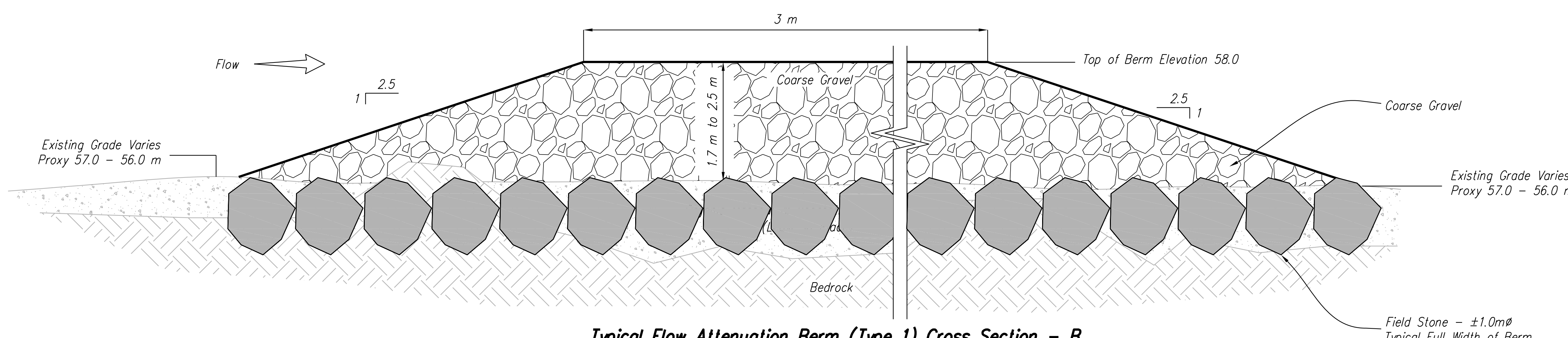


Holding Cell Berm Cross Section – A
Scale: None



Typical Flow Attenuation Berm (Type 1) Cross Section – B
Scale: None

Note: Sand, Coarse Gravel and Field Stone Shall Meet the Applicable Specifications: 31 05 17, 31 24 13 and 32 11 23.

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Berm Cross Sections

C-7

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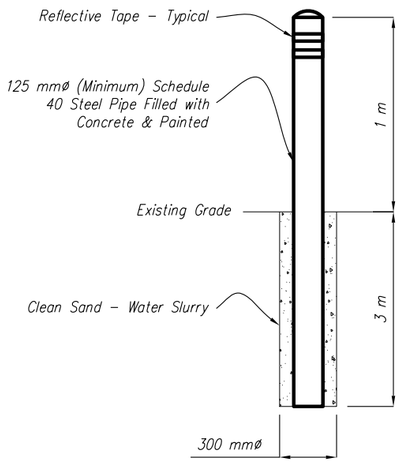
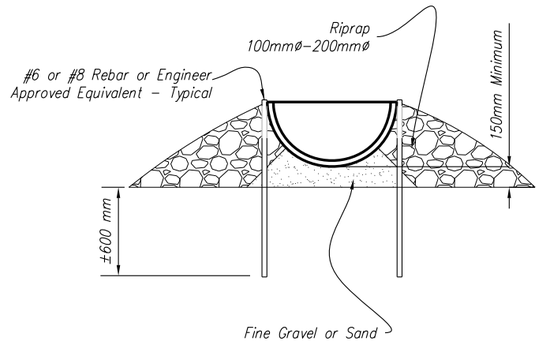
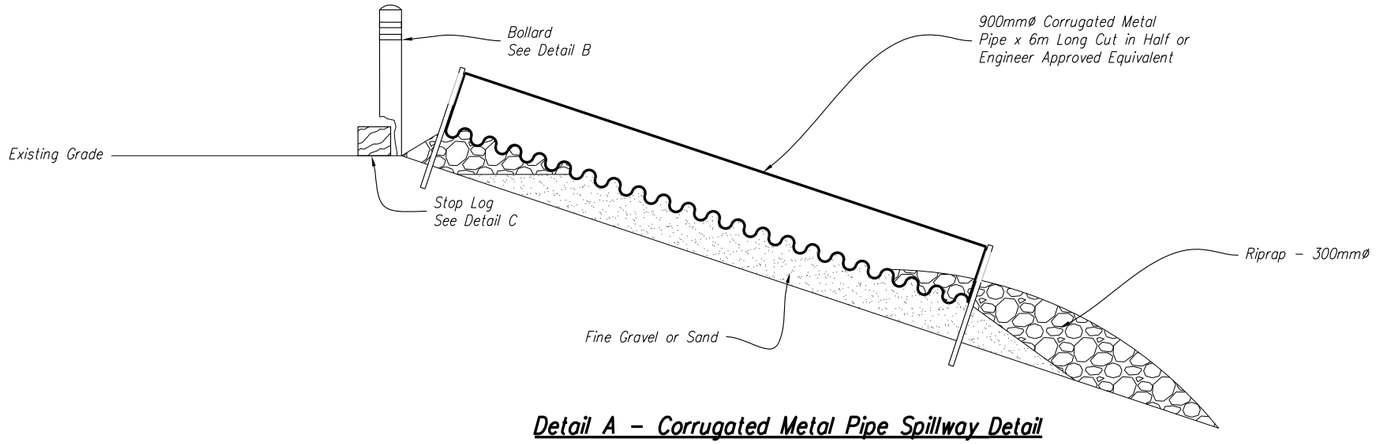
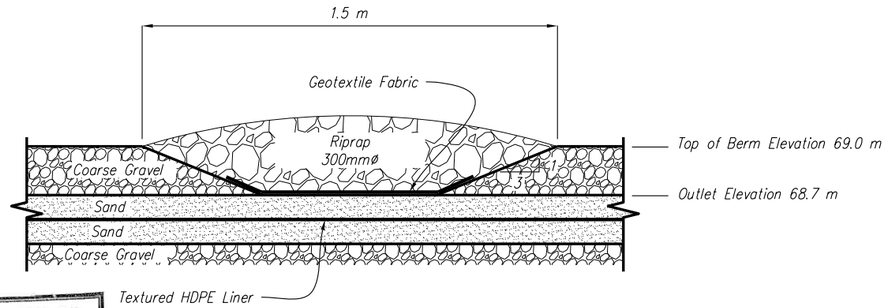


Detail B – Bollard

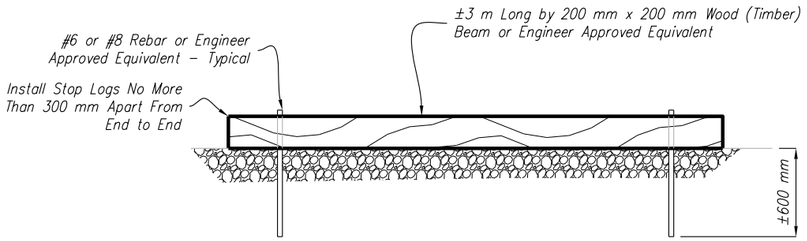




Detail A – Corrugated Metal Pipe Spillway Detail



Detail D – Holding Cell Berm Outlet



Detail C – Traffic Barrier Stop Log

REGISTERED PROFESSIONAL ENGINEER
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April 9, 2010

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GOVERNMENT OF NUNAVUT
DEPARTMENT OF COMMUNITY AND GOVERNMENT SERVICES
BAKER LAKE SEWAGE SYSTEM IMPROVEMENTS
QAMANI'TUAQ, NUNAVUT

Details

C-8

1015263-C002-C008.dwg

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APPENDIX E

O&M Manual Record and Inspection Forms

Hamlet of Baker Lake
Monthly Sewage Volume Record

Month: _____ **Year:** _____ **Truck Number:** _____

Date	Number of Trips	Volume per Trip (litres [L])	Total Daily Volume (litres [L])	Comments / Concerns
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
Monthly Totals				

Hamlet of Baker Lake
Monthly Sewage Disposal Facility Inspection Form

Date: _____ **Inspector(s):** _____

Air Temperature (°C): _____ **Ground Cover:** _____
(e.g. snow covered, vegetation)

Wind Direction & Speed: _____ **Precipitation:** _____

Issues	Are there Concerns?		Description of Concern / Condition / Problem	Action / Maintenance Required	Recurring Problem?	
	Yes	No			Yes	No
Health & Safety (public and personnel)						
Access Road (condition, ditches, snow cover, surface, erosion, etc)						
Offload Truck Pads (condition, snow cover, surface, erosion, etc)						
Offload Chutes & Bollards (condition, stability, etc)						
Signs (presence, condition, readability)						
Holding Cell (berm stability & condition, fence, sewage level, etc)						
Sewage Treatment Wetland (flow attenuation structures condition & stability, drainage courses, water presence, etc)						

Hamlet of Baker Lake
Monthly Sewage Disposal Facility Inspection Form

Issues	Are there Concerns?		Description of Concern / Condition / Problem	Action / Maintenance Required	Recurring Problem?	
	Yes	No			Yes	No
Wildlife						
Odour / Appearance						
Equipment (sewage trucks)						

General Comments:

Hamlet of Baker Lake
Monthly Municipal Solid Waste Quantity Form

Month: _____ **Year:** _____

Date	Waste Delivered by Hamlet Personnel		Waste Delivered by Others	Total (m^3)	Activities Completed at the Municipal Solid Waste Disposal Area (e.g. burning, compacting, segregating, covering, etc)	Staff Initials
	Number of Loads	Estimated Quantity (m^3)	Estimated Quantity (m^3)			
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

Hamlet of Baker Lake
Monthly Municipal Solid Waste Quantity Form

Date	Waste Delivered by Hamlet Personnel		Waste Delivered by Others	Total (m^3)	Activities Completed at the Municipal Solid Waste Disposal Area (e.g. burning, compacting, segregating, covering, etc)	Staff Initials
	Number of Loads	Estimated Quantity (m^3)	Estimated Quantity (m^3)			
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
Monthly Totals						

Hamlet of Baker Lake
Monthly Solid Waste Disposal Facility Inspection Form

Date: _____ **Inspector(s):** _____

Air Temperature (°C): _____ **Ground Cover:** _____
(e.g. snow covered, vegetation)

Wind Direction & Speed: _____ **Precipitation:** _____

Issues	Are there Concerns?		Description of Concern / Condition / Problem	Action / Maintenance Required	Recurring Problem?	
	Yes	No			Yes	No
Health & Safety (public and personnel)						
Access Road (condition, ditches, snow cover, surface, erosion, etc)						
Signs (presence, condition, readability)						
Litter (at fences, on site, off site, etc)						
Fence (stability & condition, etc)						
General Waste Segregation						
Burn Area (only burnables present, burn practices followed, etc)						

Hamlet of Baker Lake
Monthly Solid Waste Disposal Facility Inspection Form

Issues	Are there Concerns?		Description of Concern / Condition / Problem	Action / Maintenance Required	Recurring Problem?	
	Yes	No			Yes	No
Landfill Area						
Landfill Waste Placement & Compaction						
Landfill Waste Cover (stockpile, exposed waste, depth, etc)						
Landfill Cell/Layer Construction (slopes, cover, etc)						
Bulk Metal / Hazardous Waste Storage Area (proper storage, segregation, approved substances/wastes, etc)						
Public Waste Drop-off Area						
Surface Drainage (water flow, erosion, drainage, waste in ditches, etc)						
Leachate Seepage from Solid Waste Disposal Facility (for BAK-4 monitoring station)						
Site Equipment						

Hamlet of Baker Lake
Monthly Solid Waste Disposal Facility Inspection Form

Issues	Are there Concerns?		Description of Concern / Condition / Problem	Action / Maintenance Required	Recurring Problem?	
	Yes	No			Yes	No
Site Planning & Organization						
Wildlife						
Odour / Appearance						

General Comments:

NUNAMI STANTEC

APPENDIX F

Guidelines for Collection of Water / Effluent Samples for General Chemistry Analysis at the Sewage and Solid Waste Disposal Facilities

GUIDELINES FOR COLLECTION OF WATER / EFFLUENT SAMPLES FOR GENERAL CHEMISTRY ANALYSES AT THE SEWAGE AND SOLID WASTE DISPOSAL FACILITIES

Baker Lake, NU

These sample collection procedures should be followed for all water/effluent sampling carried out within and downstream of the sewage treatment wetland and solid waste disposal facility in Baker Lake, NU. Following the sample collection procedures will help ensure the correct sample bottles are obtained, proper sampling procedures are completed, and contamination of the samples is minimized.

A. Bottle Order:

1. Clean sample bottles must obtained from the laboratory before any water sampling can begin. Clean sample bottles help ensure samples are not contaminated during collection, handling, storage and transport. The Hamlet's Senior Administrative Officer (SAO) or Operations Manager must order clean sample bottles from the laboratory. If clean sample bottles are or will be required, please contact the SAO or Operations Manager.
2. Some water samples will require preservatives. Preservatives are typically acids and help ensure the chemical characteristics of the sample stays the same once it has been sampled. The required preservatives will be added to your bottle order by the laboratory.
3. The SAO or Operations Manager will order clean sample bottles from ALS Laboratories in Winnipeg, Manitoba. The SAO or Operations Manager will contact the Hamlet's Laboratory Representative at ALS (Christine Herrod) by email or phone to order the bottles. The SAO or Operations Manager will order a minimum of six sample sets and some deionised water for field blank samples.
4. Once you receive the sample bottles and preservatives, they should be kept in the sample cooler they arrived in, or stored in an area away from potential contamination sources (e.g., wastewater, gasoline/diesel, oils, chemicals, etc)

B. Field Preparation:

1. Check local weather forecasts to determine weather conditions when sampling and if there are going to be flight delay or cancellations. Water samples should be shipped to the laboratory as soon as possible. If there are going to be flight delays or cancellations, you may have to collect samples on another day.
2. Pre-label sample bottles – before you go into the field to collect water samples, it is good practice to label all required sample bottles first. This ensures all required bottles are present, no samples are missed, and samples between monitoring stations do not get mixed up. Always wear nitrile gloves when handling sample bottles.
3. Ensure you have all required preservatives, nitrile gloves, personal equipment (e.g. rubber boots, bug net) and field book or forms (if any).

C. Sample Collection:

1. To further ensure samples remain free from contamination, it is best practice to begin sampling at the "cleanest" monitoring station in the sewage treatment tundra wetland: BAK-3, the outlet of

Airplane Lake. From this point, you can work your way backwards through the wetland, sampling at BAK-5 last. If additional monitoring stations are added to the Hamlet's water license, these should be sampled in order from cleanest to "polluted" (e.g., a station closest to the holding cell).

2. Once you arrive at your monitoring station, try not to disturb anything. Ensure the streambed, banks and water upstream of your station are not disturbed. Try to confine all your activities and equipment downstream of the sampling station.
3. Put your on nitrile gloves and get all bottles and preservatives ready for sampling at the station.
4. If possible, stand in the middle of the stream or outlet point, downstream from where you will be sampling.
5. Holding the sample bottle near the base of the bottle, remove the lid from the sample bottle and either hold the lid in your hand or place it in a secure location. DO NOT touch the inside of the lid, bottle or neck of the sample bottle.
6. Dip the sample bottle into the water upstream from where you are standing, being careful not to touch the stream bottom with the bottle or your hand. Allow the bottle to fill up.

   If there is preservative already in the sample bottle (i.e., the bottle for bacterial samples has a white powder in it), be careful not to fill the bottle too fast or dunk the entire bottle in the stream. This will cause you to lose all the preservative.
7. If your sample requires you to add a preservative, pour some water out of the sample bottle making room for the preservative. Ensure you add the correct preservative to the correct sample. The following samples should have the following preservatives added:

Sample	Preservative
Bacteria (Faecal Coliforms)	Sodium thiosulphate ($Na_2S_2O_3$) (white powder; already in bottle)
Benzene, Toluene, Ethylbenzene and Xylene (BTEX)	Sodium bisulfite ($NaHSO_3$) (white powder or pills; already in vials)
Total Petroleum Hydrocarbons (TPHs)	Sodium bisulfite ($NaHSO_3$) (white powder or pills; already in bottles)
Polycyclic Aromatic Hydrocarbons (PAHs)	Sodium bisulfite ($NaHSO_3$) (white powder or pills; already in bottles)
Ammonia Nitrogen	Sulphuric acid (H_2SO_4)
Total Phenols	Sulphuric acid (H_2SO_4)
Total Metals	Nitric acid (HNO_3)
Oils and Grease	Hydrochloric acid (HCl)

8. Screw the lid of the sample bottle back on. If you have added preservative, lightly shake the sample to mix it with the preservative. Place the sample in the cooler.
9. Repeat Steps C.5 to C.8 for the remaining sample bottles at the monitoring station.
10. Repeat Steps C.2 to C.9 for the remaining monitoring stations. Ensure you change your nitrile gloves between each sampling station.
11. DON'T FORGET – as described in the Quality Assurance / Quality Control (QA/QC) Plan, you have to collect a replicate sample (BAK-7) at one station (repeat sample) and a field blank

sample (BAK-8) of deionised water at the other station. For more information on replicate and field blank samples, please see the Hamlet's QA/QC Plan.

12. To collect the replicate sample (BAK-7), just repeat all sampling procedures in Steps C.2 to C.9 at one monitoring station with a second set of sample bottles.
13. To collect the field blank sample (BAK-8), you will pour water from the deionised water container into each sample bottle. Be sure to follow a similar procedure in attempts to mimic the same sampling conditions. For example, ensure you follow Steps C.5 to C.7.
14. When you have finished sampling, ensure you wash your hands thoroughly with soap and water!

D. Sample Storage and Transport:

1. Sample Storage – water samples MUST analysed at the laboratory as soon as possible; bacterial samples must be analysed within 48 hours. All water samples must be shipped out as soon as possible. Until you are able to ship the sample(s) out, you must ensure they stay cold. Pack the sample cooler with frozen freeze packs or place the samples in a fridge. DO NOT FREEZE THE SAMPLES.
2. Fill out the Chain of Custody form – before you can send the samples to the laboratory, you must tell them what to analyse the samples for. This is done through a Chain of Custody (COC) form, which must be filled out and sent with the samples. An example COC form and a blank COC form are included following this procedure.

   It is good practice to put the COC form in a Ziploc bag to ensure it does not get wet during transport.
3. To properly ship the water samples, ensure any glass sample bottles are wrapped with paper or bubble wrap so they do not get broken during transport. Pack the sample coolers with freeze packs so the samples stay cold during transport. You can also fill the remaining space in the cooler with Styrofoam or shredded paper to ensure samples do not move around too much during transport. Make certain the completed COC is in the cooler and tape the cooler shut.
4. Label the top of the cooler(s) with the laboratory address and your address. If you are sending more than one cooler, ensure you write 1 of _, 2 of _, etc. The address to the laboratory has been provided:

   ALS Laboratories
   Unit 12 – 1329 Niakwa Road
   Winnipeg, MB R2J 3T4
   Ph: (204) 255 – 9720
   Fax: (204) 255 – 9721
5. Ship the cooler(s) to the laboratory with Guaranteed or Express service. Ensure the airline delivers the cooler(s) to ALS Laboratories in Winnipeg. Call the laboratory to ensure they have received the cooler(s) and samples.

Unit 12 – 1329 Niakwa Road
Winnipeg, Manitoba, R2J 3T4
Tel: (204) 255-9720
Fax: (204) 255-9721
Toll Free: 1-800-607-7555

Wastewater Sampling Guide

1. **BOD / CBOD (Biochemical Oxygen Demand), Solids and Nutrient Analysis (Chloride, Sulphate, Nitrates and Nitrites)**
   - Use the 1L plastic bottle.
   - Fill to 95% capacity
   - No preservatives required
   - Keep samples cool, and return to lab as soon as practical. Hold times range from 48 hours to 28 days (i.e., analysis should begin within 48 hours of sampling)

2. **Ammonia Analysis**
   - Use the 250 mL plastic bottle
   - Fill to 95% capacity
   - Add preservative found in plastic vial. **CAUTION:** Preservative is a strong acid (1 mL of 1:1 Sulphuric acid). Add entire contents of the vial to the sample.
   - Cap bottle tightly and invert to mix.
   - Maximum hold time is 28 days.

3. **Metals Analysis (Total Metals)**
   - Use the 250 mL plastic bottle
   - Fill to near capacity
   - Add preservative found in the blue-taped plastic vial. **CAUTION:** Preservative is a strong acid (3 mL of 20% Nitric acid). Add entire contents of the vial to the sample.
   - Cap bottle tightly and invert to mix.
   - Maximum hold time is 6 months.

4. **Fecal Coliforms**
   - This procedure is used for wastewaters and dirty surface waters
   - Use one 100 mL sterile plastic container. Bottles already contain a powder preservative (sodium thiosulphate).
   - Uncap bottle (inside of cap must not come into contact with any surfaces)
   - Fill bottle to the mark. Cap bottle tightly and invert to mix.
   - Keep cool and return to the laboratory as soon as possible
   - Maximum hold time is 48 hours (i.e., analysis should be started within 48 hours).

5. **Oil and Grease as Total Recoverable**
   - Use a one litre (1 L) glass amber bottle
   - Fill to greater than 95% capacity
   - Add preservative found in the yellow-taped plastic vial. **CAUTION:** Preservative is a strong acid (2 mL of 1:1 Hydrochloric acid). Add entire contents of the vial to the sample.
   - Cap bottle tightly and invert to mix.
   - Keep cool, return to lab as soon as possible
   - Maximum hold time is 28 days.

6. **Colourmetric Phenols (Total Phenols)**
   - Use the 250 mL glass amber bottle
   - Fill to 90% capacity
   - Add preservative found in the orange-taped plastic vial. **CAUTION:** Preservative is a strong acid (1 mL of 1:1 Sulphuric acid). Add entire contents of the vial to the sample.
   - Cap bottle tightly and invert to mix.
   - Maximum hold time is 30 days.

7. **BTEX / Volatile Organic Compounds (benzene, ethylbenzene, toluene, xylenes, and fraction one (F1) / total volatile hydrocarbons)**
   - Use three 40 mL clear glass vials for each sample.
   - There is a white powder preservative (sodium bisulfite) in each of the vials.
   - Completely fill the sample vial. There should be no head space (i.e., no bubbles) at the top of the vial. This is best done by carefully overfilling the bottle, then capping it.
   - Invert the vial to verify no air space left in the vial
   - If air spaces (bubbles) are present, uncap the bottle and add more of the sample water. Recap and recheck to verify no air space.
   - Kepp samples cool and return to laboratory as soon as possible.
   - Maximum hold time is 5 days.

8. Total Extractable Hydrocarbons

- Use two 250 mL glass amber bottles for each sample. Bottles already contain preservative (sodium bisulfite)
- Fill to greater than 95% capacity
- Cap bottle tightly and invert to mix.
- Keep cool and return to the laboratory as soon as possible.
- Maximum hold time is 14 days.

9. Polycyclic Aromatic Hydrocarbons (PAHs)

- Use the 1 L glass amber bottle. Bottles already contain preservative (sodium bisulfite)
- Fill to greater than 95% capacity
- Cap bottle tightly and invert to mix.
- Keep cool and return to the laboratory as soon as possible.
- Maximum hold time is 14 days.

ALS Environmental

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

COC # _____

Page 1 of 1

Report To				**Report Format / Distribution**				**Service Requested** (Rush for routine analysis subject to availability)
Company:	Hamlet of Baker Lake			☑ Standard	☐ Other			◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Gary Perkins			☑ PDF	☐ Excel	☐ Digital	☑ Fax	○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	3022 - 4 Avenue P.O. Box 149			Email 1:	blforeman@netkaster.ca			○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Baker Lake, NU X0C 0A0			Email 2:				○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	(867) 793-2874	Fax:	(867) 793-2509	Email 3:				**Analysis Request**
Invoice To	Same as Report ?	☑ Yes	☐ No	**Client / Project Information**				Please indicate below Filtered, Preserved or both (F, P, F/P)
Hardcopy of Invoice with Report?		☑ Yes	☐ No	Job #:	Baker Lake Monitoring Program			
Company:				PO / AFE:				
Contact:				LSD:				
Address:								
Phone:		Fax:		Quote #:	Q288887			
Lab Work Order # (lab use only)				**ALS Contact:**	Christine Herrod	**Sampler:**	JD	

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	BOD, CBOD	Alk, pH, EC, TSS	TOC	Metals & Mercury /Hardness	Anions /Ammonia	Phenols (colourmetric)	Oil & Grease	FC-MF-High	PAH	TEH	BTX, F1		Number of Containers
	BAK-2	15-Aug-11	10:30	Surface Water	X	X	X	X	X	X	X	X					6
	BAK-3	15-Aug-11	11:00	Surface Water	X	X	X	X	X	X	X	X					6
	BAK-4	15-Aug-11	11:30	Surface Water	X	X	X	X	X	X	X	X	X	X	X		9
	BAK-5	15-Aug-11	12:00	Surface Water	X	X	X	X	X	X	X	X					6
	BAK-7	15-Aug-11	11:30	Surface Water	X	X	X	X	X	X	X	X					6
	BAK-8	15-Aug-11	10:30	Surface Water	X	X	X	X	X	X	X	X					6

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
John Doe	15-Aug-11	13:30				°C				

ALS Environmental

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC # _____

Page ____ of ____

Report To		**Report Format / Distribution**	**Service Requested** (Rush for routine analysis subject to availability)
Company:	Hamlet of Baker Lake	☑ Standard ☐ Other	◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Gary Perkins	☑ PDF ☐ Excel ☐ Digital ☑ Fax	○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	5021-49th Street PO Box 1680	Email 1: blforeman@netkaster.ca	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Baker Lake, NU X0A 0C0	Email 2:	○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	(867) 793-2874 Fax: (867) 793-2509	Email 3:	**Analysis Request**
Invoice To	Same as Report ? ☑ Yes ☐ No	**Client / Project Information**	Please indicate below Filtered, Preserved or both (F, P, F/P)
Hardcopy of Invoice with Report?	☑ Yes ☐ No	Job #: Baker Lake Monitoring Program	
Company:		PO / AFE:	
Contact:		LSD:	
Address:			
Phone:	Fax:	Quote #: Q288887	
Lab Work Order # (lab use only)		**ALS Contact:** Christine Herrod	**Sampler:**

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	BOD, CBOD	Alk, pH, EC, TSS	TOC	Metals & Mercury /Hardness	Anions /Ammonia	Phenols (colourmetric)	Oil & Grease	FC-MF-High	PAH	TEH	BTX, F1		Number of Containers
	BAK-2																
	BAK-3																
	BAK-4																
	BAK-5																
	BAK-7																
	BAK-8																

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

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SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature: ºC	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

GENERAL TERMS AND CONDITIONS:

These terms and conditions are incorporated in and form part of the Agreement between ALS Laboratory Group – Environmental Division ("ALS") and the party named in the Offer (the "Client").
1. Definitions. Capitalized Terms not defined in these Terms and Conditions have the definitions set out in the other Agreement documents.
2. The Services. ALS will provide the Services to the Client as described in the Offer and in any change of custody form provided with any sample.
3. Prices. ALS may review and change all prices, fees, surcharges or other charges set out in the Agreement if there are changes to ALS's cost beyond ALS's control, including changes in legislative requirements, Client variations of sample numbers and Client requests for changes to standard reporting requirements. Notwithstanding Condition 3, all quotations are reviewed and updated on a yearly basis.
4. Payment Terms. The Client shall pay ALS within 30 days of the invoice date OAC. ALS may, for reasonable business reasons, require the Client to arrange for payment in advance.
5. Quotation Numbers. The Client shall provide the quotation number to ALS (where applicable) to ensure correct pricing.
6. Taxes. Applicable taxes are not included in prices, surcharges and additional fees and will be added at the time of invoicing.
7. Quality Control. ALS has an extensive QA/QC program and all analytical data reported is analyzed using approved, referenced procedures followed by checks and reviews of senior managers and quality assurance personnel.
8. No Guarantee of Results. Results are obtained from chemical measurements. The Client is responsible for informing itself on the limitation of the results and acknowledges that the results are not guaranteed.
9. Standard of Care. ALS will use reasonable care and diligence as required by the laws of the province or territory where the sample is tested.
10. Storage. Where possible, ALS will store samples for 30 days from the date a final report is issued to the Client, after which ALS may discard the sample.
11. Holds. If the Client requests a sample be placed on hold, ALS will store the sample for 60 days for the quoted price, after which ALS will invoice the Client and discard the sample.
12. Archives. If the Client requests a sample be archived, ALS will stored the sample for 6 months for the quoted price, after which ALS will invoice the Client and discard the sample.
13. Handling Protocol. Legal sample handling protocol must be arranged before samples are collected. ALS may charge a 20% surcharge on the list price plus the hourly technologist or chemist rates for legal sample protocol. Samples processed under legal protocol are stored indefinitely (storage charges may apply).
14. Samples. The quality, condition, content and source of samples stored and tested are not known to ALS except as declared and described on the chain of custody form completed and submitted by the Client and accompanying the sample.
15. Risk of Loss. ALS will use reasonable care to protect samples during storage, however all samples are stored at the Client's risk and the Client is responsible for obtaining appropriate insurance, if desired. The Client acknowledges that during the performance of the Services samples may be altered, lost, damaged or destroyed and the Client releases ALS from any claim the Client may have for any loss or damage to the sample.
16. Environmental. The Client must comply with all applicable environment legislation, including labeling all hazardous samples to comply with WHMIS and TDG regulations, and must provide appropriate material safety data sheets that include the nature of the hazard and a contact name and phone number to call for information. The Client will indemnify ALS for all loss or damages, including any fine or cost of complying with an order of any government authority, resulting from the Client's breach of this paragraph.
17. Hazardous Materials Disposal. ALS may return, at the Client's cost, hazardous material to the Client for disposal.
18. Hazardous Materials Surcharge. ALS may apply an additional surcharge for handling of hazardous samples or samples with Naturally Occuring Radioactive Materials (NORM), H_2S, CN, etc.
19. Sample Containers. ALS may ship sample containers to the Client's location by the most cost effective means using ALS preferred courier suppliers, within the specified project timeline.
20. Additional Charges. ALS may charge the Client (a) its cost for emergency bottle shipments and shipments to and from a remote site, and (b) where pick up and delivery services are provided, subject in each instance to a minimum charge of $25.00.
21. Large Bottle Orders. The Client shall provide ALS with 24 hours notice for large bottle orders.
22. Re-Tests. ALS reserves the right to re-test any samples that remains in its possession. Re-tests requested by the Client may be charged.
23. Waiver. The Client is responsible for making any assessment regarding the suitability of the Services and the intended results for the Client's purposes and waives any claims against ALS it may have as a result of the interpretation of the results. The Client shall indemnify ALS for all claims made by any third party against ALS in respect of all losses however arising from the performance of the Services or the use of any report provided in the performance of the Services.
24. Limitation of Liability. In no event shall ALS be liable for any consequential, indirect, incidental, special, exemplary or punitive damages, whether foreseeable of unforeseeable, (including claims for loss of profits or revenue or losses caused by stoppage of other work or impairment of other assets) incurred by the Client arising out of breach or failure of express of implied warranty, breach of contract, breach of warranty, misrepresentation, negligence, strict liability in tort or otherwise. In any event, the liability of ALS to the Client shall be limited to the cost of testing the sample as requested in the chain of custody form under which the sample was originally deposited. For the purposes of this paragraph and paragraphs 8, 15, 16, 23 and 25, as the applicable, "ALS" includes without limitations its directors, officers, employees and affiliates and the "Client" includes without limitation any third party that may have a claim against ALS through the Client.
25. Notice of Liability. Notwithstanding paragraph 24, ALS shall not be liable to the Client unless the Client provides notice in writing to ALS of such loss or damage, together with full particulars thereof, within 30 days of the Client's receipt of the report of the analysis of the sample giving rise to such liability. The provisions of this paragraph allocate the risk under the Agreement between the Client and ALS, and the fees to be paid by the Client to ALS reflect this allocation of risks and the limitations of liability in this Agreement.
26. Entire Agreement. The Agreement is the entire agreement between the parties and supercedes and takes precedence over any terms and conditions contained in any documentation provided by the Client. ALS's execution of any subsequent documentation from the Client only acknowledges receipt and not acceptance of any terms or conditions therein. If there is a conflict between these terms and conditions and any other Agreement document, these terms and conditions prevail.

GENF 19.00 Terms

ALS Environmental

Canadian Locations (Toll Free 1-800-668-9878)

Vancouver, BC
8081 Lougheed Hwy
Burnaby, BC, Ph: 604-253-4188
V5A 1W9 Fax: 604-253-6700

Fort St. John, BC
10345A Dogwood Street
Grandhaven, BC
Mailing: Box 256, 9420 - 93rd Ave
Fort St. John , BC Ph: 250-261-5517
V1J 6W7 Fax: 250-261-5587
After Hours / Emergency Ph: 250-261-4947

Grande Prairie, AB
9505-111 Street
T8V 5W1 Fax: 780-513-2191
After Hours / Emergency Ph: 780-512-4343

Calgary, AB
1313-44 Avenue NE
T2E 6L5 Fax: 403-291-0298
After Hours / Emergency Ph: 403-651-1471

Edmonton, AB
9936-67 Avenue NW
Edmonton, AB Ph: 780-413-5227
T6E 0P5 Fax: 780-437-2311
After Hours / Emergency Ph: 780-913-2299

The Centre, AB
5424 97th Street
Edmonton, AB Ph: 780-391-2300
T6E 5C1 Fax: 780-434-9178

Fort McMurray, AB
Bay 1, 245 MacDonald Crescent
Fort McMurray, AB Ph: 780-791-1524
T9H 4B5 Fax: 780-791-1586
After Hours / Emergency Ph: 780-714-8482

Saskatoon, SK
819 - 58 Street East
Saskatoon, SK Ph: 306-668-8370
S7K 6X5 Fax: 306-668-8383
After Hours / Emergency Ph: 306-221-7147

Winnipeg, MB
1329 Niakwa Road East, Unit 12
Winnipeg, MB Ph: 204-255-9720
R2J 3T4 Fax: 204-255-9721
After Hours / Emergency Ph: 204-784-6677

Thunder Bay, ON
1081 Barton Street
Thunder Bay, ON Ph: 807-623-6463
P7B 5N3 Fax: 807-623-7598
After Hours / Emergency Ph: 807-624-4482

Waterloo, ON
60 Northland Drive, Unit 1
Waterloo, ON Ph: 519-886-6910
N2V 2B8 Fax: 519-886-9047
After Hours / Emergency Ph: 519-589-0044

London, ON
309 Exeter Road, Unit #29
London, ON Ph: 519-652-6044
N6L 1C1 Fax: 519-652-0671

Mississauga, ON
5730 Coopers Avenue, Unit 26
Mississauga, ON Ph: 905-507-6910
L4Z 2E9 Fax: 905-507-6927

Burlington, ON
5420 Mainway Drive, Unit 5
Burlington, ON Ph: 905-331-3111
L7L 6A4 Fax: 905-331-4567

Richmond Hill, ON
95 West Beaver Creek Road, Unit 1
Richmond Hill, ON Ph: 905-881-9887
L4B 1H2 Fax: 905-881-8062

Yellowknife, NT
75 Con Road
Yellowknife, NT Ph: 867-873-5593
X1A 2M1 Fax: 867-920-4238
After Hours / Emergency Ph: 867-446-5593

Sample Container, Preservation and Holding Time Table. Keep samples cool (4ºC) and ship to an ALS location as soon as possible.

Note: Specific container, preservation and holding times may vary based on regulatory requirements - consult your local ALS laboratory for assistance prior to sampling.

Inorganics	Analysis [1]	Water Container	Water Preservation	Additional Notes	Soil Container	Water / Soil Hold Time
ROUTINE INORGANICS AND MISC	Acidity and Alkalinity	0.5-1 L Plastic			125-250 mL Jar or Bag	14 Days / NA
	Anions (Br, Cl, SO4, F) and Electrical Conductivity	0.5-1 L Plastic			125-250 mL Jar or Bag	28 Days / 6 Months
	Bromate, Chlorate and Chlorite	125 mL Plastic	EDA (Ethylenediamine)		NA	28 Days (Chlorite 14 Days) / NA
	BOD, Colour or Turbidity	0.5-1 L Plastic			NA	2-3* Days / NA
	COD and Phenols (colourimetric)	100 - 250 mL Glass	1:1 Sulfuric Acid (H2SO4)		NA	28 Days / NA
	Cyanide, Total or Weak Acid Dissociable	250 mL Plastic	6N NaOH		125-250 mL Jar or Bag	14 Days / 7 Days
	Dissolved Oxygen	300 mL BOD bottle	1 each; MnSO4 & alkaline iodide azide pillows		NA	8 Hours / NA
	Dissolved or Total Inorganic Carbon (DIC or TIC)	100 mL Amber Glass		Field Filter for Dissolved	125-250 mL Jar or Bag	14 Days / 14 Days
	Dissolved or Total Organic Carbon (DOC or TOC)	100 mL Amber Glass	1:1 Hydrochloric Acid (HCl)	Field Filter for Dissolved	125-250 mL Jar or Bag	28 Days / 14 Days
	Flashpoint	2 x 100mL Amber Glass		Zero Headspace	125-250 mL Jar	14 Days / 14 Days
	pH	0.5-1 L Plastic			125-250 mL Jar or Bag	0.25 Hours / 1 Year
	Solids (TS, TSS, TDS)	0.5-1 L Plastic			NA	7 Days / NA
	Sulfide	125 mL Plastic	Zinc Acetate & 6N NaOH		125-250 mL Jar or Bag	7 Days / 7 Days
	Sulfite	125 mL Plastic	EDA (Ethylenediamine)		NA	48 Hours / NA
NUTRIENTS	Ammonia Nitrogen	250 mL Plastic	1:1 Sulfuric Acid (H2SO4)		125-250 mL Jar or Bag	28 Days / 48 Hours
	Nitrate or Nitrite Nitrogen (and Ammonia unpreserved)	0.5-1 L Plastic			NA	2-3* Days / NA
	Nitrogen, Kjeldahl, Organic, Total or Dissolved	250 mL Glass/Plastic	1:1 Sulfuric Acid (H2SO4)	Field Filter for Dissolved	NA	28 Days / NA
	Nitrogen, Total or TKN-Calc (BC Only)	250 mL Glass/Plastic	1:1 Hydrochloric Acid (HCl)		NA	28 Days / NA
	Nutrients, Available (N,P,K,S)	NA			125-250 mL Jar or Bag	NA / 14 Days
	Phoshorous, Reactive (orthophosphate)	0.5-1 L Plastic			NA	2-3* Days / NA
	Phosphorous, Total Dissolved	0.5-1 L Plastic	1:1 Sulfuric Acid (H2SO4)	Field Filter for Dissolved	NA	28 Days / NA
	Phosphorus, Total	500 mL Plastic	1:1 Sulfuric Acid (H2SO4)		NA	28 Days / NA
METALS	Chromium VI (Hexavalent)	125 mL Plastic	50 % NaOH		125-250 mL Jar or Bag	30 Days / 30 Days
	Mercury, Methyl	250 mL pre-cleaned Glass or TFE	Contact Lab	Contact Lab	125-250 mL Jar or Bag	6 Months / 40 Days
	Mercury, Total or Dissolved	250 mL Plastic	1:3 Nitric Acid to pH<2	Field Filter for Dissolved	125-250 mL Jar or Bag	28 Days / 28 Days
	Metals, Total or Dissolved	250 mL Plastic	1:3 Nitric Acid to pH<2	Field Filter for Dissolved	125-250 mL Jar or Bag	6 Months / 6 Months
Organics						
HYDRO-CARBONS	BTEX / FI or VPH	2 or 3 x 40 mL Glass Vials [3]	Sodium Bisulfate	Zero Headspace	125 mL Jar	14 Days / 7 Days
	Volatile Organics (THM, EPA 624, Perchloroethylene)	2 or 3 x 40 mL Glass Vials [3]	Sodium Bisulfate [2]	Zero Headspace	125 mL Jar	14 Days / 7 Days
	CWS F2-F4	2 x 250 mL Amber Glass	Sodium Bisulfate [2]		125 - 500 mL Jar	14 Days / 14 Days
	EPH or LEPH/HEPH	2 x 500 mL Amber Glass	Sodium Bisulfate [2]		125 - 500 mL Jar	14 Days / 14 Days
	Polycyclic Aromatic Hydrocarbons (PAHs)	2 x 0.5 - 1 L Amber Glass	Sodium Bisulfate [2]		125 - 500 mL Jar	14 Days / 14 Days
	Oil &Grease or Mineral Oil & Grease	2 x 0.5 - 1 L Amber Glass	1:1 HCl or H2SO4		125 - 500 mL Jar	28 Days / 28 Days
TRACE ORGANICS	Alcohols	2 x 40 mL Glass Vials [3]		Zero Headspace	125 - 500 mL Jar	7 Days / 14 Days
	Alkanolamines (MEA, DEA, DIPA)	1 L Amber Glass			125 - 500 mL Jar	7 Days / 14 Days
	Dioxins and Furans	2 x 1 L Amber Glass			125 - 500 mL Jar	Unlimited / Unlimited
	EOC (Extractable Organic Chlorides)	1 L Amber Glass			125 - 500 mL Jar	14 Days / 28 Days
	Formaldehyde	2 x 40 mL Glass Vials [3]	Copper Sulphate	Zero Headspace	125 - 500 mL Jar	7 Days / 5 Days
	Glycols	2 x 40 mL Amber Glass Vials			125 - 500 mL Jar	7 Days / 14 Days
	Naphthenic Acids	2 x 250 mL Amber Glass			125 - 500 mL Jar	14 Days / 14 Days
	PCB	2 x 0.5 - 1 L Amber Glass			125 - 500 mL Jar	Unlimited / Unlimited
	Phenolics, Chlorinated and Non-Chlorinated	2 x 0.5 - 1 L Amber Glass	Ascorbic Acid & Sodium Bisulfate		125 - 500 mL Jar	14 Days / 14 Days
	Priority Pollutants (EPA 625 list)	2 x 1 L Amber Glass			500 mL Jar	7 Days / 14 Days
	Resin Acids & Fatty Acids	2 x 0.5 - 1 L Amber Glass	Ascorbic Acid & NaOH		125 mL Jar	14 Days / 14 Days
	Sulfolane	2 x 0.5 - 1 L Amber Glass			125 mL Jar	7 Days / 14 Days
PESTICIDE RESIDUES	Carbamate Pesticides	2 x 1 L Amber Glass	Potassium Dihydrogen Citrate or ChlorAC buffer		125 - 500 mL Jar	28 Days / 14 Days
	Glyphosate / AMPA	2 x 1 L Amber Glass	Use Sodium Thiosulfate if chlorinated		125 - 500 mL Jar	14 Days / 14 Days
	Herbicides, Acidic	2 x 1 L Amber Glass	Sodium Bisulfate		125 - 500 mL Jar	14 Days / 14 Days
	Nonylphenol & Ethoxylates	2 x 0.5 - 1 L Amber Glass	Sodium Bisulfate		125 - 500 mL Jar	28 Days / 14 Days
	Organochlorine or Organophosphate Pesticides	2 x 1 L Amber Glass			125 - 500 mL Jar	7 Days / 14 Days
	Soil Sterilant Scan	2 x 1 L Amber Glass			250 g Poly Bag	7 Days / 14 Days
Micro						
MICRO-BIOLOGICAL	Coliforms - Fecal /Total/E-coli or Heterotrphic Plate Count(HPC)	250 mL Sterilized Plastic	Sodium Thiosulfate		500 mL Sterilized Jar	24-30 Hours (24 - HPC) / NA
	Microtox	1 L Amber Glass			125-250 mL Jar or Bag	3 Days / 3 Days

1. Additional analyses with the same container and preservation may be possible - consult the lab for details.
2. Use Sodium Thiosulfate instead of Sodium Bisulfate if sample is chlorinated.
3. The number of 40 mL glass vials required (2 or 3) for BTEX & VOC varies by lab based on instrumentation. Consult the lab for details.

* 3 Day holding time for British Columbia as per BC Ministry of Environment (2009)

APPENDIX G

Northwest Territories – Nunavut Spill Report Form

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR	REPORT TIME	☐ ORIGINAL SPILL REPORT, OR ☐ UPDATE # _____ TO THE ORIGINAL SPILL REPORT	REPORT NUMBER ____-_____
B	OCCURRENCE DATE: MONTH – DAY – YEAR	OCCURRENCE TIME		

C	LAND USE PERMIT NUMBER (IF APPLICABLE)	WATER LICENCE NUMBER (IF APPLICABLE)
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION	REGION ☐ NWT ☐ NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN
E	LATITUDE DEGREES MINUTES SECONDS	LONGITUDE DEGREES MINUTES SECONDS

F	RESPONSIBLE PARTY OR VESSEL NAME	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION	
G	ANY CONTRACTOR INVOLVED	CONTRACTOR ADDRESS OR OFFICE LOCATION	
H	PRODUCT SPILLED	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER
	SECOND PRODUCT SPILLED (IF APPLICABLE)	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER
I	SPILL SOURCE	SPILL CAUSE	AREA OF CONTAMINATION IN SQUARE METRES
J	FACTORS AFFECTING SPILL OR RECOVERY	DESCRIBE ANY ASSISTANCE REQUIRED	HAZARDS TO PERSONS, PROPERTY OR ENVIRONMENT
K	ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS		

L	REPORTED TO SPILL LINE BY	POSITION	EMPLOYER	LOCATION CALLING FROM	TELEPHONE
M	ANY ALTERNATE CONTACT	POSITION	EMPLOYER	ALTERNATE CONTACT LOCATION	ALTERNATE TELEPHONE

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC

SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN

FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			