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NUNAVUT WATER BOARD
NUNAVUT IMALIRIYIN KATIMAYINGI

APPLICATION FORM

Application for licence, amendment to licence, or renewal of licence

APPLICATION/LICENCE NO: N6L3-1191
(Amendment or renewal only)

1. NAME AND MAILING ADDRESS OF APPLICANT/LICENSEE

Hamlet of Baker Lake
Box 149
Baker Lake,NT X0C 0A0
(867)
Phone: 793-2874 Fax: 793-2509

2. ADDRESS OF HEAD OFFICE IN CANADA IF INCORPORATED

Phone: _____ Fax: _____

3. LOCATION OF UNDERTAKING (describe and attach a map, indicating watercourse and location of any proposed waste deposits)

Latitude: 64*18' N Longitude: 96*03' W

4. DESCRIPTION OF UNDERTAKING (describe and attach plans and drawings)

Install a new water intake line and improvements to Baker Lake Pump House

5. TYPE OF UNDERTAKING

- ☐ Industrial
- ☐ Power
- ☐ Agricultural
- ☐ Mining and Milling
- ☐ Conservation
- ☐ Recreation
- ☒ Municipal
- ☐ Other (describe): _____

6. WATER USE

- ☒ To obtain water
- ☐ To cross a watercourse
- ☐ To modify the bed or bank of a water
- ☐ Other (describe): _____
- ☐ Flood control
- ☐ To divert water
- ☐ To alter the flow of, or store, water

7. QUANTITY OF WATER INVOLVED (litres per second, litres per day or cubic metres per year, including both quantity to be used and quality to be returned to source.)

42000 cubic metres per year

8. WASTE DEPOSIT (type, quantity, quality, treatment, and disposal)

The original Intake line will remain in lake, the line is 120 metres long, 100 mm dia. and is made up of ductile iron.

9. OTHER PERSONS OR PROPERTIES AFFECTED BY THIS UNDERTAKING (give name, mailing address and location; attach if necessary)

nil

10. PREDICTED ENVIRONMENTAL IMPACTS OF UNDERTAKING AND PROPOSED MITIGATION MEASURES

The original intake line will remain in the lake, if funding is made available dredging and disturbing the lake bed would be a environmental impact. Installation of the new intake will require some trenching, construction would take place on ice, the Hamlet would ensure that any debris would be cleaned up off ice.

11. CONTRACTORS AND SUB-CONTRACTORS (name, address and functions)

Hamlet of Baker is undertaking this project.

12. STUDIES UNDERTAKEN TO DATE (list and attach copies of studies, reports, research, etc.)

Baker Lake Water Quality Study, December 11, 1995
Baker Lake Salinity Testing, Sept. 1991
White Hills Lake, water source evaluation, April 1991

13. THE FOLLOWING DOCUMENTS SHALL BE INCLUDED WITH THE APPLICATION

Land Use Permit		
DIAND	[ ] Yes [✓] No	Date Expected_____
Regional Inuit Association	[ ] Yes [✓] No	Date Expected_____
Supplementary Questionnaire	[ ] Yes [✓] No	Date Expected_____
Inuktitut Summary of Project	[ ] Yes [✓] No	Date Expected_____
MAP @ 1 : 250,000 (with camp, drill sites, etc.)	[✓] Yes [ ] No	Date Expected included with application

14. PROPOSED TIME SCHEDULE

Start Date: July 15, 1998 Completion Date: Dec 15, 1998

Leo Cauvette	CWMS Trainee		
Name (Print)	**Title (Print)**	**Signature**	**Date**

For Nunavut Water Board use only

APPLICATION FEE **Amount: $**_____ **Receipt No.:**_____

WATER USE DEPOSIT **Amount: $**_____ **Receipt No.:**_____

BAKER LAKE

A General

A.1 Location

Baker Lake is located at the northwest end of Baker Lake near the mouth of the Thelon River. The Community is bounded on the north by a ridge and on the south by Baker Lake itself. The geographical co-ordinates of the community are 64°18′ N and 96°03′ W, making it nearest to the geographic centre of Canada. It is 257 air km northeast of Rankin Inlet and 946 air km northeast of Yellowknife.

A.2 Geology and Terrain

Baker Lake is on situated within the Canadian Shield on the Wager Plateau near its boundary with the Kazan Upland. Near Baker Lake, silty sand and silty clay deposits lie over boulder till, beach deposits, and reworked till. Beach ridges are well developed both east and south of the community as well as the higher hills inland to the west and north. The land slopes up from the beach toward a few rocky ridges. Most of these ridges are approximately one kilometre inland.

Surficial soils tend to be covered by a layer of organic soil, consisting of moss, lichen or sedge grass. Permafrost conditions are prevalent. Thawing of the active layer in the summer months creates unstable surface and subsurface conditions. The maximum active layer thickness is approximately 1.5 m.

Historically the Hamlet has suffered severe snowdrifting problems; prevailing north-west winds piled snow to incredible heights in locations along the lee of the ridge, to the north of the community, limiting vehicle access on community roads. This problem has substantially decreased with the construction of the snowfencing (see below).

A.3 Vegetation

The area is within the tundra zone and is devoid of any tree species. The only vegetation includes mosses, lichens and grasses.

A.4 Climate

The mean annual precipitation is 13.8 cm of rainfall and 100 cm of snowfall. The total precipitation is 23.5 cm. The July mean high and low temperatures are 16.0° C and 6.0° C, respectively. The January mean high and low temperatures are -29.5° C and -36.4° C, respectively. Winds are north at 21.6 km/h.

A.5 Community History and Economy

Named after Sir William Baker of the Hudson Bay Company, Baker Lake is unique to Inuit-based society found around the globe. The local Inuit population are the descendants of the Copper Eskimos and are the only true inland Inuit. They are believed to be descendants of the Thule Inuit who evolved a distinctive lifestyle dependent on the Caribou and fish of the interior rather that the marine mammal hunting traditions of other Inuit groups.

Throughout the late-nineteenth and early-twentieth centuries, whaling ships frequented the area near Baker Lake, often times wintering in Hudson Bay. A trading post was established by the Hudson Bay Company in 1916 followed by the Anglican Mission in 1926 and the Roman Catholic Mission in 1927. The RCMP arrived in 1929. A meteorological station was built in 1948 following the use of the settlement as an advance base for a snowmobile expedition two years earlier. An airstrip, weather station, nursing station and school were all built at this time.

Baker Lake has very little economic activity at present; job creation is a major issue for the community. The traditional activities of hunting, trapping and fishing still support the area, as does the tourist industry. Outfitting provides some local business as does a park and visitor centre for tourists. The main businesses in the community are arts and crafts manufacturing, construction, taxi service, sale of building materials, general retail, food sales, recreational vehicles sales, sporting goods sales, gift sales, building management, expediting, hotels, outfitters, restaurants and amusement centres.

Baker Lake gained Hamlet status on April 6, 1977.

A.6 General Demographic Information

The population of Baker Lake, 1,186, is climbing at a rate of 2.26% per year. This figure is projected to rise to 1,341 in 1996, 1,483 in 2001, and 1,623 in 2006. The population by ethnic distribution is 89% Inuit and 11% non-aboriginal. There are seven Dene people in the Hamlet. The population by age and sex groups is as follows: 0-4, 17%; 5-14, 20%; 15-64, 61%; 65+, 2%; 53% male and 47% female.

A.7 Transportation and Access

The GNWT and the Hamlet jointly operate a 1,280 m X 31 m certified Arctic "B" gravel runway. Facilities include a terminal building as well as navigational and weather reading equipment. There is also crash firefighting and rescue services. Scheduled flight service is available with Calm Air via Rankin Inlet. An unlicensed water aerodrome provides float plane access with limited services. The window of operation for this facility falls between July 15, break-up and October 24, freeze-up.

Marine service is provided by NTCL barge from Churchill. There is a Transport Canada dock, however the facility has limited manoeuvrability as it is shallow. The window of marine operation is between late July and mid-October.

There is no road for year-round access to the community. Within the community there are approximately 19 km of gravel surface roads. Road maintenance is an necessity since the spring thaw runoff washes out roads each year. During the winter, severe snow drifting still causes some road blockage problems. Calcium chloride is applied annually to 7.2 km of road to act as a dust suppressant and surface stabilizing agent.

A.8 Housing

Occupied private dwellings increased 33.9% between 1986 and 1994. As of 1994, the Housing Corporation owned 271 housing units. The Housing Assistance Program, the Alternative Housing Program and Government Lease-to-Own units accounted for 56 homes in the community.

A.9 Commercial Accommodation

The Baker Lake Lodge, accommodating twenty, operates only during the summer months. The Iglu Hotel accommodates fifty-five people.

B General Municipal Facilities and Services

B.1 Recreation and Culture

Baker Lake has a large arena/ curling rink that was built in 1986/87. The community's gymnasium, built in 1976, is located within the school. A large community hall was built in 1987/88 and accommodates events such as square dances and traditional games. There is also a summer pool, playgrounds, softball diamond, campground and a community library. Trail development is in the planning stages. Other community events include dog team races, fishing derbies, Keewatin Student Games, Keewatin Slowpitch Tournament, Keewatin Senior Men's Hockey Tournament, Kivalliq Cup (Men's Regional Tournament) and the Keewatin Ladies' Hockey Tournament.

B.2 Education

The Ilitsijaqturvik School teaches grades K-12. Nineteen teachers and two language specialists are employed. Vocational and continuing education, available through the Arctic College Extension program, is supplemented with the help of an adult educator.

B.3 Health

The Baker Lake Health Centre, built in 1985, is 619 m² in area. The facility consists of three medical beds, one bassinet and one

crib. Four nurses and one therapist are employed.

B.4 **Fire Protection**

Fire protection in Baker Lake consists of a twenty-one-person volunteer fire brigade, a 1978 International model Superior truck with a triple combination pumper, pagers for the fire brigade and a community siren. The community firehall is 158 m² in area.

B. 5 **Snowdrift Abatement**

The severity of The Hamlet's snowdrifting problems have been considerably reduced by construction of the initial sections of snowfencing on the Northwestern side of the community. From the start of construction in 1990 to the end of 1995, 771 m of fencing have been constructed. When completed in the year 2003, the fence will be over 2200 m long.

Fence data :
Construction Method ...,Steel pile posts and steel pile braces are fixed in the ground by the ad-freeze method. Steel brackets are welded to the posts and wooden stringers are bolted to the brackets. The 25 mm wide slats are nailed vertically to the stringers on 50 mm centres so as to leave 50 % of the fence face open.

Pile spacing ..... 4.8 m
Height of fence above grade..... 5.5 m
Depth of pile below grade..... 4.4 m

Specifications :
Fence Pile - 114.3 mm diam* 6.3 mm wall thickness*9140 mm long A 53 steel pipe piles
Brace Pile - Same as fence pile but only 4570 mm long
Stingers and braces-m*m*4880 mm long rough sawn wood
Slats - 25 mm* 150 mm * 4880 mm long rough sawn wood

B.5 **Other Services and Municipal Buildings**

A three-person RCMP detachment serves the Hamlet of Baker Lake. There is a three-person community social services staff and a day care centre. Churches in the area include the Bahai House, Christian Arctic Fellowship and a Roman Catholic Mission.

Mail is delivered three times per week. Bell telephone (local and long distance) and CBC Television are broadcast via the Anik Satellite. There is also a community radio, IBC Television recording equipment, community programming, CITS-TV and CKQN-FM radio. Power is provided by NWTPC, area office Rankin Inlet, with a 1,980 kW capacity diesel generator.

Other MACA-provided buildings in the community include: staff housing, a community office (401 m²), a two-bay parking garage (161 m²),a six-bay parking garage (480 m²) and a three bay maintenance

garage (272 m2).

C Water and Sanitation

C.1 Water Supply and Treatment

A good source of potable water is Baker Lake itself. It is a large body of water about 90 km long and 25-30 km wide, fed mainly by the Thelon River draining from the east and the Kazan River from the south.

Over the past several years, residents of Baker Lake have expressed concern over their existing water source. These concerns are about the water quality of Baker Lake (runoff pollution, saltwater intrusion, siltation, and changing currents), condition of the pumphouse, and location of the water intake. The community prefers Whitehills Lake as the long term source. The condition of the existing system was evaluated, and major improvements are required if the pumphouse is to continue to be used over the long term.

This proposed project has included an assessment of Whitehills Lake as a potential water source plus further investigation of Baker Lake. The "Whitehills Lake Water Source Evaluation" revealed that Whitehills Lake is a suitable potable water source with chlorination for disinfection and that a transmission pipeline with back-up water supplied from Baker Lake is the most feasible method of distribution for this source. Once the planning, pre-design and design of this system have been completed, construction of a new water intake and pumphouse or improvements to the old components (depending on which lake is chosen) can begin. The planning study will consider the impact of possible future core area piped water servicing on the water supply facility.

Some residents, feeling that the treated water is unsatisfactory, haul ice blocks and water from the Thelon River.

The current pumphouse, owned and operated by the GNWT, was constructed in 1966 and is located near the centre of the community on the shore of Baker Lake. It is an insulated steel building on a concrete slab. The intake structure consists of a plywood box with a 19 mm mesh screen top. The intake line is a 100 mm iron pipe approximately 120 m long. Originally, the water flowed by gravity through the intake line into the 4.6 m deep wetwell below the pumphouse. It was then drawn from the wetwell by the a 2hp transfer pump. During the early 80's, in an attempt to increase the intake flow rate, the pump suction connections of the 2 transfer pumps were 'hard piped' to the intake line and the wetwell was no longer used. This arrangement still prevails.

Treatment consists of chlorination using a Wallace and Tiernan hypochlorinator. Whenever the transfer pumps are operating, chlorine is automatically injected into the waterlines which discharge into the storage tanks.

C.2 Water Storage and Distribution

Two separate water distribution systems operate out of the pumphouse; a piped system which serves four public buildings and four residences and a trucked system serves all the rest of the community.

Within the pumphouse, each system has its own storage tanks. For the piped system, water is stored in a painted steel tank with a useful storage of about 4500 l. At the base of the piped system storage tank, 2 Jacuzzi 2 hp pumps are connected in parallel. One of the pumps is always on. The piped system has two mains, each with its own water meter. One of the mains, owned by the GNWT, serves the Health Centre, Group Home, Hospice and Nurse's Residence. this main loops back to the pumphouse and discharges the unconsumed water back into the piped water storage tank. The length of the loop is about 250 m.

The other main serves belongs to Transport Canada and is known as the MOT main. The MOT main serves four houses and a garage, all owned by Transport Canada. This main is a remnant of the original MOT system which served 14 house, the MOT complex and the Garage. The original main suffered serious problems with freezeups and breakages. As houses on the main passed into the control of the GNWT they were taken off the main and retrofitted with water tanks. By 1995 only the four Transport Canada houses and the garage were still being served by the main. In that year Transport Canada abandoned the sections of the main not required to serve its buildings and rebuilt portions of the main.

MOT SYSTEM HAS BEEN DISCONNECTED FROM PUMPHOUSE AND ABANDONED DET 08/27/97

As it presently exists the MOT water main is about 530 m long. The first 250 m of this line, which runs from the pumphouse to the houses, consists of 75 mm P.E. pipe coated with 75 mm of polyurethane foam insulation. This section is not looped and has to be protected from freezing by a heat trace. At the end of 250 m, the main is teed to form a 280 m long loop. In this section of the main which has a dim. of 50 mm, the water is kept moving by a circulation pump located in the Garage.

For the truckfill system, water is stored in 4 fibreglass tanks with a total useful capacity of about 16,000 l. One of the two Bell and Gosset 3 hp centrifugal pumps draws water from the tanks and delivers it to the trucks through a water meter and a truckfill arm on the exterior of the building. The fill rate is 1100 lpm.

Water delivery is provided by the Hamlet. At present the Hamlet fleet consists of three water trucks (1990, 1993, 1986) with 4540 L capacity water tanks and a 1994 truck with a 11,350 l capacity tank. Delivery is provided five days per week, with each house receiving service two to three times per week. Frequency of water service per house is dependent on the water tank size in each house, and whether the house has a pressure (sewage pumpout) or a non-pressure (bagged sewage) water system. Most of the new dwellings have a 1135 L water tank.

C.3 Sewage Collection and Disposal

Almost all the buildings in the Hamlet have sewage holding tanks which are pumped out by the Hamlet's sewage trucks. The exceptions are a few houses which still have bagged sewage and the buildings on the MOT piped system.

The MOT piped sewage system serves the same four Transport Canada residences and the garage which are served by the MOT water main. It is a remnant of the system constructed by Transport Canada in 1979-80. This system originally served 14 houses, the MOT complex and the MOT garage. Sewage from these buildings flowed through 100 mm diam service connections into the 150 mm mains. There were a total of 470 m of sewer mains with 11 fibreglass manholes and one concrete manhole. The mains discharged into the wetwell of a small collector/lift station, equipped with a macerator, which had been constructed by the GNWT in 1978 to accept sewage and honeybags from the Hamlet sewage vehicles.

It had been planned that the sewage from the MOT system, along with the sewage from the Hamlet vehicles and the macerated honeybags, would be pumped from the collector through a forcemain to the new sewage disposal area near Finger Lake. Unfortunately, by the time the MOT piped sewage system was completed, in September 1980, the GNWT's forcemain had failed and been abandoned. (The macerator never performed satisfactorily and was also taken out of service.) Consequently all the community's sewage had to taken to the sewage sewage disposal area by the Hamlet's sewage vehicles via a newly constructed road. The MOT sewage continued to flow into the wetwell of the collector, but because the interval between pumpouts was sometimes lengthy, the wetwell capacity proved insufficient. To provide additional storage, two interconnected insulated tanks with a total capacity of 100,000 litres were placed beside the collector station. Submersible pumps transferred the sewage from the wetwell to the tanks. The Hamlet trucks then pumped the sewage from the tanks. The area was never bermed and frequent sewage spills were reported over the years, especially during the spring when large flows of meltwater infiltrated the system.

Since 1989, as houses on the system passed to the control of the GNWT, they were removed from the piped system and retrofitted with sewage tanks.

By 1995 only four houses remained on the piped sewage system. In that year Transport Canada abandoned all the system except for the 150 m of main and 5 manholes required to service the four remaining houses. A new wetwell was constructed between the lowest house and the Garage. The original collector building was moved to the new location and placed on top of the new wetwell. The submersible pumps and storage tanks were similarly relocated and a berm was constructed around the whole site. As before, the pumps transfer the sewage from the wetwell to the tanks and the tanks are pumped out by the Hamlet sewage trucks.

For the rest of the community, holding tanks are pumped out three times a week by the Hamlet.
Four trucks (two-1989, one-1993) with 4540 L capacity tanks and a 1994 truck with a 8172 l capacity tank, are utilized to collect the pumpout sewage in Baker Lake.
The newer buildings are equipped with 2275 L holding tanks. Bagged sewage is placed outside on the ground by the garbage drums. They are collected with the garbage using the garbage packing truck. Sewage bags are collected three times per week by the Hamlet.

Baker Lake produces about 35 million litres of sewage annually. The volume produced is increasing by about 5 % per year.

The sewage is presently treated by the natural wetlands method. At the sewage truck dumpsite, located 3.5 km from the community, the trucks discharge their loads into a small holding cell. The sewage effluent exits the cell by exfiltrating the cell walls or, more commonly, by overtopping the walls. The sewage affluent than flows 200 m through a thickly vegetated wetlands area to a small pond called Lagoon Lake. From Lagoon Lake the sewage flows 300 m to Finger Lake, 600 m through Finger Lake and 1000 m along a stream to the inlet to Airplane Lake. The Water Board considers that the inlet to Airplane Lake constitutes the end of the sewage treatment area.

From the end of the sewage treatment area the treated sewage flows an additional 1300 m to the mouth of Garbage Creek where it enters Baker Lake. As the Hamlet's water intake is located in Baker Lake about 2 km west of the mouth of Garbage Creek, concerns have been expressed that the water supply may be contaminated by the sewage.

In 1994 the Water Board carried out a study "to determine the possible effects of the effluent and run-off from the sewage lagoon, the solid waste disposal site, and surface run-off from the community, on the quality of drinking water obtained from Baker Lake." The Board sampled 8 locations along the sewage flowpath beginning at the inlet to Finger Lake and ending at the water supply pumphouse. The locations were sampled four times between June and September. Twenty-four parameters were analyzed including fecal coliform, ammonia-nitrogen and metals. The study concluded that "the drinking water in Baker Lake does not appear to be threatened by contamination from run-off from the waste disposal facilities or from surface run-off from the community".

One of the benefits of the study was that it demonstrated that the wetlands treatment area is treating the Hamlet's sewage very effectively. The table below compares sewage effluent parameter values recorded during the study with values required by the Hamlet's Water Licence (renewed Sept. 1, 1993). The table shows that the recorded values for fecal coliform, oil and grease and suspended solids were much lower than the required maximums and ph was well within the required range. BOD5, the other parameter

regulated under the Water Licence, was not monitored by the Study.

Table 1 - Baker Lake Sewage Effluent Parameter Values at end of Treatment Area

Parameter	Recorded Range	Water Licence 1994 Requirement
Fecal coliform (CFU/dl)	4 to 650	10,000 max.
Oil and Grease (mg/l)	<0.2 to 0.3	5 max.
Suspended Solids (mg/l)	<3	100 max.
ph	6.96 to 8.68	6 to 9

The results of the Water Board Study indicate that the existing wetlands treatment system is highly effective and the quality of the effluent produced greatly exceeds Water Board requirements. A lagoon might improve effluent quality marginally during the spring melt but any marginal improvement that might result would not appear to justify the high cost of construction.

In 1991, a new honeybag cell was excavated beside the present sewage disposal site. the cell is fenced.

C.4 Solid Waste Collection and Disposal

Domestic solid wastes are collected from 205 L drums by one 1988 Ford model F-350 compactor with 9 m³ capacity and one 1995 Collection occurs three times per week by a crew of three. Residents burn wastes in the containers at the point of storage, prior to collection.

only a very few residences still use bagged sewage service. These are collected at least twice per week from separate drums near the domestic waste drums.

The existing solid waste disposal site is located 3.3 km northeast of the community. It occupies an approximate area of 25,000 m². The wastes are burned daily and compacted monthly during the summer. A separate area of 100 m², to the south of the access road, is set aside for bulky wastes. Used oil is disposed of along the perimeter of the dump and is used to burn garbage. Every year the community participates in a spring cleanup.

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