Government of Nunavut: Application to NWB for Water Licence
December, 2008

EXECUTIVE SUMMARY

Enclosed is a water licence application for the Hamlet of Rankin Inlet, Nunavut on behalf of the Government of Nunavut (GN). The GN is seeking a five-year renewal and amendment of its current license. The license is for water intake, treatment and distribution, and municipal sewage treatment and disposal from the Hamlet of Rankin Inlet, operated by the GN for the Hamlet.

The community draws its water from Nipissar Lake, located 2 km northwest of the Hamlet. Water distribution and sewage collection is by way of a utilidor system that circulates warm water to prevent freezing. A small percentage of the town still uses a truck delivery and pump out system. All sewage collected goes to the Sewage Treatment Plant where it goes through partial primary treatment through a mechanical system with a rotating drum screen. Solids are removed from the sewage before discharge into bottom of Prairie Bay, 500 metres off shore.

As a component of this licence, the GN seeks to increase the allowable water intake to 850,000 m^3 annually to service the Hamlet's growing population. This amount should not have significant impact on Lake Nipissar.

Overall, this project will not substantially affect the quality, quantity or flow of water through Inuit Owned Lands.

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NUNAVUT WATER BOARD
NUNAVUT IMALIRIYIN

Water Licence Application
Supplementary Questionnaire
for Municipalities

Department of Community and Government Services,
Government of Nunavut
Hamlet of Rankin Inlet, Nunavut
Licence: NWB3GRA0207
December, 2008

I. GENERAL

1. Date: December 3, 2008

2. Applicant: Government of Nunavut

3. Contacts:
   Name of Contact: Wayne Thistle
   Position: Municipal Planning Engineer
   Telephone: (867) 645-8178
   Fax: (867) 645-8196

4. Community Status: __ Village __ Town __ City
   x Hamlet __ Settlement Corporation

5. Indicate the status of the municipality's license on the date of the application.
   __ New Application
   x Renewal - Water License # No. NWB3GRA0207

II. ATTACHMENTS

1. Attach current or up-to-date detailed map(s) showing the locations of the:

   a. raw water intake;
   b. water storage and treatment facilities;
   c. fuel and chemical storage;
   d. sewage treatment facilities (lagoon, honey bag pit, wetland);
   e. wastewater treatment area and discharge outlets;
   f. solid waste disposal areas and drainage patterns;
   g. hazardous waste disposal area;
   h. transportation access routes;
   i. existing water bodies/courses and any changes to these water bodies/courses that have or may occur as a result of water use or waste disposal facilities, locations of environmental monitoring sites. (Outline drainage basin);
   j. Traditional use areas outlined on site map and areas around the community used for recreation, camping, fishing, etc.
   k. abandoned and/or restored water treatment, sewage, and solid waste disposal facilities.

Are maps attached? x Yes __ No

If no, please indicate when they will be available.

Indicate which organization has provided the various maps or diagrams.
Nuna Burnside Engineering & Environmental Ltd.

III. WATER SUPPLY

Water Source

1. Type of source: x Lake __ River __Well __ Other _____

2. Name of water source and alternative, if any.

Nipissar Lake _____ _____
Primary Source Secondary Source

3. Usual break-up & freeze-up period: June _____ October _____
Break-up Freeze-up

Water Intake

1. Please provide short descriptions for the following:

a. Freshwater intake facility
b. Operating capacity of pumps used
c. Intake screen size.

The community continues to draw its water from the Lake Nipissar, located 2 km northwest of the Hamlet.

The Nipissar Lake pumphouse includes vertical turbine submersible pumps installed inside twin intake lines. Each of the 10 Hp pumps has a 1020 L/min. capacity. Only one pump operates at a time. Operation of the pump is controlled by the water level in the water storage tank adjacent to the Williamson Lake pumphouse. An air compressor aerates water around the intake to prevent taste and odour problems.

Water Storage

1. Type of water storage facility. (check where applicable)
___ Reservoir/Pond x Storage tank ___ None _____ Other

Description:

The storage tank was completed in 1993 and is used for fire or emergency storage. In case of an emergency lasting longer than two days water in Williamson Lake could be accessed by means of a portable pump, flexible hose, and ice auger.

Water Storage Tank Data	
Height	12.8 m
Diameter	18.3 m
Useable Storage	
2 hour fire demand	545,000 L
2 day emergency storage	2,030,000 L
Peak balance	473,000 L
Total	3,364,000 L

2. If "reservoir" checked:

Is the reservoir lined? ___ Yes ___ No

What type of liner? _____ When was it installed?_____

Water Treatment

1. Indicate the quality of the water.

Summer:	x good	___ fair	___ poor
Fall:	x good	___ fair	___ poor
Winter:	x good	___ fair	___ poor
Spring:	x good	___ fair	___ poor

2. Describe.

Water for the water storage tank and the distribution system is chlorinated by gas chlorinators, installed in 1996. A fluoridation system injects hydrofluosilicic acid directly into the water. In addition, compressed air is injected into the raw water at the Nipissar Lake intake.

3. Type of water treatment.

___ Filtration and chlorination
_x__ Chlorination only
___ None
___ Other __Fluoridation_____
Description

Water Use And Distribution

1. Volume of water use:

Records from the operator of the Water Intake Pumphouse indicate that the average town use of water is approximately 2400 m^3/day. This is an annual consumption of 876,000 m^3/year.

General Condition of the water supply facilities

1. General condition of the:

a. Water supply facility
x Satisfactory __ Unsatisfactory

If unsatisfactory, explain.

b. Storage facility
x Satisfactory __ Unsatisfactory

If unsatisfactory, explain.

c. Distribution system

x Satisfactory __Unsatisfactory

If unsatisfactory, explain.

Modifications

1. Are there any changes *planned* for the water supply system?

x No ___Yes

If yes, please attach a copy of the plan, or describe changes. Provide information on the implementation schedule.

2. Does the community believe changes are needed to the water supply, storage or treatment facilities? Describe.

No

Identification

Are there signs identifying drinking water sources presently used by the municipality?

x Yes __ No

IV. SEWAGE DISPOSAL

1. What type(s) of sewage treatment does the community have?

___ Lagoon
x Mechanical system
___ Wetland
___ Honey bag
___ Combination/Other: describe

***Lagoon** (if applicable)*

1. Has there been any operating problems with the lagoon?

___ Yes ___ No

If yes, describe

***Mechanical System** (if applicable)*

1. Describe (type, specifications, operation and maintenance program for the mechanical wastewater treatment system).

The plant consists of a rotating drum screen, which provides primary treatment and reduces BOD from an average influent level of approximately 230 to 280 mg/L to approximately 100 to 140 mg/L.

2. Are sludges produced? x Yes __ No

If yes, describe how the sludges are disposed of:

The sludge is disposed of at the waste disposal site.

Wetland*(if applicable)*

1. Describe the Wetland wastewater treatment system.

Honey Bag Pit

1. Does the municipality use a honey bag pit?

   ___ Yes x No

   If yes, describe the location, drainage, and operation/maintenance of the site:

Commercial, Industrial and/or Hazardous Wastes

1. Are there any sources of commercial or industrial *liquid* waste being discharged or deposited to the wastewater treatment system that may affect the quality of the effluent or leachate produced? *(The municipality should be aware that any commercial or industrial discharge has to be approved by the municipality)*

   ___ Yes x No

   If yes, indicate sources, types and quantities.

Sewage Discharge

1. Are fish, shell fish and other wildlife harvested in or near the discharge area ?

   ___ Yes x No

   If yes, indicate species harvested, and level of harvest.

General Condition of the sewage treatment facilities

1. General condition of the:

   a. Sewage collection system
      x Satisfactory _ Unsatisfactory
      If unsatisfactory, explain.

   b. Discharge control system
      x Satisfactory __ Unsatisfactory
      If unsatisfactory, explain.

   c. Dams, diversion dykes, berms
      __ Satisfactory __ Unsatisfactory
      If unsatisfactory, explain.

Modifications

1. Are there any changes *planned* in the sewage treatment facilities?

   __ No x Yes

   If yes, please attach a copy of the plan, or describe changes. Provide information on the implementation schedule.

   See attached.

2. Does the municipality or residents believe changes are needed to the sewage treatment facilities? Describe.

The Hamlet Council is concerned that raw sewage is discharged to the ocean and may be impacting marine life.

Abandonment and Restoration

1. List and describe abandoned or restored sewage treatment facilities.
   Refer to original attachment maps.

   None

Identification

Are there signs identifying past and present sewage disposal sites ?

x Yes __ No

V. SOLID WASTE DISPOSAL

1. Briefly describe how solid wastes are collected and delivered to the disposal area.
   Solid waste is the responsibility for the Hamlet under a separate Water License NWB3RAN0207.

   The Hamlet has two garbage trucks that work on a schedule and collect and bring the garbage to the waste disposal site.

2. Is the solid waste site fenced? x Yes __ No

3. Is the fence adequate? __ Yes x No

   If no, describe:
   Fence is starting to fall down.

Waste Reduction

1. Does the municipality burn garbage?
   x Yes __No
   If yes, describe how and when this is done.

2. Has the municipality considered measures for waste reduction such as recycling or reuse?
   x Yes __ No

   If yes, describe

   The Hamlet has initiated a bottle return system. They have also participated in a program with INAC Manitoba that included shipping out old cars for recycling. They shipped out approximately 60 cars in 2007.

Animal Carcasses Pit

1. Does the municipality have an area for the disposal of animal carcasses?
   x Yes __ No
   If yes, describe the location, drainage and operation/maintenance of the site

The spot is located at the back of the dump. When an animal is disposed of it is covered in dirt. A designated area at the new landfill has been identified.

Waste Oil Pit

1. Describe the waste oil storage area.

Do not have an area for this. Almost all waste oil is used by a local contrctor to burn in his waste oil furnace.

Bulky Scrap Metal Waste Disposal Area

1. Does the municipality have a scrap metal or bulky waste disposal area?
   x Yes __ No
   If yes, briefly describe its location and operation plan.

   There is an area set aside for metal at the current (old) landfill, but no operation plan in place. A bulky waste disposal area has been identified at the new landfill. The operation and maintenance is described in the Solid Waste Management Facility Operation and Maintenance Plan (Nuna Burnside, 2008).

Commercial, Industrial and/or Hazardous Wastes Disposal Area

1. Are there any commercial or industrial waste being discharged or deposited in the solid waste disposal area? *(The municipality should be aware that any discharge of commercial or industrial waste has to be approved by the municipality)*
   ___ Yes x No
   If yes, please indicate sources, types and quantity.

2. Will the municipality use a hazardous waste disposal area?
   x Yes ___ No
   If yes, describe its:

   a. Location
      A hazardous waste disposal area has been identified at the new landfill.

   b. Structure
      The area will be a fenced in structure with a lined elevated area.

   c. Operation and maintenance (describe special handling/disposal methods for these wastes)

   Batteries must be stored upright. Oils, lubricants and antifreeze may be bulked together in common drums, preferably remaining in their original packaging. Unknown substances should remain in their packages and placed into drums.

   Hazardous wastes will be labeled and assigned for removal from the community to a licensed receiver in the south when the storage area nears capacity or when a cost effective volume to warrant shipping was accumulated.

General Condition of the Solid Waste Disposal Area

1. Comment on the general conditions of the:

a. Solid waste disposal area
__ Satisfactory x Unsatisfactory

If unsatisfactory, explain.

The current (old) landfill has several problems with its operations and has not received adequate maintenance for several years. Some of the things contributing to the unsatisfactory condition of the landfill include lack of ground cover on garbage, no site supervisor to prevent people scavenging and opening bags, blowing of litter.

Modifications

1. Are there any changes planned for the solid waste disposal area?
__ No x Yes
If yes, attach a copy of the plan, or describe changes. Provide information on the implementation schedule.

The waste facility reached its maximum capacity in 2002 and a new waste disposal site was planned in 2003. Construction of the new landfill was started in 2003 and completed in 2006. In 2007, the Hamlet decided to commission the new landfill and approved the environmental assessment of the current (old) landfill for its abandonment and restoration. The Hamlet has obtained Gartner Lee and Associates to complete the abandonment and restoration (A&R) plan for the old landfill.

2. Are changes needed to the solid waste disposal area? Describe.

Abandonment and Restoration

1. List and describe abandoned or restored solid waste facilities.
Indicate their location on a map.

The Hamlet has obtained Gartner Lee and Associates to complete the abandonment and restoration (A&R) plan for the old landfill.

Identification

Are there signs identifying past and present solid waste disposal sites ?
x Yes __ No

VI. INSPECTION AND MONITORING

1. When were municipal facilities inspected by:
x Indian and Northern Affairs Inspector Date: 2008/07/22
____ Municipal and Community Affairs Date: _____
x Other: Nuna Burnside Date: 2008/09/08

2. Is there a system in place for reporting spills?
x Yes ___ No
If yes, describe.

All spills are reported to the NT-NU 24-Hour Spill Report Line.

3. Is there a contingency plan for clean up of spills?

x Yes ___ No

If yes, describe.

An Environmental Emergency Contingency Plan will be submitted to the board by Nuna Burnside in December 2008.

4. Have any spills occurred in the past five years?

x Yes ___ No

If yes, describe and show on a map the locations of the spills. What action has been taken to clean the affected areas?

Nipissar Lake Pumphouse Fuel Spill, June 30, 2008

On June 30, 2008, a fuel spill occurred at the Nipissar Lake Pumphouse in Rankin Inlet. Apparently youths attempting to climb on the roof of the pumphouse pulled down the fuel tank return line, and allowed the escape of a few hundreds litres of fuel oil into the sand and gravel surface next to the pumphouse. The fuel flowed overland away from the lake and seeped into the parking lot in front of the pumphouse. A small amount reached the shore of the lake. An NT-NU Spill Report was prepared by CGS staff and forwarded to the GN Spill Report Centre.

Emergency response consisted of:

- Strongly repairing the pipe attachment to the building to avoid a repeat event
- Use of a floater boom and absorbent mats in the lake
- Excavation of the impacted soil and containing the material in bags
- Excavation continued until all evidence of fuel oil was removed
- Monitoring wells were installed
- EBA Engineering Ltd. arranged the removal and disposal of the impacted soil at the Hamlet landfill
- EBA collected confirmatory samples.

Monitoring Program

1. Is water sampling and analysis done?

x Yes ___No

If Yes, answer the questions a to e

a. Briefly describe how samples are taken and sent to the laboratory.

Samples are collected by an experienced technician. They are collected in appropriate bottles provided by an accredited laboratory. Samples are put into coolers with ice to keep at a temperature of 4°C and shipped to a laboratory within the required holding times.

b. Briefly describe any monitoring done for wastewater effluent and leachate.

Samples are collected at the wastewater discharge point identified in the licence as GRA-3. Samples are also collected from the leachate discharging out of the original landfill.

c. Who is responsible for water sampling?
Name: Manasie Oigonn

Position: Utilidor Systems Manager

Telephone #: (867) 645-8158

Fax # : (867) 645-8197

d. Recognized laboratory performing analysis of samples.

Name: Taiga Environmental Laboratory

Address: 4601-52 Avenue, Yellowknife, NWT

Telephone #: (867) 669-2788

Fax #: (867) 669-2718

e. Are any changes planned in the water quality monitoring program?
___ Yes x No
If yes, describe.

VII. PUBLIC CONCERNS

1. What concerns does the municipality or residents have regarding the municipal water supply or waste disposal facilities? List the concerns and describe what steps have been taken to address those concerns.

The community has some concerns about the wastewater effluent point regarding its effects to ice thickness and marine life.

VIII. PUBLIC HEALTH *(Help may be obtained from the Regional Environmental Health Officer if you have difficulty with this section.)*

The Kivalliq region does not currently have a Regional Environmental Health Officer; the Iqaluit Region Environmental Health Officer is filling in at the time.

1. Date: December 12, 2008

2. Municipality: Iqaluit

3. Contact: Wanda Joy

Telephone #: 867-975-4817

Fax # : 867-975-4833

4. Have there been any problems or health/environmental concerns with drinking water ?
___ Yes x No

If yes, describe

5. Have there been any problems or health/environmental concerns with sewage disposal/treatment?
___ Yes x No

If yes, describe

6. Have there been any problems or health/environmental concerns with solid waste disposal?
___ Yes x No

If yes, describe

Monitoring Program

1. Does the Regional Health Board perform water quality sampling?
___No x If Yes, answer questions (a) to (e)

a. Briefly describe the sampling methodology.

DPW (Department of Public Works) takes the samples and the Health Board does the testing.

b. Briefly describe any monitoring of wastewater effluent and leachate.

Only drinking water is sampled for the Regional Health Board.

c. Who is responsible for sampling?

Name: Larry White
Position: Lab Assistant
Telephone #: (867) 645-8331

d. Recognized laboratory performing analysis of samples.

Name: Kivalliq Health Centre
Address: P.O. Box 008, Rankin Inlet, NU, X0C 0G0
Telephone #: (867) 645-8300
Fax # : (867) 645-8330

e. Are any changes planned in the water quality monitoring program?
__ Yes x No
If yes, describe.

IX. TECHNICAL INFORMATION *(Assistance may be obtained from the Regional Community Government (CG&T) office if you have difficult with this section).*

1. Date:

2. Municipality: The Hamlet of Rankin Inlet

3. Contact: Wayne Thistle
(Community and Government Services, Government of Nunavut)

Telephone #: (867) 645-8178

Fax # : (867) 645-8196

4. Population (according to most recent census results): 2,358

5. Estimated growth rate over next 5 years: 1.4%

6. Has any baseline data collection and evaluation been undertaken with respect to the physical, biological, and chemical characteristics of the main water bodies in the area?
x Yes ___No

If yes, provide a summary of program details or site title, authors, cities, and dates:

Prepared by	Title	Completion Date
• Stanley Associates Engineering Ltd.	Nipissar Lake Watershed Model	1996
• Nuna Burnside Engineering and Environmental Limited	A brief overview of local water bodies as part of Sewage Treatment Plan and NWB licence renewal submissions (Internal documents).	2008

If no, are such studies being planned?
___ No x Yes (If yes, when and by whom):

GN is proposing to contract an environmental risk assessment of sewage effluent discharge into Hudson Bay in 2009. RFP documents being prepared.

7. Have Elders been consulted in the collection of baseline data on main water bodies in the area?
x No __Yes

If yes, specify.

8. Have any baseline data collection and evaluation been undertaken with respect to the various biophysical components of the environment potentially affected by the project?
x No __Yes

If yes, provide details below.

Prepared by Date	Title	Completion

If no, are such studies being planned?

x No __Yes.

If yes, specify:

Attachments

1. Attach detailed plan or drawing(s) of the present *solid waste disposal area*. Include the following information:

   a. details of pond size and elevation;
   b. details of all retaining structures (dimensions, materials of construction, etc.);
   c. details of the drainage basin, and existing and proposed drainage modifications;
   d. details of all decant, siphon mechanisms etc., including sewage treatment facilities;
   e. details regarding direction and path of wastewater flow from the area;
   f. distance from watercourses and fish bearing waters;
   g. location and construction of liners;
   h. leachate and groundwater collection systems; and
   i. control structures.

2. Attach detailed plan or drawing(s) of the present *sewage treatment system*. The drawing(s) should include the following:

   a. details of all retaining structures (dimensions, materials of construction, etc.);
   b. details of the drainage basin, and existing and proposed drainage modifications;
   c. details regarding direction and path of wastewater flow from the area;
   d. indications of the distance from watercourses and fish bearing waters;
   e. all sources of seepage presently encountered near these areas, including volumes (m^3/day) and directions.
   f. The volume of seepage flow (m^3 / day); and
   g. The direction of each flow.

   Refer to Figures 1 through 4 and the drawings in Appendix A.

3. Are drawings for the solid waste disposal area and sewage treatment system attached?
x Yes ___No

If yes, who has provided them?
Nuna Burnside Engineering and Environmental Ltd.

If no, indicate when they will be available?

Hydrology

1. Effects on surface water flow:
Are any stream channels altered? __ Yes x No
Is the natural storage or water level of any lake or pond changed?__ Yes x No
Are there changes in water flow downstream of the project?__ Yes x No

Is a storage reservoir created in a natural channel? __ Yes x No

If yes to any of the above, briefly describe the expected change in flow or storage:

2. Drainage Area: Nipissar Lake

What is the drainage area? 323 ha
What is the average elevation of the drainage basin? __75___metres
Is the drainage basin outlined on an attached map? x Yes ___No

Describe the drainage basin characteristics, (vegetation, general soil type, lakes, swamps and permafrost areas, etc.)

Surface materials consist mainly of exposed volcanic or sedimentary Precambrian rock and various types of re-worked ground moraine, notable marine terraces. The soil is a mixture of organic materials, gravel, sands and fines. Numerous eskers provide a good source of granular material. The shoreline is composed of recently deposited sands and silts. The Hamlet is within the continuous permafrost zone, with an estimated permafrost thickness of 300 m. The active layer of permafrost is very shallow, extending 0.3 m below the ground surface. Areas with developed soil layers support hardy grasses, while rock outcrops support lichens. Clusters of small willow bushes grow in well-sheltered areas.

3. Channel characteristics:
Is the course of any channel changed? ___ Yes x No

If yes, describe measures to maintain stream bed and bank stability.

4. Will the cross-section of any watercourse be changed? __ Yes x No
If yes, describe the change and its effect on the flow capacity of the channel.

Water Supply

1. What is the rate of withdrawal from the source? 2108 m^3/day.

2. Is water drawn from the source ___ intermittently x continuously

3. If it is drawn intermittently, during what month(s) is it drawn? _____

4. For what period is it drawn (days/weeks/months)? 365 days

5. What is the rate of flow of source (if river) or size (if lake)?

   Nipissar Lake covers an area of 1,090,565 m^2. With an estimated average depth of 4 metres, the volume of the lake is estimated to be 4,362,260 m^3. The lake's estimated annual recharge is 314,000 m^3 per year.

6. At the intended rate of water usage, describe the effects on the river or lake from which water will be drawn.

   There have been no observed effects on the lake with the current rate of usage. It is recommended that a study be conducted to determine any effects on the lake due to the water taking. For the purpose of this application, there have been no observed effects.

Water Intake

1. Please provide short descriptions of the following:
   a. freshwater intake facility
   b. operating capacity of the pumps
   c. intake screen size

   The community draws its water from the Lake Nipissar, located 2 km northwest of the Hamlet. The Nipissar Lake pumphouse contains vertical turbine submersible pumps installed inside twin intake lines. Each of the 10 Hp pumps has a 1020 L/min. capacity. Only one pump operates at a time. Operation of the pump is controlled by the water level in the water storage tank adjacent to the Williamson Lake pumphouse. An air compressor aerates water around the intake to prevent taste and odour problems.

Water Storage

1. Is a dam or dyke being used to store or alter the flow of water? ___Yes x No

2. What are the dimensions of the dam or dyke?
   Length:_____ Width: _____ Height:_____
   U/S slope: _____ D/S slope: _____

3. Does the proposed dam create a reservoir in a natural watercourse?
   ___ Yes ___No
   If yes, what is the storage capacity and surface area of the reservoir?

_____ m^3 _____ ha.

4. Will the dam or dyke affect fish migration or movement?
___ Yes x No
If yes, describe all measures for compensation of fish habitat lost due to the dam or dyke, and mitigation for fish migration or movement.

Water Treatment

1. Indicate the capacity of the treatment facility. _____1000_____ L/min

2. What is the capacity of the water storage facility_3,364_____ m^3

3. Describe the method of water treatment (i.e., backwash, flocculation, sedimentation, chemicals used), and provide the results of the most recent bacteriological and chemical analysis. Attach a diagram, if possible.

   Water for the water storage tank and the distribution system is chlorinated by new gas chlorinators, installed in 1996. A fluoridation system injects hydrofluosilicic acid directly into the water. In addition, compressed air is injected into the raw water at the Nipissar Lake intake.

4. Are there any changes planned in the water treatment facilities?
x No ___Yes
If yes, attach a copy of the plan or indicate changes and include an implementation schedule.

Sewage Disposal

1. Indicate the level of sewage treatment:
___ primary ___ secondary ___ tertiary
Pre-treatment (if applicable): x screening ___ maceration
Lagoons (if applicable): ___ anaerobic ___ aerobic ___facultative

2. Indicate the capacity of the sewage treatment facility_____ m^3

3. Based on current population projections, the facility will meet the needs of the community until the year _____ .

4. Average depth of the wastewater lagoon ___n/a_____ m.

5. What is the design freeboard? ___n/a_____ m.

6. Indicate the retention time of the sewage while in the treatment facility__n/a_____ days.

7. Indicate the estimated rate of discharge of wastewater__65___L/sec.

8. Indicate the location of the discharge point__500 meters into Hudson Bay_____

9. Is the discharge: ___seasonal x continuous
If the discharge is seasonal, during what month(s) is it done? _____
What is the duration of the discharge (days/weeks/months) ? _____

10. Are there any changes planned in the sewage disposal facilities?
___ No x Yes
If yes, attach a copy of the plan or indicate changes and include an implementation schedule.
See Attached.

Solid Waste Disposal

1. Indicate the capacity of the disposal area 352,700 m^3.

2. The *average* depth of the solid waste disposal site 3.3 m.

3. The current facility will meet community needs until the year 2005.

4. Do any natural watercourse enter the solid waste disposal area? What methods are used to decrease the amount of runoff water entering these areas?

no

5. Indicate the volume of water that may enter these areas from any source(s) and attach all pertinent details of the diversions.

Source	Volume
none	

6. Please describe any diversions of watercourses:

none

7. Are there any changes planned in the solid waste disposal facilities?
___ No x Yes
If yes, attach a copy of the plan or indicate changes and include an implementation schedule.

The current landfill will be decommissioned and the use of the new landfill will begin pending approvals. Solid Waste disposal is the reasonability of the Hamlet as per Water License NWB3RAN0207.

Other

1. Describe any additional details on the existing municipal facilities which should be considered by the Nunavut Water Board during it review.

Refer to other documents submitted with the application including:

- Environmental Emergency Contingency Plan, Hamlet of Rankin Inlet, Nuna Burnside Engineering and Environmental Ltd., December 2008

- Environmental Monitoring Program and Quality Assessment/Quality Control Plan, Hamlet of Rankin Inlet, Nuna Burnside Engineering and Environmental Ltd., December 2008

- Solid Waste Management Facility, Operations and Maintenance Plan, Hamlet of Rankin Inlet, Nuna Burnside Engineering and Environmental Ltd., December 2008

- Sewage Treatment Facility, Operations and Maintenance Plan, Hamlet of Rankin Inlet, Nuna Burnside Engineering and Environmental Ltd., December 2008

- Water Supply Facility, Operations and Maintenance Plan, Hamlet of Rankin Inlet, Nuna Burnside Engineering and Environmental Ltd., December 2008

Effective June 16, 2006

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NUNAVUT IMALIRIYIN KATIMAYINGI
NUNAVUT WATER BOARD
OFFICE DES EAUX DU NUNAVUT

WATER LICENCE
APPLICATION FORM

Application for: (check one)

☐ **New** ☒ **Renewal** ☐ **Amendment** ☐ **Assignment** ☐ **Cancellation**

LICENCE NO:
(for NWB use only)

1. NAME AND MAILING ADDRESS OF APPLICANT/LICENSEE

The Government of Nunavut
PO Bag 002
Rankin Inlet, Nunavut
X0C 0G0

Phone: (867) 645-8159
Fax: (867) 645-8196
e-mail: _____

2. ADDRESS OF CORPORATE OFFICE IN CANADA (if applicable)

N/A

Phone: _____
Fax: _____
e-mail: _____

3. LOCATION OF UNDERTAKING (describe and attach a topographical map, indicating the main components of the Undertaking)

Latitude: (64°49' " N) Longitude: (92°05' " W)
NTS Map Sheet No. 55 K 16 Scale: 1:50,000

4. DESCRIPTION OF UNDERTAKING (attach plans and drawings)

See attached additional information.

5. TYPE OF PRIMARY UNDERTAKING (A supplementary questionnaire **must** be submitted with the application for undertakings listed in **"bold"**)

☐ **Industrial**
☐ **Mining and Milling**(includes exploration/drilling)
☒ **Municipal** (includes camps/lodges)
☐ Power
☐ Agricultural
☐ **Conservation**
☐ Recreational
☐ **Miscellaneous** (describe below):

See Schedule II of *Northwest Territories Waters Regulations* for Description of Undertakings

6. WATER USE

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

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

Water use
- ☐ 100m^3/day or less
- ☒ Greater than 100m^3/day; if greater, indicate quantities to be used for each purpose (camp, drilling, etc.)

Water returned to source

1808 m^3/day

8. WASTE (for each type of waste describe: composition, quantity (cubic metres per day), methods of treatment and disposal, etc.)

- ☒ Sewage
- ☐ Solid Waste
- ☐ Hazardous
- ☐ Bulky Items/Scrap Metal
- ☐ Waste oil
- ☐ Greywater
- ☒ Sludges
- ☐ Other describe):

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

Land Use Permit

DIAND	☒ Yes	☐ No	If no, date expected _____
Regional Inuit Association	☐ Yes	☒ No	If no, date expected _____
Commissioner	☐ Yes	☒ No	If no, date expected _____

10. PREDICTED ENVIRONMENTAL IMPACTS OF UNDERTAKING AND PROPOSED MITIGATION MEASURES (direct, indirect, cumulative impacts, etc.)

see attached additional information.

NIRB Screening ☒ Yes ☐ No If no, date expected _____

11. INUIT WATER RIGHTS

Will the project or activity substantially affect the quality, quantity, or flow of water flowing through Inuit Owned Lands and the rights of Inuit under Article 20 of the Nunavut Land Claims Agreement?

No

If yes, has the applicant entered into an agreement with the Designated Inuit organization to pay compensation for any loss or damage that may be caused by the alteration. If no compensation agreement

has been made, how will compensation be determined?

12. CONTRACTORS AND SUB-CONTRACTORS (name, address and functions)
None

13. STUDIES UNDERTAKEN TO DATE (list and attach copies of studies, reports, research, etc.)
see attached additional information.

14. THE FOLLOWING DOCUMENTS MUST BE INCLUDED WITH THE APPLICATION FOR THE REGULATORY PROCESS TO BEGIN

Supplementary Questionnaire (where applicable: see section 5) ☒ Yes ☐ No If no, date expected _____

Inuktitut and/or Inuinnaqtun/English Summary of Project ☒ Yes ☐ No If no, date expected _____

Application fee of $30.00 (Payee Receiver General for Canada) ☒ Yes ☐ No If no, date expected _____

Water Use fee of $30.00 (unless otherwise indicated in Section 9 of the *NWT Waters Regulations;* Payee Receiver General for Canada)

☐ Yes ☐ No If no, date expected _____

15. PROPOSED TIME SCHEDULE (unless otherwise indicated, the NWB will consider the application for a five (5) year term)

☐ one year or less (or) ☒ Multi Year

Start Date: 2009 Completion Date: 2014

Wayne Thistle	Municipal Planning Engineer/Acting Project Manager		
Name (Print)	**Title (Print)**	**Signature**	**Date**

For Nunavut Water Board office use only

APPLICATION FEE **Amount: $_____** **Pay ID No.: _____**

WATER USE DEPOSIT **Amount: $_____** **Pay ID No.: _____**

Table 1: Waste Water Treatment Plant, Effluent Discharge Point - GRA-3

	Units	Detection Limit	CCME Guidelines (Marine)	Water Board Licence Requirements	Sampling Date 16-May-08	30-Jun-08	01-Aug-08
Total Alkalinity (as CaCO3	mg/L				143		
Conductivity	µS/cm	0.4			611	519	566
pH			7.0 to 8.7	6 to 9	7.76	7.62	7.96
TSS	mg/L	3		180	-	46	71
Ammonia as Nitrogen	mg/L	0.005			6.35	9.4	28.7
BOD	mg/L	2		120	110	61	90
Nitrate and Nitrite as Nitrogen	mg/L	0.01	16		<0.01	0.01	<0.01
Calcium	mg/L	0.1			34.1	27.1	23.8
Magnesium	mg/L	0.1			8.9	6.8	5.8
Potassium	mg/L	0.1			8.4	6.1	8.1
Sodium	mg/L	0.1			64	40.2	40.4
Sulphate	mg/L	1			29	24	24
Fecal Coliforms	CFU/100mL	100000		1.00E+06	**1.29E+06**	5.70E+05	**3.00E+06**
Oil and Grease (visible)				no visible sheen	non-visual	non-visual	non-visual
Arsenic	µg/L	0.2	12.5		1.5	0.9	1.4
Cadmium	µg/L	0.1			0.2	<0.1	0.4
Chromium	µg/L	0.3			1.5	1.4	2.3
Copper	µg/L	0.3			116	149	232
Iron	µg/L	50			377	313	612
Lead	µg/L	0.1			2	1.9	5.2
Mercury	µg/L	0.01	0.016		**0.03**	**0.02**	<0.01
Nickel	µg/L	0.1			6.3	9.6	6
Zinc	µg/L	10			85	91	140
Total Phenols	mg/L	0.001			0.03	0.019	0.055

BOLD - indicates exceedence in the licence requirements or CCME standards
CCME - Canadian Council of Ministers of the Environment, Canadian Water Quality Guidelines for the Protection of Aquatic Life, Updated 2007

Table 2.0 Influent Quality to The Rankin Inlet Sewage Treatment Plant Sewage Sampling in 2004

Parameter	Measurement	Johnson cove Lift Station	Nanuk Lift Station
BOD(mg/L)	Average	147	241
	Deviation	94	62
	Summer Average	170	257
	Winter Average	142	233
	CG&T Model	134	134
TSS (mg/L)	Average	152	159
	Deviation	113	42
	Summer Average	208	160
	Winter Average	132	158
	CG&T Model	142	142
Ammonia as N (mg/L)	Average	22.7	40.9
	Deviation	6	18.6
	Summer Average	27.2	59.3
	Winter Average	20.4	31.6
	CG&T Model	23	23
Alkalinity (mg/L)	Average	180	286
	Deviation	23	63
	Summer Average	192	306
	Winter Average	173	277
	CG&T Model	N/A	N/A
Fecal Coliform (CFU/100ml)	Average	7.19	7.82
	Deviation	0.48	0.43
	Summer Average	7.31	7.81
	Winter Average	7.12	7.82
	CG&T Model	N/A	N/A
pH (mg/L)	Average	7.19	7.82
	Deviation	0.48	0.43
	Summer Average	7.31	7.81
	Winter Average	7.12	7.82
	CG&T Model	N/A	N/A
Nitrate-Nitrite as N (mg/L)	Average	7.19	7.82
	Deviation	0.48	0.43
	Summer Average	7.31	7.81
	Winter Average	7.12	7.82
	CG&T Model	N/A	N/A

Data from Ferguson Simek Clark, 2004

Table 3.0 Influent Quality for The Rankin Inlet Sewage Treatment Plant Sampling 2005

Parameter	9-Nov-05	16-Dec-05	20-Dec-05	22-Dec-05
BOD (mg/L)	123	97	140	92
TSS (mg/L)	117	94	72	75
Ammonia as N (mg/L)	15.2	14.1	13.4	5.53
Fecal Coliform (MPN/100mL)	>110000	>110000	>110000	>110000
Total Oil & Grease (mg/L)	35	22	21	22
Total Coliforms (mg/L)	-	>11000	>110000	>110000

Data from Dillon Consulting Limited, 2005

Water Use Projections for the Hamlet of Rankin Inlet, Nunavut

Water Use Projections Table
Key Assumptions

Starting Year:	2006	Starting Population:	2358
Population Growth Rate:	1.4%	Residential Water Usage Rate [L/cd]::	220.0

Planning Year	Calendar Year	Projected Population[1]	Projected Water Consumption[2]	Projected Total Consumption Volume				Based on Recorded Usage Rate in 2008	
			[Lpcd]	[Litres/day]	[Litres/year]	[m3/day]	[m3/year]	[m3/day]	[m3/year]
	2006	2358	331.8	782435	285,588,672	782	285,589		
	2007	2392	332.8	796150	290,594,757	796	290,595		
0	2008	2426	333.8	809900	295,613,377	810	295,613	2108	769420
	2009	2460	334.8	823683	300,644,356	824	300,644		
	2010	2495	335.8	837907	305,836,035	838	305,836		
	2011	2530	336.8	852166	311,040,449	852	311,040		
5	2012	2566	337.8	866868	316,406,662	867	316,407		
	2013	2602	338.8	881605	321,785,974	882	321,786		
	2014	2639	339.8	896790	327,328,173	897	327,328		
	2015	2676	340.8	912010	332,883,827	912	332,884		
	2016	2714	341.8	927681	338,603,444	928	338,603		
	2017	2752	342.8	943389	344,336,861	943	344,337		
10	2018	2791	343.8	959549	350,235,308	960	350,235		
	2019	2831	344.8	976164	356,299,679	976	356,300		
	2020	2871	345.8	992818	362,378,709	993	362,379		
	2021	2912	346.8	1009931	368,624,715	1010	368,625		
	2022	2953	347.8	1027084	374,885,693	1027	374,886		
	2023	2995	348.8	1044698	381,314,687	1045	381,315		
	2024	3037	349.8	1062353	387,758,957	1062	387,759		
	2025	3080	350.8	1080472	394,372,269	1080	394,372		
	2026	3124	351.8	1099056	401,155,495	1099	401,155		
	2027	3168	352.8	1117684	407,954,795	1118	407,955		
20	2028	3213	353.8	1136781	414,925,019	1137	414,925	2466	900000
	2029	3258	354.8	1155922	421,911,589	1156	421,912		
	2030	3304	355.8	1175534	429,070,078	1176	429,070		
	2031	3351	356.8	1195620	436,401,342	1196	436,401		
	2032	3398	357.8	1215753	443,749,704	1216	443,750		
	2033	3446	358.8	1236361	451,271,817	1236	451,272		
	2034	3495	359.8	1257448	458,968,526	1257	458,969		
	2035	3544	360.8	1278584	466,683,053	1279	466,683		
	2036	3594	361.8	1300200	474,573,133	1300	474,573		
	2037	3645	362.8	1322300	482,639,599	1322	482,640		
30	2038	3697	363.8	1344886	490,883,286	1345	490,883		

Note:

1) Population in 2006 taken from Statistics Canada 2006 Census of Population. A population growth of 1.5% was applied to the subsequent years.

2) The projected water consumption is based on the Nunavut water usage formula [RWU L/c/d x (-1 + (0.323 x Ln (population)].

3) The Residential Water Usesage Rate is estimated to be 220 L/c/d for populations greater than 2000 and assumes that the water is distributed by a piping system.

Projected Sewage Generation Rates for the Hamlet of Rankin Inlet

Planning Year	Calendar Year	Total Population[1]	Projected Sewage generation[2] (lpcd)	Projected Volume (litres/day)	Projected Volume (litres/year)	Projected Volume (m3/year)	Projected Sludge Quantity (kg/annum)	Cumulative Sludge Volume[3] (m^3)
	2006	2358	331.8	782,435	285,588,672	285,589	43,033.5	1,434.5
	2007	2392	332.8	796,150	290,594,757	290,595	43,654.0	2,889.6
0	2008	2426	333.8	809,900	295,613,377	295,613	44,274.5	4,365.4
	2009	2460	334.8	823,683	300,644,356	300,644	44,895.0	5,861.9
	2010	2495	335.8	837,907	305,836,035	305,836	45,533.8	7,379.7
	2011	2530	336.8	852,166	311,040,449	311,040	46,172.5	8,918.8
	2012	2566	337.8	866,868	316,406,662	316,407	46,829.5	10,479.8
	2013	2602	338.8	881,605	321,785,974	321,786	47,486.5	12,062.6
	2014	2639	339.8	896,790	327,328,173	327,328	48,161.8	13,668.0
	2015	2676	340.8	912,010	332,883,827	332,884	48,837.0	15,295.9
	2016	2714	341.8	927,681	338,603,444	338,603	49,530.5	16,947.0
	2017	2752	342.8	943,389	344,336,861	344,337	50,224.0	18,621.1
10	2018	2791	343.8	959,549	350,235,308	350,235	50,935.8	20,318.9
	2019	2831	344.8	976,164	356,299,679	356,300	51,665.8	22,041.1
	2020	2871	345.8	992,818	362,378,709	362,379	52,395.8	23,787.7
	2021	2912	346.8	1,009,931	368,624,715	368,625	53,144.0	25,559.1
	2022	2953	347.8	1,027,084	374,885,693	374,886	53,892.3	27,355.5
	2023	2995	348.8	1,044,698	381,314,687	381,315	54,658.8	29,177.5
	2024	3037	349.8	1,062,353	387,758,957	387,759	55,425.3	31,025.0
	2025	3080	350.8	1,080,472	394,372,269	394,372	56,210.0	32,898.7
	2026	3124	351.8	1,099,056	401,155,495	401,155	57,013.0	34,799.1
	2027	3168	352.8	1,117,684	407,954,795	407,955	57,816.0	36,726.3
20	2028	3213	353.8	1,136,781	414,925,019	414,925	58,637.3	38,680.9
	2029	3258	354.8	1,155,922	421,911,589	421,912	59,458.5	40,662.8
	2030	3304	355.8	1,175,534	429,070,078	429,070	60,298.0	42,672.8
	2031	3351	356.8	1,195,620	436,401,342	436,401	61,155.8	44,711.3
	2032	3398	357.8	1,215,753	443,749,704	443,750	62,013.5	46,778.4
	2033	3446	358.8	1,236,361	451,271,817	451,272	62,889.5	48,874.7
	2034	3495	359.8	1,257,448	458,968,526	458,969	63,783.8	51,000.8
	2035	3544	360.8	1,278,584	466,683,053	466,683	64,678.0	53,156.8
	2036	3594	361.8	1,300,200	474,573,133	474,573	65,590.5	55,343.1
	2037	3645	362.8	1,322,300	482,639,599	482,640	66,521.3	57,560.5
30	2038	3697	363.8	1,344,886	490,883,286	490,883	67,470.3	59,809.5

Note:
1) Population in 2006 taken from Statistics Canada 2006 Census of Population. A population growth of 1.4% was applied to the subsequent years.

2) The projected sewage generation is based on the Nunavut water usage formula [RWU L/c/d x (-1 + (0.323 x Ln (population)].

3) The Residential Water Usesage Rate is estimated to be 220 L/c/d for populations greater than 2000 and assumes that the water is distributed by a piping system.

Hydrology Calculations, Hamlet of Rankin Inlet

Annual Rainfall (m/year)	0.2972	*Canadian Climate Normals 1971-2000, Environment Canada, Rankin Inlet Airport Weather Station
Evapotranspiration (m/year)	0.200	* Specific values for Rankin Inlet were not available, estimated using several references, see below.

Nippissar Lake Drainage Basin

Lake Drainage Area (m^2)	3,230,000
Rain and Runoff (m^3/year)	959,956
Evapotranspiration (m^3/year)	646,000
Net Recharge of Lake (m^3/year)	313,956

Nippissar Lake Volume

Lake Area (m^2)	1,090,565
Estimated Average Depth (m)	4
Estimated Lake Volume (m^3)	4,362,260

Evapotranspiration Rates

Location	Value (mm)	Reference
Arviat, Nunavut	203	FSC Architects & Engineers, 2003
Mackenzie Basin, Yukon	241	Serrereze et al, 2003
Lena Basin, Russai	182	Serrereze et al, 2003
Knob Lake, Quebec	280	Church, 1974
Boot Creek, Inuvik, NWT	75	Church, 1974
Mackenzie River Basin, Yukon	216	Yi Yip, 2008
Average	**200**	

References:

FSC Architects & Engineers, 2003. Design Concept for Arviat Sewage Lagoon prepared for Department of Community Government and Transportation, Government of Nunavut.

Church, M. 1974. Hydrology and Permafrost with Reference to Northern North America. In Proceedings: Workshop Seminar on Permafrost Hydrology, 7-20. Ottawa: Canadian National Committee, International Hydrological Decade (IHD).

Yi Yip, Q.M. 2008. Climate Impacts on Hydrometric Variables in Mackenzie River Basin. University of Waterloo, Waterloo, 2008.

Serreze, M.C., D.H. Bromwich, M.P. Clark, A.J. Etringer, T. Zhang and R. Lammers, 2003. Large-scale hydro-climatology of the terrestrial Arctic drainage system. Journal Geophysical Research, 108(D2). Doi:10. 1029/2002JD000919

Nunavut Water Board
P.O. Box 119
Gjoa Haven, Nunavut
X0E 1J0

Re: Government of Nunavut, Rankin Inlet Water License Renewal

1. Name and Mailing Address of Applicant/Licensee

This application is being submitted on behalf of the Government of Nunavut, Community and Government Services, P.O. Bag 002, Rankin Inlet, Nunavut, X0C 0G0. Telephone: (867) 645-8178 Fax: (867) 645-8196

2. Address if Head Office in Canada if Incorporated

N/A

3. Location of Undertaking

The Hamlet of Rankin Inlet is located on Rankin Inlet, on the west coast of Hudson Bay (Figure 1). It is 96-air km southwest of Chesterfield Inlet and 1088 air km east of Yellowknife, at 62° 49'N latitude and 92° 05' W longitudes (Figure 1). Rankin Inlet is the regional centre for the Kivalliq Region of Nunavut. The hamlet has a land area of 20.24 km^2 and as of the 2006 census a population of 2,358.

Surface materials consist mainly of exposed volcanic or sedimentary Precambrian rock and various types of re-worked ground moraine, notable marine terraces. The soil is a mixture of organic materials, gravel, sands and fines. Numerous eskers provide a good source of granular material. The shoreline is composed of recently deposited sands and silts. The Hamlet is within the continuous permafrost zone, with an estimated permafrost thickness of 300 m. The active layer of permafrost is very shallow, extending 0.3 m below the ground surface. Areas with developed soil layers support hardy grasses, while rock outcrops support lichens. Clusters of small willow bushes grow in well-sheltered areas.

The Rankin Inlet area receives an average of 18.1 cm of rainfall and 107 cm of snowfall per annum. Mean annual precipitation totals 29.7 cm per annum. July mean high and low temperatures are 14.9°C and 5.9°C, respectively. January mean high and low temperatures are -28.3°C and -35.5°C, respectively. Winds are generally north-west, and average 23 km/h (Rankin Inlet Weather Station, Climate Normals 1991-2000, Environment Canada, 2008).

4. Description of Undertaking

This application includes the water intake system and utilidor system, and the sewage treatment plant for the Hamlet of Rankin Inlet. The current landfill, the new landfill and the land farm are included on a separate licence issued to the Hamlet of Rankin Inlet. The community of Rankin Inlet and the above facilities are shown on Figure 2.

Water Supply

The community draws its water from the Nipissar Lake, located 2 km northwest of the Hamlet. Nipissar Lake covers an area of 1,090,565 m^3. Using an average depth of 4 metres the estimated volume of the lake is 4,362260 m^3. The total drainage area of Nipissar Lake is 323 hectares. Using an annual precipitation rate of 297.2 mm and an annual evapotranspiration rate of 200 mm, the calculated total recharge to the lake is approximately 314 000 m^3 per year (Appendix B, Hydrology Calculations). This is lower than the numbers given in the Nipissar Lake Watershed Model, which calculates the useable storage of the lake to be about 1,400,000 m^3 and the estimated annual recharge as 600,000 m^3 per year (Stanley Assoc., 1996). Regional drainage in the area is shown in Figure 3.

The Nipissar Lake pumphouse has vertical turbine submersible pumps installed inside twin intake lines. Each of the 10 Hp pumps has a 1020 L/min. capacity. Only one pump operates at a time. Operation of the pump is controlled by the water level in the water storage tank adjacent to the Williamson Lake pumphouse. An air compressor aerates water around the intake to prevent taste and odour problems.

Water from the Nipissar Lake pumphouse is pumped to the community through a shallow buried insulated main, which operates year-round. In 1995, new supply and return lines were constructed and the old lines were abandoned.

Piping System Data	
Length	2000 m
Supply Line	200 mm diameter insulated HDPE
Return Line	150 mm diameter insulated HDPE
Access Vaults	7 vaults, each 1600 mm diam HDPE. Inside the vaults, each line is fitted with a butterfly valve and two 75 mm diam thaw ports.

The lines slope continuously upward from Nipissar Lake to Williamson Lake; there are no intermediate drain points.

The supply line passes through the Williamson Lake pumphouse where most of the water is chlorinated in the bottom of the water storage tank adjacent to the pumphouse. A small portion of the water is heated in the Nipissar Lake heat exchanger in the Williamson Lake pumphouse and then pumped back through the return line. Most of the heated water arriving in the Nipissar pumphouse is injected back in to the supply line. Some of the heated water is bled into the Lake Nipissar intake casings to prevent freezing of the intake lines.

The Williamson Lake pumphouse, completed in 1976, is located on the north berm of the Williamson Lake, in the centre of the community. The pumphouse contains two wet wells; four distribution pumps, two hot water boilers, three heat exchangers (one for the Nipissar supply line, one for the town and one spare), chlorination equipment, a diesel standby generator, valves, alarms, and controls.

Water flows by gravity from the water storage tank through a valve into the two wet wells; the valve is regulated by the water level in the wet wells. The four 22.4 kW distribution pumps, each rated at 25 L/s, pump water from the wet wells into the distribution system through a common header. The pump system is sized for maximum daily demand and the fire flow needs. One pump operates continuously, circulating heated water through the distribution loops with a portion returning to the pumphouse. As demand in the distribution system increases, additional pumps activate according to pressure drop in the system.

The heat for the distribution water is produced by two fuel oil fired boilers. The heated water circulates through the Hamlet heat exchanger, which in turn heats water for injection into the distribution header. Modulating valves, located on each loop where the loop returns to the pumphouse, control water temperatures in the loops by varying their flow rates. If a loop return temperature falls below a set point, the modulating valve for that loop opens to increase the return flow rate. If the temperature rises above the set point, the valve closes to reduce the loop's return flow rate.

The boilers also provide heat for the building heating system through the Town heat exchanger and for the Nipissar Lake supply line through the Nipissar Lake heat exchanger.

Water Storage

In 1965, Williamson Lake, then located in the outskirts if the community, was chosen as the community's water reservoir. Berms were constructed on the east side to raise the water level about 1.5 m. However, this caused water to seep out of the reservoir through a talik under the berm. In 1995, the Hamlet installed an overflow pipe to keep the Lake at a low level, stopping the sewage from seeping.

From 1965 to 1976, water was pumped into Williamson Lake from Nipissar Lake only during the summer. With the rebuilding of the system in 1976, year-round pumping began. This reduced the need for storage and the lake level was lowered by 0.8 m. As years passed the community expanded to surround the Lake; in 1979, a road to the airport was constructed through the southern part of the Lake. Increasingly, concerns were raised about contamination.

In the 1980's, Williamson Lake was replaced as the storage reservoir. After consideration on many options, including concrete and earthen reservoirs, it was decided to build an insulated steel tank with two-day storage capacity to replace Williamson Lake. The tank was completed in 1993. The Lake was then removed from the system and the intake pipe from the Lake to the pumphouse was sealed. In case of an emergency lasting longer than two days, the lake could still be accessed by means of a portable pump, flexible hose, and ice auger.

Water Storage Tank Data	
Height	12.8 m
Diameter	18.3 m
Useable Storage	
2 hour fire demand	545,000 L
2 day emergency storage	2,030,000 L
Peak balance	473,000 L
Total	3,364,000 L

Water Distribution

There are two systems of water distribution in Rankin Inlet. Approximately 99% of the population receives piped water while the remainder is on trucked service. The Hamlet of Rankin Inlet delivers water to the community utilizing an 8172 L capacity water truck. The truck is filled from the truck fill arm, located on the northwest side of the Williamson Lake pumphouse and delivers three to five days per week. All water deliveries are metered.

The piped water distribution system consists of shallow-buried and insulated mains, usually installed in the same trenches as the sewer mains to save installation costs. Since the mains both originate and terminate at the Williamson Lake pumphouse, they are known as loops. As part of the freeze protection system, the water is constantly circulating in the loops. Water not consumed is returned to the wet wells at the pumphouse.

There are presently four loops in operation. The two loops that service the downtown core and the older residential area leave the pumphouse as a single 250 mm diameter main. This main serves about 20 lots in the core before it branches into the two loops. One loop serves 130 lots, mainly located in Expansion Area 1 and the downtown core, before it returns to the pumphouse. The two loops are mostly 200 mm diameter although some 150 mm diameter pipes are in the downtown area. The oldest sections of these two pump loops were installed in 1972 and the newest in 1993.

A third loop leaves the pumphouse as 200 mm diameter line, serves about 46 lots in area 5 and then returns to the pumphouse as 50mm diameter line.

A fourth loop leaves the pumphouse as a150 mm diameter line and serves Kivalliq Hall, a student residence located across Sivulliq Street from the pumphouse. It returns as a 50 mm diameter line.

In 1995, construction was completed on a 200 mm diameter fifth loop and one sub-loop, which will serve part of the 200 lots Nuvuk subdivision. These loops will become operational when the new sewage disposal system comes on line.

In case of heavy fire flow demand at a hydrant on either of the two core loops or on the Nuvuk loop, automatic controls in the Williamson Lake pumphouse will reserve the flow direction in the return portion of the affected loop. This brings water to the hydrant from two directions rather than one. The two shorter loops are not equipped with this type of control.

Access vaults are placed throughout the distribution system at about 100 m intervals, or at bends or intersections. Vault type depends on the year of construction. Vaults constructed prior to 1976 are insulated corrugated metal pipe. Vaults constructed from 1977 to 1979 are rectangular concrete structures. Vaults from 1979 onward are prefabricated insulated double-walled steel structures.

In current designs, the water main passing through the vault is constructed of steel and is typically fitted with a butterfly valve, two 50mm thaw access ports and two 25

mm drain ports. Many vaults are fitted with electrical outlets but the present design is limited to an access conduit to allow electrical cables and hoses into the vault without keeping the hatch open. The vaults also house cleanouts on the sewer mains to allow access to the sanitary sewer system in the event of a frozen or plugged sewer line.

Water service connections to single-family residential buildings consist of un-insulated 25 mm HDPE supply and return lines taped together, wrapped in a self-limiting heat tape and inserted into a 100 mm diameter insulated HDPE carrier pipe. Water flows from the main through the supply line to circulation pump and flow switch, located inside the building. Water required for consumption then flows through a water meter into the building's water fixtures. Water required for consumption flows into the return line and then back into the main.

By maintaining a constant flow, the circulation pump keeps the water in the service lines from freezing. The heat trace cable, controlled by the floor switch on the supply line, keeps the water from freezing when flow is reduced or stops due to circulation pump failure or other causes. This dual-line circulating system has been found to be the most economical and reliable method of providing water service to the buildings.

Installed service connections are valve at the main and can be shut off by means of valve extensions that expend to above ground level. Older service connections cannot be shut off from above the ground.

For multi-family residential, commercial or industrial buildings, the water service connections are individually designated but use basically the same system as described above.

Sewage Collection and Disposal

There are two systems of sewage collection in Rankin Inlet: approximately 99% of the population has piped sewage service while the remainder receives trucked pump out service. Pump out sewage is collected by the Hamlet's 1993 – 4540 L tank truck. The truck discharges the sewage into the piped system through a temporary facility in an old lift station, located just west of the macerator. Most of the trucked service customers live in the Nuvuk subdivision.

The sewage mains are 150 mm or 200 mm diameter insulated shallow-buried HDPE pipes. They are usually installed in the same trenches as the water mains to save installation costs. Sewage from the buildings enters the mains through 100 mm diameter insulated HDPE service connections.

The oldest mains still in service were installed in 1972. Some of the older mains suffer frequent freezing and breakage due to inadequate flow. Insufficient slope, back grading, insufficient cover, damaged insulation, or freezing between the pipe and the insulation. In winter bleeding from the water mains into the sewer mains is practiced to mitigate some of these problems. Each summer the system is inspected with a sewer camera. The sections of piping in poor condition are repaired or replaced. No problems have been reported in the recently installed mains, except for occasional freeze ups of the service connections.

Sewage from the collector mains flows by gravity into the wet well of the macerator station (which has not been operational for many years), located on the eastern edge of the community. From the macerator, the untreated sewage flows 425 m through a buried/submerged outfall line and discharges into the bottom of the Johnston Cove, a confined bay that serves as a small boat harbour and recreational area. For many years, the community expressed concern about the adverse aesthetic and environmental impact of this disposal system and its possible threat to public health. Studies by the Department of Fisheries and Oceans and by MACA in 1990 and 1991 confirmed that the disposal system was unacceptable for health, environmental, and aesthetic reasons.

In response, MACA hired a consultant (1992) to evaluate alternate sewage disposal options. Various treatment processes, such as a primary and secondary mechanical treatment, and a lagoon were evaluated and various outfall locations were studied.

The concept selected was a mechanical treatment plant with rotating drum screen to provide partial primary treatment. The recommended ultimate disposal point was in the deep waters of Prairie Bay to the northeast of the community, a location that will provide good conditions for mixing and dispersal of the effluent. Two lift stations with force mains will be required to pump the sewage to the treatment plant. Design of the system components began in 1993 and construction began in 1994. The system is designed to accommodate peak flows of 65 L/s.

Effluent from the treatment plant flows by gravity through a 300 mm diameter buried insulated HDPE pipe to the outfall, completed in 1995. The waste eventually reaches a point near the bottom of Prairie Bay (Figure 2).

To protect against ice scour, the top of the filled-in trench was armoured with rock for the last 35 m of the land section and all of the submersible section. To aid dispersal and mixing, the three steel bell mouths of the diffuser set 90° apart, will divide the effluent into three separate streams as it enter the receiving waters.

5. Type of Undertaking

The undertakings included in this application are classified as "Municipal" undertakings.

6. Water Use

The water use in this licence is to obtain water for the use of the Hamlet, as their primary water supply.

7. Quantity of Water Involved

Population Estimates:

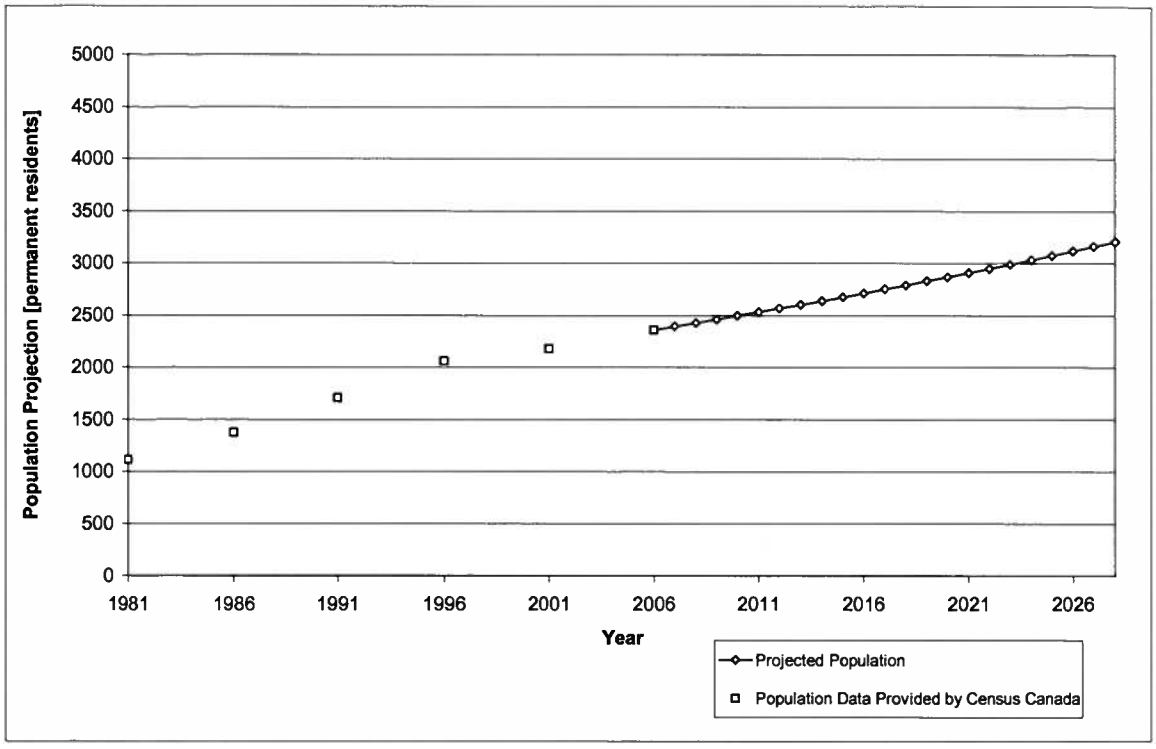
Using population numbers from Census Reports between the years 1981 and 2006 and average provincial growth rate projections from Statistics Canada (Statistics Canada, 2000), a growth rate of 1.4% was determined. Table 1 shows the projected population of the Hamlet for the next 20 years.

Table 1: Projected Population Growth for Hamlet of Rankin Inlet

Year	Projected Population
2006	2358
2007	2392
2008	2426
2009	2460
2010	2495
2011	2530
2012	2566
2013	2602
2014	2639
2015	2676
2016	2714
2017	2752
2018	2791
2019	2831
2020	2871
2021	2912
2022	2953
2023	2995
2024	3037
2025	3080
2026	3124

Year	Projected Population
2027	3168
2028	3213

Figure A: Population Projections Rankin Inlet, Nunavut



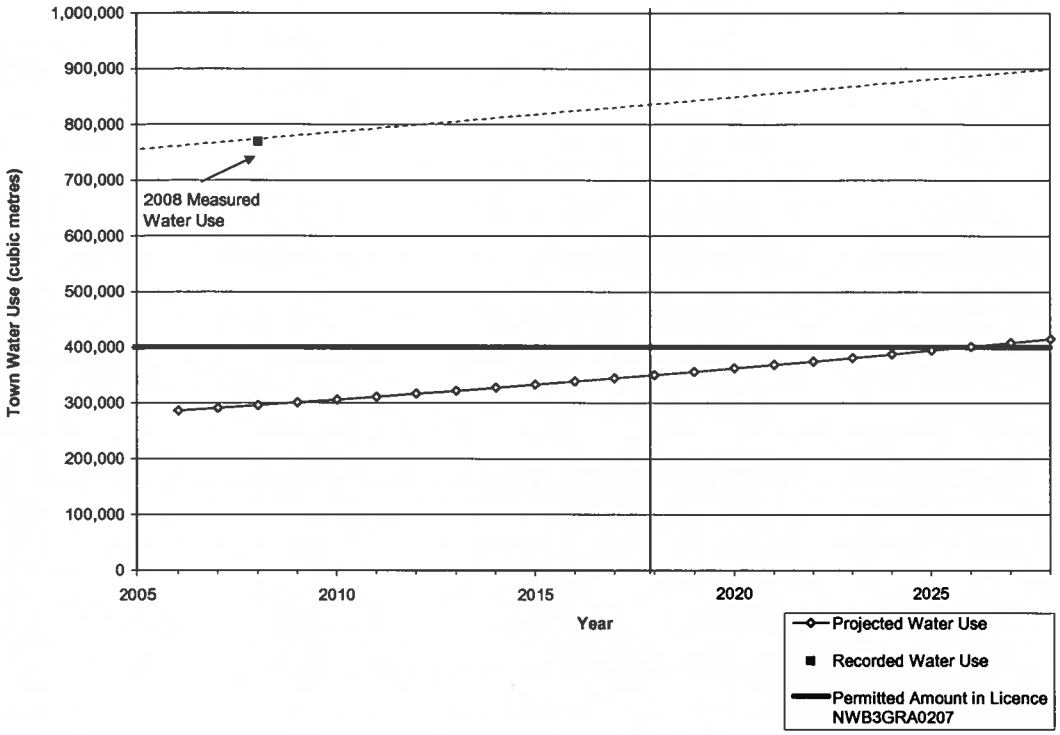
The Municipal and Community Affairs (MACA, 1996) planning guidelines suggest that the increase in the projected per capita water use in a community of between 2000 and 10,000 people should calculated using the following formulae.

RWU x (-1.0 + (0.323 x Ln (Population))

Where the RWU (residential water use) is estimated to be 220 L per capita (Lpcd) for a community with water distribution piping and the factor 0.323 x Ln population represents the commercial and industrial water use.

This equation was used to produce the projected water use shown in Figure B.

Figure B: Projected Water Use Rates, Rankin Inlet, Nunavut



The GN was able to provide a data summary sheet of flows for two days in July, 2008. The data sheets contained data on the previous and current month water flows for the town. Since this was the only available data, we estimated a daily use rate from the two monthly averages. The daily use rate estimated was 2,108 m^3/day which is 769,237 m^3 per year. As seen in Figure B, this rate is much higher than the estimated rate using MACA equations (Calculations are shown in Table B-1 in Appendix B). Using the same slope of the line from the projected usage rates, a projection of water use rates from the current use rate was plotted. This line indicates that in 20 years the annual water use will be 900,000 m^3.

The currently expired licence NWB3GRA0207, had a maximum allowable water use of 400,000 cubic metres annually. This licence was issued for 2002 to 2007. If the water use in Rankin Inlet were as the MACA equations projected, this volume would be sufficient for the Hamlet for another 10 years. The Hamlet however is using more water than estimated in the equations. This may be part to the extensive utilidor system in the Hamlet that requires water flowing through the pipes or that the Hamlet has water uses that are different from the typical community.

Using available land elevation data, the drainage basin for Nipissar Lake was drawn (Figure 3). The drainage basin for Nipissar Lake is 323 ha. Using an annual precipitation rate of 297.2 mm and an annual evapotranspiration rate of 200 mm, the calculated total recharge to the lake is approximately 314 000 m^3 per year (Appendix B, Hydrology Calculations). This is lower than the numbers given in the Nipissar Lake Watershed Model, which calculates the useable storage of the lake to be about 1,400,000 m^3 and the estimated annual recharge as 600,000 m^3 per year (Stanley Assoc., 1996). Regional drainage in the area is shown in Figure 3.

According to the water use estimates, the town is using more water per year than the estimated annual recharge of the lake. However as a confined shallow tundra lake, it is not a significant fish habitat or waterfowl area. The lake has been designated as a reservoir and is off limits to recreational activities. This considered the water takings should not have a significant impact to the environment. The Government of Nunavut and the Hamlet should identify an alternative water supply that they can pump into the reservoir during the summer months to maintain the water levels in the lake in the future.

8. Waste

Sewage

The volume of sewage waste water corresponds to the annual water use of the Hamlet. Using the water use projections, the current volume of waste water for 2008 will be 769,237 m^3. Ten years from now in 2018, the annual volume of sewage generated by the Hamlet of Rankin Inlet will be approximately 840,000 m^3.

Quality of Sewage

Ferguson Simek Clark (FSC) completed a sewage study in 2003 with the objectives to determine the volume and quality of sewage generated by the community of Rankin Inlet. The 2004 FSC report summarized the findings of a sampling program conducted on the wastewater influent to the Rankin Inlet wastewater treatment plant. Results are illustrated in Table 3.0 by overall averages for the two lift stations.

Table 3.0: Influent Quality to the Rankin Inlet Sewage Treatment Plant, Sewage Sampling in 2004

Parameter	Johnson cove Lift Station	Nanuk Lift Station
BOD(mg/L)	147	241
TSS (mg/L)	152	159
Ammonia as N (mg/L)	22.7	40.9
Fecal Coliforms (CFU/100 mL)	7.19	7.82
Nitrate-Nitrite as N (mg/L)	7.19	7.82

Dillon Consulting Limited sampled wastewater influent in December 2005 for BOD, TSS, Total Oil and Grease, Total Coliforms, Fecal Coliforms, and Ammonia Dissolved. Results are illustrated in Table 4 .0.

Table 4.0: Influent Quality for the Rankin Inlet Sewage Treatment Plant Sewage Sampling in 2005

Parameter	16-Dec-05	20-Dec-05	22-Dec-05
BOD (mg/L)	97	140	92
TSS (mg/L)	94	72	75
Ammonia as N (mg/L)	14.1	13.4	5.53
Fecal Coliforms (MPN/100ml)	>110000	>110000	>110000
Total Oil & Grease (mg/L)	22	21	22
Total Coliforms (mg/L)	>11000	>110000	>110000

Sampling of the sewage effluent was conducted by the GN in May, June and August of 2008. This data is summarized in Table 5.0. The full results are included in Appendix A.

Table 5.0: Sewage Effluent Quality for the Sewage Treatment Plant – GRA3

Parameter	16-May-08	30-June-08	01-Aug-08
BOD (mg/L)	110	61	90
TSS (mg/L)	-	46	71
Ammonia as N (mg/L)	6.35	9.4	28.7
Fecal Coliforms (CFU/100ml)	1290000	570000	3000000

Sludges

Sludges are generated through the mechanical system of the Hamlet's sewage treatment plant. The sludges are taken to the municipal dump and put into a landfill site for disposal. The Hamlet produces approximately 1 cubic metre of sludge a week[1]. Therefore, a total of 52 m^3 of sewage sludge is received by the landfill annually.

9. Persons or Properties Affected by this Undertaking

There are no persons or properties affected by this undertaking. A Land Use Permit was completed by the DIAND on 2000/07/27.

10. Predicted Environmental Impacts of Undertaking and Proposed Mitigation

The disposal of sewage may have local site effects due to increased nutrients available. The Hamlet Council has expressed some concern about the raw sewage that is being discharged into the ocean. However, the Department of Public Works has assured the Council that this is done at acceptable rates. According to Hamlet of Rankin Inlet Public Works Staff member, September 2008.

A Fisheries Impact Study around the sewage discharge site is recommended to document any potential impacts the discharge is having on marine life.

There have been no noticeable effects on the levels of Nipissar Lake due to the water intake. In the future lake water levels will be recorded based on a (to be installed) water level gauge to ensure that any potential impacts to lake water levels are monitored.

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[1] According to Hamlet of Rankin Inlet Public Works Staff member, September 2008.

11. Inuit Water Rights

The project or activity will not substantially affect the quality, quantity, or flow of water flowing through Inuit Owned Lands and the rights of Inuit under Article 20 of the Nunavut Land Claims Agreement.

12. Contractors and Sub-Contractors

None

13. Studies Undertaken to Date

- Environmental Emergency Contingency Plan, Hamlet of Rankin Inlet, by Nuna Burnside, December 2008
- Environmental Monitoring Program and Quality Assurance / Quality Control Plan, Hamlet of Rankin Inlet, by Nuna Burnside, December 2008
- Water Supply Facility, Operations and Maintenance Plan, Hamlet of Rankin Inlet, by Nuna Burnside, December 2008
- Sewage Treatment Facility, Operations and Maintenance Plan, Hamlet of Rankin Inlet, by Nuna Burnside, December 2008
- NWB Annual Report, 2008, Rankin Inlet Water Use and Waste Disposal by Nuna Burnside, December 2008.

14. Attachments

The following are attached with this document:

- Figures 1 to 4
- Appendices
  - A Sampling Results
  - B Water and Sewage Calculations
  - C Sewage Disposal Facility Drawings
- Water License Application Supplementary Questionnaire for Municipalities
- Executive Summary of License Application.

15. Proposed Time Schedule

We propose that the licence be a 5 year license starting immediately upon approval.

16. References

Department of Municipal and Community Affairs (MACA), Government of Northwest Territories, October 1996. *Guidelines for the Preparation of an Operation and Maintenance Manual for Sewage and Solid Waste Disposal Facilities in the Northwest Territories*. Queen's Printer: Yellowknife, Northwest Territories.

Dillon Consultants Inc. *Waste Water Treatment Plant Upgrades*, Community and Government Services, Government of Nunavut, June 2006.

Ferguson Simek Clark, Sewage Effluent Sampling Program, Rankin Inlet, Nunavut. 2004.

Environment Canada, 2008. *Canadian Climate Normals 1971-2000, Rankin Inlet A Weather Station*, Environment Canada. <http://climate.weatheroffice.ec.gc.ca/climate_normals/results_e.html?StnID=1721&autofwd=1>. Accessed Nov 10, 2008.

Nunavut Water Board, 2000. *Guidelines for the Discharge of Domestic Waste Water in Nunavut*.

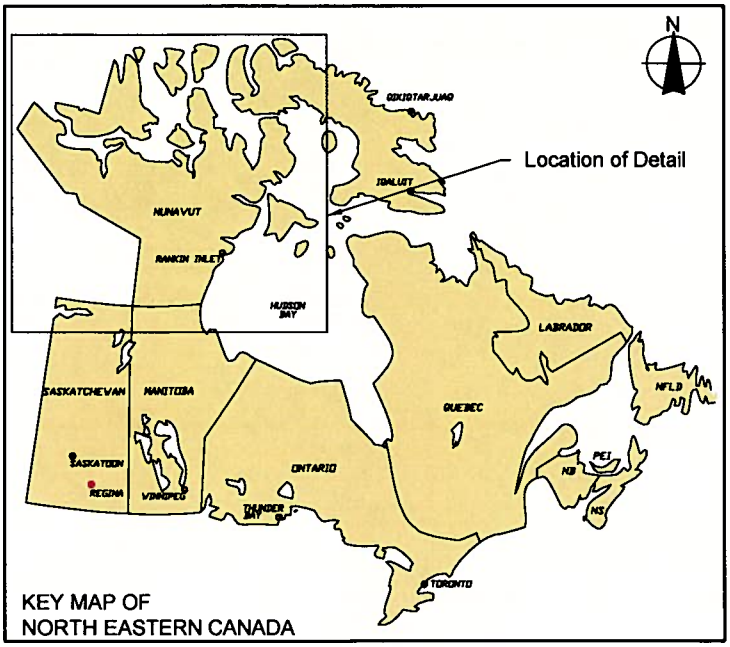
Stanley Associates Engineering Ltd., *Nipissar Lake Watershed Model*, for Department of Public Works and Services, GNWT, February 1996.

Statistics Canada, 2000. *Population Projections for Canada, Provinces and Territories 2000 – 2026*. Statistics Canada, 2000.

Figures

Figures

Map Reference:
Map Art Publishing



KEY MAP OF
NORTH EASTERN CANADA

FIGURE 1 - SITE LOCATION MAP

GOVERNMENT OF NUNAVUT

HAMLET OF RANKIN INLET, NUNAVUT

WATER LICENCE SUBMISSION

December 2008
Project Number: N-O14850

Prepared by: C. Sheppard

Verified by: J. Walls

BURNSIDE

N-O14850 WATER LICENCE SUB - GOVERNMENT SL.dwg

Plot Time: Mar 05, 2009 - 10:35am

FIGURE 2

GOVERNMENT OF NUNAVUT
HAMLET OF RANKIN INLET, NUNAVUT
WATER LICENCE SUBMISSION

COMMUNITY PLAN

Satellite Image Source:
Background 2006 satellite image covering the immediate community area obtained from MDA Geospatial Services.
Background colour satellite image covering the area beyond the immediate community obtained from the Google Earth Pro website.

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August 2008
Project Number: N-O14850

Projection: UTM Zone 15
Datum: NAD83

Prepared by: C. Sheppard
Verified by: J. Walls

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N-O14850 WATER LICENCE SUB - GOVERNMENT CP.dwg

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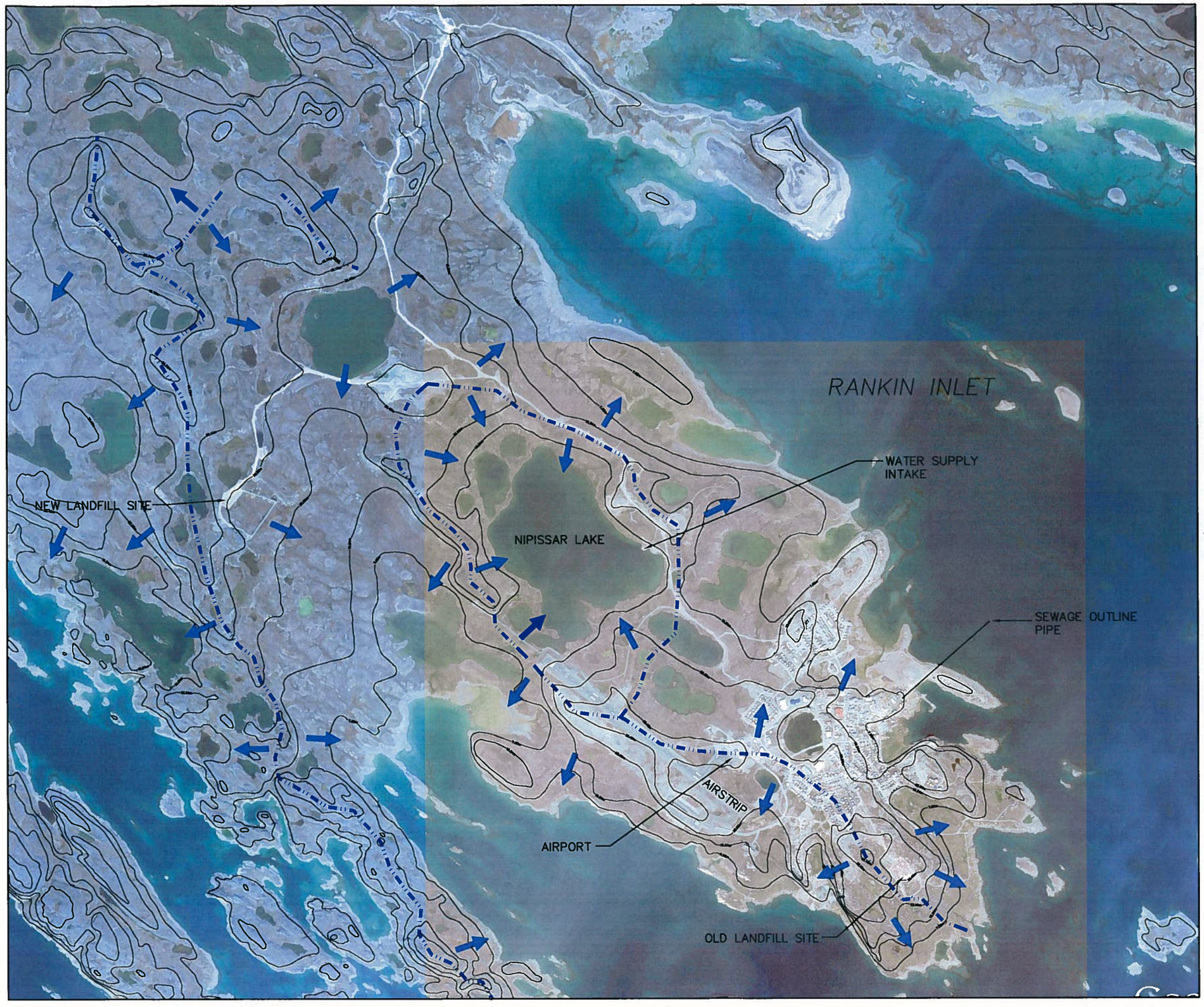

FIGURE 3

GOVERNMENT OF NUNAVUT
HAMLET OF RANKIN INLET, NUNAVUT
WATER LICENCE SUBMISSION

DRAINAGE AREAS

LEGEND

—— 100m —— 25m INTERVAL CONTOUR LINES (m amsl) (Obtained from National Topographic Digital Database)

INTERPRETED SURFACE WATER DRAINAGE DIVIDE

INTERPRETED SURFACE WATER FLOW DIRECTION

Satellite Image Source:
Background 2006 satellite image covering the immediate community area obtained from MDA Geospatial Services.
Background colour satellite image covering the area beyond the immediate community obtained from the Google Earth Pro website.

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Projection: UTM Zone 15
Datum: NAD83

Prepared by: C. Sheppard

Verified by: J. Walls

BURNSIDE

N-014850 WATER LICENCE SUB - GOVERNMENT DA.dwg

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