Appendix A
Climate Data

Climate Data

Table 1: Rankin Inlet Climate Normals Data Summary

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
Total Precipitation (mm)	6.6	8.9	12.6	14.3	18.4	29.8	39.5	57.6	43.8	34.6	19.8	11.3	297.2
Rain (mm)	0.0	0.1	0.0	1.0	7.4	25.0	39.5	57.3	39.2	11.9	0.1	0.0	181.5
Snow (cm)	6.7	9.3	12.9	13.6	11.5	4.9	0.0	0.3	4.6	23.1	20.9	11.9	107.8
Wind Speeds (km/hour)	23.9	23.9	23.4	22.4	22.1	19.8	19.2	21.1	24.2	26.5	25.3	24.0	
Average Temperatures (°C)	-31.9	-30.1	-25.2	-16.3	-5.9	4.2	10.4	9.5	3.4	-5.3	-17.8	-26.7	

*Canadian Climate Normals 1971-2000, Environment Canada, Rankin Inlet Airport Weather Station

Specific climate data for Arviat was not available. The closest weather station is located in Rankin Inlet, 225 km north of Arviat.

Appendix B
Water and Waste Calculation Tables

Water Use Projections for the Hamlet of Arviat, Nunavut

Key Assumptions

Starting Year:	2006	Starting Population:	2060
Population Growth Rate:	1.4%	Residential Water Usage Rate [L/cd]::	65.0

Planning Year	Calendar Year	Projected Population[1]	Projected Water Consumption[2]	Projected Total Consumption Volume			
			[Lpcd]	[Litres/day]	[Litres/year]	[m3/day]	[m3/year]
	2006	2060	95.8	197342	72,029,764	197	72,030
	2007	2089	96.2	201026	73,374,351	201	73,374
	2008	2119	96.7	204863	74,774,961	205	74,775
0	2009	2149	97.1	208727	76,185,393	209	76,185
	2010	2180	97.6	212748	77,653,159	213	77,653
	2011	2211	98.1	216798	79,131,412	217	79,131
	2012	2242	98.5	220877	80,620,153	221	80,620
	2013	2274	99.0	225118	82,167,919	225	82,168
5	2014	2306	99.5	229389	83,726,860	229	83,727
	2015	2339	100.0	233825	85,346,223	234	85,346
	2016	2372	100.5	238294	86,977,471	238	86,977
	2017	2406	101.0	242933	88,670,581	243	88,671
	2018	2440	101.5	247606	90,376,307	248	90,376
10	2019	2475	102.0	252453	92,145,379	252	92,145
	2020	2510	102.5	257336	93,927,821	257	93,928
	2021	2546	103.1	262398	95,775,136	262	95,775
	2022	2582	103.6	267498	97,636,596	267	97,637
	2023	2619	104.2	272779	99,564,502	273	99,565
	2024	2656	104.7	278102	101,507,348	278	101,507
	2025	2694	105.3	283612	103,518,255	284	103,518
	2026	2732	105.8	289164	105,544,922	289	105,545
	2027	2771	106.4	294908	107,641,308	295	107,641
	2028	2810	107.0	300697	109,754,294	301	109,754
20	2029	2850	107.6	306681	111,938,702	307	111,939
	2030	2890	108.2	312714	114,140,572	313	114,141
	2031	2931	108.8	318947	116,415,610	319	116,416
	2032	2973	109.4	325384	118,765,159	325	118,765
	2033	3015	110.1	331874	121,133,960	332	121,134
	2034	3058	110.7	338573	123,579,106	339	123,579
	2035	3101	111.4	345327	126,044,430	345	126,044
	2036	3145	112.0	352296	128,587,976	352	128,588
	2037	3190	112.7	359483	131,211,184	359	131,211
	2038	3235	113.4	366730	133,856,492	367	133,856
30	2039	3281	114.1	374201	136,583,426	374	136,583

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 water consumption is based on the Nunavut water usage formula [RWU L/c/d x (1 + (0.00023 x [population]).

3) The Residential Water Usesage Rate is estimated to be 90 L/c/d for municipalities where water is not distributed by a piping system. To fit the recorded water use data the RWU rate was lowerd to 65 L/c/d.

Sewage Generation Rates for the Hamlet of Arviat

Planning Year	Calendar Year	Total Population[1]	Projected Sewage generation[2] (lpcd)	Projected Volume (m^3/day)	Projected Volume (m^3/year)	Projected Sludge Quantity (kg/annum)	Cumulative Sludge Volume[4] (m^3)	Available Volume of Lagoon (m^3)
	2006	2060	95.8	197	72,030	37,595	752	34,547
	2007	2089	96.2	201	73,374	38,124	1,514	33,785
	2008	2119	96.7	205	74,775	38,672	2,288	33,011
0	2009	2149	97.1	209	76,185	39,219	3,072	32,227
	2010	2180	97.6	213	77,653	39,785	3,868	31,431
	2011	2211	98.1	217	79,131	40,351	4,675	30,624
	2012	2242	98.5	221	80,620	40,917	5,493	29,806
	2013	2274	99.0	225	82,168	41,501	6,323	28,976
5	2014	2306	99.5	229	83,727	42,085	7,165	28,134
	2015	2339	100.0	234	85,346	42,687	8,019	27,280
	2016	2372	100.5	238	86,977	43,289	8,884	26,415
	2017	2406	101.0	243	88,671	43,910	9,763	25,536
	2018	2440	101.5	248	90,376	44,530	10,653	24,646
10	2019	2475	102.0	252	92,145	45,169	11,557	23,742
	2020	2510	102.5	257	93,928	45,808	12,473	22,826
	2021	2546	103.1	262	95,775	46,465	13,402	21,897
	2022	2582	103.6	267	97,637	47,122	14,345	20,955
	2023	2619	104.2	273	99,565	47,797	15,300	19,999
15	2024	2656	104.7	278	101,507	48,472	16,270	19,029
	2025	2694	105.3	284	103,518	49,166	17,253	18,046
	2026	2732	105.8	289	105,545	49,859	18,250	17,049
	2027	2771	106.4	295	107,641	50,571	19,262	16,037
	2028	2810	107.0	301	109,754	51,283	20,287	15,012
20	2029	2850	107.6	307	111,939	52,013	21,328	13,971

Notes:
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 rate is based on the Nunavut water usage formula for municipalities that do not have piped water [RWU L/c/d x (1 + 0.00023 x population)] (MACA, 1988).
3) The Residential Water Usesage Rate is estimated to be 90 L/c/d for municipalities where water is not distributed by a piping system. To fit the recorded water use data the RWU rate was lowerd to 65 L/c/d.
4) A value of 5% dry solids is assumed for the liquid sludge accumulating at the bottom of the lagoon.

Calculations and Numbers Used

Area of Lagoon (m^2)	18980
Freeboard (m)	1
Average Usable Depth (m)	2
Useable Lagoon Volume (m^3)	37960
Population Growth Rate	1.4%
Sewage Generation Rate (lpcd)	65

Natural Waters Input in Lagoon

Annual Precipitation (m/year)	0.3402
Evaporation (m/year)	0.2
Lagoon Suface Area (m^2)	18980
Net Influx to Lagoon from Precipitation (m^3/year)	2661

* MACA, 1988. Guidelines for the Planning, Design and Operation and Maintenance of Wastewater Lagoon Systems in NWT. Prepared for Municipal and Community Affairs, Government of Northwest Territories. Yellowknife, Northwest Territories.

** Evapotranspiration estimated based on several references. See Hydrology Calculations in Appendices.

Hydrology Calculations, Hamlet of Arviat

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 Arviat were not available, estimated using several references, see below.

Wolf River Drainage Basin

River Catchment Area (m^2)*	650,000,000
Rain and Runoff (m^3/year)	193,180,000
Evapotranspiration (m^3/year)	130,000,000
Net Recharge of Catchment Area (m^3/year)	63,180,000

* IEG Environmental, 2005

Arviat Sewage Lagoon

Surface Area of Lagoon (m^2)	18,980
Average usable depth of Lagoon (m)	2
Volume of Lagoon (m^3)	37960
Rain (m^3/year)	5,641
Evapotranspiration (m^3/year)	3,796
Net Precipitation Input to Sewage Lagoon (m^3/year)	1,845
Total Lagoon Capacity for Sewage (m^3)	36,115

Runoff was not considered since the berms of the lagoon are raised and no runoff should enter lagoon.

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

Waste Quantity Calculations - Hamlet of Arviat, Nunavut

Planning Year	Calendar Year	Projected Population [people]	Annual Volume of Solid Waste [m^3]	Cumulative Volume of Solid Waste [m^3]	Annual Volume of Combustible Solid Waste [m^3]	Annual Volume of Combustible Solid Waste After Burning [m^3]	Annual Volume of Uncombustible Solid Waste [m^3]	Total Annual Volume of Uncombustible and Combusted (Burned) Solid Waste [m^3]	Annual Volume of Compacted Waste [m^3]	Annual Volume of Cover Material [m^3]	Total Annual Volume of Compacted Waste and Cover Material [m^3]	Cumulative Landfill Volume [m3]
	2006	2060	10527	10527	2105	632	8421	9053	6337	1267	7604	
	2007	2089	10675	21201	2135	640	8540	9180	6426	1285	7711	
	2008	2119	10828	32029	2166	650	8662	9312	6519	1304	7822	
0	2009	2149	10981	43011	2196	659	8785	9444	6611	1322	7933	7,933
	2010	2180	11140	54151	2228	668	8912	9580	6706	1341	8047	15,980
	2011	2211	11298	65449	2260	678	9039	9716	6802	1360	8162	24,142
	2012	2242	11457	76906	2291	687	9165	9853	6897	1379	8276	32,418
	2013	2274	11620	88526	2324	697	9296	9993	6995	1399	8394	40,813
5	2014	2306	11784	100309	2357	707	9427	10134	7094	1419	8513	49,325
	2015	2339	11952	112262	2390	717	9562	10279	7195	1439	8634	57,960
	2016	2372	12121	124383	2424	727	9697	10424	7297	1459	8756	66,716
	2017	2406	12295	136677	2459	738	9836	10573	7401	1480	8882	75,597
	2018	2440	12468	149146	2494	748	9975	10723	7506	1501	9007	84,605
10	2019	2475	12647	161793	2529	759	10118	10877	7614	1523	9136	93,741
	2020	2510	12826	174619	2565	770	10261	11030	7721	1544	9266	103,007
	2021	2546	13010	187629	2602	781	10408	11189	7832	1566	9398	112,405
	2022	2582	13194	200823	2639	792	10555	11347	7943	1589	9531	121,936
	2023	2619	13383	214206	2677	803	10706	11509	8057	1611	9668	131,604
15	2024	2656	13572	227778	2714	814	10858	11672	8170	1634	9805	141,409
	2025	2694	13766	241545	2753	826	11013	11839	8287	1657	9945	151,354
	2026	2732	13961	255505	2792	838	11168	12006	8404	1681	10085	161,439
	2027	2771	14160	269665	2832	850	11328	12177	8524	1705	10229	171,668
	2028	2810	14359	284024	2872	862	11487.3	12349	8644	1729	10373	182,041
20	2029	2850	14564	298588	2913	874	11650.8	12525	8767	1753	10521	192,562

Calculation Assumptions:
20% of waste is combustible
30% of combustible waste is remaining after burning
30% decrease in volume after compaction
20% cover material required per volume of ga
Population growth rate, 1.4%

Water Licence Application Supplementary Questionnaire for Municipalities

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

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NUNAVUT WATER BOARD

NUNAVUT IMALIRIYIN KATIMAYINGI
OFFICE DES EAUX DU NUNAVUT

Water Licence Application
Supplementary Questionnaire
For Municipalities

Hamlet of Arviat

Licence #: NWB3ARV0308

I. GENERAL

1. Date: December 23, 2008

2. Applicant: Hamlet of Arviat

3. Contacts: Mr. Elwood Johnston
   Position: Interim Senior Administrative Officer
   Telephone #: (867) 857-2841
   Fax #: (867) 857-2519
   Email: arviatsao@qiniq.com

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 # NWB3ARV0308

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.

Government of Nunavut

III. WATER SUPPLY

Water Source

1. Type of source: _ Lake **X** River __Well __Other _____

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

___Wolf River_____ _____
Primary Source Secondary Source

3. Usual break-up & freeze-up period: ___June____ _December___
Break-up Freeze-up

Water Intake

1. Please provide short descriptions for the following:

a. Freshwater intake facility
A pump house is located beside creek. Intake line pumps from pooled area along creek at a depth of approximately 4 metres.

b. Operating capacity of pump used
Portable diesel power pumps are used.

c. Intake screen size
Portable screen

Water Storage

1. Type of water storage facility. (Check where applicable)
X Reservoir/Pond ___ Storage tank ___ none

___ Other _____Description:

2. If "reservoir" checked:

Is the reservoir lined? **X** Yes __ No

What type of liner? Impermeable membrane___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.

3. Type of water treatment.

____ Filtration and chlorination
X Chlorination only
____ None
X Other Fluoride added to reservoirs___
Description

Water Use and Distribution

1. Volume of water use:

Distribution	**Estimated number of people on the system** **A**	**Estimated average water consumption (Liters/capita/day) B**	**Total water consumption (Day/day) A x B**
PIPED	0	0	0
TRUCKED	2119	65	137,735
		TOTAL	**137,735**

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?
   ___ No **X** Yes

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

Water Supply Filtration Upgrades are planned to be completed by Dillon Consulting. Plans are attached.

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

Upgrades to the water treatment facility are planned. The community has some long term concerns regarding the capacity of the Wolf River supply. There are no short term concerns.

Identification

Are there signs identifying drinking water sources presently used by the municipality?
X Yes __ No

There is a sign at the water reservoirs.

IV. SEWAGE DISPOSAL

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

   X Lagoon
   ___ Mechanical system
   X Wetland
   ___ Honey bag
   ___ Combination/Other: Describe:

Lagoon *(if applicable)*

1. Has there been any operating problems with the lagoon? ___ Yes **X** No
   If yes, describe

Mechanical System *(if applicable)*

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

2. Are sludge's produced ? __ Yes __ No
   If yes, describe how the sludge's are disposed of:

Wetland *(if applicable)*

1. Describe the Wetland wastewater treatment system.

Effluent is decanted from the lagoon flows overland towards Hudson Bay for approximately 100 m. The wetland wastewater treatment system utilizes complex physical and biological processes to treat the wastewater. A combination of sedimentation, absorption of pollutants in the surface soils, nutrient uptake by plants and oxidation of compounds by microorganisms are some of the processes that effect the treatment.

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, shellfish 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 **X** Satisfactory __ Unsatisfactory
If unsatisfactory, explain.

Modifications

1. Are there any changes *planned* in the sewage treatment facilities? **X** No __ Yes
If yes, please attach a copy of the plan, or describe changes. Provide information on the implementation schedule.

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

Abandonment and Restoration

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

The out of service lagoons will need to be abandoned. There are no present abandonment plans for the lagoons.

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 collected by the Hamlet garbage contractor truck from each building, and is trucked to the solid waste management facility approximately 2.8 km from the community.

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

3. Is the fence adequate? **X** Yes __ No
If no, describe:

Waste Reduction

1. Does the municipality burn garbage?

___Yes **X** 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 bulky metals storage area is used to allow for reuse of the metal wastes.

Animal Carcasses Pit

1. Does the municipality have an area for the disposal of animal carcasses?

__ Yes **X** No

If yes, describe the location, drainage and operation/maintenance of the site
Animal carcasses are put into the landfill area.

Waste Oil Pit

1. Describe the waste oil storage area.

Waste oil is stored at the Hamlet Public Works yard. It is stored in metal drums, labeled and put on wooden skids. The area is not fenced or controlled. The new landfill will have a proper hazardous waste storage area.

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.

The bulky scarp metal waste disposal area is located off of the road to the landfill, 0.7 km north of the landfill. There is currently no operation plan in place for the area.

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 will be constructed at the new landfill site.

b. Structure

Design drawings will be completed as part of the Detailed Design Report for the solid waste management site.

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

O&M plan will be submitted when construction of area is complete.

General Condition of the Solid Waste Disposal Area

1. Comment on the general conditions of the:
   a. Solid waste disposal area **X** Satisfactory __ Unsatisfactory

   If unsatisfactory, explain.

Modifications

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

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

The landfill is located too close to the ocean and is running out of capacity. A new landfill is planned to be constructed in 2009.

Abandonment and Restoration

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

   See Figure 2 attached.

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: July 31,2008
___ Municipal and Community Affairs Date:
___ Other: _____ Date:

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 in 2009.

4. Have any spills occurred in the past five years?
___ Yes **X** No
If yes, describe and show on a map the locations of the spills. What action has been taken to clean the affected areas?

Monitoring Program

1. Is water sampling and analysis done?
_-_ Yes **X** No

If Yes, answer the questions a to e:

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

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

c. Who is responsible for water sampling?

The SAO will need to designate a person will adequate training to complete sampling for the monitoring program required by the licence.

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 water supply or waste disposal facilities? List the concerns and describe what steps have been taken to address those concerns.

   There are some concerns in the community with regards to the long term capacity of the Wolf River Water Supply. A study was completed in 2005 by IEG Environmental to evaluate the community's water supply options. Based on the geomorphological study and flow measurements, it found that the Wolf River supply is sustainable and should be sufficient capacity to meet the Hamlet's needs for the next 20 years.

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 from water delivery trucks 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: Hamlet of Rankin Inlet

3. Contact: Brian Duguay

Telephone #: (867) 645-8156
Fax #: (867) 645-8196

4. Population**:** 2060 (2006 Census**)**

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?

__Yes **X** No

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

If no, are such studies being planned?

___ No ___Yes (If yes, when and by whom):

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. Has any baseline data collection and evaluation been undertaken with respect to the various biophysical components of the environment potentially affected by the project?

__No **X** Yes

If yes, provide details below.

A study on the sewage treatment lagoons and wetland treatment area was completed by Fleming College in 2008 as part of the International Polar Year research grants. The study results have not been released yet.

A study was completed by Nuna Burnside to locate the new proposed new landfill site (*Selection of a New Municipal Solid Waste Disposal Site and Access Road, Arviat, Nunavut*, October 2008.)

If no, are such studies being planned?

__ 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, volumes (m^3/day) and directions.
f. The volume of seepage flow (m^3 / day); and
g. The direction of each flow.

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.
Government of Nunavut

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:
   What is the drainage area? 650 km^2 (IEG Environmental, 2005)
   What is the average elevation of the drainage basin? _____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.)

The topography surrounding the Hamlet of Arviat is relatively flat with a sight rise when moving inland away from Hudson Bay. Local bedrock is generally overlain by glacial fluvial sediments. Arviat is located in the physiographic region of the Hudson Bay lowlands, characterized by low topographic relief, occasional bedrock outcrops and glacial and glacio-fluvial overburden sediments. Boulder fields and eskers are common. Approximately 20 to 30 percent of the land is shallow ponds with depths of 1 m or less. Land between the ponds is marshy, vegetated by grasses and sedges. Wolf Creek is located in a flat area consisting of alluvium with some marine silt and sand.

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? 4,766 m^3/day (*found using storage capacity / 30 days of pumping)*

2. Is water drawn from the source **X** intermittently_____continuously

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

4. For what period is it drawn (days/weeks/months)? 27-30 days

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

Average flows in Wolf River are 0.01 m^3/s Dec-May and 11.6 m^3/s June-Nov (IEG, 2005)

6. At the intended rate of water usage, describe the effects on the river or lake from which water will be drawn. No impact_____

Water Intake

1. Please provide short descriptions of the following:
   a. Freshwater intake facility
   A pump house is located beside creek. Intake line pumps from pooled area along creek at a depth of approximately 4 metres.

   b. Operating capacity of pump used
   Portable diesel power pumps are used.

   c. Intake screen size
   Portable screen

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 ___ 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. _____L/min

2. What is the capacity of the water storage facility: 143,000,000 litres

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.

   Chlorine is injected into water when trucks are filled.

4. Are there any changes planned in the water treatment facilities? __ No **X** Yes
   If yes, attach a copy of the plan or indicate changes and include an implementation schedule. Include excerpt from MACA Capital Plan if available.

   Water Supply Filtration Plant Upgrades are to be completed by Dillon Consultants. Plans are attached.

Sewage Disposal

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

2. Indicate the capacity of the sewage treatment facility: 36,115 m^3

3. Based on current population projections, the facility will meet the needs of the community until the year: 2019 (Desludging of lagoon may be necessary to meet this target).

4. Average depth of the wastewater lagoon 2 m.

5. What is the design freeboard? 1.0 m.

6. Indicate the retention time of the sewage while in the treatment facility:
   ~ 160 days.

7. Indicate the estimated rate of discharge of wastewater_____ L/sec.

8. Indicate the location of the discharge point:

9. Is the discharge: **X** seasonal ____ continuous
   If the discharge is seasonal, during what month(s) is it done?
   Decanting is completed in June and September (if necessary)

   What is the duration of the discharge (days/weeks/months) ? 3-4 weeks

10. Are there any changes planned in the sewage disposal facilities?
    X No __Yes

If yes, attach a copy of the plan or indicate changes and include an implementation schedule.

Include excerpt from MACA Capital Plan if available.

Solid Waste Disposal

1. Indicate the capacity of the disposal area 70,124 m³

2. The *average* depth of the solid waste disposal site __2___m**.**

3. The current facility will meet community needs until the year 2011.

4. Do any natural watercourses 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

6. Please describe any diversions of watercourses: _____

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

A new landfill is planned to be constructed in 2009. An Abandonment and Restoration Plan for the existing landfill will be completed before decommissioning.

Other

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

Attachments for Water Licence Application Supplementary Questionnaire for Municipalities

See Hard Copy or files on Water Board FTP site:

040803 3BM-ARV0408 Community Plan & Zoning By-Law-IMLE.pdf

080505 3BM-ARV0408 Arviat Water Supply Filtration Upgrade-ILAE.pdf