Environmental Monitoring Program and Quality Assurance/Quality Control Plan Hamlet of Rankin Inlet Department of Community and Government Services, Government of Nunavut

Prepared by

Nuna Burnside Engineering and Environmental Ltd.
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December 2008
Revised April 2010

File No: N-O 14850

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Revised April 2010

Executive Summary

Community and Government Services (CGS) of the Government of Nunavut (GN), provides water supply and sewage treatment and disposal services for the Hamlet of Rankin Inlet.

Nunavut Water Board (NWB) License Number NWB3GRA0207 expired November 30, 2008 and a new license application is in progress.

An Environmental Monitoring Program and Quality Assurance/Quality Control (QA/QC) Plan dated December 2008 was prepared by Nuna Burnside Engineering and Environmental Ltd (Nuna Burnside), as required by the original license and in support of the application for a new license.

As noted in the December 2008 Environmental Monitoring Program and QA/QC Plan, as per the NWB License, the Plan is to be reviewed and updated annually.

This April 2010 update of the Plan also addresses comments provided by review agencies during the license renewal application process.

December 2008
Revised April 2010

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December 2008
Revised April 2010

1.0 Introduction

This Environmental Monitoring Program and Quality Assurance/Quality Control Plan was prepared as a requirement of Nunavut Water Board License NWB3GRA0207, issued December 2002 to the Government of Nunavut (on behalf of the Hamlet of Rankin Inlet) and expired November 30, 2007. This Plan applies specifically to the Water Supply Facility and the Sewage Treatment Facility operated by Community and Government Services of the Government of Nunavut. Although this Plan was prepared as a condition of the expired licence, it reflects the current condition of Hamlet facilities, and outlines the Environmental Monitoring Program and Quality Assurance/Quality Control for the new license application currently being submitted.

2.0 Hamlet of Rankin Inlet

The Hamlet of Rankin Inlet is located on Rankin Inlet, on the west coast of Hudson Bay. It is 96-air km southwest of Chesterfield Inlet and 1,088 air km east of Yellowknife, at 62º 49'N latitude and 92º 05' W longitude (Figure 1). The community has a population of approximately 2,358 residents.

Community and Government Services (CGS) of the Government of Nunavut (GN) provides water supply and sewage disposal services for the Hamlet.

The Hamlet provides solid waste collection for the residents, businesses and institutions. The water, wastewater, and solid waste systems include the following facilities and services:

- A water intake plant, which draws water from Nipissar Lake and treats it by chlorination
- A waste water treatment plant that provides primary treatment of sewage with use of a mechanical screen
- A current (old) solid waste disposal facility, which includes a bulky metals disposal area and a waste oil and liquid waste storage area
- A new solid waste disposal facility that has not been commissioned yet.

The locations of these activities are shown in Figure 2.

This Plan applies specifically to Water Supply Facility and the Sewage Treatment Facility operated by CGS of the GN.

3.0 Environmental Monitoring and Quality Assurance/Quality Control

3.1 Purpose of Plan

The Water Supply Facility and Sewage Treatment Facility operate under Nunavut Water Board License NWB3GRA207 (the license) issued on December 1, 2002 and expired November 30, 2007 (Appendix A). A renewal/amendment application is in progress. The license requires the Government of Nunavut on behalf of the Hamlet to conduct a monitoring program, which includes regular water quality sampling and reporting. The license requires a Monitoring and Quality Assurance/Quality Control Plan (QA/QC Plan). The QA/QC Plan has been prepared to achieve the following objectives:

- To ensure that the collection of all samples taken in the field follows procedures and controls to maintain a high quality and ensure that the results obtained represent both the physical and chemical nature of the water at the sampling locations

- To ensure best management practices (BMP) are used throughout the sampling program

- To ensure all samples are delivered promptly to an accredited laboratory for analysis.

This document describes the procedures and controls to be used by Government of Nunavut operations staff when conducting environmental sampling under the monitoring program.

Although the QA/QC Plan is submitted to the Nunavut Water Board (NWB) as a condition of the water license, it is primarily intended to be read, understood, and implemented by Government of Nunavut operations personnel responsible for environmental quality monitoring. The water license requires Government of Nunavut personnel to adhere to these procedures, which should be applied to all water quality samples taken by the Government of Nunavut.

Quality Assurance (QA) and Quality Control (QC) are vitally important components of environmental management for the Hamlet of Rankin Inlet. Contact information for the Hamlet and Government of Nunavut is provided in Appendix B.

3.2 Quality Assurance and Quality Control

Quality Assurance (QA) is a set of operating principles that, if strictly followed during sample collection and analysis, will produce data of known and defensible quality (Wilson, 1995). As such the accuracy of the analytical results can be stated with a high

level of confidence. A high level of quality assurance can be achieved by applying the following principles:

- Personnel involved in water sampling and analysis are well trained
- Facilities and equipment required for sampling are suitable, well maintained, and always kept clean
- Standard procedures are developed and implemented for the collection, transportation and analysis of samples, based on recognized best management practices (BMP)
- Laboratory and field instruments are calibrated according to manufacturers recommendations or recognized as good operating practice
- Supplies used in sampling and analysis are of consistent high quality and are not expired
- Quality Control (QC) procedures are developed and implemented based on good operating practices to assess quality of analytical data and provide warning of unacceptable errors
- Remedial action is promptly implemented when deficiencies are identified
- Results of the monitoring program are reported in the Annual Report as required in the water license. The Annual Report must be submitted by March 31 of the year following the calendar year for which the report has been submitted.

Quality Control (QC) is a set of specific procedures used to measure the quality of the data produced and correct deficiencies in the sampling or analyses, as they occur. Quality control is used by the analyst and sampler to achieve standards of measurement for the three principles components of quality: precision, accuracy and reliability.

3.3 Lab Accreditation

All analyses shall be conducted by laboratories that are accredited by the Canadian Association of Environmental Analytical Laboratories (CAEAL) or an alternative accreditation approved by the NWB. A list of CAEAL laboratories is included in Appendix C.

Ideally, the same laboratory will be used for sample analysis each sampling event, to ensure consistency in methodology and reporting. Although all accredited laboratory

should be able to provide the same result for a particular sample, some variation is expected, which is why consistent laboratory services are recommended.

Analytical methods and accreditation are usually dictated by the guideline criteria being followed. In most cases, the guideline criteria are the Canadian Environmental Quality Guidelines (CCME, 2007). These guidelines specify bottles, hold times, preservatives, sampling protocols, as well as lab accreditation, and analytical methodologies. Prior to any sampling, this information should be reviewed to ensure consistency with regulation and standards.

4.0 Field Sampling

4.1 Sample Collection

Effluent and surface water sampling is conducted to provide the Government of Nunavut on behalf of the Hamlet with effective environmental management information and to monitor regulatory compliance.

Sample collection must follow the specifics dictated by the CAEAL laboratory selected to do the analysis. These should conform to the protocols outlined in the Canadian Environmental Quality Guidelines (CCME, 2007). Exact sampling protocols need to be confirmed for each sampling event. Staff training is a necessary component to ensure quality monitoring.

4.1.1 Sampling Location and Frequency

Monitoring Program

The monitoring program created by the water license NWB3GRA0207 includes specific requirements regarding sampling locations, sampling frequency, parameters to be analyzed and effluent quality.

Table 1: Surveillance Network Program for Water License NWB3GRA0207

Station	Description	Frequency	Analysis Requirements
GRA-1	Raw Water Supply Intake in Nipissar Lake	Monthly and annual	Measure and record in cubic metres of water pumped from station.
GRA-2	Point of Discharge in Hudson Bay (within 20 m of discharge pipe outfall approximately 5 m below surface)	Twice in the winter, twice in the summer (Pending safe sampling conditions)	• BOD • Faecal Coliforms • pH • Conductivity • Total Suspended Solids • Ammonia Nitrogen • Nitrate-Nitrite • Total Phenols • Sulphate • Sodium • Potassium • Magnesium • Calcium • Arsenic • Cadmium • Copper • Chromium • Iron • Lead • Mercury • Nickel • Zinc
GRA-3	Effluent Discharge from Sewage Treatment Facility	Monthly during months of May to August inclusive.	Same as GRA-2

The sampling stations will be clearly identified in the field by posted signs. All signs shall be in the Official Languages of Nunavut, and shall be located and maintained to the satisfaction of an Inspector. Each sampling location must have its Global Positioning System (GPS) coordinates determined. This task should be completed prior to the first sampling to be completed under this QA/QC Plan. Samples shall be taken at the same location during each sampling event. Sample locations are shown in Figure 2.

Additional sampling and analysis may be requested by an INAC Inspector or the NWB.

4.1.2 Sample Planning

To understand what sample containers, sampling techniques, and preservation methods are required, the sampler first need to understand what parameters will be analyzed in the laboratory. Table 2 is a summary of possible parameters required, grouped according to their different sampling requirements:

Table 2: Parameters Examined in NWB Water Licenses

Group	Description	Parameter	
I	Microbiological	Biological Oxygen Demand (BOD) Faecal Coliforms (FC)	
II	General Water Chemistry	pH Conductivity Ammonia Nitrogen (NH_3-N) Nitrate-Nitrite (NO_3-NO_2) Sulphate (SO_4) Sodium (Na) Total Suspended Solids (TSS) Potassium (K) Magnesium (Mg) Calcium (Ca) *Alkalinity* *Bicarbonate* *Carbonate*	*Color* *Turbidity* *Total Organic Carbon (TOC)* *Hydroxide* *Hardness* *Manganese (Mg)* *Total Hardness* *Chloride (Cl)* *Total Phosphorus* *Turbidity* *Hydroxide* *Hardness* *Fluoride* *Bromide*
	Total Metals (except Mercury):	*Aluminium (Al)* Total Arsenic (As) *Barium* *Boron* Total Cadmium (Cd) Total Copper (Cu) Total Chromium (Cr) Total Iron (Fe) Total Lead (Pb) *Manganese* *Molybdenum*	Total Nickel (Ni) *Selenium* *Silver* *Strontium* *Thallium* *Titanium* *Uranium* *Vanadium* Total Zinc (Zn)

Group	Description	Parameter
III		Total Mercury (Hg)
IV		Total Phenols (Total-P)

Note: parameters in italics are not included in license, but should be sampled for completeness.

Specific sampling procedures for each parameter will be dictated by the CAEAL accredited laboratory, which should follow the protocols outlined in the Canadian Environmental Quality Guidelines (CCME, 2007) (Appendix D). It is recommended, that the laboratory pre-fill the sample collection bottles with the proper preservative to minimize error in the field.

4.1.3 Sample Container Selection

Sample containers vary in size and material of construction depending on the specific type of analysis to be conducted. Sample containers for each analysis are shown in Table 2. Sample containers to be used shall be obtained directly from the laboratory, which shall provide new containers specific for the sampling program. The laboratory will provide the correct sizes and types of bottles based on the parameters required. The **laboratory shall be contacted at least one month prior to the sampling event** in order to ensure that containers are available for sampling.

See laboratory contact information in Appendix C.

4.1.4 Field Sampling Log

The individual collecting the samples shall record the following at each location at the time of sampling:

- Date of sampling
- Time of sampling
- Weather conditions
- Monitoring Station Number (i.e. GRA-1,GRA-2,etc.)
- Results of any field measurements (temperatures, PH, conductivity, etc.)
- Sampler shall also indicate if sample used preservatives
- Any unusual conditions
- Any deviation from standard procedures.

4.1.5 Field Measurements

No field measurements are required as part of the Hamlet sampling program, however, it is strongly recommended that the following parameters be sampled immediately on site using appropriate portable field equipment:

- pH
- Temperature
- Dissolved oxygen
- Total alkalinity
- Turbidity
- Chlorine residuals.

It is important that separate equipment be used to sample between potable water and non-potable water (i.e. surface water). Furthermore, all instruments, glassware, etc. should be cleaned between each sample following manufacturer's recommended guidelines and/or BMPs.

General Procedures for Sample Collection

General procedures for sample collection are outlined below. Different laboratories have slightly different bottle requirements and sample handling protocols. Sampling technicians must receive site specific training and laboratory procedures must take precedence over other protocols.

- Sample Locations and Sampling Frequency – The location and frequency of each sampling option has been carefully selected, and is part of site design and layout, as well as the Water Board License. Sampling will follow their requirements. Diversions must be recorded and submitted to the Water Board for approval

- Preparation – Approximately one month prior to the sampling event the laboratory will be notified and the required bottles, blanks, and materials assembled. Plans for rapid return of the samples prepared

- Field Collection – At each sampling station the specified samples will be collected and field data recorded

- Handling Storage and Transportation –Approximate personal protective equipment (gloves, safety glasses, etc.) will be used when handling samples. Samples will be stored a 4ºC and protected from freezing until delivered to the laboratory. Chain of custody for sampling, storage, and delivery must be maintained. Laboratory sample sheets will be filled in as per laboratory protocols

- Delivery to Laboratory – Samples will be delivered to the laboratory in the laboratory dictated method and within the hold times specified. Preplanning for rapid transport and delivery will usually be required.

Surface Water Sampling Procedures

All of the samples taken will be grab samples. Samples will normally be taken from natural lakes, streams, treatment ponds, or process streams. Where possible, samples shall be taken from just below the surface to avoid floating debris, which may contaminate the sample.

Freshwater Streams, Surface Drainage, and Wetlands

The samples shall be collected as close to the middle of the stream where water flows freely and is free of debris. Samples shall be collected upstream of the sampler. After getting into position, the sampler shall wait to allow any stirred sediment that occurred from entering the stream to settle or wash away. The sample bottle shall be partially filled with the water to be sampled and rinsed with the lid in place. Rinse water shall be emptied downstream of the sampling point, so that stream sediments remain undisturbed. **Prior to sampling for oil/grease, bacteria, and for any bottles containing preservative, the bottles shall not be rinsed.**

If possible, bottles shall be plunged into the stream to a depth of approximately half the total stream depth, and allow it to fill with the mouth of the bottle facing upstream. Where stream is too shallow to allow for sample bottle to be filled completely, without disturbing bottom sediment of the streambed, the sampler may use a smaller container that has been properly rinsed to transfer sample to the larger bottle. Do not use a smaller sample bottle containing preservatives.

When taking the sample, sufficient room shall be left to allow for the addition of preservatives, if required.

Lakes or Ponds

Surface sampling shall be collected using the same procedures as streams. Sample bottles shall be plunged to approximately 150 mm (6 inches) below the water surface.

4.1.6 Sample Identification

All samples collected are to be labelled according to standard identification procedures (Name of sampler, time and date of sampling, sample identifier, sampling method and type of sample). **Sample labels shall be water-resistant, and prepared prior to going into the field**.

The individual samples will be labelled with the following information:

- Sample ID #
- Sample name

- Date and time of collection
- Parameter to be analyzed
- Preservatives
- Project number identifier
- Bottle number 1 of ___.

4.1.7 Sample Preservation

To obtain good results from a sampling program, time is critical. All samples are to be shipped to the Laboratory that has been contracted to carry out the analysis the same day as they are collected. Samples must be protected from breakage, and shall be shipped in an insulated cooler that can be provided by the Laboratory. **If samples cannot be shipped until the next day, due to unavoidable events such as weather or mechanical problems with transport aircraft, all samples must be stored in a refrigerator at 4ºC**. Samples must not be frozen.

In all cases where samples cannot be delivered to the lab on the same day, specific preservatives must be added to the samples to prevent chemical changes that may alter the concentration of the parameters of interest. The samples must be preserved within two hours of sampling. Usually, samples can be preserved away from the field at the end of the site visit. In most cases, the laboratory can fill the bottles with preservative, and then ship them to the Hamlet to be filled and sent back for analysis.

For the Hamlet of Rankin Inlet, Table 3 provides the appropriate preservation methods for the parameters to be assessed.

Table 3: Sample Preservation

Type of Sample	Preservation Required
Group I Microbiological	Store in refrigerator at 4°C. Ship to Lab the same day as collected
Group II General Water Chemistry	Store in refrigerator at 4°C. Ship to Lab the same day as collected
Group II Total Metals (except mercury)	Acidify with 5 mL of <20 percent nitric acid. Store in refrigerator at 4°C. Ship to Lab the same day as collected
Group III Total Mercury	Acidify with 2 mL of 1:1 sulfuric acid and 5 percent potassium dichromate Store in refrigerator at 4°C. Ship to Lab the same day as collected
Group IV Total Phenols	Acidify with 4 mL of 1:1 sulfuric acid. Store in refrigerator at 4°C. Ship to Lab the same day as collected

Note: 1000 mL = 1 Liter

4.1.8 Sample Transportation

The main objective of the sampler is to minimize any chemical changes to the sample between the time it is collected and delivery to the laboratory. Heat, light and agitation can all impact the water chemistry and the samples shall be protected from these effects.

Effluent and surface water samples shall be stored and transported at a temperature of 4ºC. Coolers and ice packs need to be available and are usually provided by the laboratory. Upon arrival at the laboratory, samples shall be refrigerated as soon as possible.

5.0 Quality Control

Most commercial laboratories undertake QA/QC procedures with the volume of sample sent for analysis. Reports are usually provided with the Certificates of Analysis. It is recommended that the suggested QA/QC protocols by the laboratory be followed.

To ensure that the monitoring program maintains accepted quality control, field blanks and duplicate samples may be suggested by the laboratory. These samples are collected and analyzed for the sample parameters as the monitoring program in the license as part of a quality control check on monitoring activities.

The Field Blanks shall accompany the sampler into the field, labelled as field blanks, preserved in the field and submitted to the laboratory with the field samples.

5.1 Replicate or Duplicate Samples

Replicate or duplicate sampling involves collecting more than one sample for a given sampling station subject to specific analysis. Standard procedures used for the routine sampling shall be applied. The replicate or duplicate samples are useful in identifying problems with accuracy and sampling methods.

Once per operating season for each active monitoring station a set of duplicate samples will be taken, representing as many of the routine analysis as possible. Where possible this shall be carried out in conjunction with the sampling undertaken by an INAC Inspector.

6.0 Laboratory Analysis / Reporting

The laboratory will perform the analysis of all samples as outlined herein. The results shall be received by the GN on behalf of the Hamlet within the time frame agreed to with the laboratory. The results shall contain the limits of detection used for analysis of each parameter as supplied by the laboratory.

The GN may request clarification of the analysis by contacting the NWB Technical Advisor and a review of the analysis will be provided upon request.

The laboratory results are compared to the limits of the Water Licence for each parameter, and/or to other comparative criteria such as the Canadian Environment Water Quality Guidelines. A copy of these guidelines is included in Appendix D.

The results shall be submitted to the NWB for review with the Annual report. A copy of the NWB Annual Report Form is included in Appendix E.

The content of the Annual Report and Guideline Criteria is outlined in the following documents:

- Sewage Treatment Facility Operations and Maintenance Plan
- Water Supply Facility Operations and Maintenance Plan.

All staff involved in sampling and reporting must have sufficient training to ensure the sampling program operates effectively.

7.0 Annual Report

The results of the Environmental Monitoring Program shall be included in the NWB Annual Report as required by the license.

8.0 Glossary

Quality Assurance (QA): is the definitive program for laboratory operation that specifies the measures required to produce defensible data of known precision and accuracy. QA includes quality control and quality assessment activities.

Quality Control (QC): is a set of measures within a sample analysis methodology to assure that the process is in control.

Quality Assessment: is a process to determine the quality of the laboratory measurements through internal and external QC evaluations. It includes performance evaluation samples, laboratory inter-comparisons samples and performance audits.

9.0 Summary

This Environmental Monitoring Program and QA/QC Plan has been prepared specifically for the Water Supply Facility and Sewage Treatment Facility, in the Hamlet of Rankin Inlet, operated by Community and Government Services of the Government of Nunavut on behalf of the Hamlet.

Appropriate training for site staff is necessary as part of the implementation of this Plan. This document should be reviewed and updated annually, and whenever the NWB Water License is amended or new relevant legislation is issued.

10.0 References

Canadian Council of Ministers of the Environment (CCME), 2007. *Canadian Water Quality Guidelines for the Protection of Aquatic Life: Summary table*. Updated September, 2007. In: Canadian environmental quality guidelines, 1999, Canadian Council of the Environment, Winnipeg.

Canadian Council of Ministers of the Environment, 2006, *Canadian Environmental Quality Guidelines*.

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

Nunavut Water Board, December 2002. *Hamlet of Rankin Inlet Water License NWB3GRA0207*. Gjoa Haven, Nunavut.

Nuna Burnside Engineering and Environmental Ltd. (2008, revised April 2010). *Sewage Treatment Facility Operations and Maintenance (O&M), Hamlet of Rankin Inlet*. Government of Nunavut, 2008.

Nuna Burnside Engineering and Environmental Ltd. (2008, revised April 2010). *Water Supply Facility Operations and Maintenance (O&M), Hamlet of Rankin Inlet*. Government of Nunavut, 2008.

Wilson, Neal. 1995. *Soil Water and Ground Water Sampling*. CRC Press: New York, USA.

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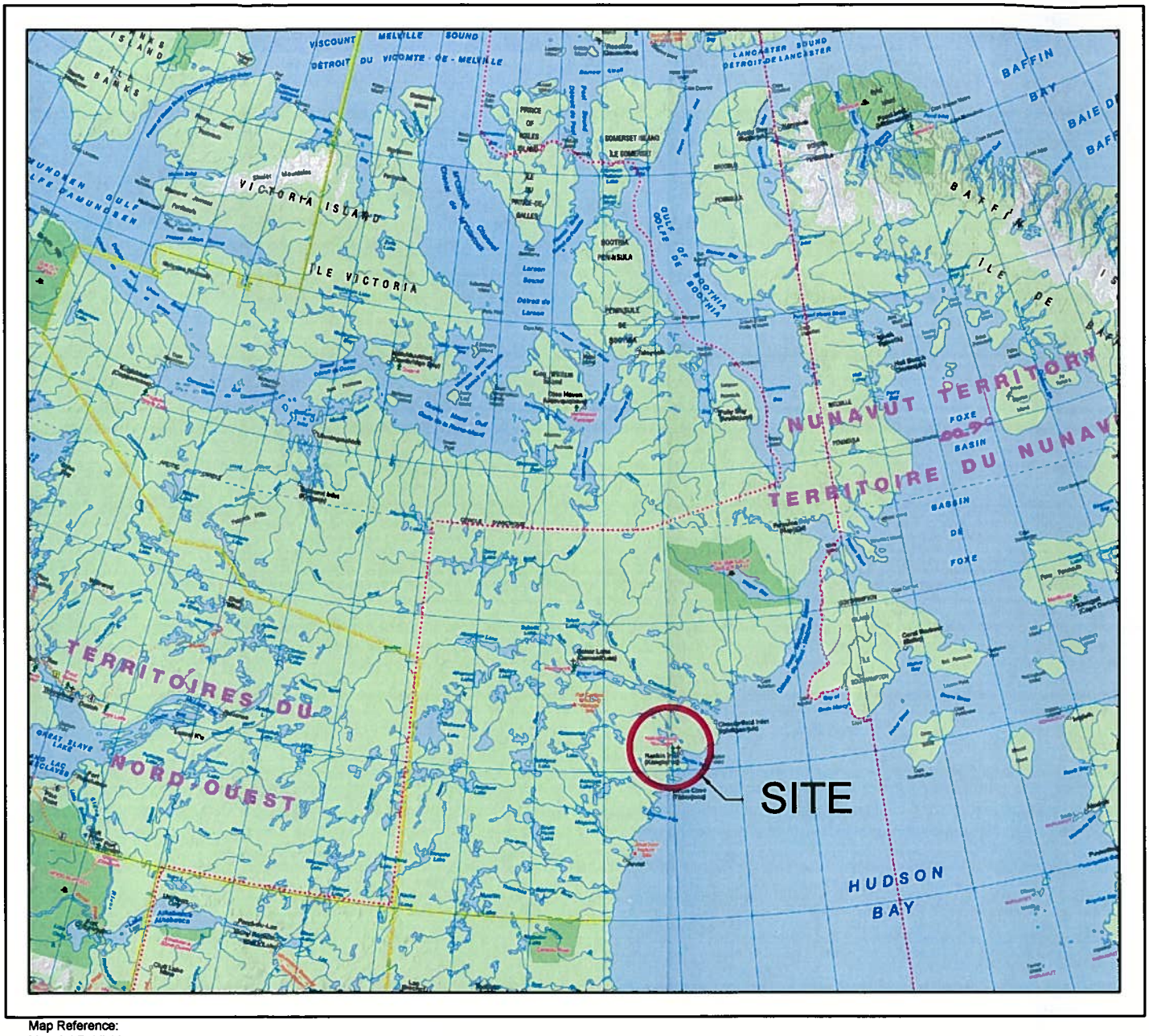
Figures



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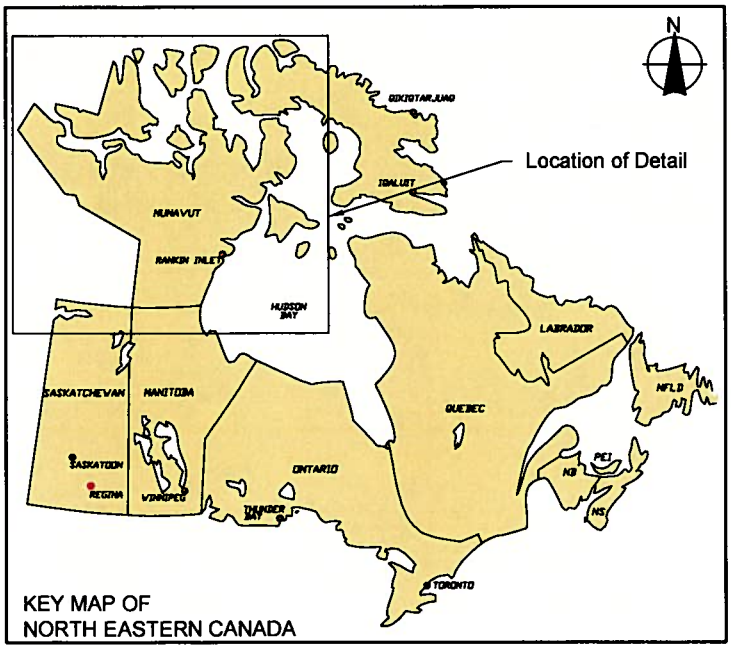

KEY MAP OF
NORTH EASTERN CANADA

FIGURE 1 - SITE LOCATION MAP

HAMLET OF RANKIN INLET

HAMLET OF RANKIN INLET, NUNAVUT

ENVIRONMENTAL MONITORING PROGRAM &
QA / QC CONTROL PLAN

December 2008
Project Number: N-O14850

Prepared by: C. Sheppard

Verified by: J. Walls

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N-O14850 ENVIRONMENTAL QA-QC - HAMLET SL.dwg

Plot Time: Mar 05, 2009 - 11:28am

FIGURE 2

GOVERNMENT OF NUNAVUT
HAMLET OF RANKIN INLET, NUNAVUT
ENVIRONMENTAL MONITORING PROGRAM & QA/QC CONTROL PLAN

MONITORING LOCATIONS

LEGEND

- MONITORING STATION

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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0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0 2.2 2.4
Kilometres

1:30,000
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 ENVIRONMENTAL QA-QC - GOVERNMENT ML.dwg

Plot Time: Mar 05, 2009 - 11:53am

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Appendix A

Nunavut Water Licence NWB3GRA0207

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

DECISION

LICENCE NUMBER: NWB3GRA0207

This is the decision of the Nunavut Water Board (NWB) with respect to an application for a Licence originally filed by the Hamlet of Rankin Inlet on 20 November 2002:

Department of Public Works & Services, Government of Nunavut

to allow for the use of water and disposal of waste in the Hamlet at Rankin Inlet, Nunavut.

With respect to this application, the NWB gave notice to the public that the Hamlet had filed an application for a water licence.

DECISION

After having been satisfied that the application, which had originally been filed by the Hamlet of Rankin Inlet on November 20, 2002, was exempt from the requirement for screening by the Nunavut Impact Review Board in accordance with S. 12.3.2 of the *Nunavut Land Claim Agreement* (NLCA), the NWB decided that the application could go through the regulatory process.

Based on the review of the comments and concerns , it was noted that the issue of the operation of Water Treatment and Sewage Treatment Facilities in Rankin Inlet by the Department of Public Works and Services (Government of Nunavut) prevented the issuance of water licence to the Hamlet of Rankin Inlet for the operation of these Facilities. It was determined that the most appropriate action was to issue a water licence to the Hamlet of Rankin Inlet for the operation of the Solid Waste Disposal Facility, while the Department of Public Works and Services would be licensed for the operation of the Water Treatment and Sewage Treatment Facilities, on behalf of the Government of Nunavut.

Applications reflective of this division of activities were received from both the Hamlet of Rankin Inlet and the Department of Public Works and Services. Notice of these applications was posted with local organizations in Rankin Inlet. As the technical information previously reviewed remained unchanged, the Nunavut Water Board accepted written concerns and comments on these applications until December 6, 2002.

After reviewing the submission of the Applicant and written comments expressed by interested parties, the NWB, having given due regard to the facts and circumstances, the merits of the submissions made to it and to the purpose, scope and intent of the *Nunavut Land Claims Agreement* and of the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* (NWNSRTA), decided to waive the requirement to hold a public hearing and furthermore to delegate its authority to approve the application to the Chief Administrative Officer pursuant to S. 49(a) of the NWNSRTA and determined that:

Licence Number NWB3GRA0207 be issued subject to the terms and conditions contained therein. (Motion #: 2002-22)

SIGNED this 1st day of December, 2002 at Gjoa Haven, NU.

Original signed by:

Philippe di Pizzo
Chief Administrative Officer

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I. INTRODUCTION

Following an application filed by Ferguson Simek Clark on behalf of the Hamlet of Rankin Inlet on 6 June 2002 to the Nunavut Water Board, the Board conducted an initial assessment of the Hamlet's request for a municipal water licence for water use and waste disposal activities within the Hamlet. The assessment was conducted so that the Nunavut Water Board could make a fully informed decision on the application. The application was referred for review and comments to Federal, Territorial and local organizations. Based upon the results of this initial assessment and the technical review, including consideration of any potential accidents, malfunctions, or cumulative environmental effects that the overall project might have in the area, the Board concluded that this application was complete and could go through the regulatory process.

In accordance with the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* S. 55.1 and Article 13 of the *Nunavut Land Claims Agreement*, public notice of the application was posted. No public concerns were expressed, and the NWB waived the requirement to hold a public hearing for the application. Authority to approve the application was delegated to the Chief Administrative Officer pursuant to S. 13.7.5 of the *Agreement*. After considering and reviewing the comments submitted by interested parties, the NWB has issued licence NWB3GRA0207.

II. GENERAL CONSIDERATIONS

Term of the Licence

In accordance with the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* S. 45, the NWB may issue a licence for a term not exceeding twenty-five years. The NWB believes that a term of five years is appropriate. Because this is the first licence issued to the Department by the Nunavut Water Board for operations in Rankin Inlet, a 5-year licence will allow enough time for the Department to establish a consistent compliance record. The 5-year licence will allow the Licensee to properly carry out the terms and conditions of the licence and to ensure that sufficient time is given to permit the Licensee to develop, submit, and implement the plans required under the licence to the satisfaction of the NWB.

Annual Report

The requirements imposed on the Licensee in this licence are for the purpose of ensuring that the NWB has an accurate annual update of municipal activities during a calendar year. This information is maintained on the public registry and is available to any interested parties upon request. Refer to attached standard form for completing Annual Report (see Attachment I).

Regulated Parameters

Effluent quality criteria imposed in this Licence are consistent with the *Guidelines for the Discharge of Treated Municipal Wastewater in the Northwest Territories* (Northwest Territories Water Board; 1992), and follow advice received from both the Department of Indian and Northern Affairs and Environment Canada.

Operation and Maintenance Manual (O&M)

The purpose of an Operation and Maintenance Manual is to assist Department staff in the proper operation and maintenance of their waste disposal facilities. The manual should demonstrate to the Nunavut Water Board that the Department is capable of operating and maintaining all waste disposal sites adequately. The Plan should be completed using the *Guidelines for the Preparation of an Operations and Maintenance Manual for Sewage and Solid Waste Disposal Facilities in the Northwest Territories* (Duong and Kent, 1996; see Attachment II).

Abandonment and Restoration (A&R)

To ensure that all future abandoned facilities are reclaimed in an appropriate manner, the NWB has imposed the requirement for the submission of Abandonment and Restoration Plans. These plans should be submitted when the Licensee files preliminary design drawings for the construction of new facilities to replace existing ones.

Monitoring Program

The Monitoring Program is a program established to collect data on water quality to assess the effectiveness of treatment for protection of public health and to assess potential impacts to the environment associated with the municipal facilities. As this is the first Municipal Water Licence issued to the Department by the Board, minimum requirements have been imposed, but additional sampling may be required by an Inspector.

Quality Assurance/Quality Control (QA/QC) Plan

The requirements to develop a QA/QC Plan imposed on the Licensee in this licence are for the purpose of ensuring the NWB that samples taken in the field as part of the Monitoring Program will maintain a high quality, so as to accurately represent the physical and chemical nature of the samples being taken.

LICENCE NWB3GRA0207

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

DEPARTMENT OF PUBLIC WORKS & SERVICES, GOVERNMENT OF NUNAVUT
(Licensee)

of **RANKIN INLET, NUNAVUT, X0A 0S0**
(Mailing Address)

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

Licence Number **NWB3GRA0207**

Water Management Area **NUNAVUT 05**

Location **RANKIN INLET, NUNAVUT**

Purpose **WATER USE AND WASTE DISPOSAL**

Description **MUNICIPAL UNDERTAKINGS**

Quantity of Water Not to be Exceeded **400,000 CUBIC METRES ANNUALLY**

Date of Licence **DECEMBER 1, 2002**

Expiry Date of Licence **NOVEMBER 30, 2007**

Dated this 1st of December 2002 at Gjoa Haven, NU.

Original signed by:

Philippe di Pizzo
Chief Administrative Officer

PART A: SCOPE AND DEFINITIONS

1. Scope

a. This Licence allows for the use of water and the disposal of waste by the Department of Public Works and Services, Government of Nunavut for municipal undertakings at the Hamlet of Rankin Inlet, Nunavut (64°49'N, 92°05'W);

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

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

2. Definitions

In this Licence: **NWB3GRA0207**

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

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

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

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

"Average Concentration" means the arithmetic mean of the last four consecutive analytical results for contained in composite or grab samples collected from the Waste Facility's final discharge point;

"**Average Concentration For Faecal Coliforms**" means the geometric mean of the last four consecutive analytical results for faecal coliforms contained in composite or grab samples collected from the Waste Facility's final discharge point;

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

"**Chief Administrative Officer**" means the Executive Director of the Nunavut Water Board;

"**Commercial Waste Water**" means water and associated waste generated by the operation of a commercial enterprise, but does not include toilet wastes or greywater;

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

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

"**Grab Sample**" means a single water or wastewater sample taken at a time and place representative of the total discharge;

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

"**Licensee**" means the holder of this Licence;

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

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

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

"**Sewage**" means all toilet wastes and greywater;

"**Sewage Treatment Facility**" comprises the area and engineered lagoon and decant structures designed to contain sewage as described in the Application for Water Licence;

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

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

"Water Supply Facility" means the area and associated intake infrastructure at Nipissar Lake, as described in the Application for Water Licence.

PART B: GENERAL CONDITIONS

1. The Licensee shall file an Annual Report with the Board not later than March 31st of the year following the calendar year reported which shall contain the following information:

   i. tabular summaries of all data generated under the "Monitoring Program";

   ii. the monthly and annual quantities in cubic metres of each and all waste discharged;

   iii. a summary of modifications and/or major maintenance work carried out on the Solid Waste Disposal Facility, including all associated structures and facilities;

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

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

   vi. a summary of any studies, reports and plans (e.g., Operation and Maintenance, Abandonment and Restoration, QA/QC) requested by the Board that relate to waste disposal, water use or reclamation, and a brief description of any future studies planned; and

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

2. The Licensee shall comply with the "Monitoring Program" described in this Licence, and any amendments to the "Monitoring Program" as may be made from time to time, pursuant to the conditions of this Licence.

3. The "Monitoring Program" and compliance dates specified in the Licence may be modified at the discretion of the Board.

4. Meters, devices or other such methods used for measuring the volumes of waste discharged shall be installed, operated and maintained by the Licensee to the satisfaction of an Inspector.

5. The Licensee shall, within ninety (90) days after the first visit of the Inspector, post the necessary signs, where possible, to identify the stations of the "Monitoring Program." All signage postings shall be in the Official Languages of Nunavut, and shall be located and maintained to the satisfaction of an Inspector.

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

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

(i) Chief Administrative Officer:

Executive Director
Nunavut Water Board
P. O. Box 119
Gjoa Haven, NU X0B 1J0
Telephone: (867) 360-6338
Fax: (867) 360-6369

(ii) Inspector Contact:

Water Resources Officer
Nunavut District, Nunavut Region
P.O. Box 100
Iqaluit, NU X0A 0H0
Telephone: (867) 975-4298
Fax: (867) 979-6445

(iii) Analyst Contact

Taiga Laboratories
Department of Indian and Northern Affairs
4601 - 52 Avenue, P.O. Box 1500
Yellowknife, NT X1A 2R3
Telephone: (867) 669-2781
Fax: (867) 669-2718

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

PART C: CONDITIONS APPLYING TO WATER USE

1. The Licensee shall obtain all fresh water from Nipissar Lake using the Water Supply Facilities or as otherwise approved by the Board.

2. The annual quantity of water used for all purposes shall not exceed 400,000 cubic metres.

3. The Licensee shall maintain the Water Supply Facilities to the satisfaction of the Inspector.

4. The water intake hose used on the water pumps shall be equipped with a screen with a mesh size sufficient to ensure no entrainment of fish.

PART D: CONDITIONS APPLYING TO WASTE DISPOSAL

1. The Licensee shall direct all Sewage to the Sewage Treatment Facility or as otherwise approved by the Board.

2. All Effluent discharged from the Sewage Treatment Facility at "Monitoring Program" Station Number GRA-3 shall meet the following effluent quality standards:

Parameter	Maximum Average Concentration
Faecal Coliforms	1 x 10^6CFU/dl
BOD_5	120 mg/L
Total Suspended Solids	180 mg/L
Oil and grease	No visible sheen
pH	between 6 and 9

3. A Freeboard limit of 1.0 metre, or as recommended by a qualified geotechnical engineer and as approved by the Board, shall be maintained at all dykes and earthfill structures associated with a Sewage Treatment Facility.

4. The Sewage Treatment Facility shall be maintained and operated in such a manner as to prevent structural failure.

5. The Licensee shall maintain the Sewage Treatment Facility to the satisfaction of an Inspector.

PART E: CONDITIONS APPLYING TO MODIFICATION AND CONSTRUCTION

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

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

   a. the Licensee has notified the Board in writing of such proposed modifications at least sixty (60) days prior to beginning the modifications;

   ii. said modifications do not place the Licensee in contravention of the Licence or the *Act*;

   iii. the Board has not, during the sixty (60) days following notification of the proposed modifications, informed the Licensee that review of the proposal will require more than sixty (60) days; and

   iv. the Board has not rejected the proposed modifications.

3. Modifications for which all of the conditions referred to in Part E, Item 1, have not been met may be carried out only with written approval from the Board.

4. The Licensee shall provide as built plans/drawings of the modifications referred to in this Licence within ninety (90) days of completion of the modifications.

PART F: CONDITIONS APPLYING TO OPERATION AND MAINTENANCE

1. The Licensee shall, before December 1, 2003 submit to the Board for approval, a Plan for the Operation and Maintenance of the Water Treatment Facility and the Sewage Treatment Facility in accordance with *"Guidelines for Preparing an Operation and Maintenance Manual for Sewage and Solid Waste Disposal Facilities"* (October 1996).

2. The Licensee shall implement the Plan specified in Part F, Item 1 as and when approved by the Board.

3. The Licensee shall revise the Plan referred to in Part F, Item 1, if not acceptable to the Board. The revised Plan shall be submitted to the Board for approval within thirty (30) days of notification of the Board decision.

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

    i. employ the appropriate contingency plan as provided for in the Operation and Maintenance Plan;

    ii. report the incident immediately *via* the 24-Hour Spill Reporting Line at (867) 920-8130 and to an Inspector; and

    iii. submit to an Inspector a detailed report on each occurrence not later than thirty (30) days after initially reporting the event.

PART G: CONDITIONS APPLYING TO ABANDONMENT AND RESTORATION

1. The Licensee shall submit to the Board for approval an Abandonment and Restoration Plan at least six (6) months prior to abandoning any facilities and the construction of new facilities to replace existing ones. The Plan shall include, but not be limited to where applicable:

    i. water intake facilities;

    ii. the water treatment and sewage treatment sites and facilities;

    iii. petroleum and chemical storage areas;

    iv. any site affected by waste spills;

v. leachate prevention;

vi. an implementation schedule;

vii. maps delineating all disturbed areas, and site facilities;

viii. consideration of altered drainage patterns;

ix. type and source of cover materials;

x. future area use;

xi. hazardous wastes; and

xii. a proposal identifying measures by which restoration costs will be financed by the Licensee upon abandonment.

2. The Licensee shall implement the plan specified in Part G, Item 1 as and when approved by the Board.

3. The Licensee shall revise the Plan referred to in Part G, Item 1 if not approved. The revised Plan shall be submitted to the Board for approval within thirty (30) days of receiving notification of the Board's decision.

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

PART H: CONDITIONS APPLYING TO THE MONITORING PROGRAM

1. The Licensee shall maintain Surveillance Stations at the following locations:

Station Number	Description
GRA-1	Raw Water supply prior to treatment
GRA-3	Effluent discharge from the Sewage Treatment Facility

2. The Licensee shall sample monthly at Monitoring Station GRA-3 during the months of May to August, inclusive.

3. The Licensee shall analyze samples collected at Station Number GRA-3 for the following parameters:

BOD	Faecal Coliforms
pH	Conductivity
Total Suspended Solids	Ammonia Nitrogen
Nitrate-Nitrite	Oil and Grease (visual)
Total Phenols	Sulphate
Sodium	Potassium
Magnesium	Calcium
Total Arsenic	Total Cadmium
Total Copper	Total Chromium
Total Iron	Total Lead
Total Mercury	Total Nickel
Total Zinc	

4. Additional sampling and analysis may be requested by an Inspector;

5. The Licensee shall conform to the Quality Assurance/Quality Control (QA/QC) Plan which shall be provided to the Licensee by the NWB within 60 days of the issuance of this licence;

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

7. All analyses shall be performed in a Canadian Association of Environmental Analytical Laboratories (CAEAL) Certified Laboratory, or as otherwise approved by an Analyst;

8. The Licensee shall measure and record in cubic metres the monthly and annual quantities of water pumped from Monitoring Program Station Number GRA-1 for all purposes;

9. The Licensee shall measure and record the annual quantities of sewage solids removed from the sewage disposal facility ~~shall be measured and recorded~~;

10. The Licensee shall, unless otherwise requested by an Inspector, include all of the data and information required by the "Monitoring Program" in the Licensee's Annual Report, as required *per* Part B, Item 1; and

11. Modifications to the Monitoring Program may be made only upon written approval of the Chief Administrative Officer.

Contact Information- Hamlet of Rankin Inlet

Contact	Location	Telephone Number	Fax Number
Hamlet of Rankin Inlet SAO	Rankin Inlet	(867) 645-2895	(867) 645-2146
24-Hour NWT/Nunavut Spill Report Line	Yellowknife	(867) 920-8130	(867) 873-6924
INAC–Water/Wastewater Resources Manager	Iqaluit	(867) 975-4550	(867) 979-6445
Government of Nunavut - Regional Engineer	Rankin Inlet	(867) 645-8159	(867) 645-8196
Environment Canada - Inspector	Iqaluit	(867) 975-4644	(867) 979-4594
Fire Department	Rankin Inlet	(867) 645-2525	-
RCMP Detachment	Rankin Inlet	(867) 645-1111	(867) 645-2568
Community Health Centre	Rankin Inlet	(867) 645-8300	(867) 645-8324

Appendix B
Contact Information

Contact Information- Hamlet of Rankin Inlet

Contact	Location	Telephone Number	Fax Number
Hamlet of Rankin Inlet SAO	Rankin Inlet	(867) 645-2895	(867) 645-2146
24-Hour NWT/Nunavut Spill Report Line	Yellowknife	(867) 920-8130	(867) 873-6924
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RCMP Detachment	Rankin Inlet	(867) 645-1111	(867) 645-2568
Community Health Centre	Rankin Inlet	(867) 645-8300	(867) 645-8324

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Appendix C
CAEAL Laboratory Contact Information

Canadian Association of Environmental Analytical Laboratories (CAEAL)

Laboratory Contact Information

ALS Laboratory Group – Environmental Division
Toll Free: 1-800-668-9878

1329 Niakwa Road East, Unit 12
Winnepeg, Manitoba
R2J 3T4
Phone: (204) 255-9720
Fax: (204) 255-9721

75 Con Road
Yellowknife, NWT
X1A 2M1
Phone: (861) 766-5308
Fax: (867) 920-4238

Taiga Environmental Laboratory

4601-52 Avenue
Yellowknife, NWT
X1A 2R3
Phone: (867) 669-2788
Fax: (867) 669-2718

AGAT Laboratories Limited

5623 McAdam Road
Mississauga, Ontario
L4Z 1N9
Phone: (905) 501-9998
Fax: (905) 501-0589
Toll Free: 1-800-856-6261

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Appendix D
Canadian Water Quality Guidelines for Protection of Aquatic Life

Canadian Water Quality Guidelines for the Protection of Aquatic Life

SUMMARY TABLE

Update 7.0
September 2007

Summary of Canadian water quality guidelines for the protection of aquatic life.

	Freshwater		Marine	
Parameter[a]	**Concentration ($\mu g \cdot L^{-1}$)**	**Date[b]**	**Concentration ($\mu g \cdot L^{-1}$)**	**Date[b]**
Acenaphthene [See Polycyclic aromatic hydrocarbons (PAHs)]				
Acridine [See Polycyclic aromatic hydrocarbons (PAHs)]				
Aldicarb	1[c]	1993	0.15[c]	1993
Aldrin + Dieldrin[d]	~~0.004~~[e,f]	1987		
Aluminium[d]	5–100[g]	1987		
Ammonia (total)	see factsheet	2001		
Ammonia (un-ionized)	19[h]	2001		
Aniline	2.2[i]	1993	Insufficient data	1993
Anthracene [See Polycyclic aromatic hydrocarbons (PAHs)]				
Arsenic[j]	5.0[k]	1997	12.5[c]	1997
Atrazine	1.8[i]	1989		
Benz*(a)*anthracene [See Polycyclic aromatic hydrocarbons (PAHs)]				
Benzene[j]	370[c, k]	1999	110[c]	1999
Benzo*(a)*pyrene [See Polycyclic aromatic hydrocarbons (PAHs)]				
2,2-Bis(*p*-chlorophenyl)-1,1,1-trichloroethane [See DDT (total)]				
Bromacil	5.0[c,i]	1997	Insufficient data	1997
Bromoform [See Halogenated methanes, Tribromomethane]				
Bromoxynil	5.0[i]	1993	Insufficient data	1993
Cadmium	0.017[c,l]	1996	0.12[i]	1996
Captan	1.3[c]	1991		
Carbaryl	0.20[i]	1997	0.32[c,i]	1997
Carbofuran	1.8[i]	1989		
Carbon tetrachloride [See Halogenated methanes, Tetrachloromethane]				
Chlordane[d]	~~0.006~~[e,f]	1987		
Chlorinated benzenes				
Monochlorobenzene	1.3[c,k]	1997	25[c,k]	1997
1,2-Dichlorobenzene	0.70[c,k]	1997	42[c,k]	1997
1,3-Dichlorobenzene	150[c,k]	1997	Insufficient data[k]	1997
1,4-Dichlorobenzene	26[c,k]	1997	Insufficient data[k]	1997
1,2,3-Trichlorobenzene	8.0[c,k]	1997	Insufficient data[k]	1997
1,2,4-Trichlorobenzene	24[c,k]	1997	5.4[c,k]	1997
1,3,5-Trichlorobenzene[d]	Insufficient data[k]	1997	Insufficient data[k]	1997

Continued.

Parameter[a]	Freshwater		Marine	
	Concentration ($\mu g \cdot L^{-1}$)	Date[b]	Concentration ($\mu g \cdot L^{-1}$)	Date[b]
Chlorinated benzenes—Continued				
1,2,3,4-Tetrachlorobenzene	1.8[c,k]	1997	Insufficient data[k]	1997
1,2,3,5-Tetrachlorobenzene[d]	Insufficient data[k]	1997	Insufficient data[k]	1997
1,2,4,5-Tetrachlorobenzene[d]	Insufficient data[k]	1997	Insufficient data[k]	1997
Pentachlorobenzene	6.0[c,k]	1997	Insufficient data[k]	1997
Hexachlorobenzene[d]	Insufficient data[e,f,k]	1997	Insufficient data[k]	1997
Chlorinated ethanes				
1,2-Dichloroethane	100[c,i]	1991	Insufficient data	1991
1,1,1-Trichloroethane	Insufficient data	1991	Insufficient data	1991
1,1,2,2-Tetrachloroethane	Insufficient data	1991	Insufficient data	1991
Chlorinated ethenes				
1,1,2-Trichloroethene (Tichloroethylene; TCE)	21[c,i]	1991	Insufficient data	1991
1,1,2,2-Tetrachloroethene (Tetrachloroethylene; PCE)	111[c,i]	1993	Insufficient data	1993
Chlorinated methanes [See Halogenated methanes]				
Chlorinated phenols[d]				
Monochlorophenols	7	1987		
Dichlorophenols	0.2	1987		
Trichlorophenols	18	1987		
Tetrachlorophenols	1	1987		
Pentachlorophenol (PCP)	0.5	1987		
Chlorine, reactive [See Reactive chlorine species]				
Chloroform [See Halogenated methanes, Trichloromethane]				
4-Chloro-2-methyl phenoxy acetic acid [See MCPA]				
Chlorothalonil	0.18[c]	1994	0.36[c]	1994
Chlorpyrifos	0.0035	1997	0.002[c]	1997
Chromium				
Trivalent chromium (Cr(III))	8.9[c,k]	1997	56[c,k]	1997
Hexavalent chromium (Cr(VI))	1.0[k]	1997	1.5[k]	1997
Chrysene [See Polycyclic aromatic hydrocarbons (PAHs)]				
Colour	Narrative	1999	Narrative	1999
Copper[d]	2–4[m]	1987		
Cyanazine	2.0[c,i]	1990		
Cyanide[d]	5 (as free CN)	1987		
DDAC (Didecyl dimethyl ammonium chloride)	1.5[c]	1999	Insufficient data	1999
DDT (total)[d] (2,2-Bis(*p*-chlorophenyl)-1,1,1-trichloroethane; dichloro diphenyl trichloroethane)	~~0.001~~[e,f]	1987		
Debris (litter/settleable matter)			Narrative[c]	1996

Continued.

Parameter[a]	Freshwater		Marine	
	Concentration ($\mu g \cdot L^{-1}$)	Date[b]	Concentration ($\mu g \cdot L^{-1}$)	Date[b]
Deltamethrin	0.0004	1997	Insufficient data	1997
Deposited bedload sediment [See Total particulate matter]				
Dibromochloromethane [See Halogenated methanes]				
Dicamba	10[c,i]	1993		
Dichlorobenzene [See Chlorinated benzenes]				
Dichlorobromomethane [See Halogenated methanes]				
Dichloro diphenyl trichloroethane [See DDT (total)]				
Dichloroethane [See Chlorinated ethanes]				
Dichloroethylene [See Chlorinated ethanes, 1,2-Dichloroethane]				
Dichloromethane [See Halogenated methanes]				
Dichlorophenols [See Chlorinated phenols]				
2,4-Dichlorophenoxyacetic acid [see Phenoxy herbicides]				
Diclofop-methyl	6.1	1993		
Didecyl dimethyl ammonium chloride [See DDAC]				
Diethylene glycol [See Glycols]				
Di(2-ethylhexyl) phthalate [See Phthalate esters]				
Diisopropanolamine (DIPA)[aa]	1600[c]	2005	Insufficient data	2005
Dimethoate	6.2[c]	1993	Insufficient data	1993
Di-*n*-butyl phthalate [See Phthalate esters]				
Di-*n*-octyl phthalate [See Phthalate esters]				
Dinoseb	0.05	1992		
Dissolved gas supersaturation	Narrative	1999	Narrative	1999
Dissolved oxygen	5500–9500[k,n]	1999	>8000 and Narrative[c,k]	1996
Endosulfan[d]	0.02	1987		
Endrin[d]	~~0.0023~~[e,f]	1987		
Ethylbenzene[j]	90[c,k]	1996	25[c,k]	1996
Ethylene glycol [See Glycols]				
Fluoranthene [See Polycyclic aromatic hydrocarbons (PAHs)]				
Fluorene [See Polycyclic aromatic hydrocarbons (PAHs)]				
Glycols				
Ethylene glycol	192 000[k]	1997	Insufficient data	1997
Diethylene glycol	Insufficient data[k]	1997	Insufficient data	1997
Propylene glycol	500 000[k]	1997	Insufficient data	1997
Glyphosate	65[c]	1989		

Continued.

	Freshwater		Marine	
Parameter[a]	**Concentration (μg·L^{-1})**	**Date[b]**	**Concentration (μg·L^{-1})**	**Date[b]**
Halogenated methanes				
Monochloromethane (Methyl chloride)[d]	Insufficient data	1992	Insufficient data	1992
Dichloromethane (Methylene chloride)	98.1[c,i]	1992	Insufficient data	1992
Trichloromethane (Chloroform)	1.8[c,i]	1992	Insufficient data	1992
Tetrachloromethane (Carbon tetrachloride)	13.3[c,i]	1992	Insufficient data	1992
Monobromomethane (Methyl bromide)[d]	Insufficient data	1992	Insufficient data	1992
Tribromomethane (Bromoform)[d]	Insufficient data	1992	Insufficient data	1992
Dibromochloromethane[d]	Insufficient data	1992	Insufficient data	1992
Dichlorobromomethane[d]	Insufficient data	1992	Insufficient data	1992
HCBD [See Hexachlorobutadiene (HCBD)]				
Heptachlor (Heptachlor epoxide)[d]	~~0.01~~ [e,f]	1987		
Hexachlorobenzene [See Chlorinated benzenes]				
Hexachlorobutadiene (HCBD)	1.3[c, k]	1999		
Hexachlorocyclohexane (Lindane)[d]	0.01	1987		
Hypochlorous acid [See Reactive chlorine species]				
Imidacloprid[aa]	0.23[c]	2007	0.65[c]	2007
Inorganic fluorides	120[c]	2002		
3-Iodo-2-propynyl butyl carbamate [See IPBC]				
IPBC (3-Iodo-2-propynyl butyl carbamate)	1.9[c]	1999		
Iron[d]	300	1987		
Lead[d]	1–7[o]	1987		
Lindane [See Hexachlorocyclohexane]				
Linuron	7.0[c]	1995	Insufficient data	1995
MCPA (4-Chloro-2-methyl phenoxy acetic acid; 2-methyl-4-chloro phenoxy acetic acid)	2.6[c]	1995	4.2[c]	1995
Mercury[v]				
Inorganic Mercury[v]	0.026	2003	0.016[c,w]	2003
Methylmercury[v]	0.004[c,w]	2003		
Methyl bromide [See Halogenated methanes, Monobromomethane]				
Methyl chloride [See Halogenated methanes, Monochloromethane]				
2-Methyl-4-chloro phenoxy acetic acid [See MCPA]				
Methylene chloride [See Halogenated methanes, Dichloromethane]				
Methyl *tertiary*-butyl ether [See MTBE]				
Metolachlor	7.8[c]	1991		
Metribuzin	1.0[c]	1990		
Molybdenum[j]	73[c]	1999		
Monobromomethane [See Halogenated methanes]				
Monochloramine [See Reactive chlorine species]				

Continued.

Parameter[a]	Freshwater		Marine	
	Concentration ($\mu g \cdot L^{-1}$)	Date[b]	Concentration ($\mu g \cdot L^{-1}$)	Date[b]
Monochlorobenzene [See Chlorinated benzenes]				
Monochloromethane [See Halogenated methanes]				
Monochlorophenols [See Chlorinated phenols]				
MTBE (methyl *tertiary*-butyl ether)	10 000[c]	2003	5 000[c]	2003
Naphthalene [See Polycyclic aromatic hydrocarbons (PAHs)]				
Nickel[d]	25–150[p]	1987		
Nitrate	13 000[c,u,y]	2003	16 000[c,u,y]	2003
Nitrite[d]	60[z]	1987		
Nonylphenol and its ethoxylates	1.0[c,t]	2002	0.7[c,t]	2002
Nutrients	Guidance Framework[x]	2004	Guidance Framework [aa,bb]	2007
Organotins				
Tributyltin	0.008[c]	1992	0.001[c]	1992
Tricyclohexyltin	Insufficient data	1992	Insufficient data	1992
Triphenyltin	0.022[c,i]	1992	Insufficient data	1992
Oxygen, dissolved [See Dissolved oxygen]				
PAHs [See Polycyclic aromatic hydrocarbons (PAHs)]				
PCBs [See Polychlorinated biphenyls (PCBs)(total)]				
PCE [See Chlorinated ethenes, 1,1,2,2-Tetrachloroethene]				
PCP [See Chlorinated phenols, Pentachlorophenol]				
Pentachlorobenzene [See Chlorinated benzenes]				
Pentachlorophenol [See Chlorinated phenols]				
Permethrin[aa]	0.004[c]	2006	0.001[c]	2006
pH[d]	6.5–9	1987	7.0–8.7 and Narrative	1996
Phenanthrene [See Polycyclic aromatic hydrocarbons (PAHs)]				
Phenols (mono- & dihydric)	4.0[k]	1999		
Phenoxy herbicides[d, q]	4.0	1987		
Phosphorus	Guidance Framework[x]	2004	Guidance Framework[bb]	2007
Phthalate esters				
Di-*n*-butyl phthalate	19[c]	1993	Insufficient data	1993
Di(2-ethylhexyl) phthalate	16[c]	1993	Insufficient data	1993
Di-*n*-octyl phthalate	Insufficient data	1993	Insufficient data	1993
Picloram	29[c]	1990		
Polychlorinated biphenyls (PCBs) (total)[d]	~~0.001~~[e,f]	1987	~~0.01~~[e,f]	1991

Continued.

	Freshwater		Marine	
Parameter[a]	**Concentration ($\mu g \cdot L^{-1}$)**	**Date[b]**	**Concentration ($\mu g \cdot L^{-1}$)**	**Date[b]**
Polycyclic aromatic hydrocarbons (PAHs)				
Acenaphthene	5.8[c]	1999	Insufficient data	1999
Acridine	4.4[c]	1999	Insufficient data	1999
Anthracene	0.012[c]	1999	Insufficient data	1999
Benz*(a)*anthracene	0.018[c]	1999	Insufficient data	1999
Benzo*(a)*pyrene	0.015[c]	1999	Insufficient data	1999
Chrysene	Insufficient data	1999	Insufficient data	1999
Fluoranthene	0.04[c]	1999	Insufficient data	1999
Fluorene	3.0[c]	1999	Insufficient data	1999
Naphthalene	1.1[c]	1999	1.4[c]	1999
Phenanthrene	0.4[c]	1999	Insufficient data	1999
Pyrene	0.025[c]	1999	Insufficient data	1999
Quinoline	3.4[c]	1999	Insufficient data	1999
Propylene glycol [See Glycols]				
Pyrene [See Polycyclic aromatic hydrocarbons (PAHs)]				
Quinoline [See Polycyclic aromatic hydrocarbons (PAHs)]				
Reactive chlorine species (hypochlorous acid and monochloramine)	0.5 and Narrative	1999	0.5 and Narrative	1999
Salinity			<10% fluctuation[c]	1996
Selenium[d]	1.0	1987		
Silver[d]	0.1	1987		
Simazine	10	1991		
Streambed substrate [See Total particulate matter]				
Styrene	72[c]	1999		
Sulfolane[aa]	50 000[c]	2005	Insufficient data	2005
Suspended sediments [See Total particulate matter]				
TCE [See Chlorinated ethenes, 1,1,2-Trichloroethene]				
Tebuthiuron	1.6[c]	1995	Insufficient data	1995
Temperature	Narrative[s]	1987	Not to exceed ±1°C and Narrative[c]	1996
Tetrachlorobenzene [See Chlorinated benzenes]				
Tetrachloroethane [See Chlorinated ethanes]				
Tetrachloroethene [See Chlorinated ethenes]				
Tetrachloroethylene [See Chlorinated ethenes, 1,1,2,2-Tetrachloroethene]				

Continued.

	Freshwater		Marine	
Parameter[a]	**Concentration ($\mu g \cdot L^{-1}$)**	**Date[b]**	**Concentration ($\mu g \cdot L^{-1}$)**	**Date[b]**
Tetrachloromethane [See Halogenated methanes]				
Tetrachlorophenols [See Chlorinated phenols]				
Thallium[j]	0.8	1999		
Toluene	2.0[c,j,k]	1996	215[c,k]	1996
Total particulate matter				
Deposited bedload sediment	Insufficient data	1999	Insufficient data	1999
Streambed substrate	Narrative	1999	Narrative	1999
Suspended sediments	Narrative	1999	Narrative	1999
Turbidity	Narrative	1999	Narrative	1999
Toxaphene[d]	~~0.008~~ [e,f]	1987		
Triallate	0.24[c]	1992		
Tribromomethane [See Halogenated methanes]				
Tributyltin [See Organotins]				
Trichlorobenzene [See Chlorinated benzenes]				
Trichloroethane [See Chlorinated ethanes]				
Trichloroethene [See Chlorinated ethenes]				
Trichloroethylene [See Chlorinated ethenes, 1,1,2-Trichloroethene]				
Trichloromethane [See Halogenated methanes]				
Trichlorophenols [See Chlorinated phenols]				
Tricyclohexyltin [See Organotins]				
Trifluralin	0.20[i]	1993		
Triphenyltin [See Organotins]				
Turbidity [See Total particulate matter]				
Zinc[d]	30	1987		

[a]Unless otherwise indicated, supporting documents are available from the National Guidelines and Standards Office, Environment Canada.

[b]The guidelines dated 1987 have been carried over from *Canadian Water Quality Guidelines* (CCREM 1987) and no fact sheet was prepared. The guidelines dated 1989 to 1997 were developed and initially published in CCREM 1987 as appendixes on the date indicated. They are published as fact sheets in this document. Other guidelines dated 1997 and those dated 1999 are published for the first time in this document.

[c]Interim guideline.

[d]No fact sheet created. For more information on this guideline, please refer to *Canadian Water Quality Guidelines* (CCREM 1987).

[e]This guideline (originally published in *Canadian Water Quality Guidelines* [CCREM 1987 + Appendixes] in 1987 or 1991 [PCBs in marine waters]) is no longer recommended and the value is withdrawn. A water quality guideline is not recommended. Environmental exposure is predominantly via sediment, soil, and/or tissue, therefore, the reader is referred to the respective guidelines for these media.

[f]This substance meets the criteria for Track 1 substances under the national CCME Policy for the Management of Toxic Substances (PMTS) (i.e., persistent, bioaccumulative, primarily the result of human activity, and CEPA-toxic or equivalent), and should be subject to virtual elimination strategies. Guidelines can serve as action levels or interim management objectives towards virtual elimination.

[g]Aluminium guideline= 5 $\mu g \cdot L^{-1}$ at pH <6.5
= 100 $\mu g \cdot L^{-1}$ at pH ≥6.5

[h]Ammonia guideline: Expressed as µg unionized ammonia·L^{-1}. This would be equivalent to 15.2 µg ammonia-nitrogen·L^{-1}. Guideline for total ammonia is temperature and pH dependent, please consult factsheet for more information.

[i]Guideline value slightly modified from CCREM 1987 + Appendixes due to re-evaluation of the significant figures.

[j]The technical document for the guideline is available from the Ontario Ministry of the Environment.

[k]Substance has been re-evaluated since CCREM 1987 + Appendixes. Either a new guideline has been derived or insufficient data existed to derive a new guideline.

[l]Cadmium guideline = $10^{\{0.86[\log(\text{hardness})] - 3.2\}}$.

[m]Copper guideline = 2 $\mu g \cdot L^{-1}$ at a water hardness of 0–120 $mg \cdot L^{-1}$ (soft to medium) as $CaCO_3$
= 3 $\mu g \cdot L^{-1}$ at a water harness of 120–180 $mg \cdot L^{-1}$ (hard) as $CaCO_3$
= 4 $\mu g \cdot L^{-1}$ at a water harness >180 $mg \cdot L^{-1}$ (very hard) as $CaCO_3$

[n]Dissolved oxygen for warm-water biota: early life stages = 6000 $\mu g \cdot L^{-1}$
other life stages = 5500 $\mu g \cdot L^{-1}$
for cold-water biota: early life stages = 9500 $\mu g \cdot L^{-1}$
other life stages = 6500 $\mu g \cdot L^{-1}$

[o]Lead guideline = 1 $\mu g \cdot L^{-1}$ at a water harness of 0–60 $mg \cdot L^{-1}$ (soft) as $CaCO_3$
= 2 $\mu g \cdot L^{-1}$ at a water harness of 60–120 $mg \cdot L^{-1}$ (medium) as $CaCO_3$
= 4 $\mu g \cdot L^{-1}$ at a water harness of 120–180 $mg \cdot L^{-1}$ (hard) as $CaCO_3$
= 7 $\mu g \cdot L^{-1}$ at a water harness >180 $mg \cdot L^{-1}$ (very hard) as $CaCO_3$

[p]Nickel guideline = 25 $\mu g \cdot L^{-1}$ at a water harness of 0–60 $mg \cdot L^{-1}$ (soft) as $CaCO_3$
= 65 $\mu g \cdot L^{-1}$ at a water harness of 60–120 $mg \cdot L^{-1}$ (medium) as $CaCO_3$
= 110 $\mu g \cdot L^{-1}$ at a water harness of 120–180 $mg \cdot L^{-1}$ (hard) as $CaCO_3$
= 150 $\mu g \cdot L^{-1}$ at a water harness >180 $mg \cdot L^{-1}$ (very hard) as $CaCO_3$

[q]The guideline of 4.0 $\mu g \cdot L^{-1}$ for phenoxy herbicides is based on data for ester formulations of 2,4-dichlorophenoxyacetic acid.

[r]The technical document for the guideline is available from British Columbia Ministry of Environment, Lands and Parks.

[s]Temperature: (for more information, see CCREM 1987)

Thermal Stratification: Thermal additions to receiving waters should be such that thermal stratification and subsequent turnover dates are not altered from those existing prior to the addition of heat from artificial origins.

Maximum Weekly Average Temperature: Thermal additions to receiving waters should be such that the maximum weekly average temperature is not exceeded.

Short-term Exposure to Extreme Temperature: Thermal additions to receiving waters should be such that the short-term exposures to maximum temperatures are not exceeded. Exposures should not be so lengthy or frequent as to adversely affect the important species.

[t]Expressed on a TEQ basis using NP TEFs, see Table 2 in factsheet.

[u]For protection from direct toxic effects; the guidelines do not consider indirect effects due to eutrophication.

[v]May not prevent accumulation of methylmercury in aquatic life, therefore, may not protect wildlife that consume aquatic life; see factsheet for details. Consult also the appropriate Canadian Tissue Residue Guideline for the Protection of Wildlife Consumers of Aquatic Biota.

[w]May not fully protect higher trophic level fish; see factsheet for details.

[x]Canadian Guidance Framework for Phosphorus is for developing phosphorus guidelines (does not provide guidance on other freshwater nutrients). It provides Trigger Ranges for Total Phosphorus (see Guidance Framework for Phosphorus factsheet):

ultra-oligotrophic <4 $\mu g \cdot L^{-1}$
oligotrophic 4-10 $\mu g \cdot L^{-1}$
mesotrophic 10-20 $\mu g \cdot L^{-1}$
meso-eutrophic 20-35 $\mu g \cdot L^{-1}$
eutrophic 35-100 $\mu g \cdot L^{-1}$
hyper-eutrophic >100 $\mu g \cdot L^{-1}$

[y]Guidelines are expressed in μg nitrate$\cdot L^{-1}$. These values are equivalent to 2900 μg nitrate-nitrogen$\cdot L^{-1}$, and 3600 μg nitrate-nitrogen$\cdot L^{-1}$, for freshwater and marine respectively.

[z]Guideline is expressed as μg nitrite-nitrogen$\cdot L^{-1}$. This value is equivalent to 197 μg nitrite$\cdot L^{-1}$.

[aa]Supporting documents are available from the Canadian Council of Ministers of the Environment at http://www.ccme.ca/publications/ceqg_rcqe.html?category_id=125

[bb]The Canadian Guidance Framework for the Management of Nearshore Marine Systems is for developing nutrient (phosphorus and nitrogen) guidelines for nearshore marine systems. Refer to factsheet for details

Reference

CCREM (Canadian Council of Resource and Environment Ministers). 1987. Canadian water quality guidelines. Prepared by the Task Force on Water Quality Guidelines.

Reference listing:

Canadian Council of Ministers of the Environment. 2007. Canadian water quality guidelines for the protection of aquatic life: Summary table. Updated September, 2007. In: Canadian environmental quality guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg.

For further scientific information, contact:

Environment Canada
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Internet: http://www.ec.gc.ca/ceqg-rcqe

For additional copies, contact:

CCME Documents
Toll Free: (800) 805-3025
www.ccme.ca

Aussi disponible en français

Excerpt from Publication No. 1299; ISBN 1-896997-34-1

BURNSIDE

Appendix E
NWB Annual Monitoring Report Format

NWB Annual Report **Year being reported:** Select

License No: **Issued Date:**
Expiry Date:

Project Name:

Licensee:

Mailing Address:

Name of Company filing Annual Report (**if different from Name of Licensee please clarify relationship between the two entities, if applicable**):

General Background Information on the Project (***optional**):

Licence Requirements: the licensee must provide the following information in accodance with

Select Select

A summary report of water use and waste disposal activities, including, but not limited to: methods of obtaining water; sewage and greywater management; drill waste management; solid and hazardous waste management.

Water Source(s):
Water Quantity:
- Quantity Allowable Domestic (cu.m)
- Actual Quantity Used Domestic (cu.m)
- Quantity Allowable Drilling (cu.m)
- Total Quantity Used Drilling (cu.m)

Waste Management and/or Disposal
- ☐ Solid Waste Disposal
- ☐ Sewage
- ☐ Drill Waste
- ☐ Greywater
- ☐ Hazardous
- ☐ Other:

Additional Details:

A list of unauthorized discharges and a summary of follow-up actions taken.

Spill No.: (as reported to the Spill Hot-line)
Date of Spill:
Date of Notification to an Inspector:
Additional Details: (impacts to water, mitigation measures, short/long term monitoring, etc)

Revisions to the Spill Contingency Plan

Select

Additional Details:

Revisions to the Abandonment and Restoration Plan

Select

Additional Details:

Progressive Reclamation Work Undertaken

Additional Details (i.e., work completed and future works proposed)

Results of the Monitoring Program including:

The GPS Co-ordinates (in degrees, minutes and seconds of latitude and longitude) of each location where sources of water are utilized;

Select

Additional Details:

The GPS Co-ordinates (in degrees, minutes and seconds of latitude and longitude) of each location where wastes associated with the licence are deposited;

Select

Additional Details:

Results of any additional sampling and/or analysis that was requested by an Inspector

Select

Additional Details: (date of request, analysis of results, data attached, etc)

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

Select

Additional Details: (Attached or provided below)

Any responses or follow-up actions on inspection/compliance reports

Select

Additional Details: (Dates of Report, Follow-up by the Licensee)

Any additional comments or information for the Board to consider

Date Submitted:		
Submitted/Prepared by:		
Contact Information:	**Tel:**	
	Fax:	
	email:	