Environmental Monitoring Program – Sample Collection Training Program

Project Name
Water Licence Compliance

Type of Document
Final

Project Number
OTT-00209248-A0

Prepared By: Robert Renaud, M.Sc., P.Geo.

Reviewed By: Dan McNicoll, M.Sc., P.Geol.

exp Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 7H6
Canada

Date Submitted
August 13, 2013

This page intentionally left blank

Environmental Monitoring Program – Sample Collection Training Program

Type of Document:
Final

Project Name:
Water Licence Compliance

Project Number:
OTT-00209248-A0

Prepared By:
exp
100-2650 Queensview Drive
Ottawa, ON K2B 8H6
Canada
T: 613 688-1899
F: 613 225-7337
www.exp.com

Robert Renaud, M.Sc., P.Geo.
Senior Geoscientist

Dan McNicoll, M.Sc., P.Geol.
Senior Manager & Senior Geoscientist

Date Submitted:
August 13, 2013

This page intentionally left blank

Table of Contents

Appendices

This page intentionally left blank

1 Introduction

The purpose of this document is to provide guidance/training on how to properly collect and submit water and waste water samples to ensure that the environmental monitoring program is undertaken with a high degree of quality, in order to ensure that the results accurately reflect the physical and chemical nature of the matrix being tested.

1.1 Background

The Government of Nunavut (GN) Department of Community & Government Services (CGS) has a mandate to assist the Hamlets in addressing non-compliance issues with their Nunavut Water Board (NWB) licences. The CGS mandate includes providing assistance in the following areas:

- Education and assistance with licence requirements, such as annual reports, monitoring etc.;
- Preparation of documentation such as Operation & Maintenance Manuals for spill contingency plans; and,
- Initiation of capital programs, such as fencing of the solid waste facilities.

Exp Services Inc. has been retained to provide engineering assistance to CGS in order to accomplish their water licence compliance mandate.

1.2 Monitoring and Regulatory Requirements

The Nunavut Water Board has responsibilities and powers over the use, management and regulation of inland water in Nunavut and its objectives are to provide for the conservation and utilization of waters in Nunavut in a manner that will provide the optimum benefits for the residents of Nunavut in particular and Canadians in general.

Under the conditions set forth in the "*Nunavut Waters and Nunavut Surface Rights Tribunal Act, (2002, c-10)*", the NWB regulates water use and waste disposal activities in Nunavut through the issuance of water licences. The water licences issued to communities in Nunavut impose various conditions, typically including the preparation of an Annual Report which summarizes all of the data gathered under the monitoring program, as well as a summary of modifications and/or major maintenance work carried out on the licensed facilities during the reporting year. The water licences issued by the NWB also typically include requirements to prepare other documents including, but not limited to, Operation and Maintenance manuals, Abandonment and Restoration plans, Quality Assurance and Quality Control manuals, and Spill Contingency plans.

The NWB water licences typically specify the number and locations of monitoring stations, the specific lists of chemical parameters to be measured, the frequency of sample collection, and the effluent quality standards.

1.3 Objectives

The objectives of this guidance/training plan are to: i) ensure that all aspects of the water and wastewater sampling program is undertaken in a correct and consistent manner; ii) ensure the reliability of the data collected during monitoring activities at the locations specified in the Hamlet's water licence, and iii) satisfy the requirement of the water licence.

1.4 Scope of Training Program

The scope of this training program includes the following topics:

1. A description of the environmental monitoring program sample types.
2. A description of the required pre-sampling activities.
3. A description of sampling safety concerns and the need for personal protective equipment.
4. A description of the sampling procedures specific to each sample type.
5. A description of sample care procedures.
6. A description of sample shipping and tracking procedures.
7. A description of common errors and tips to avoid them.

1.5 Definitions

The following definitions that are relevant to this plan include:

Quality Assurance is a system that ensures that quality control procedures are correctly performed and documented.

Quality Control refers to the established procedures observed both in the field and in the laboratory, designed to ensure that the resulting end data meet intended quality objectives.

Trip Blank is a sample of clean water that was prepared by the analytical laboratory and shipped to the sample site in the cooler along with the empty sample bottles. This trip blank sample remains unopened and is transported back to the laboratory with the monitoring program samples. The trip blanks is analyzed by the laboratory along with the monitoring program samples. The purpose of the trip blank is the assess contamination introduced during shipping and field handling procedures.

CALA refers to the Canadian Association for Laboratory Accreditation, formally known as the Canadian Association for Environmental Analytical Laboratories (CAEAL).

Chain of Custody Documentation refers to the documentation that accompanies samples sent to an analytical laboratory. It is a legal document which ensures that the sample taken at a specific site is the same sample received in the laboratory. It also provides information on the sample condition and integrity as received by the laboratory.

2 Field Sampling

2.1 Sampling Media

In order to comply with the current and potential future requirements of the Hamlet's NWB Water License, the following samples may need to be collected: i) surface water from the raw water supply lake; ii) surface water samples from creeks or ditches accepting wastewater effluent from the sewage lagoon; iii) surface water seepage from the landfill (if present); and/or, iv) groundwater samples from existing monitoring wells (if present). This training program will prepare the user to sample all of these potential scenarios. The sampling locations are shown in figures included in the attached Quality Assurance and Quality Control Plan.

2.2 Pre-Sampling Activities

2.2.1 Bottle Order and Shipment

At least two weeks before the upcoming environmental sampling event, send a request to the contract laboratory for the appropriate sample sets (bottles) for the required sampling test groups as specified in the Hamlet's NWB Water Licence (see Appendix B of the attached Quality Assurance and Quality Control Plan). Remember to request that a trip blank be prepared and sent along with the sample bottles.

Ensure that the bottle shipment has arrived from the contract laboratory in time for the sampling program and verify the integrity of all sampling containers. Report any missing or broken bottles to the contract laboratory as soon as possible, so that replacement bottles may be shipped.

2.2.2 Personal Protective Equipment

Ensure that the required personal protective equipment (PPE), such as latex gloves and safety glasses, is on hand before commencing the environmental monitoring program. Place an order for any required PPE that is missing well before the upcoming environmental sampling event to ensure a timely delivery.

2.2.3 Sampling Location Inspection

Perform an initial inspection of all routinely-monitored sampling locations before the commencement of the monitoring program. Make note of any equipment damage or conditions that may prevent, or alter, the collection of the environmental monitoring program samples.

2.2.4 Sampling Event Timing

Care should be exercised with respect to planning the timing of the environmental sampling event. In addition to respecting the sample collection timing conditions specified in the NWB water licence and the need for ensuring the timely procurement of the sample bottles and PPE, it is imperative to consider the flight schedules and air cargo drop-off times when planning when sampling events will occur. If possible, environmental samples should be collected and shipped to the contract laboratory on the same day. Certain test parameters, such as microbiological parameters, have very short hold times. Delays that occur in getting the samples to the contract laboratory may result in the spoilage of the samples and/or otherwise invalidating the analytical results. This could result in costly resampling, both economically and with respect to timing, and could possibly result in the Hamlet being in non-compliance with the terms of their NWB water licence.

It is understood, given flight schedules that the sampling activities cannot always occur on the same day as sample shipment. However, sample care procedures, outlined below in subsequent sections, should be applied.

2.3 Sampling Safety Concerns

Samples should be collected as close as possible to the same day and time during the specified months identified in the Water Licence. Needless to say, if the sampling day turns out to be very stormy, it would be well advised to sample the day before or after to ensure sampler safety and sampling accuracy. If however, sampling must be conducted in adverse conditions for whatever reason, it is important to have proper footwear and clothing to avoid slipping or falling during sampling – especially when sampling wastewater.

Due to potential health hazards associated with sewage handling and treatment, the following safety procedures should be obeyed in order to minimize health risks to personnel working in and around the wastewater facilities:

- Equipment is to be kept clean;
- Wear protective clothing such as latex gloves, and safety glasses at all times;
- Work clothes should not be worn home;
- Hands should be washed frequently, as a minimum before eating and after work;
- Personnel should receive appropriate vaccinations and ensure they are kept up-to-date; and
- Visit the Health Clinic for all injuries. When working with wastewater, the smallest cut or scratch is potentially dangerous.

Disposable latex gloves should be changed between sampling locations. The gloves not only protect the sampler from coming in contact with potentially harmful water (i.e. wastewater) but it also ensures the sample integrity by not permitting foreign material, substances, etc. from mixing with the sample. Safety glasses should also be worn to protect the eyes from splashing, especially important when sampling effluent from the sewage disposal facilities.

2.4 Sampling Procedures

All sampling, sample preservation, and analyses is to be conducted in accordance with methods described in the current edition of *Standard Methods for the Examination of Water and Wastewater* (American Public Health Association, American Water Works Association, and Water Environment Federation, most current edition).

To obtain meaningful results from the analyses, the following six factors are of particular importance:

- Sample collection as per schedule and location.
- Correct usage of container/sample bottle for parameter being tested.
- Correct labelling of sample bottles and filling out record/field sheet.
- Correct procedure for field sampling.
- Proper and timely shipment of samples to the laboratory.
- Timely delivery of samples to the laboratory from the air cargo facility.

2.5 Sampling Collection

Refer to the *Environmental Monitoring Program Checklist*, found in Appendix C of the attached Quality Assurance and Quality Control Plan, for specific details on the sampling locations, equipment to be used, and sampling methods. As a general recommendation, please refrain from using insect repellant, disinfection hand gel or other chemical products before and during sample collection. Also, please refrain from smoking during sample collection.

2.5.1 Locations

The water licence issued to the Hamlet by the Nunavut Water Board (NWB) specifies the locations of monitoring stations across the licensed facilities. Latitude and longitude coordinates for the monitoring stations are provided in the attached Quality Assurance and Quality Control Plan. Marker signs should indicate the exact sampling locations in the field. It is important that these signs be properly maintained to ensure that the sample locations remain unchanged.

2.5.2 Sampling Equipment

Dedicated latex or nitrile gloves (i.e., one pair per sample location) are to be used during sampling. When collecting a sample at a surface water location (fresh water or wastewater), it is important to do so in a safe manner. The proper use of sampling equipment can make the process safer. The use of a sampling pole to collect the sample can prevent the sampler having to reach and possibly lose their balance.

Any dedicated sampling equipment such as sampling poles (see photo on left for an example) are to be cleaned with soap and water after each sampling location to prevent cross-contamination. Other than the disposable gloves, a sampling pole to reach more difficult locations, and potentially polyethylene tubing and foot valves for groundwater sampling, no other sampling equipment is foreseen.

Environmental monitoring samples collected for analysis of selected chemical parameters are to be placed directly into new pre-cleaned, laboratory-supplied sample bottles. Do not rinse the sampling bottles since some bottles contain preservatives. It is very important to fill all bottles since some analyses require a large volume of water. All filled water samples are to be placed in clean coolers for transportation to the subcontract laboratory. The samples are transported/submitted under Chain of Custody documentation. Included on a Chain of Custody form is the client information, the sample information, the analyses requested, the relevant regulations, the turnaround time for the analytical results, comments, and temperature of the samples at the time they arrived in the laboratory. An example of a completed Chain of Custody form is included in Appendix D of the attached Quality Assurance and Quality Control Plan.

2.5.3 Sampling Methods

Please see the Hamlet's NWB Water Licence or Appendix E of the attached Quality Assurance and Quality Control Plan for the Environmental Monitoring Program Schedule. In general, samples may need to be collected from: i) surface water from the raw water supply lake; ii) surface water samples from creeks or ditches accepting wastewater effluent from the sewage lagoon; iii) surface water seepage from the landfill (if present); and/or, iv) groundwater samples from existing monitoring wells (if present). The sampling method used for each of these scenarios will be discussed hereafter.

2.5.3.1 *Surface Water Sampling from Lakes or Lagoons*

Fresh water or wastewater samples collected from a standing body of water (i.e. lake or lagoon) may be required as per the current or future requirements of the Hamlet's NWB Water Licence. In this case, the samples should be collected as far from the shoreline as possible in order to obtain as representative a sample as possible. For better results, the use of an extended bottle sampler or sampling pole should be considered. In this case, the sample bottle is fastened to the sampling pole and extended out into the lake or lagoon where the bottle is slightly submerged below the surface of the lagoon and allowed to fill up before pulling it back and capping it. It is very important not to overfill the bottles since some have preservatives in them. Ideally, the bottles should be filled to approximately 2 to 5 cm (1 to 2 inches) from the top. The only exception to this is the two 50 ml glass bottles which need to be completely filled with no air bubbles (see Section 3.3). As previously mentioned in Section 2.5.2, the sampling pole will need to be washed with soap and water after each sampling location. Details on how to construct a proper sampling pole is included in Appendix B of this manual.

2.5.3.2 *Wastewater Effluent Sampling from Ditches, Streams and/or Creeks*

Effluent discharge samples need to be collected as per the requirements of the Hamlet's NWB Water Licence for Sewage Disposal. For effluent samples collected from fast moving water such as streams, creeks and/or rivers, the sample containers should be filled in a well-mixed section of the stream and as far from the shoreline as possible. In most cases, simply reaching out an arm's length should be sufficient but if more reach is considered necessary depending on sampling location, a sampling pole can be used similar to that described in Section 2.5.3.1. The sample bottle should be immersed into the receiving water body with the neck upwards and allowed to slowly fill so as to minimise the amount of sediment in the bottle. It is very important not to overfill the bottles since some have preservatives in them. Ideally, the bottles should be filled to approximately 2 to 5 cm (1 to 2 inches) from the top. The only exception to this is the two 50 ml glass bottles which need to be completely filled with no air bubbles (see Section 3.3).

2.5.3.3 *Landfill Runoff Sampling*

Effluent discharge samples from landfills may be required as per the current or future requirements of the Hamlet's NWB Water Licence for Waste Disposal Facilities. Landfill runoff samples should be collected from the receiving water filled ditch, stream or creek by immersing the sample bottle into the runoff stream with the neck upwards and allowed to slowly fill so as to minimise the amount of sediment in the bottle. It is very important not to overfill the bottles since some have preservatives in them. Ideally, the bottles should be filled to approximately 2 to 5 cm (1 to 2 inches) from the top. The only exception to this is the two 50 ml glass bottles which need to be completely filled with no air bubbles (see Section 3.3). Arm's length sampling should be more than sufficient for this type of sampling.

2.5.3.4 *Groundwater Sampling*

Where required by the Hamlet's NWB Water Licence, groundwater samples should be collected from the existing monitoring well network as specified in the water licence. Groundwater samples should be collected giving due consideration to adequate ground thaw and obtaining representative groundwater samples. Groundwater samples should be collected using dedicated sampling tubing with Waterra™ foot valves (see photo on right). It is very important not to overfill the bottles since some have preservatives in them. Ideally, the bottles should be filled to approximately 2 to 5 cm (1 to 2 inches) from the top. The only exception to this is the two 50 ml glass bottles which need to be completely filled with no air bubbles (see Section 3.3).

Well purging should not be undertaken due to the potential limited availability of groundwater in the monitoring wells. Instead, samples should be collected of all available groundwater present in the monitoring wells.

2.5.4 Quality Assurance and Quality Control Program

Cross contamination is a common source of error in sampling procedures. Quality Control (QC) samples help identify when and how contamination might occur. There are various types of QC samples. For the purposes of the Hamlet's environmental monitoring, **exp** recommends the use of trip blanks.

It is essential to request a trip blank sample to be prepared when placing the bottle order with the contract laboratory.

2.6 Sample Care

All water samples are to be collected in laboratory-supplied containers with the proper preservative, where applicable. A complete list of parameter handling and preservatives can be found in Appendix C of the attached Quality Assurance and Quality Control Plan.

All sample containers are to be tightly sealed and properly labelled with the:

1. sample ID;
2. date and time of sample collection; and,
3. location of sample collection.

The outside of the bottles are to be cleaned with soap and water after sampling and dried off prior to placing the samples in the cooler. The use of custody seals on the sample coolers is recommended. The samples are to be stored on ice in a cooler until delivery to the laboratory. A chain of custody form is to be filled out completely and is used to track the samples and placed in the cooler with the samples, in a ziplock bag. Keep the last page of the Chain of Custody and give it to the Hamlet Foreman for their records.

The following checks are generally performed by the laboratory upon receipt:

- Verification of the integrity and condition of all sample coolers.
- Verification of the integrity and condition of all sample containers.
- Checks for leakage, cracked or broken closures or containers, evidence of grossly contaminated container exteriors or shipping cooler interiors, and obvious odours, etc.
- Verification of receipt of complete documentation for each container.
- Verification that sample identification numbers on sample transmittal forms corresponds to sample identification numbers on the sample containers.
- Verifications that holding times were met and samples were kept cool during transit.

2.7 Sample Shipping and Tracking

See Section 2.6 for sampling handling and cooler packing instructions.

Call the contract laboratory before the samples are shipped to advise them of the upcoming shipment. Give them the air cargo waybill number so that they may track the shipment from their end.

Ensure all samples are shipped to the contract laboratory immediately after the completion of the environmental monitoring event to ensure that the hold times are respected for the various parameters. Samples should be shipped as priority cargo and kept in **refrigerated** storage, where possible (**never a freezer**), until loaded onto the airplane for departure. When completing the air cargo waybill, ensure that it is clear that the air cargo facility must hold the shipment at their facility in the destination city and notify the contract laboratory for pick-up.

Follow-up with the contract laboratory on the day after the samples were shipped to ensure that the samples were collected from the air cargo facility and received by the contract laboratory for analysis.

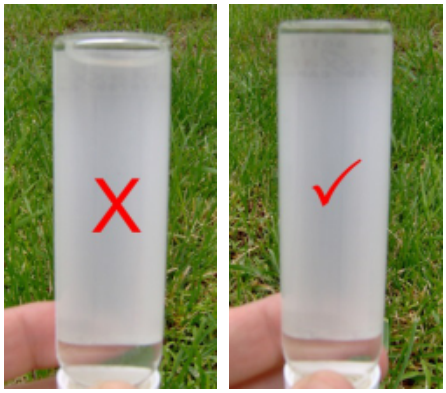
3 Avoiding Common Errors

Despite the use of rigorous sample collection and handling procedures, errors do occur. Listed below are several of the most common errors that occur during the completion of an Environmental Monitoring Program sampling event. Along with each of the common errors, tips for avoiding the error are also provided.

1. Obtaining an incomplete shipment of sampling bottles from the contract laboratory. This error may result from a misinterpretation of the sampling requirements provided in the Hamlet's water licence. Depending on the water licence, samples may need to be collected from more than one licenced facility at the same time (for example wastewater effluent from the sewage disposal facilities and landfill runoff). Often these sampling locations have different suites of chemical parameters to be analyzed. It is essential that the Hamlet staff requests bottles for the correct suite of chemical parameters for each sample to be collected. It is also essential that, at the time of the bottle order that the trip blank is ordered. It is also prudent to request more sampling containers than required in case of breakage. Despite the diligence of Hamlet staff during sample bottle ordering, sometimes the analytical laboratory does not ship the correct number of sampling bottles. The onus is on Hamlet staff to recognize this error and follow-up immediately with the contract laboratory, so that they may correct this error. Failure to do so in a timely manner may result in delays in sample collection and hence non-compliance with the monitoring requirements of the Hamlet's water licence.

2. Collecting samples from incorrect monitoring locations. While it is recommended that the same Hamlet staff members collect the environmental monitoring program samples from one sampling period to the next, sometimes staff substitutions are inevitable. Where sampling locations are not clearly designated with marker signs, it is possible that inconsistencies will occur in the actual location of sample collection, depending on who is doing the sampling. Such inconsistencies may bias the sampling results. As such, it is imperative that the sampling locations specified in the Hamlet's water licence are clearly demarcated with signs in order to avoid confusion as to the appropriate collection location by subsequent sample collectors.

3. Improper sampling technique. This manual and the on-site training program are intended to minimize the possibility that improper sampling techniques are used by Hamlet staff. Using improper sampling techniques may result in invalid sampling results or sample bias. For example, while collecting a surface water sample from a run-off or effluent creek or water course, extreme care should be given to preventing the collection of sediment along with the water sample. Sediment in the sample may bias the laboratory results. Another important example of improper sample collection technique is the presence of air bubbles (or headspace) in sample vials for analysis of volatile organic compounds (VOCs), petroleum hydrocarbons fraction 1 (PHC F1) or benzene, toluene, ethylbenzene and xylenes (BTEX). The sample vials should be flipped upside-down to check for bubbles. If a bubble covers the bottom the vial, it is necessary to resample (see photos at right). Failure to do so may result in data rejection and costly re-sampling at a later date. If incorrect sample bottles are used, this also may result in data rejection and costly re-sampling at a later date. The sample bottles can be specific to the



chemical parameters being analyzed due to limitations with respect to bottle size, bottle light transmittance, and chemical preservative used.

4. Cross contamination of environmental samples. Where possible, dedicated sampling equipment should be used for each sampling location and/or type of sample. Sampling equipment that is shared between sampling locations may result in cross-contamination if extreme care is not used to ensure the equipment is thoroughly cleaned between uses.
5. Improper sample handling. It is essential that the sample bottle labels are properly completed to ensure proper sample tracking and reporting. The outside of the sample bottles should be clean and dry before packing in the coolers. The samples should be kept cool until receipt by the contract laboratory using loose ice. Do not over pack the coolers with samples. If loose ice is unavailable, freezer packs may be used, however since they are less efficient at keeping the samples cool, ensure that multiple freezer packs are included in each cooler. The contract laboratory will measure the temperature of the samples upon receipt and will flag samples that exceed 10ºC. Failure to keep the samples at less than 10ºC may result in data rejection and costly re-sampling at a later date.
6. Insufficient sample volume. It is very important to fill all sample bottles received from the laboratory. Failure to do so may result in an insufficient sample volume for the laboratory to analyze.
7. Rinsing or overfilling of bottles. It is important not to rinse or overfill the sample bottles before sampling since some bottles have preservatives in them which are essential for accurate analyses.
8. Incomplete Chain of Custody documentation. The Chain of Custody is a legal document that accompanies the samples. When transferring the possession of samples, the Hamlet staff relinquishing the samples and the contract laboratory receiving the samples must sign, date, and note the time on the record. In addition to recording the signatures, dates and times, the Chain of Custody includes many important fields such as the sample identifications, the sample types, the number of bottles, the analyses requested, and the turnaround time required. If any of these fields are not fully completed, this may result in confusion in the analytical laboratory and in delays in the reporting of the results.
9. Delays in sample shipment. Due to the remoteness of some Nunavut communities, air cargo shipping can be challenging. Delays between sample collection and sample analysis are common. In order to minimize the possibility of exceeding sample analysis hold times, sampling events should be planned carefully, considering cargo facility drop-off times and flight schedules. Sample coolers should be shipped as priority cargo.

4 References

Standard Methods for the Examination of Water and Wastewater, American Public Health Association, American Water Works Association, and Water Environment Federation, 22nd Edition, 2012.

This page intentionally left blank

Appendix A:
Quality Assurance and Quality Control Plan

This page intentionally left blank

Hamlet of Gjoa Haven

Quality Assurance / Quality Control Plan

Project Name
Water Licence Compliance – Hamlet of Gjoa Haven

Type of Document
Final

Project Number
OTT-00209248-A0

Prepared By: Robert Renaud, M.Sc., P.Geo.

Reviewed By: Chris Kimmerly, M.Sc., P.Geo. (ON)

exp Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 7H6
Canada

Date Submitted
August, 2013

This page intentionally left blank

Hamlet of Gjoa Haven

Quality Assurance / Quality Control Plan

Type of Document:
Draft

Project Name:
Water Licence Compliance – Hamlet of Gjoa Haven

Project Number:
OTT-00209248-A0

Prepared By:
exp
100-2650 Queensview Drive
Ottawa, ON K2B 8H6
Canada
T: 613 688-1899
F: 613 225-7337
www.exp.com

Robert Renaud, M.Sc., P.Geo.
Senior Geoscientist

Chris Kimmerly, M.Sc., P.Geo. (ON)
Manager & Senior Geoscientist

Date Submitted:
August, 2013

This page intentionally left blank

Table of Contents

Appendices

This page intentionally left blank

1 Introduction

The purpose of this document is to provide guidance to ensure that environmental monitoring program samples collected in the field are done so with a high degree of quality, in order to ensure that they accurately reflect the physical and chemical nature of the matrix being tested.

1.1 Background

The Hamlet of Gjoa Haven (Hamlet) is located on King William Island (Figure 1, Appendix A). It is 1,056 km northeast of Yellowknife and the population was estimated to be approximately 1,146 in 2012.

The water supply is currently taken from Swan Lake, located approximately 3.5 km from the Hamlet. The former source, Water Lake, is no longer in service, and the berm that retained water within Water Lake has been breached. Water is drawn into the pump house at Swan Lake via a pair of inclined shaft intakes. The pump house contains heating equipment, provided to avoid freeze of the transmission watermain linking the pump house and water treatment plant. There is also a truck loading arm at the pump house, which can provide for continuing service should there be operating issues with the transmission watermain. Water is conveyed to the treatment plant via a transmission watermain that is approximately 3 km in length.

The water treatment plant is located adjacent to the developed area of the Hamlet, and south of the airport. This facility contains pressure filters, chlorination equipment, a treated water storage tank and equipment for truck loading. Treated water chlorine is measured and recorded on an on-going basis. Backwash water from the pressure filters is disposed of into a bermed area to the rear of the water treatment plant. This backwash stream is treated with a dechlorination chemical prior to discharge.

Waste water generated in the community is hauled to a site that is approximately 1.5 km southeast from the centre of the Hamlet. This facility is a constructed lagoon that is approximately 180 m in diameter. Sewage is discharge at the north side of the lagoon, and the discharge point is opposite the sewage receiving point. A semi-circular secondary cell that is approximately 40 m in diameter has been provided adjacent to the primary cell and directly below the discharge from the primary cell. Effluent from the lagoon system is conveyed through an undefined wetland area prior to discharge into the sea. The wetlands provide a flow path approximately 1,000 m prior to entering the marine environment.

The current solid waste disposal site is located approximately 1.8 km southeast from the centre of the Hamlet and approximately 700 m south of the sewage off-loading point at the lagoon. A former solid waste disposal area is located along the road to the existing solid waste facility.

The Nunavut Water Board (NWB) issued a Class B Water Licence (3BM-GJO0409) to the Hamlet on January 8, 2004. The water licence governs water use and waste disposal within the Hamlet. A copy of the Water Licence is provided in Appendix B.

1.2 Monitoring and Regulatory Requirement Program

Condition 6 of Part H of the water licence issued to the Hamlet requires that the Hamlet conform to the Quality Assurance / Quality Control (QA/QC) Plan provided to the Hamlet by the NWB. However, it is our understanding that the NWB has not provided the Hamlet with a QA/QC Plan. As such, this QA/QC plan was prepared in accordance with "*Quality Assurance (QA) and Quality Control (QC) Guidelines for use by Class "B" Licensees in Collecting Representative Water Samples in the Field and for Submission of a*

QA/QC Plan" (Department of Indian and Northern Affairs Canada, July 1996), herein referred to as "The Guidelines".

1.3 Objectives

The objectives of this QA/QC plan are to: i) to ensure the reliability of the data collected during monitoring activities at the locations specified in the Hamlet's water licence, and ii) satisfy the requirement of the water licence.

1.4 Scope of Work

This QA/QC Plan covers the environmental monitoring undertaken at the Hamlet's truck fill station, Solid Waste Disposal Facilities, raw sewage offload point, and final discharge point of the Sewage Disposal Facilities (Figure 2).

1.5 Definitions

The following definitions that are relevant to this plan include:

Quality Assurance is a system that ensures that quality control procedures are correctly performed and documented.

Quality Control refers to the established procedures observed both in the field and in the laboratory, designed to ensure that the resulting end data meet intended quality objectives.

Trip Blank is a sample of clean water that was prepared by the analytical laboratory and shipped to the sample site in the cooler along with the empty sample bottles. This trip blank sample remains unopened and is transported back to the laboratory with the monitoring program samples. The trip blanks is analyzed by the laboratory along with the monitoring program samples. The purpose of the trip blank is the assess contamination introduced during shipping and field handling procedures.

CALA refers to the Canadian Association for Laboratory Accreditation, formally known as the Canadian Association for Environmental Analytical Laboratories (CAEAL).

Chain of Custody Documentation refers to the documentation that accompanies samples sent to an analytical laboratory. It is a legal document which ensures that the sample taken at a specific site is the same sample received in the laboratory. It also provides information on the sample condition and integrity as received by the laboratory.

2 Field Sampling

2.1 Sampling Procedures

All sampling, sample preservation and analyses is to be conducted in accordance with methods described in the current edition of *Standard Methods for the Examination of Water and Wastewater* (American Public Health Association, American Water Works Association, and Water Environment Federation, most current edition).

To obtain meaningful results from the analyses, the following six factors are of particular importance:

- Sample collection as per schedule and location.
- Correct usage of container/sample bottle for parameter being tested.
- Correct labelling of sample bottles and filling out record/field sheet.
- Correct procedure for field sampling.
- Proper and timely shipment of samples to the laboratory.
- Timely delivery of samples to the laboratory from the air cargo facility.

2.2 Sampling Collection

Refer to the *Environmental Monitoring Program Checklist*, found in Appendix B for specific details on the sampling locations, equipment and sampling methods.

2.2.1 Locations

The water licence issued to the Hamlet (3BM-GJO0409) by the NWB specifies four monitoring stations across the licensed facilities.

- Station GJOP-1 is a raw water supply (from Swan Lake) volume monitoring location.
- Station GJO-2 is a runoff sampling location from the Final Discharge Point of the Solid Waste Disposal Facilities.
- Station GJO-3 is a wastewater influent (raw sewage) volume monitoring location at the truck offload point.
- Station GJO-4 is an effluent discharge sampling location from the Final Discharge Point of the Sewage Disposal Facilities.
- Station GJO-5 is a runoff sampling location from the leachate pond (prior to decanting) at the Solid Waste Disposal Facilities.

The following table includes the geographic coordinates for the eight monitoring stations described above.

Table 1 –Geographic Coordinates for the Monitoring Stations for NWB Licence 3BM-GJO0409

Monitoring Station	Latitude	Longitude
GJO-1	N 68º 39' 22.9"	W 95º 55' 06.5"
GJO-2	N 68º 37' 02.4"	W 95º 50' 25.3"
GJO-3	N 68º 37' 28.8"	W 95º 50' 21.9"
GJO-4	N 68º 37' 13.7"	W 95º 50' 23.2"
GJO-5	N 68º 37' 02.8"	W 95º 50' 26.1"

2.2.2 Sampling Equipment

Dedicated latex or nitrile gloves (i.e., one pair per sample) are to be used during sample handling. Dedicated sampling equipment such as sampling poles (see photo below for an example) are to be cleaned with soap and water after each sample is collected to prevent cross-contamination.

Environmental monitoring samples collected for analysis of selected chemical parameters are to be placed directly into new pre-cleaned, laboratory-supplied sample bottles. All monitoring samples are to be placed in clean coolers for transportation to the subcontract laboratory. The samples are transported/submitted under Chain of Custody documentation. Included on a Chain of Custody form is the client information, the sample information, the analyses requested, the relevant regulations, the turnaround time for the analytical results, comments, and temperature of the samples at the time they arrived in the laboratory. An example of a completed Chain of Custody form is included in Appendix D.

2.2.3 Sampling Methods

Please see Appendix E for the Environmental Monitoring Program Schedule. As a general recommendation, please refrain from using insect repellant, disinfection hand gel or other chemical products before and during sample collection. Also, please refrain from smoking during sample collection.

2.2.3.1 *Landfill Runoff Sampling*

Landfill runoff is to be collected monthly from the Final Discharge Point (Station GJO-2) of the Solid Waste Disposal Facilities during the months of May to August, inclusive. A landfill runoff sample is also to be collected from the landfill leachate (Station GJO-5) pond prior to decanting. Runoff samples are collected from the receiving water body (or pond) by immersing the sample bottle into the runoff stream (or pond) neck first to a depth of 5 to 10 cm (if possible). The sampling container is filled with runoff and the sample bottle is raised neck first to prevent sample spillage.

2.2.3.2 *Wastewater Effluent Sampling*

Effluent discharge is collected monthly from the Final Discharge Point (Station GJO-4) of the Sewage Disposal Facilities during the months of May to August, inclusive. Effluent samples are collected from the Final Discharge Point by immersing the sample bottle into the receiving water body neck first to a depth of 5 to 10 cm. The sampling container is filled with effluent and the sample bottle is raised neck first to prevent sample spillage.

2.3 Sample Handling

All water samples are to be collected in laboratory-supplied containers with the proper preservative, where applicable. A complete list of parameter handling and preservatives can be found in Appendix C.

All sample containers are to be tightly sealed and properly labelled with the sample ID, date and time of sample collection, location of sample collection and parameters to be analyzed. The outside of the bottles are to be cleaned with soap and water after sampling and dried off prior to placing the samples in the cooler. The samples are to be stored on ice in a cooler until delivery to the laboratory. A chain of custody form is to be filled out completely and is used to track the samples and placed in the cooler with the samples, in a ziplock bag. Keep the last page of the Chain of Custody and give it to the Hamlet Foreman for their records.

The following checks are generally performed by the laboratory upon receipt:

- Verification of the integrity and condition of all sample coolers.
- Verification of the integrity and condition of all sample containers.
- Checks for leakage, cracked or broken closures or containers, evidence of grossly contaminated container exteriors or shipping cooler interiors, and obvious odours, etc.
- Verification of receipt of complete documentation for each container.
- Verification that sample identification numbers on sample transmittal forms corresponds to sample identification numbers on the sample containers.
- Verifications that holding times were met and samples were kept cool during transit.

2.4 Quality Assurance and Quality Control Program

Cross contamination is a common source of error in sampling procedures. QC samples help identify when and how contamination might occur. There are various types of QC samples. For the purposes of the Hamlet's environmental monitoring, **exp** recommends the use of trip blanks.

It is essential to request a trip blank sample to be prepared when placing the bottle order with the contract laboratory.

3 Laboratory Analysis

3.1 Laboratory Accreditation

As indicated in the Guidelines, the Hamlet should use an analytical laboratory accredited by the Canadian Association for Laboratory Accreditation (CALA); formally known as the Canadian Association for Environmental Analytical Laboratories (CAEAL) for the monitoring program for NWB Licence 3BM-GJO0409. Appendix F includes a copy of the laboratory's CALA accreditation certificate and a list of the parameters for which they are certified.

3.2 Method Detection Limits

The method detection limits (MDLs) are provided on the contract laboratory's Certificates of Analysis.

4 Reporting Requirements

4.1 General Submissions

As a condition of NWB Licence 3BM-GJO0409 (Appendix B), the Hamlet is required to submit an Annual Report to the NWB, no later than March 31st of the year following the calendar year reported. Among other requirements, the annual report is required to include tabular summaries of all analytical data generated under the Monitoring Program (compared to the Maximum Average Concentrations – provided in Part D of the NWB Licence 3BM-GJO0409 – where applicable).

5 References

Quality Assurance (QA) and Quality Control (QC) Guidelines for use by Class "B" Licensees in Collecting Representative Water Samples in the Field and for Submission of a QA/QC Plan, Department of Indian and Northern Affairs Canada, July 1996.

Standard Methods for the Examination of Water and Wastewater, American Public Health Association, American Water Works Association, and Water Environment Federation, 22nd Edition, 2012.

Appendix A: Figures

This page intentionally left blank

exp Services Inc.
t: +1.613.688.1899 | f: +1.613.225.7330
2650 Queensview Drive, Unit 100
Ottawa, ON K2B 8H6
Canada
www.exp.com

• BUILDINGS • EARTH & ENVIRONMENT • ENERGY •
• INDUSTRIAL • INFRASTRUCTURE • SUSTAINABILITY •

scale: NTS	CLIENT: GJOA HAVEN, NUNAVUT	project no.: OTT-00209248-A0
date: 27/05/13	TITLE: LOCATION PLAN	FIG 01
drawn by: M.KELLEY		

exp Services Inc.
t: +1.613.688.1899 | f: +1.613.225.7330
2650 Queensview Drive, Unit 100
Ottawa, ON K2B 8H6
Canada
www.exp.com

• BUILDINGS • EARTH & ENVIRONMENT • ENERGY •
• INDUSTRIAL • INFRASTRUCTURE • SUSTAINABILITY •

scale: NTS	CLIENT: GJOA HAVEN, NUNAVUT	project no.: OTT-00209248-A0
date: 30/08/2013	TITLE: MONITORING STATION LOCATIONS	FIG 02
drawn by: E.A.		

Appendix B:
Hamlet of Gjoa Haven's Water Licence

This page intentionally left blank

DECISION

LICENCE NUMBER:NWB3GJO9904

This is the decision of the Nunavut Water Board (NWB) with respect to an application for a Licence dated September 16, 1998, made by:

Hamlet of Gjoa Haven

to allow for the use of water and disposal of waste for the Hamlet at Gjoa Haven, Northwest Territories.

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 was exempt from the requirement for screening by the Nunavut Impact Review Board in accordance with S. 12.3.2 of the NLCA, the NWB decided that the application could go through the regulatory process. After reviewing the submission of the Applicant and the written and oral 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, decided to waive the requirement to hold a public hearing and furthermore to delegate its authority to approve the application to the Executive Director pursuant to S. 13.7.5. of the NLCA and determined that:

Licence Number NWB3GJO9904 be issued subject to the terms and conditions contained therein. (Motion #: 98-12-08)

SIGNED this _____ day of January 1999 at Gjoa Haven, NT.

_____

Philippe di Pizzo
Executive Director

TABLE OF CONTENTS

I. INTRODUCTION

Following an application filed by the Hamlet of Gjoa Haven on October 2, 1998

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 application was referred for review and comments to Fisheries and Oceans Canada, Environment Canada, Indian and Northern Affairs, the Renewable Resources Department, Municipal and Community Affairs and the Kitikmeot Regional Health Board (G.N.W.T.), and the Hunters and Trappers Association of Gjoa Haven. 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 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 Executive Director pursuant to S. 13.7.5 of the Agreement. After considering and reviewing the comments submitted by interested parties, the NWB has issued licence NWB3GJO9904.

II. GENERAL CONSIDERATIONS

Term of the Licence

Consistent with the powers of the Northwest Territories Water Board under the Northern Inland Waters Act, 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 Hamlet, a 5-year licence will allow enough time for the Hamlet 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.

Operation and Maintenance Manual (O&M)

The purpose of an Operation and Maintenance Manual is to assist Hamlet staff in the proper operation and maintenance of the waste disposal facilities. The manual should demonstrate to the Nunavut Water Board that the Hamlet is capable of operating and maintaining all waste disposal sites adequately.

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. The Nunavut Water Board has requested that the Hamlet prepare a report which identifies all abandoned facilities within the municipal boundaries. This study shall also document ownership of the facilities. The study shall attempt to ascertain accountability for reclamation of existing abandoned facilities.

Surveillance Network Program

The Surveillance Network Program is a monitoring 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.

III. LICENCE NWB3GJO9904

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

HAMLET OF GJOA HAVEN

(Licensee)

of **GJOA HAVEN, NORTHWEST TERRITORIES, X0E 1J0**

(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	**NWB3GJO9904**
Water Management Area	**NORTHWEST TERRITORIES 04**
Location	**GJOA HAVEN, NORTHWEST TERRITORIES**
Purpose	**WATER USE AND WASTE DISPOSAL**
Description	**MUNICIPAL UNDERTAKINGS**
Quantity of Water Not to be Exceeded	**35,000 CUBIC METRES ANNUALLY**
Date of Licence	**JANUARY 7, 1999**
Expiry Date of Licence	**JANUARY 7, 2004**

Dated this ____ of January 1999 at Gjoa Haven, NT.

Philippe di Pizzo
Executive Director

PART A: SCOPE AND DEFINITIONS

1. Scope

a. This Licence allows for the use of water and the disposal of waste for municipal undertakings at the Hamlet of Gjoa Haven, Northwest Territories (68°30'N, 95°53'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 amended by the Governor in Council under a future Nunavut Waters Act, or other statues 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 automatically amended to conform with such Regulations; 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: **NWB3GJO9904**

"Average Concentration" means the concentration as determined in Part B, Item 6 of the "Surveillance Network Program" submitted to the Board in accordance with the sampling and analysis requirements specified in the "Surveillance Network Program";

"Average Concentration For Faecal Coliforms" means the running geometric mean of any four consecutive analytical results submitted to the Board in accordance with the sampling and analysis requirements specified in the "Surveillance Network Program";

“Board” means the Nunavut Water Board established under the Nunavut Land Claims Agreement;

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

"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;

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

"Inspector" means an Inspector designated by the Department of Indian and Northern Affairs Canada in a manner consistent with the Memorandum of Understanding between the Department of Indian and Northern Affairs and the Board;

"Licensee" means the holder of this Licence;

“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;

"Pumpout Sewage" means all toilet wastes and/or greywater collected by means of a vacuum truck for disposal at an approved facility;

"Sewage" means all toilet wastes and greywater;

"Sewage Disposal Facilities" comprises the area and engineered structures designed to contain sewage;

"Solid Waste Disposal Facilities" comprises the area and associated structures designed to contain solid;

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

"Waste" means 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 substance contained in it or because it has been treated or changed, by heat or other means;

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

"Water Supply Facilities" comprises the area and associated intake infrastructure at Water Supply Lake; and

"Honey Bags" A plastic or heavy paper bag that fits into a bucket toilet used to contain toilet waste.

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:

    a. tabular summaries of all data generated under the "Surveillance Network Program";

    b. the monthly and annual quantities in cubic metres of fresh water obtained from all sources;

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

    d. a summary of modifications and/or major maintenance work carried out on the Water Supply and Waste Disposal Facilities, including all associated structures and facilities;

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

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

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

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

i. updates or revisions to the approved Operation and Maintenance Plans.

2. The Licensee shall comply with the "Surveillance Network Program" annexed to this Licence, and any amendment to the said "Surveillance Network Program" as may be made from time to time, pursuant to the conditions of this Licence.

3. The "Surveillance Network 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 water used and waste discharged shall be installed, operated and maintained by the Licensee to the satisfaction of an Inspector.

5. The Licensee shall by October 31, 1999, post the necessary signs, where possible, to identify the stations of the "Surveillance Network Program." All postings shall be located and maintained to the satisfaction of an Inspector.

6. The Licensee shall by October 31, 1999, post signs in the appropriate areas to inform the public of the location of the Water Supply and Waste Disposal Facilities. All postings shall be located and maintained to the satisfaction of an Inspector.

7. 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 Water Supply or Waste Disposal Facilities.

8. The Licensee shall ensure a copy of this Licence is maintained at the municipal office at all times.

PART C: CONDITIONS APPLYING TO WATER USE

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

2. The Licensee shall insure that the freshwater obtained from Water Supply Lake meets the requirements of the Guidelines for Canadian Drinking Water Quality in accordance with the parameters outlined in the Surveillance Network Program.

3. The annual quantity of water used for all purposes shall not exceed 35,000 cubic metres.

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

5. 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.

6. 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 the Water Supply Facilities.

PART D: CONDITIONS APPLYING TO WASTE DISPOSAL

1. The Licensee shall direct all piped and pumpout Sewage to the Sewage Disposal Facilities or as otherwise approved by the Board.

2. All Sewage effluent discharged from the Sewage Disposal Facilities at "Surveillance Network Program" Station Number GJO-3 shall meet the following effluent quality standards:

Parameter	Maximum Average Concentration
Faecal Coliforms	1×10^4 CFU/100 ml
BOD_5	120 mg/L
Total Suspended Solids	180 mg/L

The Waste discharged shall have a pH between 6 and 9, and no visible sheen of oil and grease.

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 the Sewage Disposal Facilities.

4. All honey bags shall be disposed of to the satisfaction of an Inspector.

5. The Licensee shall advise an Inspector at least ten (10) days prior to initiating the decant of the sewage lagoon.

6. The sewage lagoon shall be maintained and operated in such a manner as to prevent structural failure.

7. The Licensee shall maintain the Sewage Disposal Facilities to the satisfaction of an Inspector.

8. The Licensee shall dispose of and contain all solid wastes at the Solid Waste Disposal Facilities or as otherwise approved by the Board.

PART E: CONDITIONS APPLYING TO MODIFICATIONS

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

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

    b. such modifications do not place the Licensee in contravention of the Licence;

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

    d. the Board has not rejected the proposed modifications.

2. 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.

3. The Licensee shall provide to the Board site plans of the modifications referred to in this Licence within ninety (90) days of completion of the modifications.

PART F: CONDITIONS APPLYING TO CONSTRUCTION

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

2. Construction of designed structures shall be carried out as approved by the Board.

PART G: CONDITIONS APPLYING TO OPERATION AND MAINTENANCE

1. The Licensee shall, within six (6) months of the issuance of this Licence, submit to the Board for approval, a plan for the Operation and Maintenance of the Sewage and Solid Waste Disposal Facilities 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 G, Item 1 as and when approved by the Board.

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

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

    b. report the incident immediately via the 24-Hour Spill Reporting Line. Currently the number is (867) 920-8130; and

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

PART H: 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. The Plan shall include, but not be limited to:

    a. the water intake facilities;

    b. the water treatment and waste disposal sites and facilities;

    c. the petroleum and chemical storage areas;

    d. any site affected by waste spills;

    e. leachate prevention;

    f. an implementation schedule;

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

h. consideration of altered drainage patterns;

i. type and source of cover materials;

i. future area use;

j. hazardous wastes; and

k. 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 H, Item 1 as and when approved by the Board.

3. The Licensee shall revise the Plan referred to in Part H, Item 1 if not approved. The revised Plan shall be submitted to the Board for approval within six (6) months 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.

5. The Licensee shall submit to the Board by December 1, 1999, a report describing all existing abandoned water supply and waste disposal facilities located within the municipal boundaries, including ownership thereof.

NUNAVUT WATER BOARD

LICENSEE: Hamlet of Gjoa Haven

LICENCE NUMBER: NWB3GJO9904

EFFECTIVE DATE OF LICENCE ISSUANCE: January 7, 1999

SURVEILLANCE NETWORK PROGRAM

A. Location of Surveillance Stations

Station Number	Description
GJO-1	Raw Water Supply prior to treatment
GJO-2	Runoff from the Solid Waste Disposal Facilities (if present)
GJO-3	Runoff discharge from the Sewage Lagoon just prior to entering the ocean

B. Sampling and Analysis Requirements

1. Water at Station Number GJO-2 shall be sampled annually during periods of flow and analyzed for the following parameters:

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 Iron
Total Mercury
Total Zinc

2. Water at Station Number GJO-3 shall be sampled annually during periods of flow and analyzed for the following parameters:

BOD
Faecal Coliform
pH
Conductivity
Total Suspended Solids
Ammonia Nitrogen
Nitrate-Nitrite
Oil and Grease (visual)
Total Phenols
Sulphate
Sodium
Potassium
Magnesium
Calcium

3. The exact location of Surveillance Network Program stations can be developed with the assistance of the Inspector.

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

5. 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.

6. All analyses shall be performed in a laboratory approved by the Board.

C. Flow and Volume Measurement Requirements

1. The monthly and annual quantities of water pumped from Surveillance Network Program Station Number GJO-1 for domestic purposes shall be measured and recorded in cubic metres.

2. The annual quantities of sewage solids removed from the sewage disposal facility shall be measured and recorded.

D. Reports

1. The Licensee shall, unless otherwise requested by an Inspector, include all of the data and information required by the Surveillance Network Program in the Licensee's Annual Report, which Report shall be submitted to the Board on or before March 31st of the year following the calendar year being reported.

E. Modifications To The Surveillance Network Program

1. Modifications to the Surveillance Network Program may be made only upon written approval of the Board.

SCHEDULE II - LICENSING CONSIDERATIONS

I. APPLICATIONS FOR LICENCE AMENDMENT, RENEWAL, ASSIGNMENT OR CANCELLATION.

1. An Application for an amendment or renewal shall be in the form set out by the Board and shall contain the information identified therein and be accompanied by a deposit equal to any water use fee that would be payable under subsection II (1) in respect of the first year of the licence that is being applied for.

2. The fee payable on the submission of an application for the amendment, renewal, cancellation or assignment of this licence is thirty (30) dollars. Cheque made payable c/o The Receiver General for Canada

3. An application for authorization for the assignment of the licence shall be submitted to the Board, accompanied by the fee set out in (2), no less than 45 days before the date on which the applicant proposes to assign the licence, and shall:

    a. Be signed by the assignor and the assignee; and
    b. Include the name and address of the assignee.

4. An application for cancellation of a licence shall be in writing and shall set out the reason for the requested cancellation and a description of the measures taken or proposed to be taken, prior to cancellation, for abandonment of the appurtenant undertaking.

SCHEDULE III - GENERAL CONDITIONS FOR THE ADMINISTRATION OF LICENCES ISSUED BY THE NUNAVUT WATER BOARD (NWB)

1. At the time of issuance, a copy of the Licence is placed on the Water Register in the NWB Head Office in Gjoa Haven, and is available to the public.

2. To enforce the terms and conditions of the Licence, the Department of Indian Affairs and Northern Development designates Inspectors in a manner consistent with the Memorandum of Understanding between the Department of Indian and Northern Affairs and the NWB. The Inspectors coordinate their activities with the NWB staff and officials of the Water Resources Division of DIAND. The Inspector responsible for Licence No. NWB3GJO9904 is located in the Nunavut District office.

3. To keep the NWB and members of the public informed of the Licensee's conformity to Licence conditions, the Inspectors prepare inspection and compliance reports which detail observations on how the Licensee has met each condition in the Licence. These reports are forwarded to the Licensee with a covering letter requesting what action, if any, should be taken. The inspection reports and covering letters are placed on the public Water Register, as are any responses received from the Licensee pertaining to the inspection reports. It is therefore of importance that the Licensee react in all areas of concern regarding inspection reports so that these concerns may be clarified.

4. If the Licensee contemplates the renewal of Licence No. NWB3GJO9904, it is the responsibility of the licensee to apply to the NWB for renewal of the licence. The past performance of the licensee, new documentation and information, and issues raised during a public hearing, if the NWB is required to hold one, will be used to determine the terms and conditions of the Licence renewal. If the licence expires before the NWB issues a new one, then water use and waste disposal must cease, or the Licensee will be in contravention of the Nunavut Land Claims Agreement. The NWB recommends that an application for the renewal of Licence No. NWB3GJO9904 be filed **at least six months** before the Licence's expiry date.

5. If Licence No. NWB3GJO9904 requires amendment, then a public hearing may be required. The Licensee should submit applications for amendment as soon as possible to give the NWB sufficient time to go through the amendment process. The duration of the process may vary depending on the scope of the amendment requested.

6. The NWB can modify the Surveillance Network Program annexed to the licence without a public hearing. Requests for changes to the Surveillance Network Program should be forwarded to the NWB in writing, and should include the justification for the change.

7. Any communication with respect to this licence shall be made in writing to the attention of:

Philippe di Pizzo
Executive Director
Nunavut Water Board
P. O. Box 119
Gjoa Haven, NT. X0E 1J0
Telephone No: (867) 360-6338
Fax No: (867) 360-6369

8. Inspection and enforcement of the terms and conditions of this licence are performed by:

Mr. Paul Smith, Water Resources Officer
Nunavut District Office
Northern Affairs Program
Department of Indian Affairs
and Northern Development
P. O. Box 100
Iqaluit, NT. X0A 0H0
Telephone No: (867)979-4405
Fax No: (867)979-6445

9. The licensee shall submit all report, plans and studies to the Board in triplicate.

APPENDIX I

CORRESPONDENCE

i. Application for water licence for the Hamlet of Gjoa Haven. Received October 2, 1998.

ii. Nunavut Water Board. Notice to Applicant receipt of Application. Dated October 7, 1998.

iii. Nunavut Water Board. Notice to Interested Parties. Dated October 13, 1998.

iv. Nunavut Water Board. Public Notice of the Application. Dated October 13,1998.

v. Fisheries and Oceans Canada. Letter received October 20, 1998, comments on the application.

vi. Indian and Northern Affairs Canada. Letter received November 2, 1998, comments on the application.

vii. Environmental Health, Kitikmeot Region. Letter received November 5, 1998. Additional comments on the application.

viii. Environmental Protection Service, Resources, Wildlife and Economic Development. Letter dated November 24, 1998. Comments on the application.

ix. Environment Canada. Letter received November 25, 1998. Comments on the application.

FIGURE 1 - Hamlet of Gjoa Haven Surveillance Network Program Stations

(To be provided following first inspection)

P.O. BOX 119
GJOA HAVEN, NU X0B 1J0
TEL: (867) 360-6338
FAX: (867) 360-6369

ᓄᓇᕗᑦ ᐃᒪᓕᕆᔨᒃᑯᑦ ᑲᑎᒪᔨᖏᑦ
NUNAVUT WATER BOARD
NUNAVUT IMALIRIYIN KATIMAYINGI

DECISION

LICENCE NUMBER: NWB3GJO~~0308~~ 0409

This is the decision of the Nunavut Water Board (NWB) with respect to an application for a Licence dated October 9th, 2003, made by:

Hamlet of Gjoa Haven

to allow for the use of water and disposal of waste by the Hamlet of Gjoa Haven, 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 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 proceed through the regulatory process. 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 NWB3GJO~~0308~~ 0409 be issued subject to the terms and conditions contained therein. (Motion #: 2003-10-06)

SIGNED this 17th day of December 2003 at Gjoa Haven, NU.

Original signed by:

_____

Philippe di Pizzo
Chief Administrative Officer

TABLE OF CONTENTS

I. BACKGROUND

The Hamlet of Gjoa Haven is located at 61°05' N and 94° 00'W, on the southern tip shore of King William Island, in the Kitikmeot region of Nunavut. Gjoa Haven is located approximately 142 air km SW of Kugaaruk, and 1,056 air km NE of Yellowknife. The topography of Gjoa Haven is characterized by limestone lowlands covered by sands and gravels. Features include till, fine-grained marine deposits, and extensive beaches. The permafrost is continuous, extending to depths from 20 m to over 120 m. The active layer varies between 0.55 m and 0.25 m. The average annual precipitation in Gjoa Haven consists of 5.1 cm of rainfall and 25.5 cm of snowfall. The mean high in July is 13.1 degrees with a mean low of 7.2 degrees. In January, the mean high is -23.9 degrees and a mean low of -35.9 degrees. The predominant local vegetation consists of mosses and lichens on rocky outcrops, with hardy grasses and sages in more sheltered areas.

II. PROCEDURAL HISTORY

On October 9, 2003, an application for the renewal of water licence NWB3GJO9904 was filed by the Hamlet of Gjoa Haven. The Nunavut Water Board publicly posted notice of this application, in accordance with the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* S.55.1 and Article 13 of the *Nunavut Land Claims Agreement,* on October 21, 2003. An assessment of the Hamlet's request for a municipal water licence for water use and waste disposal activities within the Hamlet was then undertaken, so that the Board could make a fully informed decision on the merits of application. This assessment process included the referral of the application to a variety of Federal, Territorial and local organizations for their review and comment. As no public concern was expressed, the NWB waived the requirement to hold a public hearing for the application.

Based upon the results of the detailed assessment, which was completed, including consideration of any potential accidents, malfunctions, or cumulative environmental effects that the overall project might have in the area, the Board delegated to the Chief Administrative Officer authority to approve the application pursuant to S. 13.7.5 of the *Agreement*.

III. ISSUES

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. In determining an appropriate term of a water licence, the Board considers a number of factors, including the results of the annual Department of Indian Affairs and Northern Development (DIAND) site inspection and the compliance record of the Applicant. Specifically, the August 22, 2002 DIAND Inspection Report indicated:

1. The lagoon currently in operation does not have sufficient freeboard, and capacity should be increased;
2. Concentrations of ammonia exceeded the levels recommended in the *Canadian Guidelines for the Protection of Freshwater Aquatic Life*;
3. Levels of total suspended solids (TSS) and ammonia in effluent from the Solid Waste Disposal Facility exceeded the *Municipal Wastewater Effluent Quality Guidelines* and the *Canadian Guidelines for the Protection of freshwater Aquatic Life*, respectively; and
4. Water quality issues exist as a result of insufficiencies with the current Water Supply Facility.

The NWB has imposed the requirement to produce an Annual Report. These Reports are for the purpose of ensuring that the NWB has an accurate annual update of municipal activities during a calendar year. This information is maintained on the public registry and is available to any interested parties upon request. The Licensee's attention is drawn to the attached standard form for completing the Annual Report (see Attachment I).

The NWB has also imposed on the Licensee the requirement to produce an Operations and Maintenance Manual for their sewage and solid waste operations. The purpose of an Operation and Maintenance Manual is to assist Hamlet staff in the proper operation and maintenance of their waste disposal facilities. The manual should demonstrate to the Nunavut Water Board that the Hamlet 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).

The NWB believes that a license term of five (5) years is appropriate, and will allow enough time for the Hamlet to establish a consistent compliance record with the terms and conditions of its licence. It will also ensure that sufficient time is given to permit the Licensee to develop, submit, and implement the plans required under its licence to the satisfaction of the NWB.

Water Use

The Municipality currently receives water from the Swan Lake water supply located 3.5km from the Hamlet. Water is stored in the single-cell Water Lake reservoir, adjacent to the truck fill station, prior to treatment. The water receives a chlorine treatment and is then distributed to the community by truck. Water requirements for 2003 were reported as 44,487 m^3. Demand for 2008 was not reported in application. Utilizing the water demand formula developed by the Department of Municipal and Community Affairs (Government of the Northwest Territories), projected demand requirements for 2008 was calculated at 57,224 m^3.

While concerns were expressed regarding the present water treatment system, no concerns were expressed by the parties in their written submissions as to the amount of water required by the

Applicant or the manner in which this water will be used. The Applicant has indicated that the proposed water treatment system will address those water quality concerns which presently exist. Accordingly, and based upon the projected requirements of the Hamlet, the Board has set the terms and conditions in the water licence, which govern water usage and which are contained herein. The maximum permitted usage of water by the Hamlet of Gjoa Haven, over the term of the water license and for all purposes, has been set at 60,000 m^3 annually.

Deposit of Waste

Sewage

The Hamlet of Gjoa Haven utilizes a Sewage Disposal Facility approximately 1.5 km southeast from the Municipality. This Sewage Disposal Facility consists of a 22,700 m^3 single-cell lagoon, which is currently at capacity. The effluent from this lagoon proceeds downstream to the marine environment through an undefined, natural wetland along a 1000 m flow path prior to entering the marine environment.

Specific comments relevant to sewage disposal operations in the Hamlet were provided by DIAND, and Environment Canada. DIAND and Environment Canada recommended that the Hamlet develop appropriate Operations and Maintenance and Spill Contingency Plans. DIAND and Environment Canada further recommended that the Hamlet take steps to remedy capacity and effluent quality issues currently evidenced at the Sewage Disposal Facility.

Additionally, DIAND provided recommendations concerning effluent discharge criteria, which are consistent with the *Guidelines for the Discharge of Treated Municipal Wastewater in the Northwest Territories* (Northwest Territories Water Board*;* 1992), as well as specific recommendations concerning the Monitoring Program. This Program is 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. The Board concurs with these recommendations, which are reflected in the terms and conditions of the Water Licence. The Board also draws the attention of the Licensee to their requirements to implement the Quality Assurance/Quality Control (QA/QC) Plan to be provided by the NWB. The purpose of the QA/QC Plan is to ensure 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. It should also be noted that while minimum sampling requirements have been imposed, additional sampling may be requested by an Inspector.

Solid Waste

The Hamlet's solid waste management site is located adjacent to the Sewage Disposal system, approximately 1.8 km southeast of the community. Waste is segregated, with a generic landfill area, a bulky wastes area, and an area segregated for hazardous wastes. Combustible wastes are burned regularly, and the landfill is compacted and covered annually.

Recommendations relevant to solid waste disposal operations in the Hamlet were provided by DIAND and Environment Canada. Both DIAND and Environment Canada recommended that the Hamlet develop appropriate Operations and Maintenance and Spill Contingency Plans. DIAND and Environment Canada further recommended that the Hamlet segregate hazardous materials such as waste oils and batteries from municipal solid waste, and that these materials be disposed of off-site in an approved facility. Additionally, DIAND and Environment Canada recommended the appropriate management of waste oil at the solid waste site, so as to prevent the deposition of hydrocarbons into water in contravention of the *Fisheries Act*. The Board concurs with these recommendations, which are reflected in the terms and conditions of the Water Licence. Finally, Environment Canada recommended the installation of a bermed hazardous waste containment area at the solid waste site, so as to prevent the deposition of waste into water in contravention of the *Fisheries Act*. The Board concurs that the Hamlet should give serious consideration to this recommendation, and in the interim take whatever steps are practicable to prevent such depositions.

LICENCE NWB3GJO~~0308~~ 0409

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

HAMLET OF GJOA HAVEN
(Licensee)

of **GJOA HAVEN, NUNAVUT, X0B 1J0**
(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 **NWB3GJO~~0308~~ 0409**

Water Management Area **NUNAVUT 07**

Location **GJOA HAVEN, NUNAVUT**

Purpose **WATER USE AND WASTE DISPOSAL**

Description **MUNICIPAL UNDERTAKINGS**

Quantity of Water Not to be Exceeded **62,000 CUBIC METRES ANNUALLY**

Date of Licence **~~JANUARY 8, 2004~~ ~~December 17, 2003~~ JANUARY 8, 2004**

Expiry Date of Licence **~~JANUARY 31, 2009~~ ~~January 31, 2008~~ JANUARY 31, 2009**

Dated this 17th of December 2003 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 for municipal undertakings at the Hamlet of Gjoa Haven, Nunavut (68°30' N; 95°53'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: **NWB3GJO~~0308~~ 0409**

"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 Disposal 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 Disposal 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;

"Composite Sample" means a water or wastewater sample made up of four (4) samples taken at regular periods over a 24 hour period;

"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;

"Final Discharge Point" means an identifiable discharge point of a Waste Disposal Facility beyond which the Licensee no longer exercises care and control over the quality of the Effluent;

"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;

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

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

"Licensee" means the holder of this Licence;

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

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

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

"Sewage" means all toilet wastes and greywater;

"Sewage Disposal Facilities" comprises the area and engineered lagoon and decant structures designed to contain and treat sewage as described in the Application for Water Licence filed by the Applicant on October 9, 2003 and illustrated in Drawing # 99-6790;

"Solid Waste Disposal Facilities" comprises the area and associated structures designed to contain solid waste as described in the Application for Water Licence filed by the Applicant on October 9, 2003 and illustrated in Drawing # 99-6790;

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

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

"Waste Disposal Facilities" means all facilities designated for the disposal of waste, and includes the Sewage Disposal Facilities and Solid Waste Disposal Facilities, as described in the Application for Water Licence filed by the Applicant on October 9, 2003 and illustrated in Drawing # 99-6790; and

"Water Supply Facilities" comprises the area and associated intake infrastructure at the Swan Lake and/or Water Lake Water Supply, as described in the Application for Water Licence filed by the Applicant on October 9, 2003 and illustrated in Drawing #s 02-0602-1000/1-4.

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 fresh water obtained from all

sources;

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

iv. a summary of modifications and/or major maintenance work carried out on the Water Supply and Waste Disposal Facilities, including all associated structures and facilities;

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

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

vii. 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;

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

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 water used and 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 Water Supply or Waste Disposal Facilities.

7. The Licensee shall ensure a copy of this Licence is maintained at the municipal office at all times.

8. 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

9. 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 the Swan Lake and/or Water Lake Water Supply 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 62,000 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 Disposal Facilities or as otherwise approved by the Board.

2. All Effluent discharged from the Sewage Disposal Facilities at Monitoring Program Station GJO-4 shall meet the following effluent quality standards:

Parameter	Maximum Average Concentration
Faecal Coliforms	1×10^4 CFU/dl
BOD_5	80 mg/L
Total Suspended Solids	100 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 dams, dykes or structures intended to contain, withhold, divert or retain water or wastes.

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

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

6. The Licensee shall dispose of and contain all solid wastes at the Solid Waste Disposal Facilities or as otherwise approved by the Board.

7. The Licensee shall implement measures to ensure hazardous materials and/or leachate from the Solid Waste Disposal Facility does not enter water.

8. The Licensee shall submit to the Board for review within six (6) months of the issuance of this license a report identifying each Final Discharge Point. The report shall at least include:

    a. Plans, specifications and a general description of each Final Discharge Point together with its specific geo-referenced location;

    b. A description of how each Final Discharge Point is designed and maintained.

9. If, during the term of this Licence, additional Final Discharge Points are identified, the Licensee shall submit the information as required by Part D, Item 8 for each new Final Discharge Point within 30 days after the discharge point is identified and at least 60 days prior to depositing Effluent from the new Final Discharge Point and/or proposed changes are made to a Final Discharge Point.

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 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 Waste Disposal Facilities provided that such modifications are consistent with the terms of this Licence and the following requirements are met:

    i. 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, within 6 months of the issuance of this license, submit to the Board for approval, a Plan for the Operation and Maintenance of the Sewage and Solid Waste Disposal Facilities in accordance with *"Guidelines for Preparing an Operation and Maintenance Manual for Sewage and Solid Waste Disposal Facilities"* (October 1996). This Plan shall specifically address the hazardous waste disposal and operational issues at the Solid Disposal Facility, as well as the operational issues identified at the Sewage Disposal Facility, which were identified in the August 22, 2002 DIAND Inspection Report.

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.

5. In the absence of a contingency plan contained within an approved Operation and Maintenance Plan, and should during the period of this Licence an unauthorized discharge of waste occur, or if such a discharge is foreseeable, the Licensee shall:

    i. take whatever steps are immediately practicable to protect human life, health and the environment;

ii. without delay seek guidance from the Departments of Community Government and Transportation and Sustainable Development with regards to mitigation and remedial actions required to address the discharge;
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 waste disposal 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 Monitoring Stations at the following locations:

Monitoring Station	Description
GJO-1	Raw water supply at the Swan Lake Water Supply prior to treatment
GJO-2	Effluent discharge from the Final Discharge Point of the Solid Waste Disposal Facilities
GJO-3	Raw Sewage at truck offload point
GJO-4	Effluent discharge from the Final Discharge Point of the Sewage Disposal Facilities

2. The Licensee shall sample monthly at Monitoring Station GJO-2 and GJO-4 during the months of May to August, inclusive. Samples shall be analyzed 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	

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

4. The Licensee shall measure and record in cubic metres the monthly and annual quantities of raw sewage offloaded from trucks at Monitoring Station GJO-3 for all purposes.

5. Additional sampling and analysis may be requested by an Inspector.

6. The Licensee shall conform to the Quality Assurance/Quality Control (QA/QC) Plan which shall be provided to the Licensee by the NWB within 120 days of the issuance of this license.

7. 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.

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

9. The Licensee shall measure and record the annual quantities of sewage solids removed from the Sewage Disposal Facility.

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.

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

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

ᓄᓇᕗᑦ ᐃᒪᓕᕆᔨᒃᑯᑦ ᑲᑎᒪᔨᖏᑦ
NUNAVUT WATER BOARD
NUNAVUT IMALIRIYIN KATIMAYINGI
OFFICE DES EAUX DU NUNAVUT

File: 3BM-GJO0409

September 15, 2008

Mr. David Boyle, Manager, Community Planning
Dept. of Community and Government Services
P.O. Box 272
Kugluktuk, NU
X0B 0E0
Email: dboyle@gov.nu.ca
saogjoa@qiniq.com

RE: 3BM-GJO0409 Type "B" – Amendment No.1

Dear Mr. Boyle:

Please find attached, Amendment No.1 to Licence No. 3BM-GJO0409 Type "B" issued to the Hamlet of Gjoa Haven by the Nunavut Water Board (NWB) (**Motion 2008-05-11**) pursuant to its authority under Article 13 of the *Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in Right of Canada* and the *Nunavut Waters and Nunavut Surface Rights Tribunal Act*. The terms and conditions of the original Licence related to water use and waste disposal remain an integral part of this approval.

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

Sincerely,

Thomas Kabloona
A/Chief Executive Officer

Enclosure: Licence No. **3BM-GJO0409 - Amendment No.1**
GN-DOE and INAC Comments

Cc: Distribution - Kitikmeot

LICENCE AMENDMENT No. 1

Licensee:	**Hamlet of Gjoa Haven**
Licence No:	**3BM-GJO0409 Type "B"**
Licence Issued:	**January 8, 2004**
Effective Date:	**September 4, 2008**

Pursuant to its authority under Article 13 of the *Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in Right of Canada* and the *Nunavut Waters* and the *Nunavut Surface Rights Tribunal Act*, the Nunavut Water Board hereby grants the following Licence amendment.

The Licence issued January 8, 2004 with an expiry date of January 31, 2009 shall be amended to include the following terms and conditions, with respect to the use of water and deposit of waste during municipal construction and maintenance activities, to allow for the construction of a culvert and the realignment of a small creek within the hamlet of Gjoa Haven at latitude 68° 37' 30" N and longitude 95° 51' 56" W.

The Licence, (Page 8), shall be amended to indicate the following:

PART B: GENERAL CONDITIONS

Amend Item 1
Annual Report

Add:

ix. A written summary and photographs of the culvert's installation and creek alignment shall be included in a 3BM-GJO0409 annual report for the year of their construction.

PART E: CONDITIONS APPLYING TO MODIFICATION AND CONSTRUCTION

Add Item 5 The Licensee shall install a culvert as indicated in "Sketch Showing Proposed Subdivision Gjoa Haven Page 1 of 2" as well as realign a creek as indicated in "Sketch Showing Proposed Subdivision Gjoa Haven Page 2 of 2".

Add Item 6 The Licensee shall ensure that any chemicals, petroleum products or wastes associated with the undertaking do not enter any water body.

Add Item 7 The Licensee shall ensure that all fill material used is from an approved source and shall be free of contaminants.

Add Item 8 Licensee is to use erosion control measures (i.e., silt curtains) to prevent and minimize erosion and adverse effects on water quality if there is water flow during the installation of the culvert as well as during the creek realignment.

Add Item 9 Explosives shall not be used in the construction of the watercrossing or to facilitate the installation of a culvert.

Add Item 10 Dredging, infilling, or excavation of the channel shall not be conducted upstream or downstream of the culvert installation location without first implementing mitigation mechanisms such as silt screens to prevent sedimentation and erosion.

Add Item 11 The Licensee shall install the culvert in a location that minimized disturbance to riparian vegetation.

Add Item 12 Sedimentation and erosion shall be minimized through the use of erosion control measures.

Add Item 13 During installation of the culvert machinery should not enter into the watercourse and disturbance to the banks of the watercourse shall be minimized.

Add Item 14 Watercrossings should be constructed using clean rocks of appropriate size that do not generate acid and do not fracture or breakdown readily.

Add Item 15 Materials used for the construction shall not be taken from below the ordinary high water mark of any water body.

Add Item 16 Revegetation of disturbed areas should be encouraged whenever possible.

Add Item 17 The culvert shall not alter the natural flow rate or discharge volume of the watercourse.

All remaining terms and conditions of the Licence 3BM-GJO0409 Type 'B" dated January 8, 2004 still apply.

This Licence Amendment issued and recorded at Gjoa Haven, NU on September 4, 2008.

Approved by,

Thomas Kabloona
A/Chief Executive Officer

This page intentionally left blank

Appendix C:
Environmental Monitoring Program Checklist, Summary of Sample Bottle Requirements

This page intentionally left blank

HAMLET OF GJOA HAVEN
ENVIRONMENTAL MONITORING PROGRAM CHECKLIST

PRE-SAMPLING ACTIVITIES		
Bottle Order	At least two weeks before upcoming environmental sampling (see Environmental Monitoring Program Schedule in Appendix E), send a request to the contract laboratory for the appropriate sample sets (bottles) for the required sampling test groups (see Condition 2 of Part H of Nunavut Water Board Licence 3BM-GJO0409)	☐
Personal Protective Equipment	Ensure that the required personal protective equipment (PPE), such as latex gloves, is on hand before commencing the environmental monitoring program.	☐
Bottle Shipment	Ensure that the bottle shipment has arrived from the contract laboratory in time for the sampling program and verify the integrity of all sampling containers. Report any missing or broken bottles to the contract laboratory as soon as possible, so that replacement bottles may be shipped.	☐
Sampling Location Inspections	Perform an initial inspection of all routinely-monitored sampling locations before the commencement of the monitoring program. Make note of any equipment damage or conditions that may prevent the collection of the environmental monitoring program samples.	☐
GENERAL SAMPLING INSTRUCTIONS		
Prevention of Cross-Contamination	Ensure that any laboratory provided sampling instructions are strictly followed. Latex or nitrile gloves should be worn during sampling and should be replaced with fresh gloves after all sample containers are filled at each sampling location. Dedicated sampling equipment such as sampling poles should be cleaned with soap and water after each sample is collected to prevent cross-contamination. As a general recommendation, please refrain from using insect repellant, disinfection hand gel or other chemical products before and during sample collection. Also, please refrain from smoking during sample collection.	☐
Sample Care (including Packing of Cooler)	All sample containers should be tightly sealed and properly labelled with the sample ID, date and time of sample collection, location of sample collection and parameters to be analyzed. The outside of the bottles should be cleaned with soap and water and dried prior to placing the samples in the cooler. The samples should be stored on ice in a cooler until delivery to the laboratory. A chain of custody form should be filled out completely and be used to track the samples and placed in the cooler with the samples, in a ziplock bag. Keep the last page of the Chain of Custody and give it to the Hamlet Foreman for their records.	☐
RAW WATER SUPPLY		
Sampling Station GJO-1	Station GJO-1 (see Figure 2) is a raw water supply (from Swan Lake) volume monitoring location. The water licence does not require the collection of any water samples from this location. Measure and record (in m^3) the monthly and annual quantities of water pumped from Station GJO-1.	☐
SOLID WASTE DISPOSAL FACILITIES		
Sampling Station GJO-2	Landfill runoff is collected monthly during the months of May to August, inclusive (see Schedule in Appendix E for timing and list of parameters to be sampled). Runoff samples are collected from the receiving water body (see Figure 2) by immersing the sample bottle into the runoff stream neck first to a depth of 5 to 10 cm (if possible). The sampling container is filled with runoff and the sample bottle is raised neck first to prevent sample spillage.	☐
Sampling Station GJO-5	Landfill runoff is collected from the landfill leachate pond prior to decanting. Runoff samples are collected from the pond (see Figure 2) by immersing the sample bottle into the pond neck first to a depth of 5 to 10 cm (if possible). The sampling container is filled with runoff and the sample bottle is raised neck first to prevent sample spillage.	☐
SEWAGE DISPOSAL FACILITIES		
Sampling Station GJO-4	Effluent discharge is collected monthly from the Sewage Disposal Facilities (see Figure 2) during the months of May to August, inclusive (see Schedule in Appendix E for timing and list of parameters to be sampled). Effluent samples are collected from the lagoon by immersing the sample bottle into the lagoon neck first to a depth of 5 to 10 cm (if possible). The sampling container is filled with runoff	☐

	and the sample bottle is raised neck first to prevent sample spillage.	
POST-SAMPLING ACTIVITIES		
Sample Shipment	See **Sample Care** section for sampling handling and cooler packing instructions. Ensure all samples are shipped to the contract laboratory immediately after the completion of the environmental monitoring event to ensure that the hold times are respected for the various parameters. Follow-up with the contract laboratory on the day after the samples were shipped to ensure that the samples were collected from the air cargo facility and received by the contract laboratory for analysis.	☐
Analytical Results	Ensure that the analytical results for the environmental monitoring program samples are received within the specified turn-around time. Follow-up with the contract laboratory if the results are not provided as expected to ensure timely reporting to the Nunavut Water Board (as required by Water Licence 3BM-GJO0409).	☐

Checklist Performed By:

Name	Signature	Date

Sample Bottle Requirements for Parameters Listed in Condition 2 of Part H of Nunavut Water Board Licence No. 3BM-GJO0409

Parameter	Recommended Sample Container	Preservative	Hold Time
Anions (Br, Cl, F, NO_3, NO_2, PO_4, SO_4)	250 mL plastic	None	5/28 Days
Biochemical Oxygen Demand (BOD_5)	500 mL plastic	None	4 days
Conductivity	250 mL plastic	None	28 days
Dissolved ICPMS, ICP Metals	250 mL plastic	None - if not field filtering	60 days
Total ICPMS, ICP Metals - NOT FILTERED	250 mL plastic	HNO_3 (pH < 2)	30 days
Nitrogen - Ammonia (NH_3 - N) / Total Kjeldahl Nitrogen (TKN)	250 mL plastic	H_2SO_4 (pH < 2)	10 days
Phenolics - Total	120 mL amber glass	H_2SO_4 (pH < 2)	30 days
Solids - (TS, TSS, TDS)	500 mL plastic	None	7 days
Microbiological (incl. faecal coliforms)	300 mL plastic - Sterilized	$Na_2S_2O_3$	48 hours

This page intentionally left blank

Appendix D:
Completed Example of Chain of Custody Documentation

This page intentionally left blank

TAIGA ENVIRONMENTAL LABORATORY
LABORATOIRE ENVIRONNEMENTAL TAIGA
4601 – 52 Avenue, P.O. Box 1500, Yellowknife, NT, X1A 2R3
Tel: (867) 669-2788 • Fax: (867) 669-2718
www.taiga.gc.ca

FIELD SHEET

Batch No: (lab use only)

Send Results & Invoice to:
(Please notify if results or invoice are to be sent to different locations)

Company/Agency: Hamlet of Gjoa Haven
Address:
City/Town: Gjoa Haven Province/Territory: NU
Postal Code: X0B 1J0
Phone: 867-123-4567 Fax: 867-987-6543
E-mail: john.smith@gmail.com
Signature:

Client Project No:
Date collected: July 10/13
Time collected: 11:45 AM (GJO-2), 12:15PM (GJO-4)
Sampler: John Smith
Location: Landfill / Sewage Disposal
Rush Required: ☐ Yes ☑ No
Note: *Analysis may be subcontracted without prior notice. See reverse for how to complete form and sampling protocols.*

Date Received: Received By:
Comments:
(Laboratory use only)

-WATER SAMPLES –

Sample Type (freshwater, sewage, wastewater, potable, groundwater, salt water, *etc*)	Wastewater	Wastewater	
Client Sample ID (As it should appear on final report)	GJO-2	GJO-4	
Taiga Sample ID (Laboratory use only)			

Bottle Type and Parameter — [√] PLEASE CHECK PARAMETERS REQUESTED BELOW:

Routine	pH, Conductivity, Alkalinity	✓pH ✓Cond Alk	✓pH ✓Cond Alk	pH Cond Alk
	Individual Anions Suite ☐	Cl ✓ SO_4 ✓ F NO_2-N NO_3-N	Cl ✓ SO_4 ✓ F NO_2-N NO_3-N	Cl SO_4 F NO_2-N NO_3-N
	Total Nitrite (NO_2) + Nitrate (NO_3)	✓NO_2 + NO_3-N ✓	✓NO_2 + NO_3-N ✓	NO_2 + NO_3-N
	Individual Cations Suite ☐	Ca ✓ Mg ✓ Na ✓ K ✓	Ca ✓ Mg ✓ Na ✓ K ✓	Ca Mg Na K
	Hardness (Calculated)	Hardness	Hardness	Hardness
	Reactive Silica	SiO_2	SiO_2	SiO_2
	Laboratory use only	Rec'd: Y N	Rec'd: Y N	Rec'd: Y N
Nutrients	Chlorine: Total, Residual	T. Cl R. Cl	T. Cl R. Cl	T. Cl R. Cl
	Chemical Oxygen Demand	COD	COD	COD
	Color	Apparent True	Apparent True	Apparent True
	Turbidity	Turbidity	Turbidity	Turbidity
	Total Suspended Solids, Dissolved Solids	✓TSS TDS	✓TSS TDS	TSS TDS
	Ammonia	✓NH_3	✓NH_3	NH_3-N
	Phosphorus: Total, Dissolved, Ortho	TP DP OP	TP DP OP	TP DP OP
	Carbon: Total, Dissolved	TOC DOC	TOC DOC	TOC DOC
	Nitrogen: Total, Dissolved	TN DN	TN DN	TN DN
	Visible Oil and Grease	✓Visible	✓Visible	Visible
	Laboratory use only	Received: Y N	Received: Y N	Received: Y N
Sterile	Fecal Coliforms (FC)	FC	✓FC	FC
	Total Coliforms (TC), E. Coli (EC)	TC EC	TC EC	TC EC
	Fecal Streptococcus (FS)	FS	FS	FS
	Laboratory use only	Received: Y N T: ____°C Sterile container: Y N	Received: Y N T: ____°C Sterile container: Y N	Received: Y N T: ____°C Sterile container: Y N
	Biological Oxygen Demand	BOD	✓BOD	BOD
	Carbonaceous BOD	CBOD	CBOD	CBOD
	Laboratory use only	Received: Y N T: ____°C	Received: Y N T: ____°C	Received: Y N T: ____°C
Metals	Please indicate if sample is preserved and/or filtered	Pres ✓ Filt ☐ Pres ☐	Pres ☐ Filt ☐ Pres ☐	Pres ☐ Filt ☐ Pres ☐
	ICP-MS(1): Cd, Cr, Cu, Co, Mn, Ni, Pb, Zn, Fe	Total Dissolved	Total Dissolved	Total Dissolved
	ICP-MS(2): 25 element scan includes As (not included: B, Bi, Hg, Sn)	Total Dissolved	Total Dissolved	Total Dissolved
	Individual Metals by ICP-MS (please circle each metal): Ag, Al, As, B, Ba, Be, Bi, Cd, Co, Cr, Cs, Cu, Fe, Hg, Li, Mn, Mo, Ni, Pb, Rb, Sb, Se, Sn, Sr, Ti, Tl, U, V, Zn	✓Total Dissolved	Total Dissolved	Total Dissolved
	Laboratory use only	TM rec'd: Y N DM rec'd: Y N	TM rec'd: Y N DM rec'd: Y N	TM rec'd: Y N DM rec'd: Y N
	Hexane Extractable Material (O&G)	HEM	HEM	HEM
	Laboratory use only	Rec'd: Y N Pres: Y N	Rec'd: Y N Pres: Y N	Rec'd: Y N Pres: Y N
	BTEX, Purgeable HC (40mL x 2 vials)	BTEX Purg HC	BTEX Purg HC	BTEX Purg HC
	Extractable HC (1L amber glass bottle)	Ext HC	Ext HC	Ext HC
	Trihalomethanes (40 mL x 2 vials)	THM	THM	THM
	Laboratory use only	Vial rec'd: Y N Ext rec'd: Y N	Vial rec'd: Y N Ext rec'd: Y N	Vial rec'd: Y N Ext rec'd: Y N
	Other: *see special request form*	Total Phenols	Total Phenols	

For safety purposes, please disclose any contaminants (e.g. heavy metals, cyanide, etc.) that may be present at high levels and pose a risk to human health:

This page intentionally left blank

Appendix E:
Environmental Monitoring Program Schedule

This page intentionally left blank

Gjoa Haven Monitoring Program Schedule
Nunavut Water Board Licence No. 3BM-GJO0409

Monitoring	Location	Month												
Station ID	Description	January	February	March	April	May	June	July	August	September	October	November	December	Annual
GJO-1	Raw water supply intake at Swan Lake	V	V	V	V	V	V	V	V	V	V	V	V	V
GJO-2	Runoff from the Final Discharge Point of the Solid Waste Disposal Facilities					R	R	R	R					
GJO-3	Raw sewage at Truck Offload Point	V	V	V	V	V	V	V	V	V	V	V	V	V
GJO-4	Effluent discharge from the Final Discharge Point of the Sewage Disposal Facilities					R	R	R	R					
GJO-5	Runoff collected in Landfill Leachate Pond of the Solid Waste Disposal Facilities					R[1]	R[1]	R[1]	R[1]					

Test Groups	
V	Volume (m^3)
R	Routine (Biochemical Oxygen Demand (BOD_5), pH, Total Suspended Solids (TSS), nitrate-nitrite, total phenols, magnesium, sodium, total arsenic, total copper, total iron, total mercury, total zinc, faecal coliforms, conductivity, oil & grease (visual), ammonia nitrogen, calcium, potassium, sulphate, total cadmium, total chromium, total lead, total nickel)

[1] Collect sample prior to decanting retention pond.

This page intentionally left blank

Appendix F:
Subcontract Laboratory Accreditation & Supporting Documentation

This page intentionally left blank

CALA
Canadian Association for Laboratory Accreditation Inc.

CALA Directory of Laboratories

Membership Number: 2635
Laboratory Name: Taiga Environmental Laboratory
Parent Institution: Aboriginal Affairs and Northern Development Canada (AANDC)
Address: P.O. Box 1500 4601 - 52nd Avenue Yellowknife NT X1A 2R3
Contact: Ms. Angelique Ruzindana Umunyana
Phone: (867) 669-2781
Fax: (867) 669-2718
Email: angelique.ruzindanaumunyana@aandc-aadnc.gc.ca

Standard: Conforms with requirements of ISO/IEC 17025
Clients Served: All Interested Parties
Revised On: August 13, 2013
Valid To: February 5, 2014

Scope of Accreditation

Solids (Inorganic)
Metals - Soil, Sediment (079)
TEL 061; modified from EPA SW-846 METHOD 3050 A
ICP/MS
Aluminum
Antimony
Arsenic
Barium
Beryllium
Boron
Cadmium
Calcium
Chromium
Cobalt
Copper
Iron
Lead
Lithium
Magnesium
Manganese
Mercury
Molybdenum
Nickel
Potassium
Selenium
Silver
Sodium

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at http://www.cala.ca/cala_directories.html

Strontium
Tin
Titanium
Uranium
Vanadium
Zinc

Solids (Inorganic)
Moisture - Soil (030)
TEL007; CWS-PHC CCME Tier 1
GRAVIMETRIC
Moisture

Solids (Organic)
BTEX - Soil (072)
TEL 038; modified from USEPA 5030 B, 602, 502.2
GC/MS - PURGE AND TRAP
Benzene
Ethylbenzene
m/p-xylene
o-xylene
Toluene

Solids (Organic)
Petroleum Hydrocarbons (PHC) - Soil (073)
TEL 057; modified from USEPA SW 846 METHODS 3500 B, 3541, 3630 C, 8100, 8310
GC/FID - EXTRACTION
F2: C10-C16
F3: C16-C34
F4: C34-C50

Solids (Organic)
Petroleum Hydrocarbons (PHC) - Soil (075)
TEL 046; modified from US EPA SW-846 METHODS 5030, 8000, 8015, 8260 B
SOXTHERM EXTRACTION - GRAVIMETRIC
F4: Gravimetric

Solids (Organic)
Polycyclic Aromatic Hydrocarbons (PAH) - Soil (071)
TEL 047; modified from USEPA SW 846 METHODS 3500 B, 3541, 3630 C, 8100, 8310
GC/MS - EXTRACTION
Acenaphthene
Acenaphthylene (Parameter suspended on 8/14/2013)
Benzo (a) anthracene
Benzo (a) pyrene
Benzo (b) fluoranthene
Benzo (g,h,i) perylene
Chrysene (Parameter suspended on 8/14/2013)
Dibenzo (a,h) anthracene
Fluoranthene
Fluorene
Indeno (1,2,3 - cd) pyrene
Naphthalene
Phenanthrene
Pyrene

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at http://www.cala.ca/cala_directories.html

Water (Inorganic)
Alkalinity - Water (066)
TEL 060:PC TITRATE; modified from SM 2320 A, B
AUTO TITRIMETRIC
Alkalinity (pH 4.5)

Water (Inorganic)
Ammonia as Nitrogen - Water (089)
TEL 068; modified from SM 4500-NH3 G
COLORIMETRIC - DISCRETE
Ammonia

Water (Inorganic)
Anions - Water (059)
TEL 055; modified from SM 4110 B
ION CHROMATOGRAPHY
Chloride
Fluoride
Nitrate
Nitrite
Sulfate

Water (Inorganic)
Biochemical Oxygen Demand (BOD) - Water (004)
TEL 019/TEL 071; modified from SM 5210 A, B
D.O. METER/PC-BOD
BOD (5 day)
CBOD (5 day)

Water (Inorganic)
Carbon - Water (029)
TEL033; modified from SM 5310 B
INFRARED
Organic Carbon

Water (Inorganic)
Cations - Water (042)
TEL055; modified from SM 4110 B
ION CHROMATOGRAPHY
Calcium
Magnesium
Potassium
Sodium

Water (Inorganic)
Chemical Oxygen Demand (COD) - Water (061)
TEL 016; modified from SM 5220 D
REFLUX - COLORIMETRIC
COD

Water (Inorganic)
Colour - Water (063)
TEL 051; modified from SM 2120 C
HACH - SPECTROPHOTOMETRIC
Apparent Color
True Colour

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at http://www.cala.ca/cala_directories.html

Water (Inorganic)
Conductivity - Water (068)
TEL 059:PC TITRATE; modified from SM 2510 B
AUTO CONDUCTIVITY METER
Conductivity (25°C)

Water (Inorganic)
Dissolved Metals - Water (013)
TEL035; modified from US EPA 200.8
ICP/MS
Aluminum
Antimony
Arsenic
Barium
Beryllium
Boron
Cadmium
Cesium
Chromium
Cobalt
Copper
Iron
Lead
Lithium
Manganese
Molybdenum
Nickel
Rubidium
Selenium
Silver
Strontium
Thallium
Tin
Titanium
Uranium
Vanadium
Zinc

Water (Inorganic)
Hexane Extractable Material (Oil and Grease) - Water (060)
TEL 024: HEM AND SGT-HEM; modified from US EPA 1664 A, REVISION A
SOLID PHASE EXTRACTION
Mineral Oil and Grease
Total Oil and Grease

Water (Inorganic)
Mercury - Water (080)
TEL 062; modified from EPA 245.7
ATOMIC FLUORESCENCE MERCURY ANALYSIS SYSTEM
Mercury

Water (Inorganic)
pH - Water (067)
TEL 058:PC TITRATE; modified from SM 4500-H+ A, B
AUTO - pH METER
pH

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at http://www.cala.ca/cala_directories.html

Water (Inorganic)
Phosphate - Water (087)
TEL 069; modified from SM 4500-P F
DISCRETE ANALYZER
Phosphate

Water (Inorganic)
Reactive Silica - Water (090)
TEL 070; modified from SM 4500-Si F
COLORIMETRIC - DISCRETE ANALYZER
Reactive Silica

Water (Inorganic)
Solids - Water (011)
TEL008, TEL009; modified from SM 2540 C, D
GRAVIMETRIC
Total Dissolved Solids
Total Suspended Solids

Water (Inorganic)
Total and Dissolved Nitrogen - Water (086)
TEL 066; modified from ISO/TR 11905:1997(E) and ASTM D 5176-91
PYROLYSIS AND CHEMILUMINESCENCE DETECTION
Dissolved Nitrogen
Total Nitrogen

Water (Inorganic)
Total and Dissolved Phosphorus - Water (088)
TEL 069; modified from SM 4500-P F
COLORIMETRIC - DISCRETE
Dissolved Phosphorus
Total Phosphorus

Water (Inorganic)
Total Metals - Water (054)
TEL035; modified from US EPA 200.8
ICP/MS
Aluminum
Arsenic
Barium
Beryllium
Boron
Cadmium
Cesium
Chromium
Cobalt
Copper
Iron
Lead
Lithium
Manganese
Mercury
Molybdenum
Nickel
Rubidium
Selenium
Silver
Strontium

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at http://www.cala.ca/cala_directories.html

Thallium
Tin
Titanium
Uranium
Vanadium
Zinc

Water (Inorganic)
Turbidity - Water (028)
TEL006; modified from SM 2130 B
NEPHELOMETRY
Turbidity

Water (Microbiology)
Coliforms - Water (045)
TEL053; modified from IDEXX QUANTI-TRAY
MOST PROBABLE NUMBER (QUANTI-TRAY)
Escherichia coli (E. coli)
Total Coliforms

Water (Microbiology)
Fecal (Thermotolerant) Coliforms - Water (041)
TEL017; modified from SM 9222 D
MEMBRANE FILTRATION (mFC)
Fecal (Thermotolerant) Coliforms

Water (Microbiology)
Fecal Streptococci - Water (055)
TEL053; modified from IDEXX QUANTI-TRAY
MOST PROBABLE NUMBER (QUANTI-TRAY)
Fecal Streptococcus

Water (Organic)
BTEX - Water (070)
TEL 037 (BTEX); modified from USEPA METHOD 5030 B, 602, 502.2
GC/MS - PURGE AND TRAP
Benzene
Ethylbenzene
m/p-xylene
o-xylene
Toluene

Water (Organic)
Extractable Hydrocarbons - Water (085)
TEL 067; modified from SM 6010 and USEPA 3510C, 3630C
GC/FID - SOLID PHASE EXTRACTION
C10-C50

Water (Organic)
Purgeable Hydrocarbons - Water (084)
TEL 044; modified from USEPA SW-846 5030, 8000, 8015, 8260B
GC/FID - PURGE AND TRAP
C6-C10

Water (Organic)
Trihalomethanes (THM) - Water (077)
TEL039 (THM); modified from USEPA 5030 B, 602, 502.2
GC/MS - PURGE AND TRAP
Bromodichloromethane

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at http://www.cala.ca/cala_directories.html

Appendix B:
Sampling Pole Construction Instructions

This page intentionally left blank

How to Make a Sampling Pole

Sampling the water at your lake or pond can be a relaxing and rewarding experience. However, occasionally you can be faced with a very frustrating, or even dangerous situation, if sampling sites are located in especially hard-to-reach areas. Often, tributaries flow in areas that are either obstructed by vegetation, surrounded by unstable and unsafe footing, or simply unpleasant to venture into. If you have ever been faced with one of these arduous sampling tasks, you may benefit from using a sampling pole!

Normally, to sample a tributary, a big white bottle is filled by scooping surface water from a flowing area of a stream. This requires the volunteer to crouch on the stream bank, or to step into the waters of the tributary. Ideally, this task should be relatively simple and safe. Often times, however, this can mean climbing down steep embankments, crawling on dam structures, or balancing on slippery rocks. In these cases, a sampling pole can be used to help reach appropriate sampling areas without putting oneself in a dangerous or unpleasant situation. A sampling pole simply acts as an extension of the sampler's arm, since the sampling bottle is attached to the end of the pole. Tributary water can then be scooped into the bottle from a much greater distance than if using the normal method.

If you often find yourself in precarious tributary sampling situations, DES suggests that you consider using a sampling pole to assist you during your monthly sampling events. This helpful tool can be bought; however, it is easy to construct and can make your sampling job a much more pleasant experience! Just follow these simple instructions, as adapted from the Massachusetts Department of Environmental Protection (MADEP).

Materials:

- Aluminum extension pole that extends 4' to 8' is recommended. Available in most hardware or home centers, usually used for window washing or painting.
- One-handed C Clamp (quick release), which will hold a 3 ½" sample bottle
- 2 bolts
- 2 steel washers
- 2 neoprene washers
- Friction tape
- Waterproof glue
- Drill
- Screwdriver
- Pliers

Instructions:

1. If there is a threaded end on the aluminum pole, remove it (a drill should work).
2. Drill two holes through the end of the pole and the clamp handle, making sure to match them up so they can be connected. Be careful to drill your holes through the clamp handle WITHOUT the release lever.
3. Attach the clamp to the pole using the nuts, bolts and washers. The neoprene washers should be in contact with the plastic clamp handle to prevent cracking as the bolts are tightened.
4. Add a drop of waterproof glue to the end of each nut (if you are not using lock washers).
5. Finish by adding friction tape to the inside of the clamp's jaws to prevent the bottle from slipping.