Environmental Monitoring Program – Sample Collection Training Program

Project Name
Water Licence Compliance

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Project Number
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Appendices

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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.

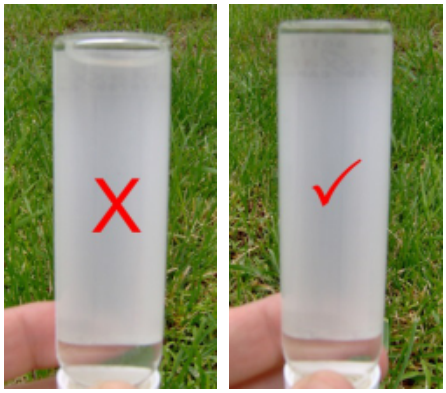
3 Avoiding Common Errors

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.

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Appendix A:
Quality Assurance and Quality Control Plan

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Hamlet of Kimmirut

Quality Assurance / Quality Control Plan

Project Name
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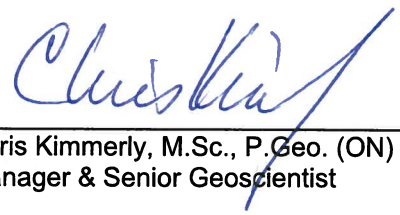

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Appendices

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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 Kimmirut (Hamlet) is located on the southern coast of Baffin Island, approximately 120 km southwest of Iqaluit, in the Territory of Nunavut (Figure 1, Appendix A). The population was estimated to be approximately 461 in 2012.

The water supply for the Hamlet is Fundo Lake. Supply is taken from Fundo Lake via an inclined shaft intake which is equipped with a submersible pump located below the water level in the lake. Water treatment at the Truck-Fill Station is limited to chlorination.

The Hamlet is currently discharging untreated sewage into a ditch located approximately 750 m south of the Hamlet and adjacent to the existing solid waste disposal site (approximately 600 m east of Fundo Lake). In 2001, a new sewage lagoon was constructed approximately 1.5 km to the west of the Hamlet but was never operated. An assessment of the existing facility determined that this existing lagoon did not have sufficient capacity to meet the over winter storage requirements of the Hamlet. Thus much of the over winter sewage would accumulate in the form of an ice pack in the gulch downstream of the sewage lagoon. The sewage in the ice pack would be released uncontrolled and without treatment during the spring melt.

Work on the Enhanced Sewage Disposal Facility was completed during the summer of 2011. The Enhanced Sewage Disposal Facility is comprised of an upper holding cell, spillway corridor, lower holding cell and wetlands. The system is designed to treat the municipal sewage generated over the period of a year. This wastewater treatment system utilizes the wetlands as the main method of treatment, with the sewage lagoon providing storage and controls the release to the wetlands.

The existing solid waste disposal facility is located approximately 750 m south of the Hamlet. It is adjacent to the current unlicensed sewage disposal facility and immediately south of the fuel tank farm. The existing solid waste disposal facility is partially fenced and has separated areas for disposal of various waste materials.

The Solid Waste Disposal Facility, as defined in water licence, is located approximately 1.5 km to the west of the Hamlet and adjacent to the Enhanced Sewage Disposal Facility. This solid waste disposal facility has never been used by the community for general waste although it has been used for storage of old vehicles and bulky items.

The Nunavut Water Board (NWB) issued a Class B Water Licence (3BM-KIM0911) to the Hamlet on January 9, 2009. 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 11 of Part H of the water licence (3BM-KIM0911) issued to the Hamlet (Appendix B) requires that the Hamlet submit to the NWB for approval, a Quality Assurance / Quality Control (QA/QC) Plan. This plan is to be 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 water supply, Solid Waste Disposal Facility, Sewage Disposal Facility, and, Enhanced Sewage Disposal Facility (Figure 1).

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.

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

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- 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 C for specific details on the sampling locations, equipment and sampling methods.

2.2.1 Locations

The water licence issued to the Hamlet (3BM-KIM0911) by the NWB specifies eight monitoring stations across the licensed facilities (Figure 2).

- Station KIM-1 is a raw water supply (from Fundo Lake) volume monitoring location. The water licence does not require the collection of any water samples from this location.
- Station KIM-2 is a run-off sampling location from the Solid Waste Disposal Facilities.
- Station KIM-3 is an effluent discharge sampling location from the existing Sewage Disposal Facility.
- Station KIM-4 is an effluent discharge sampling location from the Upper Lagoon Spillway of the Enhanced Sewage Disposal Facility.
- Station KIM-5 is an effluent discharge sampling location from the Upper Lagoon Pump Discharge of the Enhanced Sewage Disposal Facility.
- Station KIM-6 is an effluent discharge sampling location from the Lower Lagoon Spillway of the Enhanced Sewage Disposal Facility.
- Station KIM-7 is an effluent discharge sampling location from the Lower Lagoon Pump Discharge of the Enhanced Sewage Disposal Facility.
- Station KIM-8 is a surface water sampling location at the end of the Wetland Area.

Note:

- The solid waste disposal facility is defined by the water licence as the facility described in the 2001 licence renewal. This solid waste disposal facility has never been used by the community for general waste although it has been used for storage of old vehicles and bulky items. As such, **exp** recommends that the monitoring station KIM-2 be considered to be the run-off sampling location downgradient of the facility currently being utilized by the Hamlet.
- The sewage disposal facility is defined by the water licence as the facility described in the 2001 licence renewal. This facility was the sewage lagoon which was recently enhanced. This facility has not been commissioned. The Hamlet is currently using the sewage disposal facility adjacent to the existing solid waste facility. As such, **exp** recommends that the monitoring station KIM-3 be considered to be the outfall from the facility currently being utilized by the Hamlet.

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

Table 1 –Geographic Coordinates for the Monitoring Stations for NWB Licence 3BM-KIM0911

Monitoring Station	Latitude	Longitude
KIM-1	N 62°50’12.19”	W 69°53’01.49”
KIM-2/3*	N 62°50’27.30”	W 69°52’24.80”
KIM-4	N 62°50’49.74”	W 69°54’26.64”
KIM-5	N 62°50’49.74”	W 69°54’24.84”
KIM-6	N 62°50’36.24”	W 69°54’32.76”
KIM-7	N 62°50’36.24”	W 69°54’30.24”
KIM-8	N 62°50’5.64”	W 69°54’31.50”

*** see Note above for proposed deviations from monitoring stations described in the water licence.**

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 (at Station KIM-2) at the beginning, middle, and near the end of the season when flow is observed. Runoff samples are to be collected from the receiving water body 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 to be 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 to be collected from the existing Sewage Disposal Facility (Station KIM-3) monthly during the months of May to August. Effluent samples are to be 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 to be filled with effluent and the sample bottle is raised neck first to prevent sample spillage.

Effluent discharge is to be collected from the Upper Lagoon Spillway of the Enhanced Sewage Disposal Facility (Station KIM-4) twice annually (start of the overflow and start of the decanting). Effluent samples are to be collected from the Upper Lagoon Spillway in the same manner described above (i.e., for Station KIM-3).

Effluent discharge is to be collected from the Upper Lagoon Pump Discharge of the Enhanced Sewage Disposal Facility (Station KIM-5) twice annually (start of the overflow and start of the decanting). Effluent samples are to be collected from the Upper Lagoon Pump Discharge in the same manner described above (i.e., for Station KIM-3).

Effluent discharge is to be collected from the Lower Lagoon Spillway of the Enhanced Sewage Disposal Facility (Station KIM-6) twice annually (start and end of the decanting). Effluent samples are to be collected from the Lower Lagoon Spillway in the same manner described above (i.e., for Station KIM-3).

Effluent discharge is to be collected from the Lower Lagoon Pump Discharge of the Enhanced Sewage Disposal Facility (Station KIM-7) twice annually (start and end of the decanting). Effluent samples are to be collected from the Lower Lagoon Pump Discharge in the same manner described above (i.e., for Station KIM-3).

2.2.3.3 *Surface Water Sampling*

A surface water sample is to be collected at the end of the Wetland Area (Station KIM-8) monthly during periods of flow from spring to freeze-up. The surface water samples are to be collected from the wetland by immersing the sample bottle into the wetland neck first to a depth of 5 to 10 cm (if possible). The sampling container is to be filled with runoff 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-KIM0911. 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-KIM0911 (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-KIM0911 – 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.

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Appendix A: Figures

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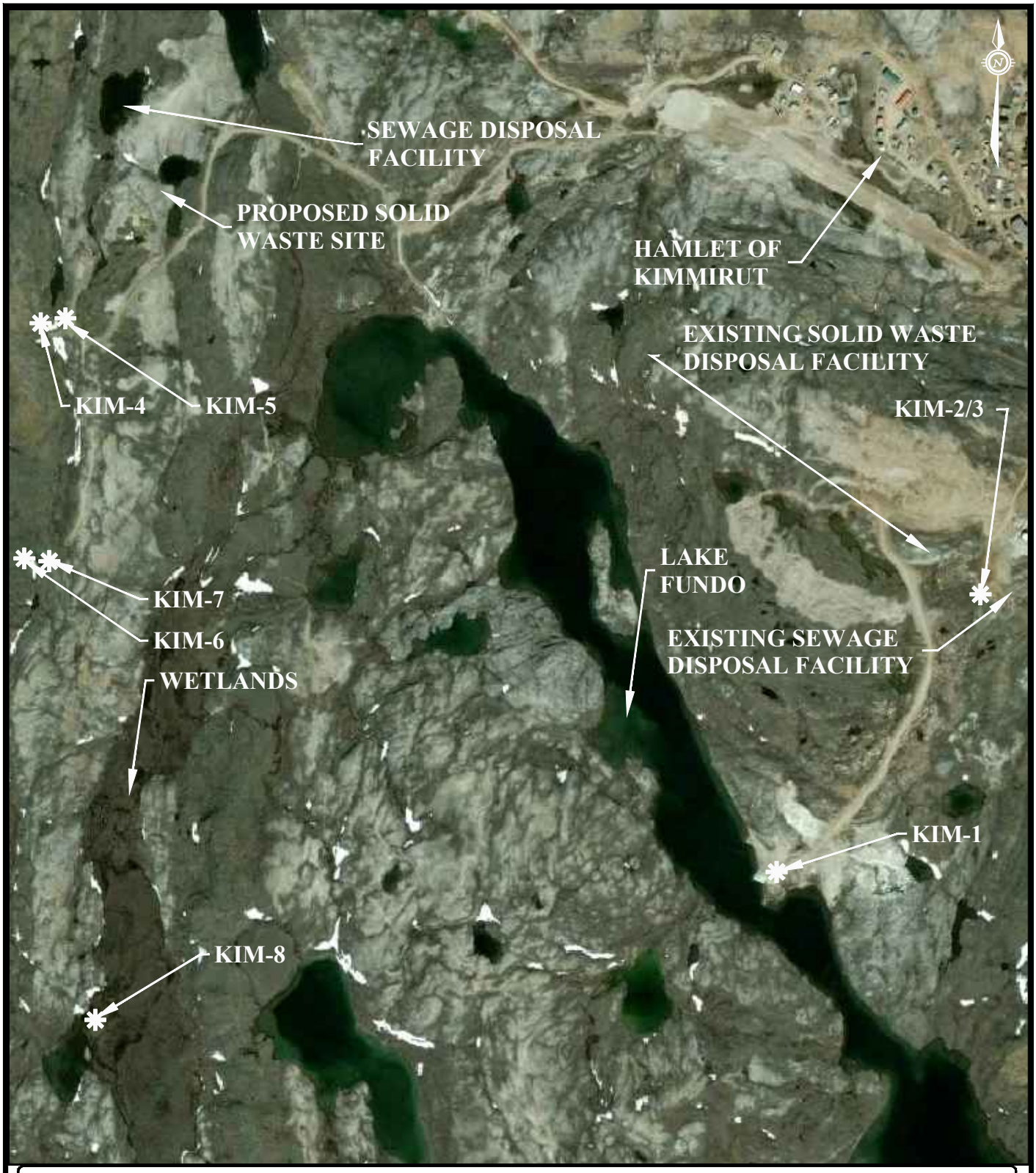
scale: NTS	CLIENT: HAMLET OF KIMMIRUT	project no.: OTT-00209248-A0
date: 27/05/13	TITLE: LOCATION PLAN	FIG 01
drawn by: M.KELLEY		



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scale: NTS	CLIENT: HAMLET OF KIMMIRUT	project no.: OTT-00209248-A0
date: 13/08/13		
drawn by: M.KELLEY	TITLE: MONITORING STATION LOCATIONS	FIG 02

Appendix B:
Hamlet of Kimmirut's Water Licence

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NUNAVUT WATER BOARD
NUNAVUT IMALIRIYIN KATIMAYINGI
OFFICE DES EAUX DU NUNAVUT

File No.: 3BM-KIM0911

March 19, 2010

Mr. Akeego Ikkidluak
Acting Senior Administrative Officer
Hamlet of Kimmirut
Box 120
Kimmirut, NU X0A 0N0
E-mail: saokim@qiniq.com

RE: Hamlet of Kimmirut Application to Amend Type "B"
Water Licence 3BM-KIM0911

Dear Mr. Ikkidluak:

Please find attached the decision of the Nunavut Water Board (NWB or Board) to not amend the Hamlet of Kimmirut's water licence 3BM-KIM0911 (Licence) as requested in an application for amendment received by the Board on June 8, 2009, as well as the associated reasons for decision. This decision is made pursuant to the NWB's authority under Article 12 of the *Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in Right of Canada* (Nunavut Land Claims Agreement or NLCA) and the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* (NWNSRTA). As set out in the reasons for decision, based on the application, submissions by all parties and applicable legislation, the Board is not satisfied that the requirements of s. 57[1] of the NWNSRTA have been met, and accordingly cannot amend the Licence as requested in the application.

The Board notes that the Hamlet's Licence expires on January 29, 2011. It is the Licensee's responsibility to apply to the NWB for a renewal prior to the expiry of the Licence. Note that if

[1] NWNSRTA s.**57.** The Board may not issue a licence unless the applicant satisfies the Board that
(*a*) any waste produced by the appurtenant undertaking will be treated and disposed of in a manner that is appropriate for the maintenance of the water quality standards and effluent standards that are prescribed by the regulations or, in the absence of such regulations, that the Board considers acceptable; and
(*b*) the financial responsibility of the applicant, taking into account the applicant's past performance, is adequate for (i) the completion of the appurtenant undertaking, (ii) such measures as may be required in mitigation of any adverse impact, and (iii) the satisfactory maintenance and restoration of the site in the event of any future closing or abandonment of that undertaking.

the Licence expires before the NWB issues a new one, then water use and waste disposal must cease, or the Licensee may be in contravention of the NLCA and the NWNSRTA. However, the expiry or cancellation of a licence does not relieve the holder from any obligations imposed by the licence. The Board recommends that renewal of the Licence be filed at least three (3) months prior to the Licence expiry date. As with all renewal applications, the past performance of the Licensee, new documentation and information, and issues raised during a public hearing, if the Board decides to hold one, may be considered when deciding upon an application.

As set out in the reasons for decision, the Board anticipates that an application for amendment will be required to authorize the construction of the proposed new solid waste disposal facility. The Licensee may wish to prepare a new application for amendment to the Licence. In that case, the NWB will consider, as with all amendment applications, whether it is in the public interest to hold a public hearing. The Board's determination that a public hearing was not required in respect of this amendment application does not limit their decision in respect of a future amendment application.

The Licensee should submit applications for amendment as soon as possible to give the NWB sufficient time to go through the amendment process. The process and timing may vary depending on the scope of the amendment, however a minimum of sixty (60) days is required from time of acceptance by the NWB. It is the responsibility of the Licensee to ensure that all application materials have been received and acknowledged by the Manager of Licensing.

The NWB strongly recommends that the Licensee review and consider the comments received from interested persons on the specific issues identified in response to this amendment application and the NWB's reasons for decision. This information is attached for your consideration.

Sincerely,

Thomas Kabloona
Nunavut Water Board, Chair

TK/tla/kt

Enclosure: Comments from EC, INAC and GN-DOE

cc: Qikiqtani Distribution List

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NUNAVUT WATER BOARD
NUNAVUT IMALIRIYIN KATIMAYINGI
OFFICE DES EAUX DU NUNAVUT

DECISION

LICENCE NUMBER: 3BM-KIM0911

This is the decision of the Nunavut Water Board (NWB) with respect to an application for an amendment to Water Licence 3BM-KIM0911 (Licence) received June 8, 2009, by the Licensee:

HAMLET OF KIMMIRUT

to allow for the use of water and disposal of waste for the Hamlet of Kimmirut, located within the Qikiqtani region of Nunavut. With respect to this application, the NWB gave notice to the public that the Hamlet had filed an application for a water licence amendment.

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 *Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in Right of Canada* (Nunavut Land Claims Agreement or NLCA), the NWB decided that the application could proceed through the regulatory process. After reviewing the full 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 Article 12 of the NLCA and of the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* (NWNSRTA), decided to waive the requirement to hold a public hearing and determined that the NWB:

> **Not amend Licence Number 3BM-KIM0911, as requested in the application for amendment submitted by the Government of Nunavut Community Government Services, on behalf of the Licensee, the Hamlet of Kimmirut, received June 8, 2009 (Motion #: 2010-~~18~~ 23-B1-03)**

SIGNED this 16 day of March, 2010 at Gjoa Haven, NU.

_____
Thomas Kabloona, Nunavut Water Board, Chair

TABLE OF CONTENTS

I. BACKGROUND

The Hamlet of Kimmirut is a small community with a population of approximately 560. The Hamlet is located on the southern tip of Baffin Island in Nunavut, at 62º50'06"N and 69º52'04''W within the Qikiqtani region of Nunavut.

The Hamlet of Kimmirut currently discharges its untreated wastewater to a ditch which drains directly to the ocean. This site is located approximately 750 m south of the community. In 2000, a new sewage lagoon was designed and partially constructed 1.5 km from the community to improve the treatment of sewage. However, due to the unsafe condition of the access road to the lagoon, the lagoon was never commissioned. In 2009, design enhancements for the sewage lagoon and construction of enhancements were approved by the NWB to upgrade and increase the capacity of the facility.

The Hamlet of Kimmirut currently disposes of its solid waste in an existing landfill site located adjacent to the existing sewage disposal site. A new solid waste disposal facility was partially constructed adjacent to the sewage lagoon but was never commissioned.

Lake Fundo is the community's primary source of potable water with a relatively large volume of 6,783,000 cubic meters compared to the 30,000 cubic meters authorized for use on an annual basis.

The community uses trucked services for both water delivery and sewage collection.

II. PROCEDURAL HISTORY

On June 8, 2009, the Government of Nunavut Community Government Services (GN-CGS, Applicant), on behalf of the Hamlet of Kimmirut (Licensee), submitted an application for amendment of an existing water licence 3BM-KIM0911 (Application).[2] The amendment application was submitted in follow-up to a letter dated January 27, 2009 from Trow Associates Inc. (Trow) acting on behalf of the GN-CGS.[3] And a subsequent teleconference dated February 13, 2009 discussing issues raised in that letter. The Application concerned the following areas of Water Licence 3BM-KIM0911 (Licence): 1) Sewage effluent discharge criteria; 2) Flow monitoring requirements for sewage lagoon discharge; and 3) the method of sewage disposal during construction of the Enhanced Sewage Disposal Facility.

[2] Letter from B. Roy, GN-CGS, to P. Beaulieu, NWB, Subject: Application for the Amendment of existing Water Licence 3BM-KIM0911 for the Hamlet of Kimmirut, Baffin Region, Nunavut, dated June 8, 2009.
[3] Letter from S. Douglas and S. Burden, Trow, to B.Roy, GN-CGS, Subject: Water Licence 3BM-KIM0911 Hamlet of Kimmirut, dated January 27, 2009.

Following an internal preliminary technical review, on June 18, 2009, the NWB requested additional information from GN-CGS via email to clarify the following three items:

1. The status of the quarry management plan required as a condition of Part D Item 10 of the Licence. This Plan was to be submitted to the Board for approval, sixty (60) days (March 10, 2009) following Licence issuance;
2. An abandonment and restoration plan, as required under Part G Item 1 of the Licence was to be submitted to the Board for approval at least 6 months prior to a) abandoning of any facilities and b) the construction of new facilities to replace existing ones. Although the NWB acknowledged that the amendment application stated that a consultant would be working on this plan, the NWB requested an estimated timeframe for the submission of the plan; and
3. The plan for sewage disposal during construction of the Enhanced Sewage Disposal Facility. This issue was raised in correspondence dated January 27th, 2009 from Trow Associates Inc. to GN-CGS.[4]

In response to the NWB's request, the GN-GCS submitted additional information to the NWB on June 19, 2009.[5] Following additional internal review of the Application, the NWB concluded that it met the requirements of section 48(1) of the *Nunavut Waters and Nunavut Surface Waters Tribunal Act* (NWNSRTA or Act) and forwarded notice of the Application to interested persons inviting written representations within 30 days.[6]

By July 27, 2009 comments on the Application were received from Indian and Northern Affairs Canada (INAC)[7], Environment Canada (EC)[8], and Government of Nunavut Department of Environment (GN-DOE)[9]. Following review of the submissions, on August 21, 2009, the NWB acknowledged receipt of parties' comments and provided GN-CGS with an opportunity to provide a response to the comments before making a determination on the Application. GN-CGS was asked to pay particular attention to the following issues:

1. The plan for sewage disposal during construction;
2. Plan for compliance; and

[4] Email from D. Hohnstein, NWB, to B. Roy, GN-CGS, Subject: Kimmirut Info Requirements, dated June 18, 2009.
[5] Letter from B. Roy, GN-CGS, to P. Beaulieu, NWB, No subject, dated June 19, 2009.
[6] Letter from R,Dwyer, NWB, to B.Roy, GN-CGS, and A.Ikkidluak, Hamlet of Kimmirut, Subject: Amendment Application for Water Licence 3BM-KIM0911, dated June 26, 2009.
[7] Letter from T. Trenholm, INAC, to P. Beaulieu, NWB, Subject: 3BM-KIM0911 – Hamlet of Kimmirut – Application for Amendment, dated July 27, 2009.
[8] Letter from C. Spavor, EC, to R. Dwyer, NWB, Subject: Amendment Application for Water Licence 3BM-KIM0911, dated July 27, 2009.
[9] Letter from A. Loder, GN-DOE, to P. Beaulieu, NWB, Subject: NWB File #3BM-KIM0911 – Hamlet of Kimmirut – Water Licence Amendment Application.

3. Sewage effluent discharge criteria.[10]

On November 2, 2009, GN-CGS submitted a response to the NWB August 21, 2009 correspondence including the following documentation.

- Cover letter;
- Document entitled "The Plan for Sewage Disposal During Construction";
- Document entitled "Plan for Compliance"; and
- Letter from Trow Associates Inc. to Community Government Services Re: Effluent Criteria at the Compliance Point Kimmirut Sewage Lagoon, dated October 30, 2009. [11]

On November 18, 2009, the NWB provided parties with an opportunity to review GN-CGS's submission to determine whether issues identified by parties during their initial review of the Application had been resolved. In addition, the NWB proposed to hold a technical meeting to discuss how the Board should proceed on unresolved issues.[12] The technical meeting was held via teleconference on December 7, 2009 and on December 10, 2009, draft meeting notes were distributed via email to participants of the technical meeting for review and comment. [13,14] Comments on the meeting notes were received from EC on December 15, 2009.[15]

On December 21, 2009 GN-CGS submitted the following additional information:

- Cover letter;
- Appendix A – Letter from A. Ikkidluak, Hamlet of Kimmirut, to B. Roy, GN-CGS, dated December 19, 2009;
- Appendix B – Letter from S. Douglas, Trow, and S. Burden, Trow, o B. Roy, GN-CGS, entitled "*Effluent Criteria at the Compliance Point Kimmirut Sewage Lagoon*" dated December 19, 2009;
- Appendix B – Figure A, Drainage Location Path;
- Appendix C – draft Spill Contingency Plan Municipality of Kimmirut, 2009
- Appendix D – Figure 2 – Proposed Landfill Site Kimmirut, Borehole Location Plan.[16]

[10] Letter from D. Hohnstein, NWB, to B. Roy, GN-CGS, and A.Ikkidluak, Hamlet of Kimmirut, Subject: Amendment Application for Water Licence 3BM-KIM0911, dated August 21, 2009.
[11] Letter from B. Roy, GN-CGS, to P. Beaulieu, NWB, Subject: Amendment Application for Water Licence 3BM-KIM0911, dated November 2, 2009.
[12] Letter from D. Hohnstein, NWB, to Qikiqtani Distribution List, Subject: Amendment Application for Water Licence 3BM-KIM0911, dated November 18, 2009.
[13] Email from K. Tunaley, NWB, to participants of the technical meeting, Subject: Meeting Notes – December 7, 2009 Teleconference Kimmirut, dated December 10, 2009.
[14] Meeting notes prepared by NWB, for technical meeting dated December 7, 2009 regarding the Kimmirut Water Licence Amendment
[15] Email from A. Wilson, EC, to K, Tunaley, NWB, Subject: 091210-3BM-KIM-Mtg-Notes-ODTE.doc, dated December 15, 2009.
[16] Letter from B. Roy, GN-CGS, to P. Beaulieu, NWB, No subject, dated December 21, 2009.

On January 21, 2010, the NWB distributed the additional information submitted by GN-CGS to interested parties for review and comment as well as final teleconference meeting notes.[17,18] By February 11, 2010 the NWB received comments from INAC[19] and EC[20].

On February 19, 2010 the NWB provided GN-CGS with a final opportunity to respond to the comments received, as well as to address any outstanding issues, before the Board made its final determination.[21] The Applicant did not respond by the date set out in the Board's letter.

III. BOARD DECISION

Based upon the results of the detailed assessment of the Application, consideration of the comments provided by the parties, the responses of the Applicant and the Board's jurisdiction under the *Nunavut Land Claims Agreement* and the *Nunavut Waters and Nunavut Surface Rights Tribunal Act*, the Board has not amended Licence 3BM-KIM0911, as requested in the Application for amendment, submitted by the Government of Nunavut Community Government Services, on behalf of the Licensee, the Hamlet of Kimmirut on June 8, 2009.

IV. ISSUES

The Plan for Sewage Disposal during Construction of the Enhanced Sewage Disposal Facility

Part D Item 1 of the Licence requires the Licensee to direct all sewage to the Sewage Disposal Facility prior to commissioning the Enhanced Sewage Disposal Facility. The Sewage Disposal Facility is defined in the Licence as the area and engineered lagoon and decant structures designed to contain sewage, as described in the Application for Water Licence filed by the Applicant on May 17, 2001.[22]

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[17] Letter from R. Dwyer, NWB, to B. Roy, GN-CGS, and A. Ikkidluak, Hamlet of Kimmirut, Subject: Additional Information regarding Amendment Application for 3BM-KIM0911, dated January 21, 2010.
[18] Revised meeting notes prepared by NWB, verified by meeting participants, for technical meeting dated December 7, 2009 regarding the Kimmirut Water Licence Amendment.
[19] Letter from T. Trenholm, INAC, to R. Dwyer, NWB, Subject: 3BM-KIM0911 – Government of Nunavut, Community and Government Services (GN-CGS) – Hamlet of Kimmirut – Application for Amendment – Additional Information Submission, dated February 11, 2010.
[20] Letter from C. Spavor, EC, to R. Dwyer, NWB, Subject: Additional Information regarding Amendment Application for 3BM-KIM0911, dated February 4, 2010.
[21] Letter from D. Hohnstein, NWB to B. Roy, GN-CGS, and A. Ikkidluak, Hamlet of Kimmirut, Subject: Request for Final Response regarding Amendment Application for Water Licence 3BM-KIM0911, Hamlet of Kimmirut, dated February 19, 2010
[22] See NWB Water Licence 3BM-KIM0911, dated January 19, 2009, page 20.

In its letter dated January 27, 2009 following issuance of the Licence, Trow noted that the Enhanced Sewage Disposal Facility encompasses the Sewage Disposal Facility and that it is impractical to construct the Enhanced Sewage Disposal Facility if the Sewage Disposal Facility is operational. Trow further noted that the intention of the design was to maintain the use of the current sewage disposal system (disposal to a ditch approximately 750 m south of the community that drains to the ocean) until such time as the Enhanced Sewage Disposal Facility could be constructed.[23] This plan for sewage disposal during construction was confirmed in GN-CGS's June 19, 2009 submission. This submission also indicated that funding for construction of the Enhanced Sewage Disposal Facility and the associated access roads were not confirmed.[24]

Both EC and INAC, in their written submissions dated July 27, 2009 advised the Board that the current method of sewage disposal is unacceptable. Furthermore, both parties expressed concern regarding the schedule for construction of the Enhanced Sewage Disposal Facility due to unsecured funding and recommended that immediate steps be taken to address the issue in a Plan for Compliance. [25, 26]

The Board agrees with INAC and EC that discharge of raw sewage to the environment during construction of the Enhanced Sewage Disposal Facility is unacceptable. On this basis, the Board is not satisfied that the waste produced by the appurtenant undertaking will be treated and disposed of in a manner that the Board considers acceptable. Therefore, in accordance with s. 57(a) of the NWNSRTA the Board is unable to grant the amendment.[27] To proceed with an amendment in future, the Licensee must provide additional information regarding acceptable alternative methods of sewage disposal during construction of the Enhanced Sewage Disposal Facility.

Effluent Quality Criteria

The current effluent quality criteria imposed under the Licence condition in Part D Item 2 requires all effluent discharged from the Enhanced Sewage Disposal Facility at Monitoring

[23] See letter from S. Douglas and S. Burden (Trow) to B. Roy, GN-CGS, Re: Water Licence 3BM-KIM0911 Hamlet of Kimmirut, dated January 27, 2009, page 2.
[24] See GN-CGS June 8, 2009 submission, page 11.
[25] See letter from T. Trenholm, INAC, to P. Beaulieu, NWB, Subject: 3BM-KIM0911 – Hamlet of Kimmirut – Application for Amendment, dated July 27, 2009, pages 3 and 4.
[26] See letter from C. Spavor, EC, to R. Dwyer, NWB, Subject: Amendment Application for Water Licence 3BM-KIM0911, dated July 27, 2009, page 3.
[27] NWNSRTA s.**57.** The Board may not issue a licence unless the applicant satisfies the Board that
(*a*) any waste produced by the appurtenant undertaking will be treated and disposed of in a manner that is appropriate for the maintenance of the water quality standards and effluent standards that are prescribed by the regulations or, in the absence of such regulations, that the Board considers acceptable;

Program Stations KIM-6 (lower lagoon spillway) and KIM-7 (lower lagoon pump) to not exceed the following effluent quality limits:[28]

Parameter	Maximum Average Concentration
BOD5	120 mg/L
Total Suspended Solids	180 mg/L
Faecal Coliforms	1 x 10^6 CFU/ 100mL
Oil and grease	No visible sheen
pH	Between 6 and 9

In its November 2, 2009 submission, GN-CGS proposed that all effluent discharged from the Enhanced Sewage Disposal Facility at Monitoring Program stations KIM-6 and KIM-7 not exceed the following effluent quality limits based on an average of samples taken throughout the discharge period:[29]

Parameter	Maximum Average Concentration
BOD5	150 mg/L
Total Suspended Solids	160 mg/L
Faecal Coliforms	1 x 10^6 CFU/ 100mL
Oil and grease	No visible sheen
pH	Between 6 and 9

During the December 7, 2009 technical meeting, EC requested information regarding the fish bearing nature of the pond immediately downstream of the wetland area, draining to the large Soper Lake. GN-CGS agreed to discuss the issue with the Hamlet of Kimmirut and provide documentation regarding the fish bearing nature of the water body to the NWB and reviewers. [30] As part of it December 21, 2009 submission the GN-CGS provided a letter from the Hamlet of Kimmirut indicating that the residents of the community fish in Soper Lake.[31] Following review of GN-CGS's submission, EC, in its comments dated February 4, 2010, encouraged the GN-CGS in cooperation with the Hamlet to conduct additional sampling to determine if there are fish in the wetland area or the small pond upstream of Soper Lake.[32]

[28] See NWB Water Licence 3BM-KIM0911, dated January 19, 2009, page 20.
[29] See letter from S. Douglas and S. Burden (Trow) to B. Roy, GN-CGS, Re: Effluent Criteria at the Compliance Point Kimmirut Sewage Lagoon, dated October 30, 2009, page 6.
[30] See meeting notes prepared by NWB, verified by meeting participants, for technical meeting dated December 7, 2009 regarding the Kimmirut Water Licence Amendment, page 2.
[31] See letter from A. Ikkidluak (Hamlet of Kimmirut) to R. Roy, GN-CGS, No subject, dated December 16, 2009.
[32] See letter from C. Spavor, EC, to R. Dwyer, NWB, Subject: Additional Information regarding Amendment Application for 3BM-KIM0911, dated February 4, 2010.

For the Board to determine the appropriate effluent quality criteria under the Licence, the Board must have sufficient information to assess whether regulations made under section 36(5) of the *Fisheries Act* apply to the waters governed by the Licence.,[33] Accordingly, the Board agrees with EC that information regarding the presence of fish in the wetland area is required before effluent quality criteria can be decided.

Also, following its review of GN-CGS's December 21, 2009 submission, INAC, in its comments dated February 11, 2010, noted concerns regarding the effectiveness of the wetland treatment and recommended that additional information was required prior to approval of the amendment. Specifically, INAC recommended that the Applicant submit a more detailed topographic map covering the entire sewage effluent treatment train including definitive flow patterns, discharge location into wetlands, predicted flow course through the wetlands, discharge into small ponds, and finally discharge into Soper Lake. INAC also recommended that the Applicant undertake a site specific wetland study to ensure that the end of wetlands effluent quality criteria of 45 mg/L BOD_5 and 45 mg/L TSS are achievable.[34]

Based on the submission of GN-CGS, the Board accepts that the wetland area is a significant component of the sewage treatment facility[35] and agrees with INAC that it needs to be technically verified prior to an amendment of the Licence.

For the reasons stated above, the Board cannot amend the effluent quality criteria required as a condition of Part D Item 2 of the Licence, until the following additional information is provided and considered by the Board:

1. Results of sampling to determine if there are fish in the wetland area or the small pond upstream of Soper Lake;
2. A more detailed topographic map covering the entire sewage effluent treatment train including definitive flow patterns, discharge location into wetlands, predicted flow course through the wetlands, discharge into small ponds, and finally discharge into Soper Lake; and
3. Site specific wetland study.

[33] NWNSRTA s.73. Where the Board issues a licence in respect of any waters to which regulations made under subsection 36(5) of the Fisheries Act apply, any conditions in the licence relating to the deposit of waste in those waters shall be at least as stringent as the conditions prescribed by those regulations.

[34] See letter from T. Trenholm, INAC, to R. Dwyer, NWB, Subject: 3BM-KIM0911 – Government of Nunavut, Community and Government Services (GN-CGS) – Hamlet of Kimmirut – Application for Amendment – Additional Information Submission, dated February 11, 2010, pages 2-3.

[35] See Design Brief Rehabilitation and Expansion of Existing Sewage Lagoon for the Hamlet of Kimmirut, prepared for the Government of Nunavut Community Government Services by Trow Associates Inc, OTCD00018881A, dated January 2008.

Plan for Compliance

Part B, Item 11 of the Licence requires the Licensee to submit to the Board for approval, within ninety (90) days of Licence issuance or upon the filing of any application in relation to the Licence within that time, a Plan for Compliance that clearly demonstrates the measures the Licensee will undertake, including an implementation schedule, to achieve full compliance with the conditions of the Licence, including the issues raised in the Inspector's Reports. [36]

The GN-CGS submitted a Plan for Compliance (Plan)[37] with the Application. The Plan was reviewed as part of the Application, including additional information submitted on November 2, 2009 and December 21, 2009, in response to reviewers' comments.

EC, in its written submission dated July 27, 2009, advised the Board that the Plan does not fully demonstrate how the Hamlet will come into compliance with the Licence, noting concern that the construction of the Enhanced Sewage Disposal Facility had been postponed.[38] INAC, in its submission of the same date, also identified concerns with the plan for compliance for sewage disposal and recommended that the Licensee immediately resubmit a plan for compliance, including firm timetables for construction and implementation, which addresses the issue of raw sewage disposal.[39] The current practice of sewage disposal was discussed during the December 7, 2009 technical meeting in which no alternatives were forwarded.[40]

INAC, in its comments dated February 11, 2010, noted issues with the Plan including the solid waste disposal plan for compliance, and the plan for compliance to address abandonment and restoration plans.[41] INAC recommended that the Plan should be a stand alone document that addresses the compliance related concerns noted in the December 7, 2009 teleconference meeting notes.[42] These concerns include:

- Implementation schedule;
- Operations and Maintenance Manual for existing facilities;

[36] See NWB Water Licence 3BM-KIM0911, dated January 19, 2009, page 19.
[37] See GN-CGS June 8, 2009 submission page 10-11.
[38] See letter from C. Spavor, EC, to R. Dwyer, NWB, Subject: Amendment Application for Water Licence 3BM-KIM0911, dated July 27, 2009, page 3.
[39] See letter from T. Trenholm, INAC, to P. Beaulieu, NWB, Subject: 3BM-KIM0911 – Hamlet of Kimmirut – Application for Amendment, dated July 27, 2009, page 4.
[40] See meeting notes prepared by NWB, verified by meeting participants, for technical meeting dated December 7, 2009 regarding the Kimmirut Water Licence Amendment, page 1.
[41] See letter from T. Trenholm, INAC, to R. Dwyer, NWB, Subject: 3BM-KIM0911 – Government of Nunavut, Community and Government Services (GN-CGS) – Hamlet of Kimmirut – Application for Amendment - Additional Information Submission, dated February 11, 2010.
[42] See letter from T. Trenholm, INAC, to R. Dwyer, NWB, Subject: 3BM-KIM0911 – Government of Nunavut, Community and Government Services (GN-CGS) – Hamlet of Kimmirut – Application for Amendment - Additional Information Submission, dated February 11, 2010, page 4.

- Quarry Management Plan;
- Solid waste disposal;
- Geotechnical engineer's inspection report; and
- Abandonment and Restoration Plan.[43]

Regarding the solid waste disposal plan for compliance, INAC noted that GN-CGS had not provided information pertaining to when funding is anticipated or a proposed schedule of activities. As such, it remains unclear as to when GN-CGS plans to undertake the construction of facilities and also the development of the appropriate Abandonment and Restoration Plans.[44] The Board understands that the delay in construction of the Enhanced Sewage Disposal Facility and the absence of firm implementation schedules in the Plan for Compliance, as required by Part B Item 11 of the Licence, is due to unsecured funding to carry out the proposed measures.[45,46] However, the Board agrees with the reviewers' comments and recommendations, and has decided not to approve the Plan for Compliance.

The deficiencies in the Plan for Compliance are substantive, and the Board has concluded that the Plan for Compliance does not ensure that sewage and solid waste will be treated in a manner that is acceptable to the Board. In addition, reflecting uncertainty over the timing and security of the Applicant's funding, the Board is not satisfied that the Applicant is able to meet financial responsibilities in relation to construction, implementation of the required compliance and mitigation measures, maintenance and restoration of sites and facilities under the Licence. In accordance with section 57 of the NWNSRTA[47], for the reasons set out above, the NWB is

[43] See meeting notes prepared by NWB, verified by meeting participants, for technical meeting dated December 7, 2009 regarding the Kimmirut Water Licence Amendment, pages 2-3.

[44] See letter from T. Trenholm, INAC, to R. Dwyer, NWB, Subject: 3BM-KIM0911 – Government of Nunavut, Community and Government Services (GN-CGS) – Hamlet of Kimmirut – Application for Amendment - Additional Information Submission, dated February 11, 2010, pages 3-4.

[45] See GN-CGS's November 2, 2009 submission, page 3 which states:

> "Unfortunately, the construction of the proposed wastewater treatment facility including rehabilitation of the access road towards the facility may be delayed due to insufficient funding. Additional funding has been requested to proceed with construction just after completion of the granular access road."

[46] See GN-CGS's December 21, 2009 submission, page 1 which states:

> "This facility [solid waste disposal facility] was built next to the proposed sewage lagoon and intended to commission in 2000, but was never completed nor commissioned. Additional funding has been requested to upgrade this facility to make it best fit for the community and to satisfy the requirements of the NWB. The Location map of the proposed landfill site is attached in Appendix-D. The existing facility which is being used will be decommissioned once the new facility is commissioned. Funding has been requested to complete this project."

[47] NWNSRTA s.**57.** The Board may not issue a licence unless the applicant satisfies the Board that (*a*) any waste produced by the appurtenant undertaking will be treated and disposed of in a manner that is appropriate for the maintenance of the water quality standards and effluent standards that are prescribed by the

requesting that a revised Plan for Compliance be submitted by the Licensee that addresses these issues, to be approved by the Board in writing.

V. SUMMARY

In summary, the Board has decided not to amend the Licence, as requested in the Application submitted by Applicant. The specific amendments requested by the Applicant were as follows: 1) Sewage effluent discharge criteria; 2) Flow monitoring requirements for sewage lagoon discharge; and 3) the method of sewage disposal during construction of the Enhanced Sewage Disposal Facility.

Based on its review of the Application, parties' submissions to the Board and the applicable legislation, the Board has determined that:

1. the proposed method for sewage disposal during construction is unacceptable
2. there is a lack of information regarding whether regulations made under section 36(5) of the *Fisheries Act* apply to the waters governed by the Application
3. the effectiveness of the wetland component of the treatment facility needs to be verified;
4. the proposed treatment and disposal of waste, as outlined in the Plan for Compliance, is unacceptable; and
5. the financial responsibility of the Applicant is inadequate to ensure the construction, implementation of compliance, mitigation measures and satisfactory maintenance and restoration of the site and facilities is carried out.

As a result, the Board is not satisfied that the requirements of s. 57 of the NWNSRTA have been met and accordingly cannot amend the Licence as requested.

In future, the Board anticipates that an application for amendment will be required to authorize the construction of the proposed new solid waste disposal facility and that the Licensee will prepare a new application for amendment to the Licence. In the case of a new amendment application, the Board will consider whether it is in the public interest to hold a public hearing in respect of that application. The Board's determination that a public hearing was not required in respect of this amendment application does not limit their decision in this regard for future amendment applications.

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regulations or, in the absence of such regulations, that the Board considers acceptable; and
(*b*) the financial responsibility of the applicant, taking into account the applicant's past performance, is adequate for (i) the completion of the appurtenant undertaking, (ii) such measures as may be required in mitigation of any adverse impact, and (iii) the satisfactory maintenance and restoration of the site in the event of any future closing or abandonment of that undertaking.

In the preparation of any future amendment application, the NWB strongly recommends that the Licensee review and consider the comments received from parties on the specific issues identified in response to this amendment application. In particular, the Board expects any future application for amendment to include, at a minimum, the following:

1. Acceptable, alternative methods for sewage disposal during construction;
2. Results of sampling to determine if there are fish in the wetland area or the small pond upstream of Soper Lake;
3. A more detailed topographic map covering the entire sewage effluent treatment train including definitive flow patterns, discharge location into wetlands, predicted flow course through the wetlands, discharge into small ponds, and finally discharge into Soper Lake;
4. A site-specific wetland study; and
5. A Plan for Compliance that addresses the Board's requirements and the parties' concerns.

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NUNAVUT WATER BOARD
NUNAVUT IMALIRIYIN KATIMAYINGI
OFFICE DES EAUX DU NUNAVUT

File No.: 3BM-KIM0911

January 19, 2009

Mr. Akeego Ikkidluak
Acting Senior Administrative Officer
Hamlet of Kimmirut
Box 120
Kimmirut, NU X0A 0N0
E-mail: saokim@qiniq.com

RE: NWB Licence No. 3BM-KIM0911

Dear Mr. Ikkidluak:

Please find attached Licence No. 3BM-KIM0911 issued to the Hamlet of Kimmirut by the Nunavut Water Board (NWB) 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*. The terms and conditions of the attached Licence related to water use and waste disposal are an integral part of this approval.

If the Licensee contemplates the renewal of this Licence, it is the responsibility of the Licensee to apply to the NWB for its renewal. 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. Note that 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* (NLCA) and the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* (NWNSRTA). However, the expiry or cancellation of a licence does not relieve the holder from any obligations imposed by the licence. The NWB recommends that an application for the renewal of this Licence be filed at least three months prior to the Licence expiry date.

If the Licensee contemplates or requires an amendment to this licence, the NWB may decide, in the public interest, to hold a public hearing. An application for amendment will be required for the construction of the proposed new solid waste disposal facility. The Licensee should submit applications for amendment as soon as possible to give the NWB sufficient time to go through the amendment process. The process and timing may vary depending on the scope

of the amendment, however a minimum of sixty (60) days is required from time of acceptance by the NWB. It is the responsibility of the Licensee to ensure that all application materials have been received and acknowledged by the Manager of Licensing.

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

Sincerely,

Thomas Kabloona
Nunavut Water Board, Chair

TK/tla/kt

Enclosure: Licence No. 3BM-KIM0911
Comments from EC, GN-DoE and INAC

cc: Qikiqtani Distribution List

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NUNAVUT WATER BOARD
NUNAVUT IMALIRIYIN KATIMAYINGI
OFFICE DES EAUX DU NUNAVUT

DECISION

LICENCE NUMBER: 3BM-KIM0911

This is the decision of the Nunavut Water Board (NWB) with respect to an application for a Licence renewal received August 20, 2007 and application for amendment received February 15, 2008, made by:

HAMLET OF KIMMIRUT

to allow for the use of water and disposal of waste for the Hamlet of Kimmirut, located within the Qikiqtani region of Nunavut. With respect to this application, the NWB gave notice to the public that the Hamlet had filed an application for a water licence renewal.

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 Claims Agreement* (NLCA), the NWB decided that the application could proceed through the regulatory process. After reviewing the full 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 *NLCA* and of the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* (NWNSRTA), decided to waive the requirement to hold a public hearing and determined that:

Licence Number 3BM-KIM0911 be issued subject to the terms and conditions contained therein. (Motion #: 2008-10-L03)

SIGNED this 9th day of January, 2009 at Gjoa Haven, NU.

Thomas Kabloona
Nunavut Water Board, Chair

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I. BACKGROUND

The Hamlet of Kimmirut is a small community with a population of approximately 546. The Hamlet is located on the southern tip of Baffin Island in Nunavut, at $62^0$50'06''N and $69^0$52'04''W within the Qikiqtani region of Nunavut.

The Hamlet of Kimmirut currently discharges its sewage to a ditch which drains directly to the ocean. In 2001 a new sewage lagoon was constructed 1.5 km from the community to improve the treatment of sewage. However, due to the unsafe condition of the access road to the lagoon, the lagoon has never been used.

An assessment of the existing facility as designed, determined that the existing lagoon would not have sufficient capacity to meet the over winter storage requirements of the Hamlet. Thus much of the over winter sewage would accumulate in the form of an ice pack in the gulch downstream of the sewage lagoon. The sewage in the ice pack would then be released in an uncontrolled manner and without treatment during the spring melt.

Further investigations were carried out on the existing facility to determine what works were required in order to meet the requirements of the Hamlet. Based on these investigations, a sewage treatment facility has been proposed utilizing the existing lagoon as the primary cell and the construction of a second lagoon at the bottom of the gulch to provide additional retention followed by wetlands. Rehabilitation of the existing access road is a requirement to allow use of the old lagoon and upgraded facility once completed.

The project has been designed for a twenty (20) year lifetime and a yearly sewage generation rate of approximately 33,195 cubic meters projected for the year 2028. Construction was to begin during the summer of 2008.

II. PROCEDURAL HISTORY

The NWB issued a municipal water licence to the Hamlet of Kimmirut on September 1, 2002, to allow for the use of water and disposal of waste under Licence NWB3KIM0207. The municipal water licence expired on August 31, 2007. The Hamlet of Kimmirut, in conjunction with the Government of Nunavut Department of Community and Government Services (CGS), submitted an application for water licence renewal to the NWB on August 20, 2007. Following a preliminary review of the application, the NWB noted the following documents/reports had not been received:

- Operations and Maintenance Plan of the sewage and solid waste facilities – required by September 1, 2003 and not received;
- Quality Assurance/ Quality Control Plan – required November 1, 2002 and not received.

On September 6, 2007, the NWB notified the Applicant that the above documents would be required prior to the issuance of a renewed licence.

On November 23, 2007, the NWB publicly posted notice of this application, in accordance with Section 55.1 of the Act and Article 13 of the *Nunavut Land Claims Agreement* (NLCA). This assessment process included the referral of the application to a variety of Federal, Territorial and local organizations for their review and comment. Information contained in the submission for review included:

- Application cover letter dated August 20, 2007;
- Letter dated November 30, 2006 from Municipality of Kimmirut to NWB regarding work of GN-CGS on Hamlet's behalf;
- NWB Licence renewal application; and
- Technical Summary Report in English and Inuktitut

The scope of the renewal application included water use, and ongoing disposal of sewage and solid waste. No public concern was expressed during this review. Therefore, the NWB waived the requirement to hold a public hearing and proceeded with the application process.

The NWB received comments on the application from interested parties including Environment Canada (EC) and the Government of Nunavut Department of Environment (GN-DOE) on or prior to January 11, 2008. The review identified a number of issues with the Application and the file in general that needed to be addressed including: (1) Compliance with the existing water licence; (2) Effluent discharge predictions and criteria; and (3) The need for an amendment application.

On February 15, 2008, the GN-CGS submitted an application for the amendment of the expected renewed water licence for the Hamlet of Kimmirut (NWB3KIM0207) suggesting in the cover letter that the NWB combine the two applications. The documents submitted with the amendment application included:

- Application Cover Letter dated February 15, 2008, received February 18, 2008;
- NWB Licence amendment application, received February 28, 2008;
- Facsimile Transmittal and Attachment re: Motion and approval of Preliminary design of Lagoon and Wetland Treatment dated November 1, 2007
- Authorization email from the Hamlet of Kimmirut;
- *Design Brief Rehabilitation and Expansion of Existing Sewage Lagoon for the Hamlet of Kimmirut* prepared for Department of Community Government and Services by Trow Associates Inc., dated January 2008, OTCD00018881A;
- Technical Summary Report in English and Inuktitut, received February 28, 2008;
- Cover Letter dated February 13, 2008 from S. Douglas, Trow Associates to B. Roy, GN-CGS, re: Kimmirut Wetland Planning Study (OTCD00018881A)

- *Kimmirut Wetland Planning Study* prepared for Trow Associates by Wetland Management Services, dated January 2008, 99559-03;
- *Geotechnical Investigation Sewage Lagoon Hamlet of Kimmirut, Nunavut* prepared for CGS-Projects, prepared by Trow Associated Inc., dated September 24, 2007, OTGE00018881B;
- Drawing No. 1, entitled *Borehole Location Plan-Septic Lagoon Rejuvenation* prepared by Trow Associates Inc., project no. 0TGE00018881B dated 21/08/07;
- Drawing No. 2 entitled *Borehole Location Plan-Proposed Landfill Site* prepared by Trow Associates Inc., project no. 0TGE00018881B dated 21/08/07;
- Drawing No. 3 entitled *Borehole Location Plan-Investigation of Diversion Berm* prepared by Trow Associates Inc., project no. 0TGE00018881B dated 21/08/07;
- Drawing No. SP-1 entitled *Lagoons and Wetlands Site Plan* prepared by Trow Associates Inc., project no. OTCD00018881A dated 4/01/2008, signed and stamped by an Engineer;
- Drawing No. L-1 entitled *Upper Lagoon* prepared by Trow Associates Inc., project no. OTCD00018881A dated 4/01/2008, signed and stamped by an Engineer;
- Drawing No. L-2 entitled *Lower Lagoon* prepared by Trow Associates Inc., project no. OTCD00018881A dated 4/01/2008, signed and stamped by an Engineer;
- Drawing No. DE-1 entitled *Lagoon Dewatering Details* prepared by Trow Associates Inc., project no. OTCD00018881A dated 4/01/2008, signed and stamped by an Engineer; and
- Drawing No. T-1 entitled *Topographic Map* prepared by Trow Associates Inc., project no. OTCD00018881A dated 11/02/2008, signed and stamped by an Engineer.

The scope of the amendment application includes:

- Rehabilitation of the existing access road to the Sewage Disposal Facility;
- Upgrading of the existing Sewage Disposal Facility comprised of a sewage lagoon (upper lagoon);
- Construction of a second sewage lagoon at the bottom of the gulch hydraulically below the existing lagoon (lower lagoon); and
- Effluent release to a Wetland Area that is approximately 15 - 20 ha.

Following a preliminary review of the application, the NWB concluded that the amendment application met the requirements of section 48(1) of the Act and advised the Applicant and distribution list accordingly on March 31, 2008. In addition, having completed its review of the application for licence renewal for the same licence, the NWB determined that, given the timing of the NWB final review of the renewal and the receipt of the amendment application, it would be in the best interest of all parties to combine both applications for maximum clarity and efficiency.

On May 5, 2008, the NWB received comments on the combined application from Indian and Northern Affairs Canada (INAC). Upon consideration of the submissions from EC and GN-DOE in January 2008 as well as the submission from INAC, the NWB identified the following

key issues that were forwarded to the Applicant on June 18, 2008 and that clarification was required prior to the Board considering a decision:

- Response to the NWB's letter of September 6, 2007, concerning the Operations and Maintenance Plan for the sewage and solid waste facilities and status of the QA/QC Plan;
- Status of the access road;
- Status of existing landfill and location of the proposed solid waste disposal facility and issues identified in the document entitled *Geotechnical Investigation Sewage Lagoon Hamlet of Kimmirut* (Trow Associates Inc., September 24, 2007);
- Hazardous materials storage location;
- Required follow-up to the January 8, 2008 municipal inspection report;
- Confirmation of the location of the sewage treatment facility;
- Design and operation of the sewage treatment facility;
- Quarry source for construction materials; and
- Location of waste disposal facilities in relation to the location of the Hamlet's water supply.

On August 7, 2008, GN-CGS submitted a letter response to the Board's June 18, 2008 request for clarification.

Based upon the results of the detailed assessment of the renewal and amendment application file, including consideration of any potential accidents, malfunctions, or impacts to water that the overall project might have in the area, the Board has approved the application and has issued Licence 3BM-KIM0911.

III. ISSUES

Term of Licence

In accordance with section 45 of the Act, 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 INAC site inspections and the compliance record of the Applicant. In review of the previous water licence NWB3KIM0207 inspection reports, the NWB has noted compliance issues identified by the Inspector in a Municipal Water Use Inspection Report dated December 4, 2002 for an inspection conducted on August 1, 2002 including:

- Storage of hazardous materials and metals; and
- Posting of signs at all surveillance network program stations.

A subsequent inspection was conducted on August 26, 2003 and reported the same day identifying additional compliance issues including:

- Maintenance of a copy of the Licence at the site of operations; and
- Maintenance of the Sewage Disposal Facility.

On September 15, 2003, the Inspector issued direction to the Hamlet of Kimmirut by way of a *Deposit of Waste in Contravention of Water Licence 3NWB3KIM0207* letter requiring the Licensee to (1) immediately ensure that any 45 gallon drums of oil, fuel and solvent are consolidated and properly stored and (2) to ensure that no drums of waste oil, fuel or other associated waste products from industrial sources are deposited to the municipal waste facilities.

The most recent inspection conducted on July 13, 2007 and reported on January 8, 2008 provided the following updated concerns:

- Collection and analysis of samples required under the Monitoring Program;
- Submission of the required annual reports;
- Installation of a volumetric measuring device on the water intake system;
- Posting of signs at surveillance network program stations;
- Segregation of bulk metals and hazardous wastes;
- Submission of Sewage and Solid Waste Disposal Facility Operation and Maintenance Plan;
- Presence of the Sewage Disposal Facility;
- Submission of Abandonment and Restoration Plan; and
- Submission of a Quality Assurance/ Quality Control Plan.

In its August 7th, 2008 response to intervener comments, the Hamlet clarified its request for a term of five year(s) for the Licence renewal and amendment. No comments were received from interested parties with respect to the length of term, however, the NWB has decided on a two (2) year term for the Licence based on issues with non-compliance, including non-compliance with administrative and reporting requirements.

The two (2) year Licence term is intended to send a clear message to the Hamlet and regulatory authorities that the Board will not passively encourage the Hamlet's failures to comply with the Licence conditions and associated legal requirements. The Board fully expects the Hamlet to take immediate steps towards full compliance with all Licence requirements for its existing facilities. Upon submission of an application to renew the Licence in approximately twenty one (21) months, the Board expects the Hamlet to be in full compliance with the licence. This shorter licence duration also permits the Board to increase its level of confidence of the Licensee that the facilities are operating as they should. As per Part B, Item 11 of the Licence, the Licensee must submit a Plan for Compliance that clearly demonstrates how the Hamlet will achieve full compliance with the Licence conditions during this time period.

The NWB reminds the Licensee of its responsibility to be in compliance with the conditions of the Licence. If monitoring results demonstrate that effluent does not meet discharge limits, the Licensee is required to take the necessary measures to remedy the situation.

Annual Report

The NWB has imposed on the Licensee, 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 interested parties upon request. A *"Standardized Form for Annual Reporting"* is to be used by the Licensee and is available from the NWB file transfer protocol (FTP) site under the Public Registry link at the NWB Website.

Website Public Registry:
(ftp://nunavutwaterboard.org/ADMINISTRATION/Standardized%20Forms/).

Operational Plans

Under the original licence NWB3KIM0207 Part F Item 1, the Licensee was required to submit a Plan for the Operation and Maintenance (O&M) of the Sewage and Solid Waste Facilities. This Plan was not submitted in accordance with the previous Licence.

INAC, GN-DOE and EC noted in their comments to the NWB that Operations and Maintenance Procedures should be provided. INAC recommended that this Licence renewal and amendment again require the submission of the previously requested Operations and Maintenance Manual and that a revision of this Manual be provided to the Board by the end of the first operating

season of the Enhanced Sewage Disposal Facility with updates included as part of annual reporting. INAC further recommended that this Manual should address hazardous waste management, as well as plans for spill contingency and accidents and malfunctions. In addition, the NWB deems INAC's comments with respect to annual reporting of plans for modifications to stream and water bodies, including water crossings as relevant to Operations and Maintenance planning.

The GN-DOE noted that details related to the treatment and management of sewage sludge should be provided and that a spill contingency plan should be provided for review related to the sewage lagoon and other facilities related to the water licence with reference to the DOE's *Spill Contingency Planning and Reporting Regulations* and *Spill Reporting in Nunavut: A Guide to the New Regulations*. EC's submission supported the recommendations made by INAC and GN-DOE, and offered further details with respect to those recommendations.

The Board agrees with all parties on this issue and is again requiring that this Operations and Maintenance Manual be submitted within ninety (90) days of licence issuance for the existing Sewage and Solid Waste Facilities. Following the first operating season of the Enhanced Sewage Disposal Facility the Board is requiring that the O&M Manual be revised and submitted for approval of the Board. This Manual needs to be developed to the satisfaction of the NWB for (1) the operation and maintenance of the sewage and solid waste facilities; (2) hazardous waste management procedures; (3) the management of sludge from the Enhanced Sewage Disposal Facility; (4) the protection of the environment with regard to potential spills through day-to-day operations; (5) planning modifications to streams and water bodies, including water crossings; and (6) include a monitoring program Quality Assurance/Quality Control Plan.

The purpose of the O&M Manual noted above is to assist Hamlet staff in carrying out the procedures relating to the waste disposal facilities. The O&M Manual should demonstrate to the NWB that the Hamlet is capable of operating and maintaining the infrastructure related to water use and waste disposal and to meet the requirements of the Licence. The O&M Manual should be based, at a minimum on the various NWB-approved guidelines available (i.e. *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) and other regulatory guidelines as deemed appropriate.

Quarry

The proposed design of the Enhanced Sewage Disposal Facility and access road rehabilitation requires approximately 8,200 cubic meters of granular material which may be exploited from a quarry referred to as Deposit #2. The Applicant is advised that any new quarry development requires screening by the Nunavut Impact Review Board (NIRB) in accordance with Article 12 of the NLCA. The Board cannot authorize water use or waste disposal associated with the proposed development of Deposit #2 or any other new deposit until NIRB has completed its

review of the proposed activity. Further, any new quarry development(s) that receive an approval to proceed from the NIRB will require an amendment to this Licence.

INAC, in its May 5, 2008 submission, recommended that the Licensee provide a quarry design plan to the Board prior to construction that assesses any impacts to freshwater quality that may result from the development and includes mitigation measures. The Board agrees with INAC, however it is not clear to the Board where material for construction of the road access and Enhanced Sewage Lagoon will be obtained.

Therefore, the Board requires as a condition in Part D Item 9 of this Licence, that the Licensee use clean material for construction, operation, and maintenance activities that is obtained from an approved source and which has been demonstrated not to produce Acid Rock Drainage and to be non-Metal Leaching.

In addition, for any approved source of aggregate material within the municipality, the Board requires as a condition in Part D Item 10 that the Licensee submit a quarry management plan to the Board for approval sixty (60) days following licence issuance that (a) confirms that material from the quarry does not produce acid rock drainage and is non-metal leaching; (b) provides an assessment of any potential impacts to freshwater quality; and (c) provides measures to mitigate any potential impacts to freshwater quality.

Water Use

The Hamlet of Kimmirut currently utilizes Fundo Lake as a source of potable water with the quantity used not to exceed 30,000 cubic metres annually. No concerns were raised by the parties in their written submissions as to the amount of water required by the Hamlet, the manner in which it is obtained or in the manner in which this water will be used. The NWB has renewed the terms and conditions associated with water use by the Hamlet accordingly.

Sewage

The Hamlet of Kimmirut currently discharges its untreated wastewater directly to a ditch which discharges into the sea, adjacent to the existing Solid Waste Disposal Facility, approximately 750 metres south of the community. In 2001 a new sewage lagoon was constructed approximately 1.5 km to the west of the community but has never been operated. An assessment of this existing facility determined that it did not have sufficient capacity to meet the over winter storage requirements of the Hamlet. A geotechnical investigation recommended that the existing earth berm which forms the lagoon be upgraded to provide slope stability and to prevent overtopping erosion. An assessment of wetlands potential for treatment determined that the large area below the sewage lagoon and gulch provided potential for meeting treatment requirements. Based on these assessments, construction of a second lagoon at the bottom of the gulch is being proposed to work in series with the existing lagoon prior to the release of sewage for wetland treatment. It

is proposed that in order to meet the requirements of the wetland assessment, sewage not be released to the wetlands until approximately mid June, when the wetlands are active.

As noted by INAC in its comments dated May 5, 2008, the Water Licence Application consists of a report, drawings, and recommendations prepared by the consultant (Trow Associates Inc.(Trow)) retained by the Applicant (Government of Nunavut, Department of Community Government Services (GN-CGS)). However, the Applicant does not specify which recommendations of its consultants would be implemented.

For greater certainty, the NWB has included a condition in Part E Item 1 of the Licence that requires the Licensee to implement the recommended options identified in the Water Licence Application document entitled *Design Brief Rehabilitation and Expansion of Existing Sewage Lagoon for the Hamlet of Kimmirut* dated January 2008 and prepared by Trow, and to follow the design as provided in the signed and stamped drawings numbered SP-1, L-1, L-2, DE-1, and T-1, dated 04/01/2008, Project No, OTCD00018881A, also prepared by Trow. In the event of a conflict between the conditions of this Licence and the above referenced document, the conditions of this License shall prevail.

INAC, in its comments dated May 5, 2008, also raised an issue regarding the potential effect on wastewater treatment due to changes to the Solid Waste Disposal Facility which may be relocated upstream of the Enhanced Sewage Disposal Facility. On August 7th, 2008, the Applicant clarified that relocation of the Solid Waste Disposal Facility is not being considered under the amendment application.

EC, in its comments dated January 10, 2007 recommended that parameter limits from the previous licence, which in EC's opinion are consistent with the 1992 Guidelines, should be carried forward to the renewal, assuming that the final discharge point is at the lagoon outlet and treatment does not include a wetland. This recommendation was provided prior to the Applicant's submission of the amendment application documents including the document entitled *Design Brief Rehabilitation and Expansion of Existing Sewage Lagoon for the Hamlet of Kimmirut* dated January 2008 and prepared by Trow which included the applicant's proposal to meet the previous licence parameter limits at the end of the Wetland Area. No further comments were received from EC regarding the applicant's updated proposal, however, the Board continues to agree with EC's comments and is therefore carrying forward effluent quality criteria from the previous licence to Part D Item 2 of the Licence renewal and amendment to be met at the lagoon outlet. To address the appropriate discharge limits to be used, the Hamlet may need to investigate operational parameters, using the system to hold sewage in one cell while a longer decant is carried out from the second cell, taking advantage of the growing season without overwhelming the wetlands vegetation. If the shorter decant is used, then lower, more stringent limits may be appropriate, with some allowance made for the polishing by the wetlands. Adequate monitoring of the site specific wetland treatment is necessary to confirm projected efficiencies and provide sufficient evidence for either less stringent limits to be regulated at the

lagoon discharge or relocating the compliance point from the lagoon discharge to the wetland outlet.

As noted by EC in its January 10th, 2008 submission, the Licensee must also ensure that any effluent discharged from the system's final discharge point is in compliance with Section 36(3) of the Fisheries Act. According to Section 36(3) of the Fisheries Act, the deposition of deleterious substances of any type, under any conditions where the deleterious substance, or any other deleterious substance that results from the deposit of the deleterious substance, may enter such water, is prohibited. The Licensee is advised that compliance with this Licence does not absolve the Licensee from the responsibility to comply with other applicable legislation.

Sewage Sludge

EC, in its January 10th, 2008 submission, recommended that prior to desludging, the Licensee should submit for approval a Sewage Sludge Management Plan that clearly outlines the chemical composition of the sludge and how sludge will be stored, treated and eventually disposed of. The Plan should also include estimates of the quantities of sludge likely produced and the required frequency of extraction. The GN-DOE also commented on January 9th, 2008, that the details related to the treatment and management of sewage sludge should be submitted for review.

The Board agrees with EC and the GN-DOE and requires that the O&M Plan referred to above, include procedures for the management of sludge from the Enhanced Sewage Disposal Facility.

Solid Waste

The Hamlet's Solid Waste Disposal Facility located just west of the location where sewage is currently discharged. According to the *Hamlet of Kimmirut Municipal Questionnaire for Water Licence Application Renewal of Water Licence #N514-1441* dated April 15, 2002, the Solid Waste Disposal Facility includes a waste oil storage area and a bulky scrap metal disposal area.

As stated by the Applicant in its response dated August 7th, 2008, no changes or modifications to the landfill are being considered under this renewal and amendment application. However, the Board notes that concerns regarding the management of hazardous materials, including waste oil, have been raised in inspection reports and intervener comments. As such, the Board requires that the O&M Plan referred to above include procedures for the management of hazardous materials. The Licensee is referred to the Government of Northwest Territories *Guide to the Used Oil and Waste Fuel Management Regulations* for guidance.

Abandonment and Restoration

To ensure that all existing end-of-life facilities are reclaimed in an appropriate manner, the NWB requires Licensees to submit an *Abandonment and Restoration Plan.* This Plan is to be submitted at least six (6) months prior to final closure of any licensed facility or upon the planned construction of new facilities to replace existing ones. The requirements for the Plan are outlined in Part G, Item 1 of this Licence.

Monitoring

Monitoring stations for the raw water supply and runoff from the Solid Waste Disposal Facility have been carried forward into the Licence renewal and amendment from the previous licence NWB3KIM0207.

New monitoring stations at the sewage lagoon discharge and compliance points as well as surface water at the end of the Wetland Area have been added to reflect the changes in the design of the Sewage Disposal Facility as proposed by the Applicant in the document entitled *Design Brief Rehabilitation and Expansion of Existing Sewage Lagoon for the Hamlet of Kimmirut* dated January 2008 and prepared by Trow.

Additional monitoring parameters have also been incorporated into the Licence renewal and amendment for the new monitoring stations to identify potential contaminants of concern.

LICENCE 3BM-KIM0911

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 KIMMIRUT
(Licensee)

of **BOX 120, KIMMIRUT, NUNAVUT X0A 0N0**
(Mailing Address)

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

Licence Number	**3BM-KIM0911**
Water Management Area	**NUNAVUT 05**
Location	**KIMMIRUT, QIKIQTANI REGION, NU (Latitude 62°50'6"N and Longitude 69°52'4"W)**
Purpose	**WATER USE AND WASTE DISPOSAL**
Description	**MUNICIPAL UNDERTAKINGS**
Quantity of Water Not to Exceed:	**30,000 CUBIC METRES ANNUALLY**
Date of Licence	**JANUARY 9, 2009**
Expiry Date of Licence	**JANUARY 29, 2011**

Dated this 9th of January, 2009 at Gjoa Haven, NU.

Thomas Kabloona
Nunavut Water Board,
Chair

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 Kimmirut, Qikiqtani Region, Nunavut (62°50' N; 69°52'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: **3BM-KIM0911**

"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 composite or grab samples collected from the monitoring stations identified in Part H;

"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;

"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;

"**Engineer**" means a professional engineer registered to practice in Nunavut in accordance with the *Engineering, Geological and Geophysical Act (Nunavut)* S.N.W.T. 1998, c.38, s.5;

"Enhanced Sewage Disposal Facility" comprises the area and engineered upper and lower sewage lagoons, and decant structures designed to contain and treat sewage as described in the Application for Water Licence renewal and amendment filed by the Applicant on February 15, 2008 and illustrated in Drawings SP-1, L-1, L-2, and DE-1 prepared by Trow Associates Inc., project no. OTCD00018881A dated 4/01/2008;

"Final Discharge Point" in respect of an effluent means an identifiable discharge point of a facility beyond which the operator of the facility no longer exercises 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;

"Geotechnical Engineer" means a professional engineer registered with the Association of Professional Engineers, Geologist and Geophysicists of Nunavut and whose principal field of specialization with the engineering properties of earth materials in dealing with man-made structures and earthworks that will be built on a site. These can include shallow and deep foundations, retaining walls, dams, and embankments;

"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;

"Maximum Average Concentration" means the average concentration of any four consecutively collected samples taken from the identical sampling location and taken during any given timeframe.

"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 Facility" comprises the area and engineered lagoon and decant structures designed to contain sewage, as described in the Application for Water Licence filed by the Applicant on May 17, 2001;

"Solid Waste Disposal Facility" comprises the area and associated structures (landfill site) designed to contain Solid Waste as described in the Application for Water Licence filed by the Applicant on May 17, 2001;

"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 Facility, the Enhanced Sewage Disposal Facility, and the Solid Waste Disposal Facility;

"Water Supply Facilities" comprises the area and associated intake infrastructure at Fundo Lake, as described in the Application for Water Licence filed by the Applicant on May 17, 2001;

"Wetland Area" comprises approximately 15 - 20 hectares of flat land immediately downstream of the lower sewage lagoon, at the bottom of a steep 25% slope, as described in the Application for Water Licence filed by the Applicant on February 15, 2008.

3. Enforcement

a. Failure to comply with this Licence will be a violation of the *Act*, subjecting the Licensee to the enforcement measures and the penalties provided for in the *Act*;

b. All inspection and enforcement services regarding this Licence will be provided by Inspectors appointed under the *Act*;

c. For the purpose of enforcing this Licence and with respect to the use of water and deposit or discharge of waste by the Licensee, Inspectors appointed under the *Act,* hold all powers, privileges and protections that are conferred upon them by the *Act* or by other applicable law; and

d. The Licensee shall, in relation to any application to renew or amend the Licence, have in place a Plan for Compliance approved by the Board in writing, to achieve full compliance with the conditions of this Licence, or a Plan for Compliance must be submitted at the time of Application, in order for the Application to be deemed complete.

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 "Monitoring Program" and an indication of wastewater treatment levels upstream and downstream of the Wetland Area;

b. modifications to the "Monitoring Program" in accordance with Part H Item 11;

c. the monthly and annual quantities in cubic metres of fresh water obtained at the Water Supply Facilities;

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

e. the annual quantity in cubic meters and tones of sludge removed from the Enhanced Sewage Disposal Facility along with the treatment, storage, and

disposal provided as required in Part H Item 6;

f. the results of sampling and analyses of sewage sludge in accordance with the Operations and Maintenance Manual referred to in Part F Item 2 and as required in Part H Item 5;

g. 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;

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

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

j. any updates or revisions for manuals and plans (i.e., *Operations and Maintenance Manual*) as required by changes in operation and/or technology;

k. detailed minutes of any public consultation and participation with local organizations and the residents of the community regarding licence amendments;

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

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

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

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

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

5. The Licensee shall, within ninety (90) days after the first visit by the Inspector following issuance of this Licence, post the necessary signs to identify the stations of the "Monitoring Program". All signage postings shall be in the Official Languages of Nunavut.

6. The Licensee shall post signs in the appropriate areas to inform the public of the location of the Water Supply Facilities and the Waste Disposal Facilities. All signage postings shall be in the Official Languages of Nunavut.

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

(a) Manager of Licensing:
Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU X0B 1J0
Telephone: (867) 360-6338
Fax: (867) 360-6369
Email: licensing@nunavutwaterboard.org

(b) Inspector Contact:
Water Resources Officer
Nunavut District, Nunavut Region
P.O. Box 100
Iqaluit, NU X0A 0H0
Telephone: (867) 975-4295
Fax: (867) 979-6445

(c) 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.

10. The Licensee shall ensure that all document(s) and correspondence submitted by the Licensee, to the Board, are received and acknowledged by the Manager of Licensing.

11. The Licensee shall submit to the Board for approval, within ninety (90) days of Licence issuance or upon the filing of any application in relation to the Licence within that time, a Plan for Compliance that clearly demonstrates the measures the Licensee will undertake, including an implementation schedule, to achieve full compliance with the conditions of this Licence, including the issues raised in the Inspector's Reports.

12. The Licensee shall, for all Plans submitted under this Licence, include a proposed timetable for implementation. Plans submitted, cannot be undertaken without subsequent written Board approval and direction. The Board may alter or modify a Plan if necessary to achieve the legislative objectives and will notify the Licensee in writing of acceptance, rejection or alteration of the Plan.

13. The Licensee shall, for all Plans submitted under this Licence, implement the Plan as approved by the Board in writing.

14. Every Plan to be carried out pursuant to the terms and conditions of this Licence shall become a part of this Licence, and any additional terms and condition imposed upon approval of a Plan by the Board become part of this Licence. All terms and conditions of the Licence should be contemplated in the development of a Plan where appropriate.

15. This Licence is not assignable except as provided in Section 44 of the Act.

PART C: CONDITIONS APPLYING TO WATER USE

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

2. The annual quantity of water, used for all purposes, shall not exceed thirty thousand (30,000) cubic metres.

3. The Licensee shall equip all water intake hoses with a screen of an appropriate mesh size to ensure that fish are not entrained and shall withdraw water at a rate such that fish do not become impinged on the screen.

4. The Licensee shall not remove any material from below the ordinary high water mark of any water body unless otherwise approved by the Board in writing.

5. The Licensee shall not cause erosion to the banks of any body of water and shall provide necessary controls to prevent such erosion.

6. Sediment and erosion control measures shall be implemented prior to and maintained during the operation to prevent entry of sediment into water.

PART D: CONDITIONS APPLYING TO WASTE DISPOSAL

1. Prior to commissioning the Enhanced Sewage Disposal Facility, the Licensee shall direct all Sewage to the Sewage Disposal Facility. Following construction of the Enhanced Sewage Disposal Facility, the Licensee shall direct all Sewage to the Enhanced Sewage Disposal Facility, or as otherwise approved by the Board in writing.

2. All Effluent discharged from the Sewage Disposal Facility at Monitoring Program Station KIM-3 and the Enhanced Sewage Disposal Facility at Monitoring Program Stations KIM-6 and KIM-7 shall not exceed the following Effluent quality limits:

Parameter	Maximum Average Concentration
BOD_5	120 mg/L
Total Suspended Solids	180 mg/L
Faecal Coliforms	1×10^6 CFU/100mL
Oil and grease	No visible sheen
pH	between 6 and 9

3. A Freeboard limit of 1.0 meter, or as recommended by a qualified geotechnical Engineer and as approved by the Board in writing, shall be maintained at all dams, dykes, or structures intended to contain, withhold, divert or retain water or wastes.

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

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

6. The Licensee shall dispose of and permanently contain all Solid Wastes at the Solid Waste Disposal Facility or as otherwise approved by the Board in writing.

7. The Licensee shall segregate and store all hazardous materials and/or hazardous waste, including waste oil, within the Solid Waste Disposal Facility in a manner as to prevent the deposit of deleterious substances into any water until such a time as proper disposal arrangements are made.

8. The Licensee shall implement measures to control wind-blown litter at the Solid Waste Disposal Facility.

9. The Licensee shall use clean material for construction, operation, and maintenance activities that is obtained from an approved source and which has been demonstrated not to produce acid rock drainage and to be non-metal leaching.

10. For any approved source of material within the municipality, the Licensee shall submit to the Board for approval sixty (60) following licence issuance, a quarry management plan that includes the following:

    a. Confirmation that the quarry material does not produce acid rock drainage and is non-metal leaching;
    b. An assessment of any potential impacts to freshwater quality; and
    c. Mitigation measures.

PART E: CONDITIONS APPLYING TO MODIFICATION AND CONSTRUCTION

1. The Licensee shall implement the recommended options identified in the Water Licence Application document entitled *Design Brief Rehabilitation and Expansion of Existing Sewage Lagoon for the Hamlet of Kimmirut* dated January 2008, and shall follow the design as provided in the signed and stamped drawings numbered SP-1, L-1, L-2, DE-1, and T-1, dated 04/01/2008 (Trow Associates Inc. Project No. OTCD00018881A). In the event of a conflict between the conditions of this Licence and the above referenced document, the conditions of this License shall prevail.

2. The Licensee shall submit to the Board for approval, design drawings stamped and signed by a qualified engineer registered in Nunavut, 6 months prior to the construction of any dams, dykes or structures intended to contain, withhold, divert or retain water or wastes.

3. 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. these modifications do not place the Licensee in contravention of the Licence or the Act;
    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.

4. Modifications for which all of the conditions referred to in Part E, Item 3, have not been met, may only be carried out upon written approval from the Board. The Licensee shall provide as-built plans and drawings of the Modifications referred to in this Licence within ninety (90) days of completion of the Modification. These plans and drawings shall be stamped by an Engineer.

5. All activities shall be conducted in such a way as to minimize impacts on surface drainage and the Licensee shall immediately undertake any corrective measures in the event of any impacts on surface drainage.

6. The Licensee shall ensure that sediment and erosion control measures are implemented prior to and maintained during activities carried out under this Part to prevent the release of sediment and minimize erosion.

7. The construction or disturbance of any stream/lake bed or banks of any definable water course are not permitted, unless authorized by the Board in writing.

PART F: CONDITIONS APPLYING TO OPERATION AND MAINTENANCE

1. The Licensee shall submit to the Board for approval, within ninety (90) days following issuance of the Licence, an Operation and Maintenance (O&M) Manual for the Sewage Disposal Facility and Solid Waste Disposal Facility, prepared where appropriate in accordance with the *"Guidelines for the Preparation of an Operation and Maintenance Manual for Sewage and Solid Waste Disposal Facilities in the Northwest Territories; 1996"*. The Manual shall take into consideration the comments received during the application review process.

2. The Licensee shall submit to the Board for approval, immediately following the first operating season of the Enhanced Sewage Disposal Facility, a revision to the Operations and Maintenance (O&M) Manual referred to in Part F Item 1, The Manual shall take into consideration the comments received during the application review process and shall contain the following plans:

    a. *Sewage and Solid Waste Operation and Maintenance Plan*;
    b. Hazardous Waste Management Plan;
    c. Sludge Management Procedures;
    d. Spill Contingency Plan;
    e. A plan for the modification of streams and bodies of water within the municipality including crossing; and
    f. Monitoring Program Quality Assurance/Quality Control Plan (QA/QC Plan).

3. The Licensee shall review the O&M Manual referred to in Part F, Items 1 and 2 as required by changes in operation and/or technology and modify accordingly. Revisions are to be submitted in the form of an Addendum to be included with the Annual Report.

4. An inspection of all engineered facilities related to the management of water and waste shall be carried out annually in July or August by a Geotechnical Engineer. The engineer's report shall be submitted to the Board within sixty (60) days of the inspection,

including a covering letter from the Licensee outlining an implementation plan addressing each of the Engineer's recommendations.

5. The Licensee shall perform more frequent inspections of the engineered facilities at the request of an Inspector.

6. 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 measures as approved under the Operation and Maintenance Manual for the Hamlet of Clyde River
   b. report the incident immediately via the 24-Hour Spill Reporting Line at (867) 920-8130 and to the Inspector at (867) 975-4295; and
   c. submit to the Inspector, a detailed report on each occurrence, not later than thirty (30) days after initially reporting the event, that provides the necessary information on the location (including the GPS coordinates), initial response action, remediation/clean-up, status of response (ongoing, complete), proposed disposal options for dealing with contaminated materials and any preventative measures to be implemented.

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 a) abandoning of any facilities and b) the construction of new facilities to replace existing ones. Where applicable, the Plan shall include information on the following:

   a. solid waste facility;
   b. water intake facilities;
   c. the water treatment and waste disposal sites and facilities;
   d. petroleum and chemical storage areas;
   e. any site affected by waste spills;
   f. leachate prevention;
   g. an implementation schedule;
   h. maps delineating all disturbed areas, and site facilities;
   i. consideration of altered drainage patterns;
   j. type and source of cover materials;
   k. future area use;
   l. hazardous wastes; and
   m. a proposal identifying measures by which restoration costs will be financed by the Licensee upon abandonment.

PART H: CONDITIONS APPLYING TO THE MONITORING PROGRAM

1. The Licensee shall maintain Monitoring Program Stations and implement the program as described in the table below and the conditions under this Part.

Monitoring Program Station Number	Description	Frequency	Status
KIM-1	Raw water supply intake at Fundo Lake	Volume Monthly and Annually	Active (Volume)
KIM-2	Runoff from Solid Waste Disposal Facilities	Water Quality Once at the beginning, middle and near the end of the season when flow is observed	Active (Water Quality)
KIM-3	Effluent discharge from existing Sewage Disposal Facility	Volume Monthly and Annually Water Quality Monthly during months of May to August inclusive	Active (Volume and Water Quality)
KIM-4	Enhanced Sewage Disposal Facility - Upper Lagoon Spillway	Volume Monthly and Annually Water Quality Twice Annually – start of overflow/start of decanting	New (Volume and Water Quality)
KIM-5	Enhanced Sewage Disposal Facility - Upper Lagoon Pump Discharge	Volume Monthly and Annually Water Quality Twice Annually – start of overflow/start of decanting	New (Volume and Water Quality)
KIM-6	Enhanced Sewage Disposal Facility - Lower Lagoon Spillway	Volume Monthly and Annually Water Quality Twice Annually - start and end of decanting	New (Volume and Water Quality)

KIM-7	Enhanced Sewage Disposal Facility - Lower Lagoon Pump Discharge	Volume Monthly and Annually Water Quality Twice Annually – start and end of decanting	New (Volume and Water Quality)
KIM-8	Surface water at end of Wetland Area	Water Quality Monthly during periods of flow from spring to freezeup	New (Water Quality)

2. The Licensee shall confirm the locations and GPS coordinates for all monitoring stations referred to in Part H Item 1 with an Inspector.

3. The Licensee shall collect samples at Monitoring Program Stations KIM-2, KIM-3, KIM-4, KIM-5, KIM-6, KIM-7, and KIM-8 according to the frequency provided in Part H Item 1. Samples shall be analyzed for the following parameters:

Biochemical Oxygen Demand – BOD_5	Faecal Coliforms
Total Suspended Solids	pH
Conductivity	Nitrate-Nitrite
Oil and Grease (visual)	Total Phenols
Magnesium	Calcium
Sodium	Potassium
Chloride	Sulphate
Total Hardness	Total Alkalinity
Ammonia Nitrogen	Total Zinc
Total Cadmium	Total Iron
Total Cobalt	Total Manganese
Total Chromium	Total Nickel
Total Copper	Total Lead
Total Aluminum	Total Arsenic
Total Mercury	Total Organic Carbon (TOC)
Total Petroleum Hydrocarbons (KIM-2 and KIM-13 only)	

4. The Licensee shall measure and record in cubic meters, the monthly and annual quantities of water pumped from Monitoring Program Station KIM-1 for all purposes and effluent pumped or discharged from Monitoring Program Stations KIM-3, KIM-4, KIM-5, KIM-6, and KIM-7.

5. The Licensee shall sample and analyse sludge in accordance with the approved Operations and Maintenance Manual referred to in Part F Item 2.

6. The Licensee shall measure and record the annual quantities of sludge removed from the Enhanced Sewage Disposal Facility along with the methods of treatment, storage, and disposal provided.

7. Additional monitoring stations, sampling and analysis may be requested by an Inspector.

8. 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 as approved by the Board in writing.

9. All analyses shall be performed by a laboratory certified by the Canadian Association of Environmental Analytical Laboratories (CAEAL), or as otherwise approved by an Analyst.

10. The Licensee shall include all of the data and information required by the Monitoring Program as well as an indication of wastewater treatment levels upstream and downstream of the Wetland Area in the Licensee's Annual Report, as required *per* Part B, Item 1, or as requested by an Inspector.

11. The Licensee shall, within sixty (60) days of Licence issuance, submit to the Analyst for approval, a Quality Assurance/ Quality Control (QA/QC) Plan, which addresses both field and laboratory requirements. The Plan shall be submitted to the Board upon approval by the Analyst for inclusion with the O&M Manual, required under Part F, Item 2(f).

12. Modifications to the Monitoring Program may be made only upon written approval from the NWB.

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

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HAMLET OF KIMMIRUT
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 3 of Part H of Nunavut Water Board Licence 3BM-KIM0911 in Appendix B)	☐
Personal Protective Equipment	Ensure that the necessary personal protective equipment (PPE), including 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 KIM-1	Station KIM-1 (see Figure 2) is a raw water supply (from Fundo 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 KIM-1.	☐
SOLID WASTE DISPOSAL FACILITIES		
Sampling Station KIM-2	Landfill runoff is collected at the beginning, middle, and near the end of the season when flow is observed (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.	☐
EXISTING SEWAGE DISPOSAL FACILITY		
Sampling Station KIM-3	Effluent discharge is collected from the existing Sewage Disposal Facility (see Figure 2) monthly during the months of May to August (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.	☐

ENHANCED SEWAGE DISPOSAL FACILITY		
Sampling Station KIM-4	Effluent discharge is collected from the Upper Lagoon Spillway (see Figure 2) of the Enhanced Sewage Disposal Facility twice annually (start of the overflow and start of the decanting - see Schedule in Appendix E for timing and list of parameters to be sampled). Effluent samples are collected from the spillway by immersing the sample bottle into the effluent 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 KIM-5	Effluent discharge is collected from the Upper Lagoon Pump Discharge (see Figure 2) of the Enhanced Sewage Disposal Facility twice annually (start of the overflow and start of the decanting - see Schedule in Appendix E for timing and list of parameters to be sampled). Effluent samples are collected from the pump discharge by immersing the sample bottle into the effluent 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 KIM-6	Effluent discharge is collected from the Lower Lagoon Spillway (see Figure 2) of the Enhanced Sewage Disposal Facility twice annually (start and end of the decanting - see Schedule in Appendix E for timing and list of parameters to be sampled). Effluent samples are collected from the spillway by immersing the sample bottle into the effluent 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 KIM-7	Effluent discharge is collected from the Lower Lagoon Pump Discharge (see Figure 2) of the Enhanced Sewage Disposal Facility twice annually (start and end of the decanting - see Schedule in Appendix E for timing and list of parameters to be sampled). Effluent samples are collected from the pump discharge by immersing the sample bottle into the effluent 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.	☐
WETLAND AREA		
Sampling Station KIM-8	A surface water sample is collected at the end of the Wetland Area (see Figure 2) monthly during periods of flow from spring to freeze-up (see Schedule in Appendix E for timing and list of parameters to be sampled). The surface water samples are collected from the wetland by immersing the sample bottle into the wetland 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-KIM0911).	☐

Checklist Performed By:

Name	Signature	Date

Sample Bottle Requirements for Parameters Listed in Condition 3 of Part H of Nunavut Water Board Licence No. 3BM-KIM0911

Parameter	Recommended Sample Container	Preservative	Hold Time
Alkalinity	500 mL plastic	None	14 days
Anions (Br, Cl, F, NO_3, NO_2, PO_4, SO_4)	500 mL plastic	None	5/28 Days
Biochemical Oxygen Demand (BOD_5)	500 mL plastic	None	4 days
Carbon, Total Organic (TOC)	250 mL plastic	H_2SO_4 (pH < 2)	10 days
Conductivity	500 mL plastic	None	28 days
Dissolved ICPMS, ICP Metals	250 mL plastic	HNO3 (pH < 2)	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
Total Hardness	500 mL plastic	None	28 days
Total Petroleum Hydrocarbons	2 x 500 mL amber glass	$NaHSO_4$ (pH < 2)	40 days
	3 x 40 mL clear glass septum vial	$NaHSO_4$ (pH < 2)	14 days

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Appendix D:
Completed Example of Chain of Custody Documentation

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CADUCEON™
ENVIRONMENTAL LABORATORIES
Client committed. Quality assured.

- [ ] O.Reg 153/04 (1__ 2__ 3__ 4__ 5__ 6__)
- [ ] MISA Guidelines
- [ ] Provincial Water Quality Objectives
- [ ] Sewer Use By-Law: _____
- [ ] ODWS (Non Regulatory)
- [ ] O.Reg 558 Leachate Analysis
- Disposal Site: _____
- [x] Other: CCME

Turnaround Time Requested

Rush 24 Hr	[ ]	100% Surcharge	
Rush 48 Hr	[ ]	50% Surcharge	
Rush 72 Hr	[ ]	25% Surcharge	
5-7 Day	[x]	Standard	

Specific Date: _____

Organization: EXP SERVICES INC	Address and Invoicing Address (if different): 100 - 2650 Queensview Dr. Ottawa, ON K2B 8H6
Contact: Robert Renaud	
Tel: 613-688-1899	
Fax: 613-225-7337	Quote No.:
Email: robert.renaud@exp.com	P.O. No.:
	Project Name: OTT-00209248-A0
	Additional Info: Waybill # 245-45556615

REPORT NUMBER:

Lab No.	Sample Identification	Sample Matrix *	Date Collected (yy-mm-dd)	Time Collected	Alkalinity, pH	Ammonia-N, Toc	BOD	Anions - Cl, NO2/NO3	Fecal Coliforms	Phenols	Total Metals, Hg	TSS, Conductivity	Hardness (CaCO3)	Field pH	Field Temp.	# Bottles/ Sample	Field Filtered(Y/N)
	KIM-8	SW	13-07-23	11:00	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–	8	N

Indicate Test For Each Sample By Using A Check Mark In The Box Provided

Sample Submission Information

- Sampled By (print): Rob Renaud
- Submitted By (print): Rob Renaud
- Signature: Rob Renaud
- Date(yy-mm-dd): 13-07-23 Time: 12:00

Shipping Information

- [x] Courier (Client account)
- [ ] Courier (Caduceon account)
- [ ] Drop Off
- [ ] Caduceon (Pick-up)

Reporting and Invoicing

- Invoice for Shipping: [ ]
- # of Pieces: 1
- [ ] Fax Results
- [x] Email Results
- [x] Invoice by Email
- [ ] Invoice by Mail

LABORATORY USE ONLY

- Received By (print): Signature:
- Date(yy-mm-dd) Received: Time Received:
- Comments: Laboratory Prepared Bottles: [ ] YES [ ] NO

* Sample Matrix Legend: WW=Waste Water SW=Surface Water GW=Groundwater LS=Liquid Sludge SS=Solid Sludge S=Soil Sed=Sediment PC=Paint Chips F=Filter

Laboratory Locations/Shipping Addresses

Kingston Lab - 285 Dalton Ave., Kingston, ON K7K 6Z1, Tel: (613) 544-2001 Fax: (613) 544-2770 Email: contactkingston@caduceonlabs.com
Ottawa Lab - 2378 Holly Lane, Ottawa, ON K1V 7P1, Tel: (613) 526-0123 Fax: (613) 526-1244 Email: contactottawa@caduceonlabs.com
Peterborough Lab - #206-160 Charlotte St., Peterborough, ON K9J 2T8, Tel: (705) 748-1506 Fax: (705) 748-6514 Email: contactpeterborough@caduceonlabs.com
Windsor Lab - #5-3201 Marentette Ave., Windsor, ON N8X 4G3, Tel: (519) 966-9541 Fax: (519) 966-9567 Email: contactwindsor@caduceonlabs.com
Moncton Lab - 150 Lutz St., Moncton, NB E1C 5E9, Tel: (506) 855-6472 Fax: (506) 855-8294 Email: contactmoncton@caduceonlabs.com

C 15189

White: Lab Copy / Yellow: Invoicing Copy / Pink: Client Copy

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Appendix E:
Environmental Monitoring Program Schedule

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Kimmirut Monitoring Program Schedule
Nunavut Water Board Licence No. 3BM-KIM0911

Monitoring	Location	Month												
Station ID	Description	January	February	March	April	May	June	July	August	September	October	November	December	Annual
KIM-1	Raw water supply intake at Fundo Lake	V	V	V	V	V	V	V	V	V	V	V	V	V
KIM-2	Runoff from Solid Waste Disposal Facilities						R+	R+		R+				
KIM-3	Effluent discharge from existing Sewage Disposal Facility	V	V	V	V	V, R+	V, R+	V, R+	V, R+	V	V	V	V	V
KIM-4	Enhanced Sewage Disposal Facility - Upper Lagoon Spillway	V	V	V	V	V	V, R	V	V	V, R	V	V	V	V
KIM-5	Enhanced Sewage Disposal Facility - Upper Lagoon Pump Discharge	V	V	V	V	V	V, R	V	V	V, R	V	V	V	V
KIM-6	Enhanced Sewage Disposal Facility - Lower Lagoon Spillway	V	V	V	V	V	V	V	V	V, R, R	V	V	V	V
KIM-7	Enhanced Sewage Disposal Facility - Lower Lagoon Pump Discharge	V	V	V	V	V	V	V	V	V, R, R	V	V	V	V
KIM-8	Surface water at end of Wetland Area					R	R	R	R	R	R			

Test Groups		
V	Volume (m^3)	
R	Routine	(Biochemical Oxygen Demand (BOD_5), Total Suspended Solids (TSS), conductivity, oil & grease (visual), magnesium, sodium, chloride, total hardness, ammonia nitrogen, total cadmium, total cobalt, total chromium, total copper, total aluminum, total mercury, faecal coliforms, pH, nitrate-nitrite, total phenols, calcium, potassium, sulphate, total alkalinity, total zinc, total iron, total manganese, total nickel, total lead, total arsenic, total organic carbon (TOC))
R+	Routine + TPH	All Routine parameter plus Total Petroleum Hydrocarbons (TPH)

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Appendix F:
Subcontract Laboratory Accreditation & Supporting Documentation

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CALA
Canadian Association for Laboratory Accreditation Inc.

CALA Directory of Laboratories

Membership Number: 2644
Laboratory Name: Caduceon Environmental Laboratories (Ottawa)
Parent Institution: Caduceon Enterprises Inc.
Address: 2378 Holly Lane Ottawa ON K1V 7P1
Contact: Mr. Greg Clarkin
Phone: (613) 526-0123
Fax: (613) 526-1244
Email: gclarkin@caduceonlabs.com

Standard: Conforms with requirements of ISO/IEC 17025
Clients Served:
Revised On: May 9, 2013
Valid To: October 25, 2015

Scope of Accreditation

Air (Inorganic)
Metals - Air Filter (012)
D-ICP-02; modified from APHA 3120 B
ICP - DIGESTION
Cadmium
Chromium
Cobalt
Copper
Iron
Lead
Manganese
Molybdenum
Nickel
Zinc

Air (Inorganic)
Total Suspended Particulates - Air Filter (018)
A-TSP-01; modified from MOEE E3288A
GRAVIMETRIC
Total Suspended Particulates

Dustfall
Total/Insoluble Dustfall - Dustfall (020)
A-DF-01; modified from MOEE DF-E3043A
FILTRATION - GRAVIMETRIC
Insoluble Dustfall
Total Dustfall

† "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

Fluoride Candles
Fluoride - Candles (019)
A-FISE-01; modified from MOEE FSIE-1983D
DIGESTION - ISE
Fluoride

Oil (Organic)
Polychlorinated Biphenyls (PCB) - Oil (040)
C-PCB-01; modified from EPA 8081
GC/ECD - EXTRACTION
Aroclor 1242
Aroclor 1248
Aroclor 1254
Aroclor 1260

Solids (Inorganic)
Anions - Soils, Biosolids (069)
A-IC-01; modified from APHA 4110 C
ION CHROMATOGRAPHY - EXTRACTION
Chloride
Nitrate
Nitrite
Sulphate

Solids (Inorganic)
Boron (Hot Water Soluble) - Soil (098)
D-ICP-02; MOE-LaSB E3470
ICP/AES - EXTRACTION
Boron

Solids (Inorganic)
Conductivity - Soil, Sediments (099)
A-CONDO-03; SM 2510 B & MOE-LaSB E 3138
CONDUCTIVITY METER - EXTRACTION
Conductivity

Solids (Inorganic)
Extractable Anions - Leachate (090)
A-IC-01; modified from EPA 1311, APHA 4110-C
ION CHROMATOGRAPHY - TCLP
Nitrate
Nitrite

Solids (Inorganic)
Extractable Metals - Leachate (091)
D-ICP-01; modified from EPA 1311/APHA 3120 B
ICP/AES - TCLP
Arsenic
Barium
Beryllium
Boron
Cadmium
Chromium
Lead
Nickel
Silver
Zinc

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Solids (Inorganic)
Extractable Metals - Leachate (092)
D-ICPMS-01; modified from EPA 1311/EPA 200.8
ICP/MS - TCLP
Antimony
Arsenic
Selenium
Uranium

Solids (Inorganic)
Extractable Metals - Leachate (093)
D-HG-02; modified from EPA 1311/SM 3112 B
COLD VAPOUR AA - TCLP
Mercury

Solids (Inorganic)
Flash Point - Soil, Solid Waste (096)
C-FPCC-01; modified FROM ASTM D93-10
CLOSED CUP FLASH POINT TESTER
Flashpoint

Solids (Inorganic)
Hexavalent Chromium - Soil (094)
D-CRVI-02; modified from EPA 3060A EPA 7196 A
COLORIMETRIC - MANUAL
Chromium (VI)

Solids (Inorganic)
Mercury - Soil, Solid Biosolids (017)
D-HG-01; modified from EPA 7471A
COLD VAPOUR AA - DIGESTION
Mercury

Solids (Inorganic)
Metals - Soil, Solid Biosolids (015)
D-ICP-02; modified from EPA 6010
ICP/OES - DIGESTION
Aluminum
Antimony
Arsenic
Barium
Beryllium
Boron
Cadmium
Calcium
Chromium
Cobalt
Copper
Iron
Lead
Magnesium
Manganese
Molybdenum
Nickel
Potassium
Silver
Sodium
Strontium

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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

Tin
Titanium
Tungsten
Vanadium
Zinc

Solids (Inorganic)
pH - Soil, Sediment, Solid Sludge (100)
A-pH-03; SM 4500 H & MOE-LaSB E3137
pH METER - EXTRACTION
pH

Solids (Inorganic)
Total Metals - Soils, Biosolids (070)
D-ICPMS-01; modified from EPA 6020
ICP/MS - DIGESTION
Antimony
Arsenic
Selenium
Silver
Thallium
Uranium

Solids (Organic)
Extractable Volatile Organic Compounds (VOC) - Leachate (089)
C-VOC-01; modified from EPA SW-846 METHOD 1311, 5030/8260
GC/MS - PURGE AND TRAP - TCLP
1,1-Dichloroethylene
1,2-Dichlorobenzene
1,2-Dichloroethane
1,4-Dichlorobenzene
Benzene
Carbon tetrachloride
Chlorobenzene
Chloroform
Dichloromethane
Methyl ethyl ketone
Tetrachloroethylene
Trichloroethylene
Vinyl chloride

Solids (Organic)
Petroleum Hydrocarbons (PHC) - Soil (075)
C-PHCS-01; modified from CCME CWS REF. METHOD & MOE E3398
GC/FID - EXTRACTION
F2: C10-C16
F3: C16-C34
F4: C34-C50

Solids (Organic)
Petroleum Hydrocarbons (PHC) - Soil (097)
C-PHCS-01; modified from CCME CWS REF. METHOD & MOE E3398
GRAVIMETRIC
F4: Gravimetric

† "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

Solids (Organic)
Polychlorinated Biphenyls (PCB) - Soil (053)
C-PCB-02; modified from EPA 8000/8081
GC/ECD - EXTRACTION
Aroclor 1242
Aroclor 1248
Aroclor 1254
Aroclor 1260

Solids (Organic)
Volatile Organic Compounds (VOC) - Soil (063)
C-VOC-02; modified from EPA 8260
GC/MS - PURGE AND TRAP
1,1 - Dichloropropene
1,1-Dichloroethane
1,1-dichloroethylene
1,1,1-Trichloroethane
1,1,1,2 - Tetrachloroethane
1,1,2-Trichloroethane
1,1,2,2-Tetrachloroethane
1,2 - Dibromo - 3 - chloropropane
1,2-dichlorobenzene
1,2-dichloroethane
1,2-Dichloropropane
1,2,3 - Trichlorobenzene
1,2,3 - Trichloropropane
1,2,4 - Trichlorobenzene
1,2,4 - Trimethylbenzene
1,3 - Dichloropropane
1,3-Dichlorobenzene
1,3,5 -Trimethylbenzene
1,4-dichlorobenzene
2 - Chlorotoluene
2 - Hexanone (MBK)
2,2 - Dichloropropane
4 - Chlorotoluene
Acetone (2-Propanone)
Benzene
Bromobenzene
Bromodichloromethane
Bromoform
Bromomethane
Carbon Tetrachloride
Chlorobenzene
Chlorodibromomethane
Chloroethane
Chloroform
Chloromethane
cis-1,2-Dichloroethylene
cis-1,3-Dichloropropene
Dibromomethane
Dichlorodifluoromethane
Dichloromethane
Ethylbenzene

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Ethylene Dibromide
Hexachlorobutadiene
Hexane
Isopropylbenzene
Isopropyltoluene
m/p-xylene
Methyl Ethyl Ketone
Methyl isobutyl Ketone
Methyl t-butyl ether
n - Butylbenzene
Naphthalene
o-xylene
Propylbenzene
sec - Butylbenzene
Styrene
tert - Butylbenzene
Tetrachloroethylene
Toluene
trans-1,2-Dichloroethylene
trans-1,3-Dichloropropene
Trichloroethylene
Trichlorofluoromethane
Vinyl Chloride

Solids (Organic)
Volatile Petroleum Hydrocarbons (VPH) - Soil (073)
C-GRO-01; modified from CCME CWS REF. METHOD & MOE E3398
GC/FID - PURGE AND TRAP
F1: C6-C10

Water (Inorganic) OSDWA †
Alkalinity - Water (088)
A-ALK-03; modified from APHA 2320 B
AUTO TITRIMETRIC
Alkalinity (pH 4.5)

Water (Inorganic) OSDWA †
Ammonia - Water, Wastewater, Liquid Biosolids (055)
A-NH3-01; modified from MOEE RNDNP-E3364, SDNP-E3366
AUTO COLOR
Ammonia
Ammonia - Nitrogen

Water (Inorganic)
Ammonia - Water, Wastewater, Liquid Biosolids (103)
A-NH3-01; modified from MOEE RNDNP-E3364, SDNP-E3366
COLORIMETRIC - DISCRETE
Ammonia

Water (Inorganic) OSDWA †
Anions - Water, Wastewater, Liquid Biosolids (002)
A-IC-01; modified from APHA 4110 C
ION CHROMATOGRAPHY
Bromide
Chloride
Fluoride
Nitrate
Nitrite

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Sulfate

Water (Inorganic) OSDWA †
Biochemical Oxygen Demand (BOD) - Water (008)
C-BOD-01; modified from APHA 5210 B
D.O. METER
BOD (5 day)
CBOD (5 day)

Water (Inorganic) OSDWA †
Carbon - Water (054)
C-OC-01; modified from APHA 5310C, EPA 415.1
IR-UV-PERSULFATE
Organic Carbon

Water (Inorganic) OSDWA †
Chemical Oxygen Demand (COD) - Water (083)
C-COD-01; modified from APHA 5220 D
COLORIMETRIC
COD

Water (Inorganic) OSDWA †
Colour - Water (027)
A-COL-01; modified from APHA 2120 C
SPECTROPHOTOMETRIC
True Colour

Water (Inorganic) OSDWA †
Conductivity - Water (003)
A-COND-01; modified from APHA 2510 B
CONDUCTIVITY METER
Conductivity (25°C)

Water (Inorganic) OSDWA †
Conductivity - Water (087)
A-COND-02; modified from APHA 2510 B
AUTO CONDUCTIVITY METER
Conductivity (25°C)

Water (Inorganic) OSDWA †
Dissolved and Extractable Metals - Water (004)
D-ICP-01; modified from APHA 3120 B
ICP
Aluminum
Barium
Beryllium
Bismuth
Boron
Cadmium
Calcium
Chromium
Cobalt
Copper
Iron
Lead
Lithium
Magnesium
Manganese
Molybdenum

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Nickel
Potassium
Silicon
Silver
Sodium
Strontium
Tin
Titanium
Tungsten
Vanadium
Yttrium
Zinc
Zirconium

Water (Inorganic) OSDWA †
Dissolved Metals - Water (049)
D-ICPMS-01; modified from EPA 200.8
ICP/MS
Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium
Cobalt
Copper
Lead
Molybdenum
Selenium
Silver
Thallium
Uranium
Vanadium

Water (Inorganic)
Hexavalent Chromium - Water (095)
D-CRVI-01; modified from MOE - HEXCR-E3056
COLORIMETRIC - MANUAL
Chromium (VI)

Water (Inorganic) OSDWA †
Mercury - Water, Wastewater (025)
D-HG-02; modified from APHA 3112 B
COLD VAPOUR AA - DIGESTION
Mercury

Water (Inorganic)
Nitrate + Nitrite - Water (102)
A-NO23-01; modified from SM 4500-NO3-F
COLORIMETRIC - DISCRETE ANALYZER
Nitrate plus Nitrite

Water (Inorganic)
Nitrite - Water (101)
A-NO2-01; modified from SM 4500-NO2-B
COLORIMETRIC - DISCRETE ANALYZER
Nitrite

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Water (Inorganic) OSDWA †
Nitrogen - Water, Wastewater, Liquid Biosolids (033)
A-TKN-01; modified from MOEE RTNP-E3367
AUTO COLOR - DIGESTION
Total Kjeldahl Nitrogen

Water (Inorganic)
Orthophosphate - Water (104)
A-PO4-01; modified from MOEE RNDNP-E3364, SDNP-E3366
COLORIMETRIC - DISCRETE
Phosphate

Water (Inorganic) OSDWA †
pH - Water (005)
A-pH-01; modified from APHA 4500 H
pH METER
pH

Water (Inorganic) OSDWA †
pH - Water (086)
A-pH-02; modified from APHA 4500H+ B
AUTO - pH METER
pH

Water (Inorganic) OSDWA †
Phenols - Water (056)
C-PHEN-01; modified from MOE ROPHEN-E3179
AUTO, 4-AAP
Total Phenolics

Water (Inorganic) OSDWA †
Phosphate - Water (058)
A-PO4-01; modified from MOEE RNDNP-E3364, SDNP-E3366
AUTO COLOR
Phosphate

Water (Inorganic)
Total Metals - Water, Wastewater, Liquid Biosolids (067)
D-ICP-01; modified from APHA 3120 B
ICP/AES - DIGESTION
Aluminum
Antimony
Arsenic
Barium
Beryllium
Bismuth
Boron
Cadmium
Calcium
Chromium
Cobalt
Copper
Iron
Lead
Lithium
Magnesium
Manganese
Molybdenum

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Nickel
Potassium
Silver
Sodium
Strontium
Tin
Titanium
Tungsten
Vanadium
Yttrium
Zinc
Zirconium

Water (Inorganic)
Total Metals - Water, Wastewater, Liquid Biosolids (071)
D-ICPMS-01; modified from EPA 6020
ICP/MS - DIGESTION
Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium
Cobalt
Copper
Lead
Molybdenum
Selenium
Silver
Vanadium

Water (Inorganic) OSDWA †
Total Phosphorus - Water, Wastewater, Liquid Biosolids (057)
A-TP-01; modified from MOEE RTNP-E3367
AUTO COLOR - DIGESTION
Total Phosphorus

Water (Inorganic) OSDWA †
Total Suspended Solids (TSS) - Water (009)
A-TSS-01; modified from APHA 2540 D
GRAVIMETRIC
Total Suspended Solids

Water (Inorganic) OSDWA †
Turbidity - Water (026)
A-TURB-01; modified from APHA 2130 B
NEPHELOMETRY
Turbidity

Water (Microbiology) OSDWA †
Coliforms - Water (050)
B-ECTC-01; modified from MICROMFDC-E3407
MEMBRANE FILTRATION (DC)
Background Bacteria
Escherichia coli (E. coli)
Total Coliforms

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Water (Microbiology) OSDWA †
Escherichia coli (E. coli) - Water (010)
B-MFEC-01; modified from MFMICRO-E3371
MEMBRANE FILTRATION (EC)
Escherichia coli (E. coli)

Water (Microbiology) OSDWA †
Fecal (Thermotolerant) Coliforms - Water (065)
B-MFFC-01; modified from MFMICRO-E3371
MEMBRANE FILTRATION (mFC)
Fecal (Thermotolerant) Coliforms

Water (Microbiology) OSDWA †
Heterotrophic Plate Count (HPC) - Water (021)
B-HPC-01; modified from APHA 9215 C
SPREAD PLATE
Heterotrophic Plate Count (HPC)

Water (Microbiology) OSDWA †
Total Coliforms - Water (066)
B-MFTC-01; modified from MFMICRO-E3371
MEMBRANE FILTRATION (mENDO)
Background Counts
Total Coliforms

Water (Organic) OSDWA †
Glycols - Water (085)
C-GLYCOL-01; modified from EPA 8015 B
DIRECT INJECTION GC-FID
Diethylene Glycol
Ethylene Glycol
Propylene Glycol

Water (Organic) OSDWA †
Petroleum Hydrocarbons (PHC) - Water (072)
C-GRO-01; modified from MOE E3421
GC/FID - PURGE AND TRAP
F1: C6-C10

Water (Organic) OSDWA †
Petroleum Hydrocarbons (PHC) - Water (074)
C-PHCW-02; modified from MOE E3421
GC/FID - EXTRACTION
F2: C10-C16
F3: C16-C34
F4: C34-C50

Water (Organic) OSDWA †
Volatile Organic Compounds (VOC) - Water (041)
C-VOC-01; modified from EPA 8260 and 5030
GC/MS - PURGE AND TRAP
1,1-Dichloroethane
1,1-dichloroethylene
1,1-Dichloropropene
1,1,1-Trichloroethane
1,1,1,2-Tetrachloroethane
1,1,2-Trichloroethane
1,1,2,2-Tetrachloroethane
1,2-Dibromo-3-chloropropane

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1,2-dichlorobenzene
1,2-dichloroethane
1,2-Dichloropropane
1,2,3-Trichlorobenzene
1,2,3-Trichloropropane
1,2,4-Trichlorobenzene
1,2,4-Trimethylbenzene
1,3-Dichlorobenzene
1,3-Dichloropropane
1,3,5-Trimethylbenzene
1,4-dichlorobenzene
2-Chlorotoluene
2-Hexanone (MBK)
2,2-Dichloropropane
4-Chlorotoluene
4-Isopropyl Toluene
Acetone (2-Propanone)
Benzene
Bromobenzene
Bromodichloromethane
Bromoform
Bromomethane
Carbon Tetrachloride
Chlorobenzene
Chlorodibromomethane
Chloroform
Chloromethane
cis-1,2-Dichloroethylene
cis-1,3-Dichloropropene
Dibromomethane
Dichlorodifluoromethane
Dichloromethane
Ethylbenzene
Ethylene Dibromide
Hexachlorobutadiene
Hexane
Isopropyl Benzene
m/p-xylene
Methyl Ethyl Ketone
Methyl isobutyl Ketone
Methyl t-butyl ether
n-Butylbenzene
n-Propylbenzene
Naphthalene
o-xylene
Sec-Butylbenzene
Styrene
tert-Butylbenzene
Tetrachloroethylene
Toluene
trans-1,2-Dichloroethylene
trans-1,3-Dichloropropene
Trichloroethylene

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Trichlorofluoromethane
Vinyl Chloride

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Appendix B:
Sampling Pole Construction Instructions

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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.