City of Iqaluit

Quality Assurance / Quality Control Plan

Type of Document
Final

Project Name
Water Licence 3AM-IQA0611

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1 Introduction

1.1 Background

The City of Iqaluit overlooks Koojesse Inlet on the south coast of Baffin Island (Figure 1, Appendix A). Lake Geraldine supplies raw water to the City. During the spring and summer, runoff from the surrounding watershed fills the lake. Water is stored for over-winter consumption by a dam on Lake Geraldine. From the dam outfall, water is transmitted by gravity to the water treatment plant (WTP) where it is treated by UV, filtration, chlorination, and fluorination. Treated water is stored in two storage reservoirs located next to the WTP prior to entering the main distribution system.

The City's wastewater receives primary treatment at the wastewater treatment plant (WWTP) before being disposed in Frobisher Bay. The sewage lagoon is used as a backup facility only.

Landfill runoff is collected in the on-site detention ponds. The run-off is then pumped to the retention pond located across the road from the landfill. When the retention pond is decanted, a 4" pump is then connected to a Geotube dewatering bag and the retention pond is decanted through the Geotube.

The Nunavut Water Board (NWB) issued a Class A Water Licence (3AM-IQA0611) to the City on May 15, 2006. The water licence governs water use and waste disposal within the City. A copy of the Water Licence is provided in Appendix E.

1.2 Monitoring and Regulatory Requirement Program

Condition 7 of Part I of the water licence issued to the City requires that the City submit to the NWB for approval, a Quality Assurance / Quality Control (QA/QC) Plan prepared in accordance with "*Quality Assurance (QA) and Quality Control (QC) Guidelines for use by Class "A" Licensees in Meeting SNP Requirements and for Submission of a QA/QC Plan"* (Department of Indian and Northern Affairs Canada, 1996), herein referred to as "The Guidelines".

1.3 Definitions

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.

Guidelines – see Section 1.2 above.

1.4 Scope of QA/QC Plan

This QA/QC Plan covers the environmental monitoring undertaken at the City's water treatment plant (WTP), wastewater treatment plant (WWTP) and the West 40 Landfill site (Figure 1).

1.5 Objective of the QA/QC Plan

The objective of this QA/QC plan is to ensure the reliability of the data collected during monitoring activities at the WTP (Figure 2), WWTP (Figure 3), and West 40 Landfill (Figure 4).

2 Field Sampling

2.1 Field Measurements

Field measurements of various water quality parameters (including pH, temperature, conductivity and oxidation-reduction potential (ORP)) are recorded using a multi meter instrument. The instrument probes are calibrated prior to use following manufacturer's procedures using analytical grade reagents.

2.2 Sampling Procedures

All sampling, sample preservation and analyses is 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 analysis, 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 (City controlled).
- Timely delivery of samples to the laboratory (not City controlled).

2.3 Sampling Collection

Refer to the checklists, found in Appendix B for specific details on the sampling locations, equipment and sampling methods.

2.3.1 Locations

The water licence issued to the City (3AM-IQA0611) by the NWB specifies nine monitoring stations across the licensed facilities (WTP, WWTP, and landfill). The City collects the monitoring program samples as per the schedule included in Appendix D.

- Station IQA-01 is a raw water supply (from Lake Geraldine) sampling location, prior to treatment at the WTP.
- Station IQA-02 is a wastewater sampling location at the final discharge point from the sewage lagoon.
- Station IQA-03 is a wastewater sampling location of the influent to the sewage lagoon.
- Station IQA-04 is a wastewater sampling location at the final discharge point from the WWTP.
- Station IQA-05 is a wastewater sampling location of the influent to the WWTP.
- Station IQA-06 is a sample of sludge from the WWTP.
- Station IQA-07 is a sample of surface water entering the West 40 Landfill site.

- Station IQA-08 is a sample of surface water from the final discharge point from the West 40 Landfill site.
- Station IQA-09 is a sample of contaminated soil accepted at the West 40 Landfill site.

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

Table 1 –Geographic Coordinates for the Monitoring Stations for NWB Licence 3AM-IQA0611

Station ID	Latitude*	Longitude*
IQA-01	63°45'12'' N	68°30'22'' W
IQA-02	63°44'43'' N	68°32'18'' W
IQA-03	63°44'49'' N	68°32'09'' W
IQA-04	63°44'43'' N	68°32'20'' W
IQA-05	63°44'45'' N	68°32'20'' W
IQA-06	63°44'45'' N	68°32'20'' W
IQA-07	NA	NA
IQA-08	63°43'47'' N	68°32'11'' W
IQA-09	NA	NA

* NAD 83

2.3.2 Sampling Equipment

Dedicated latex or nitrile gloves (i.e., one pair per sample) are used during sample handling. Sampling equipment such as sampling poles are 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 placed directly into new pre-cleaned, laboratory-supplied sample bottles. All monitoring samples are placed in clean coolers prior to and during transportation to the subcontract laboratory. The samples are transported/submitted under Chain of Custody documentation.

2.3.3 Sampling Methods

2.3.3.1 *Water and Wastewater Sampling*

Raw water samples are collected from the valve at the gravity intake pipe from the dam at Lake Geraldine, just as it enters the WTP. Samples of influent wastewater to the WWTP are collected from a valve located just before the wastewater enters the screw screen tanks. Effluent wastewater samples are collected from a valve located just after the wastewater passes through the Salsnes filter.

2.3.3.2 *Sewage Sludge Sampling*

Sewage sludge collected in a trailer located beneath the filter room of the WWTP. Sewage sludge samples are collected directly from the trailer by immersing the sample bottle into the sludge neck first to a depth of 5 to 10 cm. The sampling container is filled with sludge and the sample bottle is raised neck first to prevent sample spillage.

2.3.3.3 *Landfill Runoff Sampling*

Landfill run-off is collected in the on-site detention ponds. The run-off is then pumped to the retention pond located across the road from the landfill. The landfill runoff sample bottles are filled with the discharge during the decanting period. When a Geotube is used, the samples are taken from the geotube discharge (after filtration). Three water samples are collected during each decant, including a sample at the start, mid-point and at the end.

2.4 Sample Handling

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

All sample containers are 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 cleaned with soap and water after sampling and prior to placing the samples in the cooler. The samples are stored on ice in a cooler until delivery to the laboratory. A chain of custody form is filled out completely and is used to track the samples.

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.

2.5 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 including: blind duplicates, field blanks, and trip blanks. A blind duplicate is a duplicate sample that is not labelled as such. The purpose of the blind duplicate sample is to ensure analytical precision. A field blank is a sample of analyte free (i.e., clean) water poured into the container in the field, preserved and shipped to the laboratory with field samples and is analyzed along with field samples to check contamination from field conditions during sampling. A trip blank is a clean water sample that stays unopened and that remains with collected samples during transportation and is analyzed along with field samples to check residual contamination (i.e., to determine if cross contamination occurs during shipping).

Exp recommends the following number of quality control samples based on the number of samples collected:

- One trip blank per cooler.
- 10% blind duplicates.

If the total number of samples collected is less than five, include at a minimum, one blind duplicate.

3 Lab Analysis

3.1 Lab Accreditation

As previously indicated, the City of Iqaluit uses an analytical laboratory accredited by the Canadian Association for Laboratory Accreditation (CALA); formally known as the Canadian Association for Environmental Analytical Laboratories (CAEAL) in Ottawa, Ontario for the monitoring program for NWB Licence 3AM-IQA0611. Appendix C includes a copy of the laboratory's CALA accreditation certificate and a list of the parameters for which they are certified.

3.2 Detection Limits

Details on the calculation of the Method Detection Limits (MDLs) and the establishment of the Method Reporting Limits (MRLs) can be found in Appendix C.

3.3 Methodology

Current (2012) standard methodology is used by the contract laboratory. Details on the methods used can be found in the Accreditation documentation found in Appendix C.

4 Reporting Requirements

4.1 General Submissions

As a condition of NWB Licence 3AM-IQA0611 (Appendix E), and following a letter from AANDC dated December 5, 2014, the City is required to submit a quarterly general monitoring report to the NWB. The objective of this quarterly general monitoring report is to document the environmental monitoring, pursuant to the NWB licence, undertaken by the City during the period. This quarterly general monitoring report includes a description of the sampling locations, the test group parameters, all laboratory analytical data and an evaluation of compliance with the NWB licence conditions. A copy of the letter has been attached as Appendix ##

A copy of the quarterly general monitoring report template is included in Appendix F. The quarterly general monitoring report includes a description of the "Environmental Monitoring Sample Collection Program", including a listing of the monitoring stations that were sampled during the subject period. The field observations, if any, are presented and the analytical results are compared to the appropriate criteria and a general discussion of the results is presented.

Appendix A: Figures

Appendix B:
Environmental Monitoring Program Checklists, Summary of Sample Collection and Preservation

Appendix C:
Subcontract Laboratory Accreditation & Supporting Documentation

Appendix D:
Monitoring Program Sampling Schedule

Appendix E:
City of Iqaluit's Water Licence

Appendix F:
Monthly Monitoring Report Template