CLEAN-UP AND RESTORATION OF THE MID-CANADA LINE SITE AT BEAR ISLAND

Bear Island, Nunavut

QUALITY ASSURANCE AND QUALITY CONTROL PLAN

Final Version

(O/Ref.: TP-0654) (Y/Ref.: EW699-09-1300/C)

PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

June 2010

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Presented to:
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1 INTRODUCTION

This Quality Assurance/Quality Control (QA/QC) program is to be implemented to monitor the quality of the analytical results obtained from water samples collected on site. The main objective of this QA/QC program is to ensure that sampling data and analysis results are complete, precise, exact, representative and comparable. Data review is to consist of evaluating sample collection/handling methodology, general laboratory comments, field (blind) duplicate samples, and duplicate samples. Samples collected during the remediation work are to be submitted to a laboratory accredited by the Standards Council of Canada (SCC). The Montreal laboratory also possesses the Canadian Association for Environmental Analytical Laboratories (CAEAL) certificate.

This plan followed the guidance document, *Quality Assurance (QA) and Quality Control (QC)Guidelines for Class "B" Licensees in Collecting Representative Water Samples in the Field and for Submission of a QAQC Plan* (INAC, 1996), and has four main sections:

- Sample Collection;
- Sample Handling;
- Laboratory Analysis;
- Reporting.

This QA/QC plan should be followed throughout the course of the project, and should new information arise or industry best practices change, the plan will be updated accordingly.

2 SAMPLE COLLECTION

2.1 LOCATIONS

There are four sampling locations for the project on Bear Island, with the names of the locations specified by the Nunavut Water Board's Water Licence (No. 1BR-BEA1015). Five of these locations were chosen for the monitoring of the input (effluent) and output (water) from Bear Island on account of the project. The name, the description and the status of each monitoring station are included in Table I below.

Table I: Monitoring Locations as Specified by the Water License (No. 1BR-BEA1015)

Monitoring Program Station Number	Description	Status
BEA-1	Treated drinking water at supply location	Active (Volume)
BEA-2a	Final Discharge Point from Sewage Disposal Facilities, Lagoon 1	Active (Volume and Water Quality)
BEA-2b	Final Discharge Point from Sewage Disposal Facilities, Lagoon 2	Active (Volume and Water Quality)
BEA-3	Treated process water	Active (Water Quality)
BEA-4	Final Discharge Point from the NHWL	Active (Water Quality)

2.2 EQUIPMENT

All sample bottles used are to be supplied by the laboratory. This will ensure that the samples collected are properly preserved and can be analyzed for the appropriate parameters as outlined by the Water Licence.

For grab samples from surface waters or tanks, a swing sampler may be used.

2.3 METHODS

Samples will be collected with industry best practices from both the sewage lagoons discharge point and the waste handling facility. The sampling method to be used is described in the following section.

2.3.1 Waste Water Sampling

The samples collected from the sewage lagoons and the waste handling facility will be collected prior to discharging any water from these areas. These samples will be analyzed in the laboratory to ensure they meet the water quality limits set forth by the Water Licence, and described in sections 4.1.1 and 4.1.2.

These samples will be grab samples, and the sampler will wear appropriate personal protective equipment, such as nitrile gloves, and will either sample the water directly by placing the sample bottle into the water or will use a swing sampler to collect the sample. If a swing sampler is used then it will be rinsed three times prior to collecting the sample, which after being collected will be poured directly into the appropriate sample bottle.

When collecting bacteriological samples, a different bottle should always be used to collect the sample with the swing sampler, as these sample bottles contain preservatives and submersing them into the sewage lagoons can cause the preservative to spill. Also these samples require headspace, and fully submersing them can cause overfilling, and again a loss of the preservative.

2.4 SAMPLE QA/QC

To ensure the precision, accuracy, and reliability of the samples collected in the field, two types of sample QA/QC will be used. These will include the use of duplicates and trip blanks. Both of these methods are described in the following sections.

2.4.1 Duplicates

Duplicate samples are collected to test the variability of the sampling methods, and the laboratory analysis. These samples are to be collected at the same time and place, and should be identical to each other. These samples should be collected at a rate of 10 %, and results should be compared and reported as per section 5.

2.4.2 Trip Blanks

Trip blanks are samples that are prepared prior to the sampling event and are taken with the sampler into the field. These samples are subsequently handled, and shipped with the samples to the laboratory. They are intended to indicate any cross-contamination that has occurred due to handling and transporting the samples from the field to the laboratory. They should be used with every shipment to ensure the samples are not being affected by this process, and the shipping methods are appropriate.

3 SAMPLE HANDLING

3.1 PRESERVATION

All samples will be collected in bottles supplied by the laboratory, and no preservatives will be added by the field team. Bottles supplied will have any needed preservative already added when taken to the field (e.g. sample bottle for fecal coliforms). Once collected the samples will be refrigerated and kept cool (< 10^{o}C).

3.2 IDENTIFICATION

Samples will be identified according to their location and the date. For example, a sample collected at BEA-3, will be labelled as "BEA-3" and the date will be recorded on the Chain of Custody to clearly identify the sample from the others collected at this location. When collecting duplicates the tag "TT" will be added to the sample name, such that the duplicate sample collected at BEA-3 will be labelled as "BEA-3-TT."

3.3 TRANSPORTATION

The samples collected on site will be transported on the next available flight to ensure their reception at the laboratory before the expiration of any samples (e.g. bacteriological samples). The samples will be packed in coolers with ice packs to ensure they remain at an appropriate temperature throughout the trip. A Chain of Custody form will be filled out and sent with the samples indicating the sample names, sampling date, the desired analysis, and all relevant contact information such as: project manager, sampler, laboratory contact information, and signatures to ensure the samples were received.

4 LABORATORY ANALYSIS

The samples collected on Bear Island will be sent to Agat Laboratories for analysis. This laboratory located in Quebec City and is SCC accredited. The Montreal laboratory also holds the CAEAL by the Canadian Association for Environmental Analytical Laboratories (CAEAL) accreditation. A copy of the accreditation is included in Appendix B.

4.1 PARAMETERS OF CONCERN

The parameters of concern to be analyzed for are based on the sampling location. There are two basic sets of analytes which correspond to the different samples to be collected. The following two sections highlight the different analytical parameters and for which samples they will be analyzed.

4.1.1 Sewage Disposal Facilities

Sewage effluent will be sampled at one location on each lagoon, but dependant on which lagoon is sampled there are two sample names: BEA-2a and BEA-2b. The parameters to be analyzed for at these locations are listed in the water licence, and shown in Table II below:

Table II: Effluent Quality Limits for the Sewage Lagoons

Parameter	Maximum Allowable Concentration
BOD	80 mg/L
Total Suspended Solids	100 mg/L
Fecal Coliforms	10,000 CFU/ 100 mL
pH	6.0 to 9.0
Oil and Grease	No visible sheen

4.1.2 All Other Samples

The other samples to be collected on site throughout the course of the season include effluent from the waste handling facility. The parameters of concern for these samples, as stated by the water licence, are shown in Table III.

Table III: Wastewater discharge limits and parameters of concern for the waste handling area, the NHWL, and the monitoring wells.

Parameter	Maximum Allowable Concentration (µg/L)
pH	6 to 9 (pH units)
Oil and Grease	5000
Arsenic (Total)	100
Cadmium (Dissolved)	10
Chromium (Dissolved)	100
Cobalt (Dissolved)	50
Copper (Dissolved)	200
Lead (Dissolved)	50
Mercury (Total)	0.6
Nickel (Dissolved)	200
Iron	1000
PCB (Total)	1000
Zinc (Total)	500
Phenols	20
Benzene	370
Toluene	2
Ethylbenzene	90

5 REPORTING

At the end of the work season, a report will be compiled highlighting the samples collected, the analytical results, and the results of this QA/QC program. The QA/QC portion will include comments on the results of the program, and possible improvements which could be made to the program.

This report will include comments on the relative percent difference (RPD) of duplicate samples, which is used to evaluate the sample result variability. Average RPD values of less than 30% for water samples are considered an indication of acceptable duplicate sample variability. For water samples, an RPD of greater than 30% may reflect difference in sample turbidity or variance in the sample procedures. Individual RPD values greater than 50% are not considered to reflect acceptable variability. RPD values are not used to evaluate those compounds that are present at concentrations which are less than five times the method detection limit (MDL).

Results from the field blank samples which were submitted to the laboratory are also to be included. This will give an indication of the cross-contamination which occurred during the sampling and transportation of the samples to the laboratory.

This report will be compiled and submitted to Public Works and Government Services Canada annually.

APPENDIX A

Laboratory Certificate of Accreditation

CERTIFICATE OF ACCREDITATION

Standards Council of Canada
Conseil canadien des normes

CERTIFICAT D'ACCRÉDITATION

AGAT LABORATOIRE LTEE

9770, route Transcanadienne, St-Laurent, QC H4S 1V9

having been assessed by the Standards Council of Canada (SCC) and found to conform with the requirements of ISO/IEC 17025:2005 (CAN-P-4E) and the conditions for accreditation established by SCC is hereby recognized as an

ACCREDITED TESTING LABORATORY

for the specific tests or types of tests listed in the scope of accreditation approved by SCC and found on the SCC website at www.scc.ca.

ayant fait l'objet d'une évaluation réalisée par le Conseil canadien des normes (CCN) et été jugé conforme aux exigences énoncées dans ISO/CEI 17025:2005 (CAN-P-4E) et aux conditions liées à l'accréditation établies par le CCN, est, en vertu du présent certificat, reconnu comme étant un

LABORATOIRE D'ESSAIS ACCRÉDITÉ

pour les essais ou types d'essais énumérés dans la portée d'accréditation approuvée par le CCN et figurant dans le site Web du CCN à www.ccn.ca.

STANDARDS COUNCIL OF CANADA ESTABLISHED 1970 CONSEIL CANADIEN DES NORMES CRÉÉ EN 1970

Accredited laboratory number.: / Numéro de laboratoire accrédité : 645

Accreditation date: / Date d'accréditation : 2009-01-12

Issued on: / Délivré le : 2010-01-14

Expiry date: / Date d'expiration : 2013-01-12

Chairman (SCC) / Président (CCN)

This accreditation is the formal recognition of the technical competence of the laboratory, for the approved scope. In addition, this laboratory has demonstrated that they operate a quality management system (refer to the SCC web-site for the joint ISO-ILAC-IAF Communiqué dated January 2009).

Cette accréditation est la reconnaissance officielle de la compétence technique du laboratoire pour la portée d'accréditation approuvée. Ce laboratoire a également prouvé qu'il gère un système de management de la qualité (voir le site Web du CCN pour le communiqué commun ISO-ILAC-IAF daté de janvier 2009).

Canada

APPENDIX B

Letter from the Laboratory Stating that the Plan is Acceptable

AGAT Laboratoires

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ST. LAURENT, QUÉBEC
CANADA H4S 1V9
TÉL 514-33-1000
TÉLEC 514-3333046
www.agatlabs.com

June 10, 2010

Acting as laboratory service and sample container provider AGAT Laboratories agrees to the proposed quality assurance and quality control plan.

AGAT Laboratories is a full service laboratory and science company with worldwide operations. In Canada the network of AGAT laboratories includes laboratories accredited by the SCC, CALA (formerly CAEAL) and the Ministère du Développement durable, de l'Environnement et des Parcs (MDDEP).

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