Resolute Bay Landfarm Facility

Transport Canada

January 2016

QA/QC Plan

Nunavut Water Board (NWB) Licence No. 1BR-RLF-1520

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1) Quality Assurance/Quality Control (QA/QC) Plan

Prepared by consultant during each monitoring event. Below – pages 21-23 of the November 2019 report prepared by Stantec Consultaing Ltd.

5.0 QUALITY ASSURANCE / QUALITY CONTROL

A QA/QC program was conducted to assess data reliability. Surface water samples were collected in general accordance with Stantec's SOPs, were uniquely labelled, and control was maintained using chain-of-custody forms. Surface water samples were collected in laboratory-supplied containers and preserved in ice-chilled insulated coolers.

The data quality objective (DQO) of the Program was to collect data that were reproducible, complete, and suitable for comparison with the referenced guidelines / standards.

5.1 SAMPLE HOLD TIMES

Samples submitted to the laboratory were analyzed within the recommended hold times described in the CCME 2016 Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment, Volume 4 Analytical Methods (CCME, 2016a).

5.2 TEMPERATURE

Sample temperatures were recorded upon arrival at the laboratory by measuring up to three random sample container temperatures and calculating the average result to obtain a representative temperature. The ideal temperature should be approximately 4°C. Samples that arrive at the laboratory with temperatures measured above 4°C may have reported concentrations that are biased low as a result of the elevated sample temperatures.

Although it is ideal to have sample temperatures below 4°C, Bureau Veritas has noted the difficulty in maintaining samples below 4°C. As such, Bureau Veritas considers a temperature range of 4°C to 10°C as acceptable. Samples submitted to the laboratory indicated temperatures that were considered acceptable.

5.3 FIELD DUPLICATES

The method of RPD is used to evaluate the sample result variability and is calculated by the following equation:

$$RPD = \left[\frac{|S1 - S2|}{S3}\right] \times 100$$

Where:
RPD = relative percent difference
S1 = original soil or groundwater sample concentration
S2 = duplicate soil or groundwater sample concentration
S3 = average concentration = (S1 + S2)/2

In the event that the analytical result for either sample is less than five times the laboratory reportable detection limit (RDL), any calculated RPD is considered not to be valid and no conclusion can be made with respect to the data reproducibility. The generally accepted industry standard for acceptable RPD's analyses is less than or equal to 40%

for field duplicated water samples described by the CCME Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment, Volume 1 Guidance Manual (CCME, 2016b).

QC19-01 was a blind field duplicate surface water sample collected from SW3. Where they could be calculated, the RPD's ranged from 0% (total alkalinity as $CaCO_3$ and toluene) to 9% (o-xylene). The calculated RPDs were within the generally accepted industry standard for acceptable RPDs.

The RPD results are summarized on Table 2, **Appendix E**.

5.4 TRIP BLANK

The trip blank (QC19-02) consisted of de-ionized water prepared by the laboratory. The trip blank sample was submitted for analysis of the NWB Licence parameters. The laboratory analytical results indicated that the reported concentrations were less than the laboratory RDL and the pH was consistent with that expected of the de-ionized water. As such, the trip blank results indicate that sample shipping did not influence the surface water analytical results.

The trip blank results are summarized on Table 2, **Appendix E**.

5.5 EQUIPMENT BLANK

The equipment blank (QC19-03), was prepared by Stantec personnel using deionized water provided by the laboratory. The equipment blank sample was packaged in laboratory-supplied bottles in the field by Stantec using the same equipment used to collect the surface water samples. The equipment blank sample was submitted for analysis of NWB Licence parameters. Laboratory analytical results indicated the reported concentrations of the tested parameters were less than the laboratory RDLs. The laboratory pH of the equipment blank was consistent with that expected of the de-ionized water. As such, the equipment blank results indicate that sample handling and sampling equipment did not influence the surface water analytical results.

The equipment rinsate blank results are summarized on Table 2, **Appendix E**.

5.6 LABORATORY QA/QC

In addition to the Stantec QA/QC procedures, the laboratory analyzes and assesses method blanks, Certified Reference Materials, method spikes, and surrogate recoveries to monitor data quality. In general, the laboratory QA/QC results were considered acceptable with the exception of the following:

- The surrogate recovery was below the lower control limit due to matrix interference for 2-Fluorophenol. This may represent a lower bias in some results for phenols.
  - The laboratory reported concentrations of phenols were less than the laboratory RDLs with the exception of 2,4-Dimethylphenol which exceeded the RDL but was four orders of magnitude lower than the guidelines / standards.
- The recovery was below the lower control limit for 2-Chlorophenol. This may represent a low bias in some results for 2-Chlorophenol.

  - The laboratory reported concentrations of 2-Chlorophenol were less than the laboratory RDL which was one order of magnitude lower than the guidelines / standards.
- The matrix spike recovery for silver was outside of the control limits.
  - Bureau Veritas indicated that the overall quality control for this analysis met acceptability criteria.
  - The laboratory concentrations of silver were less than the laboratory RDL which was one order of magnitude below the CCME guidelines.

Because the concentrations of the analytes affected were below the laboratory RDLs or four orders of magnitude below the standards / guidelines, the low surrogate recovery of 2-Fluorophenol, the low recover of 2-Chlorophenol, and the low matrix recover for silver did not affect the interpretation of the data from the surface water samples.

The laboratory QA/QC results are presented as part of laboratory certificates of analysis in **Appendix G.**

5.7 SUMMARY

Based on the results of the assessment above, the DQO for the Program was considered to have been met and the data were considered valid.

2) QA/QC Plan confirmation of acceptance from an accredited laboratory

Provided by consultant during each monitoring event. Below – pages 38-39 of the November 2019 report prepared by Stantec Consulting Ltd.

2019/10/21

Stantec
10160 112 Street
Edmonton AB T5K 2L6 CA

Attn: Lindsay van Noortwyk , Associate / Project Manager

Re: Resolute Bay Airport LTU Sampling Plan (as provided by Stantec)

Dear Ms van Noortwyk

As requested, Bureau Veritas Laboratories has reviewed the Resolute Airport LTU Sampling Plan (appended). In our opinion the Plan meets the CCME requirements for field QC, including field and trip blanks for BTEX. .

I trust this meets your needs. If anything further is required, please do not hesitate to contact me directly at barry.loescher@BVlabs.com, 250 325-8887.

Sincerely,

Barry Loescher, PhD PChem QP
Quality Systems Specialist
Bureau Veritas Laboratories

Source	Location	Laboratory Analysis
Groundwater	MW1 MW2 MW3 MW5 Field Duplicate Trip Blank Field Blank	Total Suspended Solids (TSS) Polycyclic Aromatic Hydrocarbons (PAH) Benzene, toluene, ethylbenzene, xylenes (BTEX) Total extractable hydrocarbons (TEH) Oil and Grease Total Phenols Total Metals (aluminum, cadmium, copper, lead, nickel, silver, zinc, arsenic, cobalt, iron, molybdenum, selenium, titanium) Routine parameters (total hardness, conductivity, calcium, sodium, chloride, magnesium, potassium, sulphate, total alkalinity, nitrate-nitrite, ammonia nitrogen, and pH)
Surface Water	4 locations around the perimeter of LTU 2 Field Duplicate	BTEX TEH Routine Parameters (including fertilizer) Note: If monitoring wells are noted as dry, surface water samples will be submitted for groundwater parameter analysis.
Surface Soil	4 locations around the perimeter of LTU 2 Field Duplicate	BTEX* PHC fractions 1 through 4 (PHC F1-F4) Nutrients (nitrogen, phosphorous, potassium)
LTU	1 location from 0.45-0.6 metres below ground surface within LTU 2	Nutrients (nitrogen, phosphorous, potassium)
Data Gap / Risk Assessment	LTU 2 (> 5 cm, ideally 45-60 cm depth). 7 locations around perimeter of LTUs Background Field Duplicate	BTEX, PHC F1-F4, PHC aliphatic/aromatic subfraction analysis (sample from LTU2 only)