Quality Assurance (QA) and Quality Control (QC) Plan CFS Alert (ALT), Nunavut

In support of the
Nunavut Water Board Licence
No. 3BC-ALT1015

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Prepared for:
1 Canadian Air Division,
Department of National Defence

Originally prepared by:
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Defence Construction Canada

Revised by:
8 Wing Environmental Management
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Canada

Revision Control Page

Revision No.	Revised By	Date	Issue/Revision Description
1.0	Defence Construction Canada	November 2010	Final.
2.0	Department of National Defence	January 2014	Final. Added new landfarm facility at ALT-10. Revised contracted external CALA-certified laboratory.

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ACRONYMS

AGAT	AGAT Laboratories Ltd.
ALT	CFS Alert
BOD	Biological Oxygen Demand
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
cBOD	Carbonaceous Biochemical Oxygen Demand
COD	Chemical Oxygen Demand
CFS	Canadian Forces Station
NWB	Nunavut Water Board
PAH	Polycyclic Aromatic Hydrocarbons
pH	Measure of acidity and alkalinity
QA	Quality Assurance
QC	Quality Control
SNP	Surveillance Network Program
TPH	Total Petroleum
TSS	Total Suspended Solids

1. INTRODUCTION

This document has been prepared in response to the requirements of the Nunavut Water Board (NWB) for the submission of a Quality Assurance and Quality Control Plan , under licence number 3BC-ALT1015, issued to the Department of National Defence (DND) on August 4, 2010. This new Class B Water Licence issued allows for the use of water and the disposal of waste during operation and maintenance of Canadian Forces station (CFS) Alert ("Alert"). Alert is located on the north-eastern tip of Ellesmere Island within the Qikiqtani Region of Nunavut (latitude $82^{o}30'1"$N/ longitude $62^{0}20'37"$ W).

Alert was originally established as a High Arctic weather station in 1950, and is currently a remote camp maintained by DND that has been continually operational since 1958. the nearest communities to Alert are Grise Fiord and Resolute Bay, and are located approximately 780 km and 1080 km from the station. This station is active year round. During the summer months the population on site can expand to 200 people; however, on average the population ranges between 50 to 100 people.

This document has been prepared in accordance with the Guidelines for the Preparation of an Operation and Maintenance Manual for Sewage an Solid Waste Disposal Facilities in the Northwest Territories, published in 1996.As outlined in the licence, 11 monitoring stations shall be maintained at Alert at the following locations: Water Supply Intake, Sewage Outfall, Discharge Point, Sewage Treatment Facility Discharge Point, Main Station Landfill, Battery Dump, Millionaires Dump, Dump 3, secondary containment discharge from the Airfield Fuel Tank Farm, Upper Fuel Tank Farm, and the Landfarms, primarily for the purpose of assessing water quality. Implementation of this QA/QC Plan at Alert is scheduled to commence within one month of NWB approval.

2. SAMPLE COLLECTION

2.1 Sampling Locations

As part of the NWB Licence, the surveillance Network Program (SNP) consists of 11 watering stations at Alert, which include:

Station No.	Monitoring Station
ALT-1	Water Supply at Raw Water Intake (or Pumphouse)
ALT-2	Discharge Point at the Sewage Outfall
ALT-3	Final Discharge Point of the Sewage Treatment Facility (at weir box or similar structure, prior to entry into Parr Inlet)
ALT-4	Runoff and Leachate from the Main Station Landfill
ALT-5	Runoff and Leachate from the Battery Dump
ALT-6	Runoff and Leachate from the Millionaire's Dump
ALT-7	Runoff and Leachate from Dump 3
ALT-8	Discharge from Lower (Airfield) Fuel Tank Farm (secondary containment)
ALT-9	Discharge from Upper Fuel Tank Farm (secondary containment)
ALT-10	Discharge from Day Fuel Tank Farm (secondary containment) Discharge from the Landfarm*
ALT-11	Discharge from the Landfarm

*Landfarm at ALT-10 was added in summer 2013, the criteria and measures from the ALT-11 Landfarm will be adopted for the ALT-10 Landfarm effective summer 2014.

Sampling listed above were established by the NWB and are identified in Figure 1, Appendix A. The exact sampling locations as per the NWB licence will be identified at the commencement of the sampling program, and if feasible with assistance of an Inspector. GPS coordinates and photographic records od the sampling locations will be documented, and locations will be identified using markers for consistency and repeatability in subsequent months and years.

Timing of sampling

Timing of the collection of the water samples at Alert is outlined in the requirements of the NWB licence, which specify:

Monitoring Station Timing of Sampling

Station No.	**Timing of Sampling**
ALT-1	• Shall be measured and recorded *daily* and *annually* in cubic metres to document the quantity of water utilized.

	• Presently the quantity of water utilized daily is recorded and reported monthly.
ALT-2	• Shall correspond to timing of sampling of ALT-3.
ALT-3	• Inspections will be conducted weekly (at a minimum) during June to September inclusively, to determine periods of flow. • Shall be sampled and analysed *monthly* during periods of flow.
ALT-4-5-6-7	• Inspections will be conducted weekly (at a minimum) during June to September inclusively, to determine periods of runoff and/or seepage. • Shall be sampled and analysed *annually* during periods of runoff or seepage.
ALT-8-9-10-11	• Shall be sampled and analysed prior to the release of effluent.

Documenting Non-sampling Events

In the event that the water samples are not successfully collected and submitted for analysis, the following will be documented:

- Location(s) of the sampling attempts will be recorded (i.e. GPS coordinates, photographic records and the sampling locations will be identified on a map); and
- Justification outlining why a sampling was not successfully collected.

Attempted unsuccessful sampling event(s) and justification will be reported to the NWB in the Annual report for Alert.

2.2 Sampling Equipment

No specialized equipment will be required for the collection of the water samples at Alert. New sample bottles will be supplied by an external CALA-certified Laboratory and used for the collection of all water samples. Samples are not to be filtered.

The table below identifies the samples necessary for each sampling round. Extra bottles will requested for duplicate samples, field blanks and/or in case of breakage.

Sewage Outfall & Discharge Point (ALT-2-3)	**Runoff/Leachate from Landfill & Dumps (ALT-4-5-6-7)**
<u>6 Bottles/Monitoring Station:</u> 1 x 500 ml plastic (BOD) 1 x 250 ml plastic (TSS, pH) 1 x 100 ml plastic H2SO4 (COD) 2 x 1L glass amber bottles HCl (oil and grease) 1 x 500 ml plastic (cBOD)*	<u>16 Bottles/Monitoring Station:</u> 1 x 500 ml glass amber bottle (TPH, F2-F4) 2 x 1L glass amber bottles (PAHs) 3 x 40 ml vials NaHSO4 (BTEX, F1) 1 x 500 ml plastic (BOD) 1 x 250 ml plastic (pH, nitrate-nitrite, conductivity, alkalinity, hardness, Mg, Na, Ca, K, SO2)

Tank Farms & Landfarms (ALT-8-9-10[A]-11)	1 x 500 ml plastic (TSS) 1 x 120 ml glass amber bottle H2SO4 (phenols) 1 X 120 ml plastic bottle H2SO4 (ammonia nitrogen) 1 X 120 ml plastic HNO3 (total As,Cu,Fe,Cd,Cr, Pb,Ni) 1 X 120 ml glass HNO3/K2Cr2O7 (total Hg) 1 x 250 ml plastic Na2S2O3 (fecal coliform) 2 x 1L glass amber bottle HCl (oil and grease)
7 Bottles/Monitoring Station: 3 x 40 ml vials NaHSO4 (benzene, toluene, ethylbenzene) 1 x 100 ml metals bottle HNO3 (lead) 2 x 1L glass amber bottles HCl (oil and grease) 1 x 100 ml glass amber bottle H2SO4 (phenols)	

NOTES:
* Laboratory analysis optional. Decision to analyse is to be determined by DND as per page 3 of the NWB Licence No. 3BC-ALT1015.

[A]–ALT-10, two sets of sampling will be conducted at the Day Tank Secondary Containment and the newly added Landfarm Facility.

Sampling Methods

Sample collection instructions provided by an external CALA-certified Laboratory are provided in Appendix B. Refer to Table 1 (Appendix C) for additional laboratory considerations including minimum sample size, rinsing, flittering, and preservation and storage requirements for the parameters. Additionally, samples for ALT-3-8-9-10-11 will be collected prior to the release of any effluent to demonstrate compliance with the criteria set out by the NWB (refer to section 4.4).

Duplicates and blanks

Duplicate samples and blanks shall be submitted to and analysed by the accredited laboratory to provide an internal (i.e. laboratory) and external (i.e. at the time of sampling, shipping) QA/QC check to verify the reliability of the sample results. Duplicates samples shall be collected for approximately 10 percent of the samples. A duplicate sample is a repeat sample collected and handled using the same methods and submitted blindly for analysis. Based on the analytical results the laboratory will match the blind duplicate to the corresponding sample.

Field blanks and travel blanks will also be analysed to ensure reliability of the sampling method and to ensure the integrity of the samples was maintained during transport. Blanks will be provided by the laboratory to accompany the shipment of the sample bottles round trip and will contain reverse-osmosis de-ionized (RODI) water.

3. SAMPLE HANDLING

3.1 Preservation

Samples will be preserved in accordance with requirements identified by the external CALA-certified Laboratory for the parameters to be analysed (refer to Appendix C). The following six preservatives will be used: nitric acid (HNO_3), sulphuric acid (H_2SO_4), hydrochloric acid (HCl), sodium thiosulfate (Na_2S2O_3), sodium hydrogen sulphate ($NaHSO_4$) and potassium chromate (K_2CrO_4) and transported in the sampling bottling corresponding to the analysis to be conducted. The sample bottles by the laboratory identify the preservative contained in the sample bottle.

Samples requiring analysis within 48 hours or less will be collected immediately prior to shipping. All samples will be stored on ice and kept cool at approximately $4^{\circ}C$ prior to and during shipping.

3.2 Sample Identification

Samples collected will be labelled using consistent terminology, identifying the water monitoring station (corresponding to the facility), including the date and testing analysis. For example, ALT-10, 2011-06-01, BTEX, denotes a water sample collected at the Day Tank Secondary Containment at ALT-10, on June 2011, for the BTEX parameter.

Similarly, blind duplicate samples collected will be labelled using consistent terminology, identifying the station, followed by the year, month and duplicate sample number. For example, ALT-2011-06 DUP1 denotes a blind duplicate water sample collected in Alert, in June 2011, and is the first duplicate collected for the month. Trip and field sample will be labelled as such. Blind duplicate samples will be provided by the external CALA-certified Laboratory.

At time of collection, sample identification will be recorded in a field notebook for consistency in terminology, and to ensure the sample identifiers are unique. Sample labels will also include the following information: name of organization, time and date. Information provided on the sample labels will be clearly printed in permanent (i.e. waterproof) non-smear ink (marker or pen).

A Chain of Custody shall be completed for each sampling round and will accompany the samples to the laboratory.

3.3 Transportation

Samples will be packed appropriately (i.e. packed upright, immobile) in coolers, sealed and shipped to 8 Wing Trenton via a scheduled flight. When possible, extreme coolers will be used for transporting the samples. Scheduled round trip commercial charter flights (direct) and military flights (direct and/or overnight stop over in other Canadian cities or in Greenland) depart weekly from Trenton for Alert. Direct flights will be preferred and sought when possible; however, the required timing for the sample may ultimately determine flight(s) and some sampling is dependant on environmental factors leading to periods of flow, runoff, and or/seepage. DND will notify the designated courier company of the scheduled flight arrival time in Trenton for immediate pick-up at the time of arrival. The samples will be transported by courier to the external CALA-certified Laboratory in a timely manner.

In addition, the external CALA-certified Laboratory will be immediately notified when the samples are in transit, in order to start analysis as quickly as possible on samples with a maximum storage of 24-48 hours. A Chain of Custody will accompany the sample shipment and will clearly identify the location of samples requiring immediate analysis.

4. LAB ANALYSIS

4.1 Lab Accreditation

An external CALA-certified Laboratory* will analysis all the samples collected in support of this licence. AGAT is accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) AGAT is accredited to conduct analysis on each of the required sampling parameters, with the exception of total hardness. Refer to Appendix D for proof of valid laboratory accreditation in accordance with ISO/IEC17025:2005.

*AGAT Laboratories Ltd. in Mississauga, ON, was the previous DND contract holder from 2010-2013. At the time of this QA/QC Plan revision (Jan 2014), the tendering and contracting process of the next contract holder prevents DND from identifying any specific Laboratory for the 2014 sampling season and on wards. Once an external CALA-certified Laboratory is selected as the new contract holder, DND will promptly inform the NWB and submit a copy of the Laboratory's CALA Certification.

4.2 Detection Limits

Laboratory detection for all parameters required by the NWB are identified in Table 1 (Appendix). In addition, the laboratory shall report the detection limits of the methods used for analysis of the samples.

4.3 Methodology

The laboratory will conduct the analysis of the samples in accordance with the *Standard Methods (SM) for the Examination of Water and Wastewater* (2005), US Environmental Protection Agency (EPA), or the Ontario Ministry of Environment (MOE) methodologies. The- external CALA-certified Laboratory identified the following methods to be implemented for the parameters to be analysed:

Parameter	**Method**	**Parameter**	**Method**
TPH	MOE E3421	**Total Iron**	EPA SW846 6020/EPA 200.8
PAH	EPA SW856 3510C/8270C	**Total Mercury**	SM 3112 B
BTEX/F1	EPA 5030B/8260C	**Fecal Coliform**	SM 9222 D
BOD	SM 5210 B	**Conductivity**	SM 2510 B
COD	SM 5220 D	**Oil and Grease**	SM 5520 A,B,E,F
cBOD	SM 5210 B	**Ammonia Nitrogen**	SM 4500 NH3
pH	SM 4500-H B	**Total Alkalinity**	SM 2320 B
TSS	SM 4110 B	**Calcium**	EPA SW846 6010/EPA 200.7
Nitrate-Nitrite	SM 4110 B	**Potassium**	EPA SW846 6010/EPA 200.7
Total Phenols	SM 5310 B	**Sulphate**	SM 4110 B
Total Hardness	Calculation	**Total Cadmium**	EPA SW846 6020/EPA 200.8
Magnesium	EPA SW846 6020/EPA 200.8	**Total Chromium**	EPA SW846 6020/EPA 200.8
Sodium	EPA SW846 6020/EPA 200.8	**Total Lead**	EPA SW846 6020/EPA 200.8
Total Arsenic	EPA SW846 6020/EPA 200.8	**Total Nickel**	EPA SW846 6020/EPA 200.8
Total Copper	EPA SW846 6020/EPA 200.8		

4.4 Reporting Requirements

As previously stated in Section 2.3, duplicates samples shall be collected for approximately 10 percent of the samples to verify the reliability of the sample results.

NWB Effluent Standards

Analytical results of the effluent discharged from the sewage Treatment Facility, Tank Farms, and the Landfarm Facilities will be reported against the following effluent quality standards provided by the NWB:

Parameter	Maximum Concentration of any Grab Sample
Sewage Treatment Facility Final Discharge Point (ALT-3)	
BOD5	80 mg/L
Total Suspended Solids	70 mg/L
Oil and Grease	5mg/L and no visible sheen

pH	Between 6 and 9
Tank Farms and Landfarms (ALT-8-9-10-11)	
Benzene	370 µg/L
Toluene	2 µg/L
Ethylbenzene	90 µg/L
Lead	1 µg/L
Oil and Grease	15 mg/L and no visible sheen
Phenols	20 µg/L

Effluent standards provided by the NWB are consistent with the *Guidelines for the Discharge of Treated Municipal Wastewater in the Northwest Territories* (1992), or are consistent with other municipal licences.

5. QA/QC PLAN REVIEW

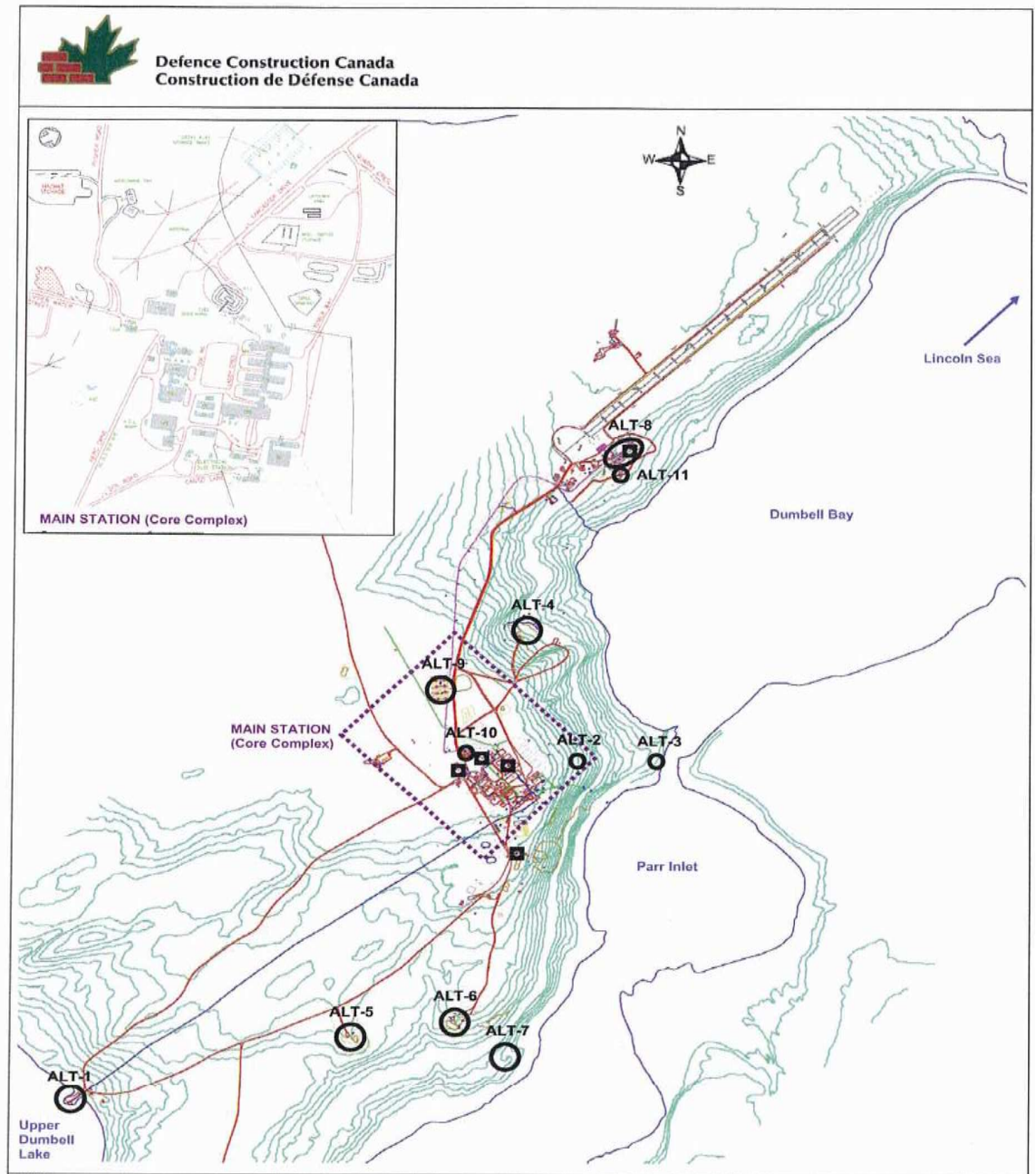
All contracted external CALA-certified Laboratory will be informed and given opportunities to review this document, *QA/QC Plan for CFS Alert*. DND may request the external CALA-certified Laboratory to provide a confirmation letter of acceptance of this plan, which would be submitted to the NWB.

In addition, this document shall be reviewed annually by DND to ensure that this plan remains current and consistently reflects the operations, activities and technology at Alert. Revisions required to this document shall be made as necessary. Revised plans will include an updated confirmation letter of acceptance from the accredited laboratory and shall subsequently be submitted to the NWB. Changes to this plan will be reflected in the Annual Report.

6. REFERENCES

Department of Indian and Northern Affairs Canada Water Resources Division and the Northwest
Territories Water Board. *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. July 1996.
Eaton, A., Clesceri, L., Rice, E., and A. Greenberg. *Standard Methods for the Examination of*
Water and Wastewater – 21st Edition. 2005.
Nunavut Water Board. *Letter, RE:NWB Licence No. 3BC-ALT1015.* August 5, 2010.
Nunavut Water Board. *NWB Licence No. 3BC-ALT1015.* August 4, 2010.
Taiga Environmental Laboratory (Taiga). *Watersampling Instructions- Collecting the sample January 18, 2010.*

Appendix A: Figure 1: CFS Alert Site Overview and Sampling Locations



Title:	CFS Alert Site Overview
Project:	Spill Contingency Plan, CFS Alert
Client:	Department of National Defence
Date:	November 2010
Figure:	Figure 2

LEGEND

ALT-1	Water Supply at Raw Water Intake (i.e., Pumphouse)
ALT-2	Sewage Outfall
ALT-3	Final Discharge Point of the Sewage Terrace System
ALT-4	Leachate from the Main Station Landfill
ALT-5	Leachate from the Battery Dump
ALT-6	Leachate from the Millionaire's Dump
ALT-7	Leachate from Dump 3
ALT-8	Lower (i.e., Airfield) Fuel Tank Farm (secondary containment)
ALT-9	Upper Fuel Tank Farm (secondary containment)
ALT-10	Day Fuel Tank Farm (secondary containment)
ALT-11	Landfarm
◘	Spill Kits

Appendix B: AGAT Laboratories: Instructions for Collecting and Submitting Samples

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Instructions for Collection and Submitting Samples to AGAT Laboratories Ltd. for Testing

Ontario Branch Locations

AGAT Laboratories has an extensive network of branches and depots located throughout Canada and internationally.

Following is a list of Ontario branches.

Branch	Address	Phone/Fax #'s	Reception - Hours of Operation
GeoChem Div. (lab)	5623 McAdam Road Mississauga, ON L4Z 1N9	Tel: 905-501-9998 Fax: 905-501-0589 Toll Free: 800-856-6261	8:00am - 7:00pm M-F 9:00am - 2:00pm Sat
Environmental lab	5835 Coopers Ave Mississauga, Ontario L4Z 1Y2	Tel: 905-712-5100 Fax: 905-712-5120	8:00am - 7:00pm M-F 9:00am - 2:00pm Sat
Kitchener Branch	975 Bleams Road Unit # 4 Kitchner, Ontario N2E 3Z5	Phone: (519) 894-3883	8:00am - 5:00pm M-F
London Branch	300 Exeter Road Units 10-12 London, Ontario N6L 1A3	Tel: 519-652-6826 Fax: 519-652-9733 Toll Free: 800-856-6261	8:00am - 5:00pm M-F
Stoney Creek Branch	903 Barton Street East Unit 19 Stoney Creek, Ontario L8E 5P3	Tel: 905-643-8163 Fax: 905-643-3391 Toll Free: 800-856-6261	8:00am - 5:00pm M-F
Sudbury Branch	2054, Kingsway Road Sudbury, Ontario P3B 4J8	Phone: (705) 560-5001 Fax: (705) 560-5035	8:00am - 5:00pm M-F

Representative Samples

A *representative* sample is one that reflects the same characteristics as, and can be considered an accurate subset of the material being measured. Representative samples taken in a similar manner at the same time and location have an equal probability of yielding the same result. Sample collection techniques are outside of the scope of the laboratory however, the sampler must be cognisant of the conditions that the material sampled represents. Sampling points must be selected to address the intent of monitoring outlined in the Regulations. The choice of sample type (i.e., grab samples, composite samples or continuous in-line sampling) will depend on certain characteristics such as average, maximum or minimum concentrations of a contaminant.

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As well, the sample type selected must be fit for purpose so that the data gathered meets the monitoring objectives. For more information the reader is recommended to review documents such as MOE's *Practices for the Collection and Handling of Drinking Water Samples, Ver.2, April 2009,* and other practices recommended by EPA, MOE, the Ontario Clean Water Agency and other leading jurisdictions.

Sample Containers

Certain tests have specific volume and container-cleaning requirements. Microbiology tests require sterile containers and many organic tests require 1-litre sample volumes. Sampling containers are provided by AGAT Laboratories and are listed by parameter type on the back of AGAT's Chain of Custody form. Minimum volumes are specified as well.

Sample Collection

The collection and handling of samples is crucial to obtaining valid data. Disposable gloves may be worn and care must be taken that the inside of the container and cap do not come into contact with anything other than the atmosphere. If the inside of the sampling container is touched, it must be considered contaminated and should not be used. While the sample is being taken, the exterior of the cap should be held in the sampler's fingertips.

The collection of drinking water grab samples is generally done from taps located at the sampling points. Sampling taps should be free of aerators, hose attachments, strainers and mixing type faucets. The best method for collecting a grab sample is to collect the sample directly into the container provided by the laboratory. This eliminates the potential for sample contamination through the use of an intermediate container.

In the case of sampling for microbiological testing, phenols, sulphide, volatile organic compounds, hydrocarbons, and oil and grease (not regulated), the sample must always be collected directly into the laboratory sample container.

Some sample containers are pre-charged with preservative; field personnel must not rinse these containers prior to sample collection. Also, sample containers for organic compound analysis should never be rinsed with the sample, as the organic compounds from the rinse may accumulate on the container walls and compromise the accuracy of the analytical results. Sample containers should be filled slowly to prevent overflowing when containers have been pre-charged with preservative, and to eliminate bubble formation.

Sample Filtering

Drinking water samples shall not be filtered in the field prior to analysis. As it is not expected that the consumer filters their water prior to drinking it, unfiltered samples will provide a more representative sample of what the consumer is drinking. Unfiltered samples for the measurement of organic compounds and microbiological parameters are very important because many organic

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compounds adsorb to the particulate present in a water sample and membrane filtering will remove bacteria from the sample.

Sample Preservation

Preservation may be required to stabilize the analyte of interest in the sample prior to its transportation to the laboratory. The main types of preservation for drinking water samples are refrigeration and pH control. Containers that have been pre-charged with preservative should not be rinsed or allowed to overflow or the preservative will be diluted.

Sample Holding Times

For certain tests, the sample must be received at the laboratory and analyzed within a short period of time. Examples of perishable parameters include turbidity, microbiological contaminants, volatile organic compounds and N-nitrosodimethylamine (NDMA). Laboratory method holding times for parameters are listed on the back page of the AGAT Laboratories Drinking Water Chain of Custody. Holding time is defined as the time between the collection of the sample and the start of analysis.

Sample Labelling

Accurate and complete labelling of samples ensures that the sample's identity is maintained. This is very important for sample tracking and data interpretation and is mandatory for sample data reporting and adverse water quality notification requirements under the Regulations. It is advisable to pre-label all sample containers prior to taking the sample or to label each container **immediately** after the sample is taken to prevent confusion. An indelible (permanent) marker or pen should be used and the material from which the label is comprised should be able to withstand water. AGAT Laboratories Ltd. will supply the sampling container. Sample containers will have labels affixed to the container itself and it will list information regarding which test(s) is analysed from the container and the preservative, if any, pre-charged into the bottle.

The sample ID generated should be simple and unique to the sampling set/batch collected.

Sample Storage and Transportation

It is recommended that all samples be delivered to the laboratory as soon as possible after sampling. Samples should be kept cool (refrigerated) if immediate shipping is not possible. Samples should be packaged using the packing materials provided by AGAT Laboratories to avoid breakage during shipping. Samples **must** be shipped to arrive at the branch/laboratory before the holding time for the samples has expired.

Samples for microbiological testing should be packed with ice packs or a suitable leak-proof container of ice and shipped in insulated boxes/coolers. Loose ice must be encased in waterproof packaging or a sealed container to avoid possible contamination of the sample. If possible, the

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sample should be chilled to below 10°C, but not frozen, prior to packing. Optimal temperatures conditions during transport are less than 10°C.

The chain-of-custody record must be included in the shipping cooler. A written record of how the samples are shipped, the time, date, carrier and tracking numbers for the shipments should be kept by the sampler.

Chain-of-Custody (COC)

As previously mentioned, proper sample labelling is crucial to maintaining the identity of a sample. However, additional measures are then required to ensure a sample is traceable from the time of collection through to its analysis. These steps are referred to as a *chain-of-custody* and are used to ensure the integrity of the sample and resulting data. A chain-of-custody form provides an accurate written record that can be used to trace the possession, transfer and custody of a sample from the time of its collection through to its introduction into the analytical data set. As illustrated in the attached example of a completed Drinking Water Chain of Custody (COC) all information must be documented to ensure that samples can be processed immediately for lab testing. An incomplete COC can result in delays while the missing information is ascertained from the sender.

Each person involved in the chain of possession must sign the custody form when a sample or set of samples is received or relinquished. In the case of drinking water samples, an AGAT Drinking Water chain-of-custody form must accompany samples to the point of receipt by the laboratory. The intent of this form is to document the transfer of custody of the samples from the sample custodian (sampler) to any other person and to the laboratory. If common carriers are used, receipts should be kept and, if packages are mailed, they should be registered and return receipts requested. These should be kept as part of the chain-of-custody documentation.

Once the samples have arrived at the laboratory, the chain-of-custody form will be signed off by an authorized person at the laboratory receiving the samples. Any samples that arrive in a condition unsuitable for analysis (e.g., broken, improperly preserved) will be documented and the client contacted for further directions on how to wish to proceed. This includes checking sampling dates recorded on containers or on COC to make certain that holding times for the tests requested have not been exceeded. Clients will be notified immediately of samples that cannot be analyzed so that a second sample can be taken

Sample Delivery to Branches

Samples can be submitted to any AGAT Branch/Depot through common couriers or by direct drop-off in person between the hours of operation indicated in the table above. Samples must be received by an AGAT staff on duty during normal office hours.

Relative to sample holding times it is essential that samples are received as quickly as possible after collection to ensure that samples can be delivered to the analytical lab in time to meet specified parameter hold times. If delivery of samples will occur late in the day on Fridays the

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Branch should be contacted in advance to enable staff to be able to make arrangements with common couriers or AGAT drivers to have samples picked up before closing time and rerouted to our main lab.

Appendix C: Table 1: Parameter Considerations

Table 1: AGAT Laboratories Ltd. parameter considerations.

Parameter	Container	Minimum Amount	Rinse	Filter	Preservation	Maximum Storage Recommendation	Detection Limit	Method	Accredited
Sewage Outfall and Discharge Points (ALT-2-3)									
BOD_5	500 ml plastic	500 ml	no	no	None, cool	4 days	5 mg/L	SM 5210 B	Yes
COD*	100 ml plastic	100 ml	no	no	H_2SO_4, cool	30 days	5 mg/L	SM 5220 D	Yes
cBOD*	500 ml plastic	500 ml	no	no	None, cool	4 days	5 mg/L	SM 5210 B	Yes
TSS	250 ml plastic	250 ml	no	no	None, cool	7 days	10 mg/L	SM 4110 B	Yes
Oil and Grease	1L amber glass	2X1 L	no	no	HCl, cool	28 days	0.5 mg/L	SM 5520 A,B,E,F	Yes
pH	250 ml plastic	250 ml	no	no	None, cool	4 days	0.1 units	SM 4500-H B	Yes
Runoff/Leachate from Landfill and Dumps (ALT-4-5-6-7)									
TPH	500 ml amber glass	500 ml	no	no	Cool	14 days	F2 – F4: 100 ug/L	MOE E3421	Yes
PAH	1L amber glass	2X1 L	no	no	None, cool	14 days	Refer to Table 2	EPA SW846 3510C/8270C	Yes
BTEX/F1	40 ml amber glass vial	3X40 ml	no	no	$NaHSO_4$	7 days	BTX - 0.2 ug/L, E 0.1ug/L	EPA 5030B/8260C	Yes
BOD	500 ml plastic	500 ml	no	no	None, cool	4 days	5 mg/L	SM 5210 B	Yes
pH	250 ml plastic	250 ml	no	no	None, cool	4 days	0.1 units	SM 4500-H B	Yes
TSS	500 ml plastic	250 ml	no	no	None, cool	7 days	10 mg/L	SM 4110 B	Yes
Nitrate-Nitrite	250 ml plastic	250 ml	no	no	None, cool	28 days	0.05 mg/L	SM 4110 B	Yes
Total Phenols	120 ml amber glass	100 ml	no	no	H_2SO_4, cool	30 days	0.001 mg/L	SM 5310 B	Yes
Total Hardness	250 ml plastic	100 ml	no	no	None, cool	6 months		Calculation	No
Magnesium	250 ml plastic	100 ml	no	no	None, cool	6 months	0.05 mg/L	EPA SW846 6020/EPA 200.8	Yes
Sodium	250 ml plastic	100 ml	no	no	None, cool	6 months	0.05 mg/L	EPA SW846 6020/EPA 200.8	Yes
Total Arsenic	120 ml plastic	100 ml	no	no	HNO_3	30 days	0.57 ug/L	EPA SW846 6020/EPA 200.8	Yes
Total Copper	120 ml plastic	100 ml	no	no	HNO_3	30 days	0.80 ug/L	EPA SW846 6020/EPA 200.8	Yes
Total Iron	120 ml plastic	100 ml	no	no	HNO_3	30 days	10.0 ug/L	EPA SW846 6020/EPA 200.8	Yes
Total Mercury	120 ml glass	120 ml	no	no	HNO_3/K_2CrO_4	7 days	0.0002 mg/L	SM 3112 B	Yes
Fecal Coliforms	250 ml plastic	250 ml	no	no	$Na_2S_2O_3$, sterile	48 hrs	1CFU/	SM 9222D	Yes

Parameter	Container	Minimum Amount	Rinse	Filter	Preservation	Maximum Storage Recommendation	Detection Limit	Method	Accredited
Continued: Runoff/Leachate from Landfill and Dumps (ALT-4-5-6-7)									
Conductivity	250 ml plastic	250 ml	no	no	None, cool	28 days	2 uS/cm	SM 2510 B	Yes
Oil and Grease	1L amber glass	2X1 L	no	no	HCl, cool	28 days	0.5 mg/L	SM 5520 A,B,E,F	Yes
Ammonia Nitrogen	120 ml plastic	100 ml	no	no	H_2SO_4, cool	28 days	0.02 mg/L	SM 4500 NH3	Yes
Total Alkalinity	250 ml plastic	250 ml	no	no	None, cool	4 days	5 mg/L	SM2320 B	Yes
Calcium	250 ml plastic	100 ml	no	no	None, cool	6 months	0.05 mg/L	EPA SW846 6010/EPA 200.7	Yes
Potassium	250 ml plastic	100 ml	no	no	None, cool	6 months	0.05 mg/L	EPA SW846 6010/EPA 200.7	Yes
Sulphate	250 ml plastic	250 ml	no	no	None, cool	28 days	0.1 mg/L	SM 4110 B	Yes
Total Cadmium	120 ml plastic	100 ml	no	no	HNO_3	30 days	0.20 ug/L	EPA SW846 6020/EPA 200.8	Yes
Total Chromium	120 ml plastic	100 ml	no	no	HNO_3	30 days	1.0 ug/L	EPA SW846 6020/EPA 200.8	Yes
Total Lead	120 ml plastic	100 ml	no	no	HNO_3	30 days	0.50 ug/L	EPA SW846 6020/EPA 200.8	Yes
Total Nickel	120 ml plastic	100 ml	no	no	HNO_3	30 days	1.0 ug/L	EPA SW846 6020/EPA 200.8	Yes
Discharge from Fuel Tank Farms and Landfarm (ALT-8-9-10-11)									
Benzene	40 ml amber glass vial	3X40ml	no	no	$NaHSO_4$	7 days	0.2 ug/L	EPA 5030B/8260C	Yes
Toluene	40 ml amber glass vial	3X40ml	no	no	$NaHSO_4$	7 days	0.2 ug/L	EPA 5030B/8260C	Yes
Ethylbenzene	40 ml amber glass vial	3X40ml	no	no	$NaHSO_4$	7 days	0.1ug/L	EPA 5030B/8260C	Yes
Lead	100 ml plastic	100 ml	no	no	HNO_3	30 days	0.50 ug/L	EPA SW846 6020/EPA 200.8	Yes
Oil and Grease	1L amber glass	2X1L	no	no	HCl, cool	28 days	0.5 mg/L	SM 5520 A,B,E,F	Yes
Phenols	100 ml amber glass	100 ml	no	no	H_2SO_4, cool	30 days	0.001 mg/L	SM 5310 B	Yes

NOTES: * Laboratory analysis optional. Decision to analyse is to be determined by DND as per page 3 of the NWB Licence No. 3BC-ALT1015.

Table 2. AGAT PAH detection limits.

Parameter	RDL (ug/L)	Parameter	RDL (ug/L)
Naphthalene	0.12	Benz(a)anthracene	0.08
Acenaphthylene	0.11	Chrysene	0.05
Acenaphthene	0.10	Benzo(b)Fluoranthene	0.05
Fluorene	0.09	Benzo(k)Fluoranthene	0.05
Phenanthrene	0.10	Benzo(a)Pyrene	0.01
Anthracene	0.05	Indeno(1,2,3-c,d)Pyrene	0.03
Fluoranthene	0.12	Dibenz(a,h)Anthracene	0.09
Pyrene	0.05	Benzo(g,h,i)Perylene	0.06
2-Methyl Naphthalene	0.20	1-Methyl Naphthalene	0.02

Appendix D: Proof of Laboratory Accreditation – AGAT Laboratories Ltd.

Canadian Association
for Laboratory Accreditation Inc.

CALA

Certificate of Accreditation

AGAT Laboratories (Mississauga)
AGAT Laboratories (Calgary)
5835 Coopers Ave.
Mississauga, Ontario

This laboratory is accredited in accordance with the recognised International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer joint ISO-ILAC-IAF Communiqué dated 18 June 2005).

Accreditation No.: A 3200
Issued on: March 27, 2008
Accreditation Date: February 2, 2005
Expiry Date: March 27, 2011

Chief Executive Officer

ilac-MRA CALA

This certificate is the property of the Canadian Association for Laboratory Accreditation Inc. and must be returned on request; reproduction must follow guidelines in place at date of issue. For the specific tests to which this accreditation applies, please refer to the laboratory's scope of accreditation at www.cala.ca.

Note: As of January 2014, DND is in the process of tendering a new external CALA-certified laboratory contract with suppliers. Once an external CALA-certified laboratory is selected, a valid Certificate of Accreditation will be submitted to the NWB.

Appendix E: Confirmations of Laboratory Acceptance of QA/QC Plan

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL 905-712-5100
FAX 905-712-5122
www.agatlabs.com

November 11, 2010

Defence Construction Canada
161 Laurier Avenue, Suite 300
Ottawa, ON, K1P 5J2

Subject: Acceptance of QA/QC Plan – CFS Alert (ALT), Nunavut

Dear Ms. Johnson,

This letter serves to confirm AGAT Laboratories Ltd acceptance of the QA/QC Plan for CFS Alert (ALT) for the analysis to be performed under Licence (No. 3BC-ALT1015).

Regards,

Nick Boulton

QA Officer

AGAT Laboratories Ltd

Note: As of January 2014, DND is in the process of tendering a new external CALA-certified laboratory contract with suppliers. Once an external CALA-certified laboratory is selected, a letter of Acceptance of the QA/QC Plan will be submitted to the NWB.