Baffinland Iron Mines Corporation

Surface Water Sampling Program – Quality Assurance and Quality Control Plan

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1 INTRODUCTION

1.1 INTRODUCTION

This Quality Assurance and Quality Control (QA/QC) Plan has been reviewed to fulfill the requirement of Part I, Item 16 of License No. 2AM-MRY1325 approved by the Nunavut Water Board to Baffinland Iron Mines Corporation (Baffinland) on July 15, 2013.

Part I, Item 16 of the Water License states:

> *The Licensee shall submit to an Analyst for approval, within six (6) months of the Licence issuance, an updated Quality Assurance/Quality Control Plan that includes requirements for sampling and analysis. This Plan shall be developed in accordance with the 1996 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 (INAC).*

In accordance with the stipulations of the Water License, this Surface Water Quality Sampling Program QA/QC Plan has been prepared following the general recommendations presented in *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* (INAC, 1996). A copy of the guidelines is included in Appendix A.

1.2 QA/QC PLAN OBJECTIVES

For the purposes of this report, QA/QC is defined as:

- ***Quality Assurance*** - System of activities used to achieve quality control.
- ***Quality Control*** - Set of best practice methods and procedures used to ensure quality of data in terms of precision, accuracy and reliability.

The QA/QC best practices outlined in this document are designed to provide guidance to field staff and analytical laboratories in order to maintain a high level of confidence in the water quality data generated from the Mary River Project.

2 SAMPLE COLLECTION

2.1 GENERAL

The samples will be collected following the general recommendations presented in *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* (INAC, 1996). A copy of the guidelines is included in Appendix A.

2.2 WATER QUALITY MONITORING LOCATIONS

The QA/QC Plan addresses the collection of freshwater surface water quality samples related to monitoring programs being carried out in support of Baffinland's Mary River Project, namely:

1. Collection of environmental surface water samples from area lakes, streams and rivers.
2. Collection of effluent samples from the current and future wastewater treatment facilities located at the Mine Site, Milne Port and Steensby Port.
3. Collection of drinking water samples from camp potable water sources.
4. Collection of surface water discharges from future ore stockpiles and waste rock dumps.
5. Collection of surface water discharges from future bulk sample open pits.
6. Collection of water samples from fuel berms and dispensing facilities.
7. Collection of water samples from landfarm facilities and maintenance shops.
8. Collection of effluent samples from oily water treatment systems.
9. Collection of surface water discharges from landfill facilities at the Mine Site and Steensby Port.
10. Collection of water samples representative of general site drainage before, during and after construction.
11. Measurement of water sample field parameters (e.g. pH, conductivity, temperature etc.).

Exact locations and sampling frequency for designated monitoring stations are presented in Baffinland's Class A Water License – No. 2AM-MRY1325 (Nunavut Water Board, 2013).

2.3 SAMPLING METHODS AND EQUIPMENT

A summary of recommended water sample containers, sample volumes, method detection limits (MDL), sample preservatives and maximum sample holding times is presented in Table 2-1. Laboratory parameters such as pH, turbidity, BOD, nitrite, nitrate, total phosphorus, faecal coliforms, chlorophyll and phenophytin typically have maximum sample storage times varying from four (4) to 72 hours. Due to the remoteness of the site, it may not always be possible to get laboratory analysis done within the sample holding time window. During the preparation of this document the analytical laboratories were consulted with respect to maximum sample holding times. As a result, Table 2-1 presents a preferred and a maximum holding time for time sensitive parameters. Every effort will be made to get samples

analysed within the preferred holding time window. If this is not possible, then the maximum holding time will apply.

Every effort will be made to prevent accidental freezing of bacteriological water samples (due to on-site climatic conditions) which could affect analytical results for these parameters.

For a complete list of the required sample analyses at each monitoring station, please refer to the Baffinland's Class A Water License – No. 2AM-MRY1325 (Nunavut Water Board, 2013).

2.3.1 GENERAL SAMPLING PROCEDURES

Generally, sampling procedures will consist of the following:

1. Sampler will wear a fresh pair of disposable nitrile gloves for each sampling event.
2. Sample bottles and preservative will be stored under clean conditions on site. Sample bottles will have the appropriate volume of preservative added in the field (or alternatively, sample bottles will be supplied by the analytical laboratory with preservatives already added).
3. A fresh sample bottle(s) will be used at each monitoring station. Sample bottles will *not* be re-used.
4. Sampling will be carried out by either: i) rinsing the sample bottle with source water three times before immersing the sample bottle to fill it (after which preservative is added, as required), or ii) if the sample bottles are provided pre-charged with preservatives then it is generally convenient to transfer water samples from the source to the sample bottle using a 1-2L plastic jug. Plastic jugs will be rinsed in the source water three times before filling the sample bottle. A dedicated jug will be used for different sample types (e.g. sewage effluent, fuel contaminated drainage and receiving waters). Sample jugs will be replaced on a regular basis before they become stained.
5. Prior to collecting the sample, the sampling jug will be rinsed in the source water three times. Rinse water will be disposed of so that it does not contaminate the source water where the sample will be collected.
6. Care will be taken to avoid disturbance of sediments and inclusion of disturbed suspended solids in the sample.
7. For samples *not requiring preservatives*, the sample bottle will be rinsed three times with source water before filling the bottle to the top.
8. For samples *requiring preservatives*, the sample bottle will be filled to the top (or to the indicator line marked on the bottle) and securely sealed. Note that for some volatile contaminants (e.g. BTEX), the sample bottle must be filled with zero headspace.
9. Sample details e.g. date, sample ID and analysis will be clearly marked on the bottle in indelible ink.
10. For *dissolved metals* analyses, if possible, the water sample will be filtered in the field immediately after sampling using a 0.45µm disposable filter and syringe. A fresh syringe and filters must be used at each monitoring station. Alternatively, sample filtration can be carried out by the analytical laboratory.

11. All samples will be sealed by ensuring their lids are tightly secured before placing the bottles into the coolers.
12. All samples will be placed in an iced cooler as soon as possible after collection.

2.3.2 LAKE SAMPLING

For monitoring of water quality arising from vertical stratification in lakes, a depth sampler will be used (e.g. a 'Van Dorn' or 'Kemmerer'). Generally, depth samplers consist of a clear polycarbonate sample tube with two spring mounted rubber bungs, one located at each end. The depth sampler is lowered to the correct depth attached to a cord, whereupon a metal weight is released. The weight slides down the cord and strikes a release mechanism button which releases the two bungs which then seal both ends of the tube. The water sample is then pulled back to the surface.

Regardless of the brand, water samplers that are used will be suitable for collection of water samples for ultra low metals analyses i.e. will have acrylic or PVC construction and silicone seals.

For depth sampling, the following considerations will be taken into account to ensure sample QA/QC:

1. Sampling station locations will be dependent upon the monitoring program objectives and the lake dimensions. Map coordinates for all lake sampling station locations will be recorded using a GPS unit.
2. The vertical stratification profile will be determined using a temperature probe equipped with a long cord with metre intervals marked on it.
3. The vertical temperature profile will be established by slowly lowering the temperature probe and recording the temperature change with depth.
4. Depending upon the purpose of the monitoring program, water quality samples may be collected from the different stratified layers. The depth sampler must be slowly lowered in the 'open' position (i.e. to let water enter it) until it reaches the required depth.
5. The depth sampler will be held at this depth for a few minutes to allow flushing of water inside it.
6. The metal weight (messenger) will be released (to activate the closing mechanism) and the depth sampler will be pulled back to the surface. Field measurements can be taken at depth or by filling a bottle with the sampled water and taking measurements from that immediately after sampling.
7. When collecting samples close to the lake bed care must be taken to ensure that the depth sampler does not disturb lake bed sediments (which could contaminate the sample).
8. Depending upon the lake area and depth, multiple sampling stations will likely be required to adequately characterize lake water quality.

2.3.3 RIVER SAMPLING

Depending upon the size of the water body, river sampling methods are the same as those presented in Sections **Error! Reference source not found.** and **Error! Reference source not found.**. To avoid inclusion of floating detritus in the sample, the sample bottle must be fully immersed in the river water. Care will be taken to ensure that disturbed sediments are not included in the sample.

When selecting water quality monitoring station locations on rivers, care will be taken where a tributary joins a river, since complete mixing of the two waters may not be achieved within several hundred metres downstream of the confluence (or further). When in doubt, vertical profile monitoring across the river's width using a field parameter such as pH, temperature or conductivity will be used to assess if complete mixing has occurred.

2.3.4 SAMPLING FOR TOXICITY TESTING

Sampling for sub-lethal toxicity testing is a condition of Environmental Effects Monitoring (EEM). Typically, a 4L effluent sample is sufficient. Depending upon the objectives of the toxicity testing, variables that will require confirmation prior to testing include:

- Type of effluent sample to be collected e.g. instantaneous grab sample, or composite sample collected over a period of time
- Type of dilution water to be used by the testing laboratory e.g. standard synthetic laboratory dilution water, receiving water collected upstream of the discharge etc.
- Preferred test organism e.g. *Daphnia magna* or rainbow trout

Brief details concerning laboratory methods are presented in Appendix D. For further details concerning acute lethality testing refer to Environment Canada (2002) and USEPA (2002).

2.4 QA/QC SAMPLES

For monitoring of QA/QC during sample collection and shipping, a set of QA/QC samples will be routinely submitted for analysis. Descriptions of the QA/QC samples that will be used (e.g. field blank, travel blank and field duplicate) are presented on Table 2-2. Ten percent of all samples will comprise QA/QC samples.

In the interest of transparency, the analytical laboratories will also be instructed to report the results of their own in-house QA/QC testing (e.g. results of random replicate analyses of submitted samples).

The results of QA/QC analyses will be routinely reviewed by Baffinland or their designate, and any anomalous results will be promptly investigated with the assistance of the analytical laboratory. Once the reason for the anomalous results is identified, Baffinland will ensure that operating procedures of field staff and/or the analytical laboratory will be altered in order to rectify the problem. Compliance monitoring and data management for water license sampling will be conducted by Baffinland, with the assistance of a designate as required.

2.5 MEASUREMENT OF FIELD PARAMETERS

Measurement of field parameters (e.g. temperature, pH, conductivity, redox potential, or dissolved oxygen, etc.), where warranted, will be carried out for each sample at the time of sampling. The required set of field parameters will vary according to sample type and monitoring objectives. For a complete list of required parameters please refer to the Baffinland's Class A Water License – No. 2AM-MRY1325 (Nunavut Water Board, 2013). The exact methods used for monitoring field parameters will depend upon the type of monitoring probes being used. Field staff will read and be familiar with the instruction manual for the equipment being used on site.

Field staff will rinse the monitoring probe three times with the water to be monitored before immersing the probe in the water. Generally, the user will ensure that the probe being used has had sufficient time to equilibrate in the water before the reading is taken. This is generally regarded as the point at which the reading has stabilized.

Field parameter data will be recorded in notebooks, or preferably in a custom form designed for this purpose (see example in Appendix B). A copy of the data should be retained on site.

2.5.1 MONITORING PROBE CALIBRATION

Monitoring probes will be stored and calibrated in accordance with manufacturers' instructions. All probes will be calibrated before each sampling event and a written record of the calibration results will be maintained on site. Field staff will ensure that calibration solutions are of the correct specification and that they have not passed their expiry date (if applicable). Monitoring probes will be stored as per manufacturers' recommendations.

TABLE 2-1: Summary of Recommended Water Sample Volumes, Method Detection Limits, Preservatives and Sample Storage Times

Parameter	Method Detection Limit	Required Sample Bottle	Sample Preservative	Maximum Sample Storage Time	
				Preferred	Maximum
General Chemistry					
Total metals	variable	250 mL plastic	0.5 mL conc. nitric acid	6 months	
Dissolved metals[1]	variable	250 mL plastic	cool 4˚C	7 days	
Anions	variable	1 L plastic	cool 4˚C	7 days	
TSS[2]	2 mg/L	1 L plastic	cool 4˚C	7 days	
TDS[3]	5 mg/L	1 L plastic	cool 4˚C	7 days	
pH	0.01 pH unit	250 mL plastic	cool 4˚C	4 hours	14 days
Conductivity	5 µS/cm	250 mL plastic	cool 4˚C	28 days	
Total hardness	0.5 mg/L	250 mL plastic	cool 4˚C	6 months	
Total acidity/alkalinity	5 mg/L	500 mL plastic	cool 4˚C	14 days	
Nutrients					
BOD_5[4]	1 mg/L	1 L plastic	cool 4˚C	4 hours	7 days
TKN[5]	0.1 mg/L	125 mL plastic	2 mL sulphuric acid, cool 4˚C	28 days	
Total ammonia	0.02 mg/L	250 mL plastic	2 mL sulphuric acid, cool 4˚C	28 days	
Nitrite	0.005 mg/L	500 mL plastic	cool 4˚C	48 hours	7 days
Nitrate	0.1 mg/L	500 mL plastic	cool 4˚C	48 hours	7 days
Total phosphorus	0.003 mg/L	250 mL plastic	2 mL sulphuric acid, cool 4˚C	48 hours	7 days
TOC[6]	0.5 mg/L	125 mL glass amber	2 mL sulphuric acid, cool 4˚C	28 days	
DOC[7]	0.5 mg/L	125 mL glass amber	2 mL sulphuric acid, cool 4˚C	28 days	
Biological					
Chlorophyll	0.2 mg/m3	1 L glass amber	cool 4˚C	72 hours	3 days
Phenophytin	0.2 mg/m3	1 L glass amber	cool 4˚C	72 hours	3 days
Sub-lethal Toxicity Testing[8]	N/A	20 L plastic tote	cool 4˚C	7 days	
Bacterial					
Faecal coliforms	0 ct/100 mL	125 mL sterile plastic or glass	cool 4˚C	6 hours	48 hours
Organics					
TPH[9]	1 mg/L	1 L glass amber[12]	cool 4˚C	14 days	
BTEX [10]	0.0005 mg/L	100 mL two septum vials[11]	cool 4˚C	14 days	
Oil and Grease	1 mg/L	1 L glass amber	cool 4˚C	14 days	
Phenols	0.001 mg/L	125 mL glass amber	2 mL sulphuric acid, cool 4˚C	14 days	

Notes:

1. Sample must be field filtered using 0.45 µm disposable filter and syringe.
2. Total suspended solids.
3. Total dissolved solids.
4. Biochemical oxygen demand – five (5) day test.
5. Total Kjehldahl Nitrogen.
6. Total organic carbon.
7. Dissolved organic carbon.
8. Type of test organism will depend upon objectives of testing.
9. Total petroleum hydrocarbons (also known as Total O&G - Mineral).
10. Benzene, toluene, ethyl benzene, xylenes.
11. Zero sample headspace.
12. For samples with pH >7, the sample may be preserved by filtering through a glass fibre filter and storing the filter in an airtight plastic bag in a freezer for up to three (3) weeks.

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TABLE 2-2: Summary of Recommended Water Sample Volumes, Method Detection Limits, Preservatives and Sample Storage Times

QA/QC Plan	Purpose	Description	Frequency	Prepared By
Field blank	Identification of potential contaminants arising from sample collection. The field blank bottle is prefilled with laboratory deionized water and is handled in the same way as a regular sample bottles (i.e., opened and closed during the sample collection). The bottle is submitted as a routine sample.	Bottle contains prefilled deionized water. Bottle is handled the same as one would handle the samples.	Ten percent of all samples collected will be QA/QC.	Field Staff
Travel blank	Identification of potential contaminants arising from sample storage, shipping and laboratory handling. The travel blank accompanies the samples to the laboratory but is not taken out into the field, or opened.	Sealed bottle containing deionized water provided by analytical laboratory.	Ten percent of all samples collected will be QA/QC.	Analytical laboratory
Field duplicate	Assesses sample variability and precision of laboratory analytical methods.	Duplicate sample selected at random.	Ten percent of all samples collected will be QA/QC.	Field Staff

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3 SAMPLE MANAGEMENT

3.1 SAMPLE SHIPPING AND CHAIN OF CUSTODY

Samples will be placed in iced coolers and shipped to the analytical laboratory as soon as possible after collection. Care will be taken to ensure that bottles are stored upright and are packed securely within the cooler. Preferably, leak-proof ice packs will be used for cooling the samples. If loose ice is used then this should be securely sealed in plastic bags to prevent leakage of melt water.

A chain of custody (COC) form will accompany the samples (see example forms presented in Appendix B). At a minimum, the COC form will list:

1. Project name and project assignment number.
2. Address of analytical laboratory, name of contact person and contact details.
3. Contact details and name of sampler.
4. Date and time of sampling.
5. Whether the sample has been filtered, or whether laboratory filtration is required.
6. List of sample I.D.'s, sample type (e.g. lake water, sewage effluent, etc.), number of sample bottles per sample and analysis requested.
7. Urgency of analysis (e.g. rush or normal). For rush samples the analytical laboratory should be notified ahead of time.
8. Whether sample contains preservative and if so, what preservative and when it was added.

4 LABORATORY ANALYSIS

4.1 LABORATORY ACCREDITATION

Currently, laboratory analysis of water samples is being carried out by three accredited analytical laboratories. A laboratory operated by Exova Canada Inc. ('Exova') and located in Nepean, Ontario has been carrying out the majority of sample analyses due to its geographical proximity to site (with respect to sample holding times). The Exova laboratory located in St. Augustin de Desmaures has been providing toxicity testing services. ALS Laboratory Group ('ALS'), located in Vancouver, BC has been used when ultra low level metals analysis has been required. Details on analytical laboratory accreditation are presented in Appendix C.

4.2 ANALYTICAL DETECTION LIMITS

Required analytical laboratory method detection limits for a range of parameters are listed in Table 2-1. It should be noted that on occasion, a loss of analytical sensitivity can be encountered due to excessively high concentrations of parameters within a sample. If this is encountered, Baffinland or their designate will work with the analytical laboratory to try and resolve the problem.

4.3 LABORATORY ANALYTICAL METHODS

Analytical methods used by the analytical laboratories generally conform to the standard methods outlined in *Standard Methods for the Examination of Water and Wastewater* (APHA et al, 1989). For some parameters alternative standard analytical methods are used, as listed in Appendix D.

4.4 ANALYTICAL LABORATORY QA/QC PROCEDURES

Each analytical laboratory carries out its own routine in-house QA/QC checks, which include:

- Use of calibration check standards and drift control standards.
- Use of surrogate standards and internal standards.
- Replicate analyses on submitted samples.
- Use of standard reference materials (SRM's) and matrix spikes.

Further details on the analytical laboratories in-house QA/QC protocols are presented in Appendix E.

5 DATA MANAGEMENT AND REPORTING

5.1 DATA MANAGEMENT

All water quality data collected by Baffinland or designate from the various environmental programs will be stored electronically in a spreadsheet database (Microsoft Excel) or using alternative software designed specifically for environmental data management.

QA/QC measures relating to data validation will include the following**:**

1. Designation of a suitable person to act as Water Quality Database Manager (WQDM).
2. Upon receipt, laboratory analytical data will be reviewed by the WQDM to check for completeness, typos, outlying values, etc. The analytical laboratory will be immediately notified of any anomalous results.
3. At a suitable frequency (e.g. once per month) the spreadsheet database should be updated by the WQDM using: i) results provided in electronic format by the analytical laboratories, and ii) copies of the field parameter monitoring records forwarded from site
4. The WQDM will be responsible for ensuring that a third party (e.g. another staff member) carries out a QA/QC check on a minimum of ten percent of newly entered data.

5.2 REPORTING

All documents prepared by Baffinland or their designate for submission to the regulators will be reviewed by senior staff and Baffinland prior to issue, as per the company's standard practice and quality management system.

6 REFERENCES

1. APHA *et al*, 1989. Standard Methods for the Examination of Water and Wastewater; AHPA, AWWA and WPCF, 17th ed.

2. Environment Canada, 2002. Metal Mining Guidance Document for Aquatic Environmental Effects Monitoring. http://www.ec.gc.ca/eem/English/MetalMining/Guidance/default.cfm.

3. INAC, 1996. Quality Assurance (QA) and Quality Control (QC) Guidelines for Use by Class "A" Licenses in Meeting SNP Requirements and for Submission of a QA/QC Plan. Prepared by Department of Indian and Northern Affairs Canada Water Resources Division and the Northwest Territories Water Board, July 1996.

4. Nunavut Water Board, 2013. Baffinland Iron Mines Corp. – Class A Water License No: 2AM-MRY1325. Issued by the Nunavut Water Board, 2013.

5. USEPA, 2002. Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms; 5th Ed., USEPA, ref. No. EPA-821-R-02-012.

Appendix A

Quality Assurance 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 (INAC, 1996).

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

JULY 1996

DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS CANADA
WATER RESOURCES DIVISION
AND THE
NORTHWEST TERRITORIES WATER BOARD

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1.0 Introduction and Definitions

In order to assist Licensees in completing their Quality Assurance and Quality Control (QA/QC) Plan, the following guidelines are provided, which indicates the minimum information that should be included.

These Guidelines are divided into three sections:

1) Field Sampling
2) Lab Analysis
3) Reporting Requirements

It is recognized that there may be different interpretations as to what is covered by "Quality Assurance/Control" due to the fact that certain Licensees have their own laboratories, while others only use commercial laboratories. For licence purposes, "Quality Assurance" and "Quality Control" refer to the following:

Quality Assurance: is the system of activities designed to better ensure that quality control is done effectively; while

Quality Control: is the use of established procedures to achieve standards of measurement for the three principal components of quality: precision, accuracy and reliability.

2.0 Field Sampling

2.1 Sample Collection

2.1.1 Location

A QA/QC plan must identify the locations of all sampling stations and the markers used to identify the stations. If the Surveillance Network Program (SNP) of the Water Licence does not specify sampling locations, locations should be chosen with help from an Inspector.

Buoys and landmarks identify sampling stations in tailings ponds and lakes, while sign post positioning usually marks stream sample stations. Stations should be used repeatedly, with the same personnel and techniques to reduce operational error. The use of Global Positioning System (GPS) to identify Latitude and Longitude for sampling stations is recommended.

2.1.2 Sampling Equipment

The Plan must include a detailed section on the equipment used for sampling, the rationale behind the choices of equipment, and descriptions of how the equipment is maintained and calibrated. Equipment and bottles should be selected so that they do not contaminate or otherwise alter the concentrations of parameters of interest.

Sampling devices, sample bottles and filtration devices should be constructed of non-metallic material. Most samples are now collected in containers constructed of high density polyethylene plastic. However, there are some exceptions, when testing for oil and grease or phenols glass containers are to be used. When conducting a fish bioassay, plastic drums are used while hydrocarbon based containers are not to be used for the collection of organic samples.

This section should also identify whether new or used bottles are used for each sample analysis. New bottles are preferred,

but sample containers may be used repeatedly with proper handling measures.

If old bottles are used, a detailed description should be included, noting how they are maintained, stored and cleaned. Usually, this will closely resemble the product manufacturer's instructions. An example of how bottles should be cleaned is outlined below:

- Rinse well with hot tap water for one minute or more.
- Empty bottle and add 30% HNO_3 to approximately 1/3 container capacity. Shake well for three to four minutes.
- Rinse vigorously with hot tap water for two minutes.
- Rinse thoroughly three times with tap water and three times with distilled water.
- Store with 0.2% HNO_3 for a minimum of one week.
- Rinse again with distilled water at least three times.

Bottles that are to be used for bacteria testing should be acid washed or autoclaved if possible.

Note: Additional information on bottle washing is also available from Water Resources Division.

2.1.3 Sampling Methods

This Section will include details on methods for sample collection and the equipment that is to be used for each station.

In lakes and ponds, regular sample bottles are used the majority of the time, but Van Dorn samples are often utilized. The sample or the sample bottle is usually lowered to mid

depth and washed three times before collecting the sample on the fourth submersion. Approximately 2% of the sample container capacity should remain to provide for mixing, preservative addition and thermal expansion.

Stream water sampling is usually done by plunging a sample bottle toward the current and allowing it to fill. Once again, the bottle should be rinsed three times before filling and room should be left for preservative addition and mixing.

A glass bottle should be used when sampling for oil and grease with the sample being collected during the first submersion and not rinsed three times first.

This section should also describe how often field blanks and replicate samples will be collected. Field blanks are samples of distilled/deionized water that are to be treated in exactly the same manner as the other samples. Blanks should therefore be taken to the field and handled and preserved as part of the sample program. They indicate when a sample may be contaminated and are indicative of general sample integrity. Replicate samples (duplicates and triplicates) are two or three samples collected from the same station at the same time. They help to ensure sample precision at the laboratory.

2.2 Sample Handling

2.2.1 Preservation

After collection, most samples must be preserved in order to prevent chemical or biochemical changes to the sample. The QA/QC plan must describe how samples from each station are to be preserved.

Preservation is generally done by the addition of certain chemicals into the bottle immediately after the sample is collected. **Table 1** is a general guide to preservatives and their appropriate concentrations. The QA/QC plan should contain more detailed information on the concentrations and amount of preservatives that will be used.

2.2.2 Sample Identification

The plan should include a description of the system used to identify samples. The system must provide positive sample identification and ensure that the identification is maintained. It is advisable to keep a logbook of samples that have already been delivered.

The identification can be maintained by marking the bottle itself or a label, with a water resistant, non-smear felt pen. The information should be clear to persons uninvolved in the sampling and may include such details as company name, sample area, SNP number, time and date.

2.2.3 Transportation

The section on transportation will describe how sample integrity will be ensured from the time of collection to completion of delivery. Delivery to the lab should be done as soon as possible after the samples have been collected.

Usually, samples are sealed and stored upright in a box with other samples to provide a snug, immobile storage space during transfer. Any samples that require refrigeration for preservation should be kept cool during transport.