



Great Bear Lake Sites

Quality Assurance and Quality Control Plan

August 10, 2017 – V1



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Contaminants and Remediation Division

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1 INTRODUCTION

1.1 BACKGROUND

Indigenous and Northern Affairs Canada (INAC) has the responsibility to manage a number of contaminated sites that are no longer maintained by the original occupant. The abandoned Great Bear Lake Sites (GBL Sites) are amongst these legacy properties. Under the Contaminated Sites Management Program (CSMP), the INAC Contaminants and Remediation Division (CARD) aims to complete remediation of the GBL Sites to improve environmental conditions and reduce environmental/safety risks.

The GBL Sites refer collectively to the abandoned historic industrial properties of Silver Bear Mines (made up of the larger Terra Mine and smaller satellite sites of Northrim, Norex, Graham Vein and Smallwood), El Bonanza and Bonanza Mine, Contact Lake Mine and the Sawmill Bay site. These properties are found on or near the eastern shore of Great Bear Lake, in the Sahtu region of the Northwest Territories.

The GBL Sites have been the subject of numerous assessments and studies to characterize the nature of environmental contamination and hazards. Efforts culminated in the production of Remedial Action Plans (RAPs) for each of the project sites, which summarized site conditions, interpreted results of sampling/assessment, evaluated remedial options and presented the selected remedial approach. The RAP for each GBL Site serves as the primary guidance document for remedial activities and site management and are available on the Sahtu Land and Water Board Public Registry.

Remediation of the GBL Sites was first initiated as the Phase I Remediation Project, completed in 2010-2011 and focussed on work activities which could be completed without heavy equipment at Contact Lake Mine, El Bonanza/Bonanza Mine and Sawmill Bay. This was followed with the consolidation and removal of drums with residual fuel/product in 2016.

Remaining work activities required to complete remediation will be implemented as the GBL Sites Phase II Remediation Project, tentatively scheduled to commence in 2019. In support of the Project, INAC has obtained the applicable regulatory authorizations through the Sahtu Land and Water Board. This includes an updated Water Licence (S17L8-002), replacing the earlier licence and taking effect on July 25, 2017.

The Water Licence outlines the requirements of the site-specific Surveillance Network Program (SNP), including water monitoring stations, analytical parameters and sampling frequency. The Water Licence also requires the provision of a Quality Assurance and Quality Control Plan (QA/QC Plan) meeting the following requirements as listed in:

Prior to the collection of SNP samples, the Licensee shall submit to the Board and an



Analyst, a Quality Assurance and Quality Control Plan, which shall include a list of techniques that will be used to collect and analyze samples collected under the SNP, for the purposes of quality assurance and quality control. The Analyst shall provide a recommendation to the Board. The Licensee shall not commence Construction until the Analyst has approved the Plan. (Annex A, Part A, Item 6)

1.2 SCOPE

Adherence to best practices in QA/QC is a crucial element of all sampling programs and provides confidence in data collection and analysis. Quality assurance is the use of planned procedures to ensure the quality of the data (e.g. minimize contamination). In contrast, quality control procedures are used to quantify the quality of the data (e.g. precision, accuracy and reliability). This QA/QC Plan outlines the approaches to be used during the collection of SNP samples, and the QA/QC measures to be applied to ensure data quality.

This QA/QC Plan has been designed to meet the requirements of the Water Licence, and as requested, is specific to SNP station monitoring. It is important to note that the SNP does not capture the entirety of monitoring to be conducted before, during and after GBL Sites remediation. Additional surface water monitoring will be conducted as part of the Water Quality Monitoring Plan (WQMP). The WQMP will also include installation of groundwater wells at select locations during site remediation. Following completion of post-remediation monitoring, the GBL Sites will enter a phase of Long-Term Monitoring and State of Environment Monitoring, during which sampling of additional environmental media may be conducted (e.g. sediment, soil, vegetation, benthos, fish). During these monitoring programs, the QA/QC approaches outlined herein will be applied to water sampling, and additional best practices outlined for other environmental media. In conformance with the Water Licence requirements, these plans (including QA/QC protocols) will be submitted to the Sahtu Land and Water Board for review.

1.3 DOCUMENT CONTROL

Document control measures will be employed to ensure INAC and its Contractors are utilizing the most current QA/QC Plan and to record the evolution of the Plan. Table 1 below presents this revision history.

Table 1 Revision History

Version #	Document Date	Sahtu Land and Water Board Approval Date	Sections Revised	Revision Rationale
DRAFT V1	August 10, 2017	Pending	n/a	n/a



2 SURVEILLANCE NETWORK PROGRAM

2.1 SNP STATIONS

The Surveillance Network Program (SNP) has been outlined within the GBL Sites Phase II Remediation Project Water Licence (S17L8-002). The monitoring requirements and effluent quality standards at the individual SNP stations are presented in Table 2 below.

Table 2 SNP Monitoring Requirements

STATION	S15L8-001 (1) (from 2015 Licence)	
Description	Treated Sewage effluent prior to Discharge	
Location	Camp Operations	
Sampling Frequency	Prior to Discharge; monthly during Discharge	
Sampling Parameters	Total Suspended Solids; 5-day biochemical oxygen demand (BOD ₅); Fecal Coliforms; pH	
Rationale for Station	To characterize Sewage effluent and ensure effluent meets the criteria listed in Part D, item 14.	
Status	Active	
Effluent Quality Standards	Part D, Item 14	
	Parameter	Maximum Grab Concentration
	Suspended Solids	100 mg/L
	Oil and Grease	5 mg/L
	BOD ₅	100 mg/L
	Fecal Coliforms	1 x 10 ⁴ CFU/100ml
	pH	6-9
STATION	S15L8-001 (2) (from 2015 Licence)	
Description	Treated Greywater prior to disposal	
Location	Camp Operations	
Sampling Frequency	Prior to Discharge; monthly during Discharge	
Sampling Parameters	Total Suspended Solids; BOD ₅ ; Fecal Coliforms; pH	
Rationale for Station	To characterize Sewage effluent and ensure effluent meets the criteria listed in Part D, item 14.	
Status	Active	
Effluent Quality Standards	Part D, Item 14	
	Parameter	Maximum Grab Concentration
	Suspended Solids	100 mg/L
	Oil and Grease	5 mg/L
	BOD ₅	100 mg/L
	Fecal Coliforms	1 x 10 ⁴ CFU/100ml
	pH	6-9
STATION	S15L8-001 (3 a, b, c, d,) (from 2015 licence)	
Description	Treated Process Water prior to disposal	
Location	Camp Operations	
Sampling Frequency	Prior to Discharge	
Sampling Parameters	As per Part D, item 16. Total and dissolved metals listed in per Part D, item 16. Total Suspended Solids (TSS); Standard ^a ;	
Rationale for Station	Characterize Process Water and ensure effluent meets the criteria list in Part D, item 16	
Status	Active	



Effluent Quality Standards	<i>Part D, Item 16</i>	
	Parameter	Maximum Grab Concentration
	Volatile Hydrocarbons	15 mg/L
	pH	6 - 9
	Extractable Hydrocarbons	5 mg/L
	Non-aqueous phase liquid/free product	Not Present
	Phenols	20 µg/L
	Arsenic (total)	100 µg/L
	Copper (dissolved)	200 µg/L
	Cadmium (dissolved)	10 µg/L
	Mercury (total)	0.6 µg/L
	Nickel (dissolved)	200 µg/L
	Lead (dissolved)	50 µg/L
	Zinc (total)	1 mg/L
	Chromium (total)	100 µg/L
	Cobalt (dissolved)	50 µg/L
	Total Suspended Solids	30 mg/L
STATION	<i>S15L8-001 (4) (from 2015 Licence)</i>	
Description	Camsell River Intake	
Location	Camp Operations	
Sampling Frequency	Prior to use; monthly during use	
Sampling Parameters	Quantity	
Rationale for Station	To measure the quantity of water used.	
Status	Active	
Effluent Quality Standards	None	
STATION	<i>S15L8-001 (5) (from 2015 Licence)</i>	
Description	Great Bear Lake Intake	
Location	Camp Operations	
Sampling Frequency	Prior to use; monthly during use	
Sampling Parameters	Quantity	
Rationale for Station	To measure the quantity of water used.	
Status	Active	
Effluent Quality Standards	None	
STATION	<i>S17L8-002 (6)</i>	
Description	Contact Lake Intake	
Location	Camp Operations	
Sampling Frequency	Prior to use; monthly during use	
Sampling Parameters	Quantity	
Rationale for Station	To measure the quantity of water used.	
Status	Active	
Effluent Quality Standards	None	
STATION	<i>S17L8-002 (7A)</i>	
Description	Ho Hum Tailings Containment Area (TCA) – Corresponding with station T-8	
Location	Silver Bear- Terra Mine	
Sampling Frequency	Annually when inactive; biweekly during open water season when Remediation is occurring	
Sampling Parameters	As Part D, item 22. Total Suspended Solids (TSS); Standard ^a ;	
Rationale for Station	To monitor the quality of TCA Discharge to Moose Bay to ensure the Effluent Quality Criteria listed in Part D, item 22 are met.	
Status	Active	



Effluent Quality Standards	<i>Part D, Item 22</i>	
	<u>Parameter</u>	<u>Maximum Grab Concentration</u>
	pH	6-9
	Total Aluminum	0.8 mg/L
	Total Arsenic	1 mg/L (7A)
	Total Copper	0.02 mg/L
	Total Lead	0.02 mg/L
	Total Nickel	0.1 mg/L
	Total Silver	0.004 mg/L
	Total Zinc	0.04 mg/L
	Ammonia as N	10 mg/L
	Nitrate as N	10 mg/L
	Nitrite as N	0.8 mg/L
	Total Suspended Solids	30 mg/L
	Oil and Grease	5 mg/L (non-visible)
STATION	<i>S17L8-002 (7B)</i>	
Description	Moose Bay- Corresponding with station T-10	
Location	Silver Bear- Terra Mine	
Sampling Frequency	Annually when inactive; biweekly during open water season when Remediation is occurring	
Sampling Parameters	As Part D, item 22. Total Suspended Solids (TSS); Standard ^a ;	
Rationale for Station	To Identify the potential influence of the quality of TCA Discharge on Moose Bay to ensure the effluent quality criteria listed in PartD, item 22 are met	
Status	Active	
Effluent Quality Standards	<i>Part D, Item 22</i>	
	<u>Parameter</u>	<u>Maximum Grab Concentration</u>
	pH	6-9
	Total Aluminum	0.8 mg/L
	Total Arsenic	0.2 mg/L (7B)
	Total Copper	0.02 mg/L
	Total Lead	0.02 mg/L
	Total Nickel	0.1 mg/L
	Total Silver	0.004 mg/L
	Total Zinc	0.04 mg/L
	Ammonia as N	10 mg/L
	Nitrate as N	10 mg/L
	Nitrite as N	0.8 mg/L
	Total Suspended Solids	30 mg/L
	Oil and Grease	5 mg/L (non-visible)
STATION	<i>S17L8-002 (8C)</i>	
Description	Hermandy Lake - Corresponding with station NO-7	
Location	Silver Bear - Northrim Mine	
Sampling Frequency	Annually when inactive; monthly during open water season when Remediation is occurring	
Sampling Parameters	Non-aqueous phase liquid/free product; Total Suspended Solids; Standard ^a ; Total Metals ^b ; Hydrocarbon ^c ;	
Rationale for Station	Tailings with Hermandy Lake	
Status	Active	
Effluent Quality Standards	None	
STATION	<i>S17L8-002 (9D)</i>	
Description	Camsell River - Corresponding with station NO-6	
Location	Silver Bear - Northrim Mine	
Sampling Frequency	Annually when inactive; monthly during open water season when Remediation is occurring	



Sampling Parameters	Non-aqueous phase liquid/free product; Total Suspended Solids; Standard ^a ; Total Metals ^b ; Hydrocarbon ^c ;
Rationale for Station	Current estimated Seepage point of Hermandy Lake to Camsell River (additional station required when original Discharge pathway restored)
Status	Active
Effluent Quality Standards	None
STATION	S17L8-002 (10E)
Description	Norex Waste Rock - Corresponding with station Norex-3
Location	Silver Bear - Norex Mine
Sampling Frequency	Annually
Sampling Parameters	Non-aqueous phase liquid/free product; Total Suspended Solids; Standard ^a ; Total Metals ^b ; Hydrocarbon ^c ;
Rationale for Station	Monitor water from adit and Waste Rock
Status	Active
Effluent Quality Standards	None
STATION	S17L8-002 (11F)
Description	Camsell River-Corresponding with station NX-12
Location	Silver Bear - Norex Mine
Sampling Frequency	Annually
Sampling Parameters	Non-aqueous phase liquid/free product; Total Suspended Solids; Standard ^a ; Total Metals ^b ; Hydrocarbon ^c ;
Rationale for Station	Monitor potential Discharge from Waste Rock and adit
Status	Active
Effluent Quality Standards	None
STATION	S17L8-002 (12G)
Description	Tailings Pond - Corresponding with established station CL-3
Location	Contact Lake Mine
Sampling Frequency	Annually when inactive; monthly during open water season when Remediation is occurring
Sampling Parameters	Non-aqueous phase liquid/free product; Standard ^a ; Total Metals ^b ; Hydrocarbon ^c ;
Rationale for Station	Outflow of Tailings pond
Status	Active
Effluent Quality Standards	None
STATION	S17L8-002 (13H)
Description	Contact Lake - Corresponding with established station CL-26
Location	Contact Lake Mine
Sampling Frequency	Annually when inactive; monthly during open water season when Remediation is occurring
Sampling Parameters	Non-aqueous phase liquid/free product; Total Suspended Solids; Standard ^a ; Total Metals ^b ; Hydrocarbon ^c ;
Rationale for Station	Discharge of Tailings pond to Contact Lake
Status	Active
Effluent Quality Standards	None
STATION	S17L8-002 (14I) a, b, c, etc.
Description	Landfarm Discharge water
Location	Landfarm at Silver Bear Mines, Sawmill Bay and El Bonanza/Bonanza
Sampling Frequency	Prior to any Discharge
Sampling Parameters	As per Part D, item 20. Standard ^a ; Total Suspended Solids; Total Metals ^b .
Rationale for Station	Monitor quality of water proposed for Discharge from the Landfarm to ensure it meets the criteria outlined in Part D, item 20.
Status	Active



Effluent Quality Standards	Part D, Item 20	
	Parameter	Maximum Grab Concentration
	pH	6-9
	Volatile Hydrocarbons	15 mg/L
	Extractable Hydrocarbons	5 mg/L
	Oil & Grease	5 mg/L, non-visible
	Non-Aqueous Phase Liquid/Free Product	Not Present
	Total Arsenic	100 µg/L
	Dissolved Cadmium	10 µg/L
	Total Chromium	100 µg/L
	Dissolved Cobalt	50 µg/L
	Dissolved Copper	200 µg/L
	Dissolved Lead	50 µg/L
	Total Mercury	0.6 µg/L
	Dissolved Nickel	200 µg/L
	Total Zinc	1000 µg/L
	Phenols	20 µg/L
	Polychlorinated Biphenyl (PCBs)	1000 µg/L

Footnotes:

^a Standard: pH, conductivity, hardness, sulphate

^b Total Metals = Total elemental analysis by ICP-Metals of ICP-MS 24 element scan: Include all elements in Total Metals. includes all elements in Total Metals plus Antimony (Sb), Arsenic (As), Barium (Ba), Bismuth (Bi), Cesium (Cs), Chromium (Cr), Lithium (Li), Thallium (Tl), Titanium (Ti), Uranium (U), & Vanadium (V).

^c Hydrocarbon: PHC (F1-F4) and BTEX

2.2 STATION TYPES

The SNP stations listed in Table 2 may be classified into three discrete categories as follows:

- **Intake:** Stations requiring volume measurements/data, without sampling.
 - S15L8-001 (4): Camsell River Intake
 - S15L8-001 (5): Great Bear Lake Intake
 - S18L8-002 (6): Contact Lake Intake
- **Effluent Generated/Discharged¹:** Stations requiring sampling of effluent generated during remediation.
 - S15L8-001 (1): Treated sewage effluent prior to discharge
 - S15L8-001 (2): Treated greywater prior to disposal
 - S15L8-001 (3 a, b, c, d...): Treated process water prior to disposal
 - S17L8-002 (14L a, b, c...): Landfarm discharge water
- **Surface Water:** Stations requiring sampling of surface water before, during and after

¹ To enhance the downstream wetland, lowering of the Ho Hum Tailings Containment Area (TCA) will be required and necessitate discharge of water from the TCA to Moose Bay (Camsell River). However, the sampling approach of these waters is consistent with other surface waterbodies and has therefore been classified with surface water sampling.



remediation.

- S17L8-002 (7A): Ho Hum TCA – Corresponding with station T-8
- S17L8-002 (7B): Moose Bay - Corresponding with station T-10
- S17L8-002 (8C): Hermandy Lake - Corresponding with station NO-7
- S17L8-002 (9D): Camsell River - Corresponding with station NO-6
- S17L8-002 (10E): Norex Waste Rock - Corresponding with station Norex-3
- S17L8-002 (11F): Camsell River-Corresponding with station NX-12
- S17L8-002 (12G): Contact Lake Tailings Pond - Corresponding with station CL-3
- S17L8-002 (13H): Contact Lake - Corresponding with established station CL-26

These station types require unique approaches to monitoring and application of distinct QA/QC protocols. Monitoring/sampling approaches for each station type are discussed in Section 3, with a detailed discussion of QA/Q protocols provided in Section 4.

3 MONITORING METHODOLOGIES

The following section provides a description of the methodologies to be applied during monitoring/sampling at the three discrete types of SNP Stations: Intake, Effluent Generated/Discharged and Surface Water.

3.1 INTAKE STATIONS

The GBL Sites Phase II Remediation Project Water Licence provides clear data requirements for water intake stations:

- *The Licensee shall maintain water uptake logs for all withdrawals/all utilized water sources and make them available at the request of an Inspector. The water uptake logs shall include the following information: identification of water source, volume of water withdrawn in cubic meters, cumulative uptake per source, time of uptake, date of uptake, and contractor and employee identification. (Part C, Item 5)*

To meet these requirements, INAC will implement the following general procedures during water withdrawal at intake stations:

- Water withdrawal locations and systems will meet the requirements of the Water Licence (S17L8-002) and the associated Land Use Permit (S17D-003). Locations will be visually inspected and signed prior to use.
- A system will be established to measure water withdrawal, tailored to the type and



volume of the withdrawal. This may include recording of pump run times (with sufficient information on flow rates or pump test data); filling of a known volume (e.g. tank or water truck) or the installation of a water meter.

- For each water withdrawal, the following minimum information will be recorded in a water uptake log: Water source, volume of water withdrawn in cubic meters, cumulative uptake per source, time of uptake, date of uptake and contractor/employee identification.
- Information will be tabulated and made available to the Inspector as requested.

3.2 EFFLUENT GENERATED/DISCHARGED

During active site remediation, several distinct effluent streams will be generated during camp operation and remedial activities. Effluent streams will require treatment prior to discharge, or direct discharge if meeting the effluent quality standards/criteria (EQC) presented within the Water Licence.

Collection timing and frequency of effluent sampling will meet the parameters as specified within the Water Licence, typically before and during discharge. Efforts will be taken to ensure the sample is representative of the effluent, including mixing if necessary (e.g. from sewage or process water tanks). Samples within the landfarm will be collected from any location with a hydrocarbon sheen or evidence of increased contaminant concentration.

Sample collection of treated sewage, greywater, process water and landfarm water will be implemented by grab sampling. Laboratory provided bottles will be submersed directly in the effluent or effluent stream, using the laboratory specific methodology for the analytical parameter (e.g. filtered, preserved, without headspace). Where bottles are pre-charged with preservatives, care will be taken to prevent release during sampling by keeping the sampling bottle near vertical, though not directly at the water surface.

Field notes will be recorded, including the following general information: date/time, personnel, effluent sampled, number of bottles, parameters, evidence of contamination (e.g. discoloration, odour, sheen) and any other observation which may influence the sample results (e.g. contaminant sources). Where sampling is conducted at the location of effluent discharge, field observations will include visual inspection for erosional effects or evidence of increased wildlife activity.



3.3 SURFACE WATER

Sampling locations as presented within the SNP are based on historic monitoring stations and/or locations at which remedial activities necessitate monitoring. Coordinates from previous sampling programs will be used to locate the stations, requiring a GPS unit of sufficient accuracy (+/- 1 m to 10 m). It should be noted that sample locations may be adjusted based on field conditions (e.g. water availability, location access, etc.), for which revised station coordinates and rationale will be provided.

The collection of *in-situ* field information forms an integral component of surface water monitoring and assists in interpreting findings and changing site conditions. Field measurement requirements are based on approaches applied during earlier assessment programs and the need to determine toxicity modifying factors when calculating Canadian Council of Ministers of the Environment (CCME) Freshwater Aquatic Life (FAL) guidelines. Where water depth permits, the following field measurements will be collected at surface water monitoring stations: temperature, pH, dissolved oxygen, turbidity and specific conductivity. Additional information to be recorded at each sampling station includes: station photographs, date/time, sampling personnel, coordinates, general location description, access methodology (e.g. boat, shoreline), weather, waterbody condition (e.g. wave height estimate), contaminant sources (e.g. sheen), sampling methodology (syringe/pole/grab/column), collection depth, number of sample bottles, sample parameters and any other pertinent information.

Sample collection at surface water stations will require methodology adapted to field conditions. These general approaches are presented as follows:

1. Syringe Sampling: Required where water depth prohibits submersion of sample bottles (e.g. sampling from waste rock piles). Single-use sterile syringes will be used to fill the pre-labelled laboratory provided sample bottles.
2. Pole Sampling: Recommended during shoreline sampling to enable sample collection at greater depth and limit sediment disruption. The sampling pole may be extended as necessary. Individual laboratory provided sample bottles will be submerged, or sub-sampled from a sterile single-use unpreserved glass bottle fitting the sampling pole. Where there is a discernable water flow direction, samples will be submersed with the bottle opening facing upstream.
3. Grab Sampling: Where only a single surficial sample is required and water depth is sufficient to prevent disruption of the sediment surface, grab samples will be collected by slowly submerging laboratory provided sample bottles into the water column (limiting inclusion of water at the surface), opening upstream in flowing water conditions.



4. Column Sampling: Select SNP stations aim to characterize conditions within waterbodies and will be sampled at depths prescribed within earlier monitoring programs (e.g. 1 m and 10 m). Column sampling will be conducted with a Van Dorn, Kemmerer or similar approved water sampling apparatus. In waterbodies with significant flow velocity, weights may be required to maintain vertical alignment of the sampler.

Where field conditions necessitate a revised approach, the CCME *Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment – Volume 3 Suggested Operating Procedures* (CCME 2016) will be consulted.

3.4 SAMPLE COLLECTION

As indicated in the Water Licence (Annex A, Part A, Item 5), “All analyses shall be performed in a laboratory accredited by the Canadian Association for Laboratory Accreditation (CALA) for the specific analyses to be performed or as approved by an Analyst.”. A contract laboratory will be selected based on this requirement and the availability of Yellowknife services. The contract laboratory will be required to outline their specific procedures during sample collection, such as sample preservation, headspace, filtration or refrigeration as necessary for the given analytical parameter.

All sample collection procedures provided by the contract laboratory will be followed throughout SNP sampling. Sampling stations require the analysis of dissolved phase constituents, including dissolved organic carbon (DOC) and dissolved metals. Field filtration will be completed by injecting the sample water through a 0.45-µm disposable filter (polyethersulfone or approved substitute), using a polypropylene syringe. The syringe and filter will be flushed with sample water several times prior to sample collection. A new filter and syringe will be used for each station. While this is the preferred technique for field filtration, the syringes, filters and additional handling have been shown to be potential sources of sample contamination. Where samples will be submitted within a timely fashion (i.e. within a few days), laboratory filtration/preservation may instead be selected.

All samples will be labelled per laboratory requirements, kept cool (ideally at 4°C), Chain of Custody (COC) forms completed, and included with samples in coolers for transport to the contract laboratory.



4 QA/QC PROCEDURES

Prior to initiating SNP sampling, INAC and/or its contractors will produce a detailed work plan. This will include an outline of the specific sampling procedures and methodologies. Personnel experienced in sampling will form a vital link when applying this Plan and incorporating additional QA/QC measures as necessary to ensure the reliability of monitoring data when faced with unexpected field conditions.

Notwithstanding the need to evaluate field conditions and apply additional QA/QC procedures accordingly, the following minimum QA/QC procedures will be applied during sampling and analysis.

4.1 SAMPLING QA/QC

Field activities have the greatest potential to cause sample contamination and are a primary focus of QA procedures. The following QA approaches will be applied during field sampling to reduce the risk of sample contamination and to ensure the reliability of data:

- Prior to sampling, vehicles (e.g. boats, ATVs), work areas and equipment will be inspected for potential contaminant sources, such as fuel leaks, fouled boat hulls or soiled sampling lines;
- All equipment used for the collection of field data (e.g. multi-meters) will be calibrated per manufacturer specifications;
- As much as possible, single-use equipment and supplies will be used to prevent cross contamination between sampling stations;
- To allow for reproducibility of results, sampling equipment will be an accepted brand, an approved design and made of non-contaminating materials;
- Where possible, sampling will be conducted from the area of least impacts to greatest, minimizing the potential for cross contamination;
- Any water sampling apparatus used (e.g. pole, Van Dorn) will be decontaminated prior to initial use and triple rinsed (including valves) prior to sampling at each station;
- Sample bottles and preservatives will be single-use and provided by the contract laboratory;
- All sampling and sample bottle handling will be conducted with single-use unpowdered nitrile gloves, replaced at each sampling station;
- Before, during and after collection, sample bottles will be kept away from contaminant sources as much as possible (e.g. fuel, dust);



- Where not pre-charged with preservatives, sample bottles will be triple rinsed with the sample water prior to filling;
- Rinse water will be discarded away from the sampling station, without disrupting the water column or sediments;
- Where sampling by boat, collection will be conducted from the front of the boat, with rinse water discarded at the back;
- All laboratory requirements for sample filtration, preservation, headspace, etc. will be adhered to;
- Samples will be labelled with (at minimum) the sample identifier (i.e. SNP station), date, time, project name, requested analyte, preservative and filtration;
- Samples will be kept cool prior to and during transport to the laboratories (ideally at 4°C, and not permitted to freeze);
- Every effort will be made to enable sample analysis within recommended hold times; however, at remote sites some deviation may be required and must be tracked to ensure data is not compromised; and
- COC forms will be completed for all samples, with one copy retained and other included in sealed sample coolers.

Several standard QC approaches will be used to confirm data precision and accuracy and to identify any potential field contamination:

- Duplicate samples will be collected at a rate of 10% and will be submitted blind to the laboratory (i.e. laboratory will not know which sample is being duplicated);
- Field blanks will be submitted from each project site to identify any potential contamination from the sampling procedure. Sampling methodology will directly mirror site samples (e.g. gloves, filters, preservation); however laboratory provided deionized water will be used; and
- Trip blanks will be provided by the laboratory, transported to the field and returned unopened to identify any potential contamination from transport. A single trip blank will be submitted with each sample shipment and as recommended in CCME (2011), will be put on hold pending results of field blank analysis. If any questionable data is found in the field blank results, the trip blanks will be analyzed to help determine the source of contamination.

Evaluation of QC sample analytical results is an important final step. Due to the natural heterogeneity of environmental media, duplicate samples generally will not correspond perfectly



with the original sample. To validate the data, the relative percent difference (RPD) will be calculated and evaluated. Results of field and trip blanks will be reviewed to ensure sample contamination is not occurring during collection, handling or transportation.

4.2 LABORATORY QA/QC

All samples will be submitted for analysis to a CALA accredited laboratory that has an approved QA/QC plan. Laboratory procedures include replicate analysis, surrogate recoveries, blank spikes, matrix spikes, instrument calibration, internal standards, method blanks and internal QC checks. Results of these procedures will be provided in laboratory reports. The standard analytical quality control protocols will meet or exceed the requirements of Canadian laboratory regulators.

Analytical methods will be selected to ensure detection limits are below the EQC for the SNP stations and are consistent with earlier assessments at the GBL Sites. The methods applied by the contract laboratories may vary; however, as part of CALA accreditation, all must meet rigorous requirements in conformance to standard methods of analysis.

The expected methods of analysis for the SNP parameters are presented in Table 3 below. These parameters reflect analysis by Maxxam Laboratories (as was conducted during earlier assessment programs), and Taiga Laboratories; however, may be revised pending confirmation of the contract laboratory selected.

Table 3 Methods of Analysis

Analyses	Laboratory Method	Analytical Method
pH @25°C	AB SOP-00005	SM 22 4500 H+ B m
Conductivity @25C	AB SOP-00005	SM 22 2510 B m
Hardness Total (calculated as CaCO ₃)	BBY WI-00033	Auto Calc
Sulphate by Automated Colourimetry	AB SOP-00018	SM 22 4500-SO ₄ E m
Elements by CRC ICPMS (dissolved)	BBY7SOP-00002	EPA 6020B R2 m
Elements by CRC ICPMS (total)	BBY7SOP-00003,	BCLM2005,EPA6020bR2m
Mercury (Dissolved) by CVAF	BBY7SOP-00015	BCMOE BCLM Oct2013 m
Mercury (Total) by CVAF	BBY7SOP-00015	BCMOE BCLM Oct2013 m
Filter and HNO ₃ Preserve for Metals	BBY7 WI-00004	BCMOE Reqs 08/14
Phosphorus -P (Total, Dissolved)	AB SOP-00024	SM 22 4500-P A,B,F m
Total Phosphorus	AB SOP-00024	SM 22 4500-P A,B,F m
CCME Hydrocarbons (F2-F4 in water)	AB SOP-00037 / AB SOP-00040	CCME PHC-CWS m



Analyses	Laboratory Method	Analytical Method
BTEX/F1 in Water by HS GC/MS/FID	AB SOP-00039	CCME CWS/EPA 8260c m
Volatile Hydrocarbons	CAL SOP-00190	EPA 8260 C / CCME
Extractable Hydrocarbons	AB SOP-00040, SOP-00037	AB EPA3510C/CCME PHCCWS
Non Aqueous Phase Liquid		Visual Exam
Oil and Grease	CAL SOP-00096	SM 5520C
Ammonia-N (Total)	AB SOP-00007	EPA 350.1 R2.0 m
Nitrate and Nitrite	AB WI-00065	Auto Calc
Nitrate + Nitrite-N (calculated)	AB WI-00065	Auto Calc
Nitrogen, (Nitrite, Nitrate) by IC	AB SOP-00023	SM 22 4110 B m
Total Suspended Solids (NFR)	AB SOP-00061	SM 22 2540 D m
Biochemical Oxygen Demand	Taiga Lab	SM5210:B
Fecal Coliforms	Taiga Lab	SM9222:D
Phenols	CAL SOP-00067	EPA 420.2
Polychlorinated Biphenyls	CAL SOP# 0062	GC/ECD - EXTRACTION

5 REFERENCES

Canadian Council of Ministers of the Environment (CCME). 2016. *Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment – Volume 3 Suggested Operating Procedures*.

Canadian Council of Ministers of the Environment (CCME). 2011. *Protocols Manual for Water Quality Sampling in Canada*.



APPENDIX A – Water Licence



SAHTU Land and Water Board Water Licence

Pursuant to the Mackenzie Valley Resource Management Act, the Northwest Territories Waters Act and Regulations, the SAHTU Land and Water Board, hereinafter referred to as the Board, hereby grants to

Department of Indian Affairs and Northern Development Canada –
Contaminants and Remediation Division

(licensee)

of

Box 1500, Yellowknife, NT X1A 2R3

(Mailing Address)

hereinafter called the Licensee, the right to alter the bank of a river, lake, stream or other body of water, subject to the restrictions and conditions contained in the Mackenzie Valley Resource Management Act, the Northwest Territories Waters Act and Regulations made thereunder and subject to and in accordance with the conditions specified in this licence.

Licence Number	S17L8-002
Licence Type	"B"
Location	Great Bear Lake Mine Sites, Sawmill Bay, Silver Bear Mines, El Bonanza/Bonanza Mines, Contact Lake Mines
Purpose	Water use and Waste disposal reclamation and remediation of mining sites
Effective Date of Licence	July 25, 2017
Expiry Date of Licence	July 24, 2024

This Licence issued and recorded at Fort Good Hope includes and is subject to the annexed conditions.

SAHTU Land and Water Board

Witness

Chairman

**This Licence and Terms and Conditions shall be kept on site.
If you have any questions please call the SAHTU Land & Water Board at
(867) 598-2413**

SAHTU LAND AND WATER BOARD

Type B Water Licence S17L8-002

Department of Indian Affairs and Northern Development – Contaminants and Remediation

Division (DIAND-CARD) – Great Bear Lake Sites Remediation Project

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PART A: SCOPE AND DEFINITIONS

1. Scope

- a) This Licence entitles Department of Indian Affairs and Northern Development - Contaminants and Remediation Division (DIAND-CARD), to use Water and dispose of Waste for miscellaneous undertakings in Remediation and restoration of the abandoned historic industrial properties of the Great Bear Lake Mine Sites consisting of Silver Bear Mines (made up of Terra, Northrim, Norex, Graham Vein and Smallwood mine sites), El Bonanza and Bonanza Mine, Contact Lake Mine and the Sawmill Bay, collectively referred as the Great Bear Lake Sites Remediation Project. The Great Bear Lake Sites are located on or adjacent to the eastern shore of Great Bear Lake, within the Sahtu Region of the Northwest Territories. As described in the complete application, the scope of activities include:
- i. Water withdrawal for camp use, industrial use, winter road Construction, cleaning, concrete mixing, and dust suppression;
 - ii. Construction, operation, maintenance, and decommissioning of a camp and satellite camps;
 - iii. Construction, operation, maintenance, and closure of Sewage Disposal Facilities;
 - iv. Construction, operation, maintenance, and closure of a Landfarm;
 - v. Construction, operation, maintenance, and closure of a Landfill;
 - vi. Closure of mine openings;
 - vii. Road grading, installation of culverts, and temporary docks;
 - viii. Remediation of hazardous and non-hazardous Wastes, rock, soil, sediment, Tailings, impacted Water, buildings and infrastructure, docks, culverts;
 - ix. Enhancement of wetland between Ho Hum TCA and Moose Bay;
 - x. The implementation of a surface Water diversion ditch system; and
 - xi. Monitoring.
- b) This Licence is issued, subject to the conditions contained herein, with respect to the taking of water and the depositing of Waste of any type in any Waters or in any place under any conditions where such Waste or any other Waste that results from the deposits of such Waste may enter any Waters. Whenever new Regulations are made or existing Regulations are amended by the Governor-in- Council under the *Waters Act*, or other statutes imposing more stringent conditions relating to the quantity or type of Waste that may be so deposited or under which any such Waste may be so deposited, this Licence shall be deemed, upon promulgation of such Regulations, to be automatically amended to conform with such Regulations; and
- c) Compliance with the terms and conditions of this Licence does not absolve the Licensee from responsibility for compliance with the requirements of all applicable federal, territorial, or municipal legislation.



2. Definitions

Acid Rock Drainage - acidic Water, often with elevated sulphate concentrations, that occurs as a result of oxidation of sulphide minerals contained in rock or other materials that are exposed as a result of natural weathering processes, Construction, or human-induced activities.

Act - the *Mackenzie Valley Resource Management Act* and/or the *Waters Act*, S.N.W.T. 2014. C.18.

Action Level - a predetermined qualitative or quantitative trigger which, if exceeded, requires the Licensee to take appropriate actions including, but not limited to: further investigations, changes to operations, or enhanced mitigation measures and reporting of same.

Analyst - an Analyst designated by the Minister under subsection 65(1) of the *Waters Act*.

Board - the Sahtu Land and Water Board established under section 60(1) of the *Mackenzie Valley Resource Management Act*.

Contingency Planning - a plan to establish a state of readiness that will enable prompt and effective response to possible spill or system failure.

Construction - any activities undertaken to construct or build any components of, or associated with, the undertaking.

Dam Safety Guidelines - the Canadian Dam Association's (CDA) Dam Safety Guidelines, 2007. The scope and application of the Dam Safety Guidelines referred to in the Licence, is presented in Section 1 of the Dam Safety Guidelines.

Discharge - the direct or indirect release of any Water or Waste to the Receiving Environment.

Engagement Plan - a document, developed in accordance with the *Board's Engagement and Consultation Policy* and the *Engagement Guidelines for Applicants and Holders of Water Licences and Land Use Permits* describing proposed engagement with affected parties and stakeholders for the life of the proposed undertaking.

Engineered Structures - any structure or facility and the associated area related to Water Use or the deposit of Waste that is designed and approved by a Professional Engineer.

Greywater - all liquid Wastes from showers, baths, sinks, kitchens and domestic washing facilities, but does not include Toilet Wastes.

Groundwater - all Water below the ground surface.

Inspector - an Inspector designated by the Minister under subsection 84(1) of the Act.

Landfill - an Engineered Structure used for containment of non-hazardous Waste.



Landfarm - an Engineered Structure used for containment and Remediation of hydrocarbon impacted soils.

Licensee - the holder of this Licence.

Maximum Grab Concentration - a concentration of a parameter listed in the Licence that cannot be exceeded in any one grab sample.

Minewater - Groundwater or any Water that is pumped or flows out of any underground working.

Minister - a duly appointed member of the Executive Council who is responsible for the Act or the department responsible for administering that Act.

Modification - a change, other than an expansion, that does not alter the purpose or function of a structure.

Ordinary High Water Mark - the usual or average level to which a body of water rises at its highest point and remains for sufficient time so as to change the characteristics of the land. In flowing waters (rivers, streams) this refers to the "active channel/bank-full level" which is often the 1:2 year flood flow return level. In inland lakes, wetlands, or marine environments, it refers to those parts of the Watercourse bed and banks that are frequently flooded by water so as to leave a mark on the land and where the natural vegetation changes from predominately aquatic vegetation to terrestrial vegetation (excepting water tolerant species). For reservoirs, this refers to normal high operating levels (full supply level).

Process Water - water used for, but not limited to, washing drums, barrels, equipment, soil and buildings and the decontamination of items and objects related to Remediation and reclamation.

Professional Engineer - a person who is registered with the Northwest Territories and Nunavut Association of Professional Engineers and Geoscientists in accordance with the Engineering and Geoscience Professions Act, S.N.W.T. 2006, c.16, as a Professional Engineer, and whose principal field of specialization is appropriate to address the components of the undertaking at hand.

Project - the Great Bear Lake Remediation Project as described in Part A, item 1 of this Licence.

Receiving Environment - the aquatic environment that receives Water or Waste released from an undertaking.

Regulations - Regulations proclaimed pursuant to Section 63 of the Act.

Remedial Action Plan - the entirety of the documents prepared by the Contaminants and Remediation Division, including all supporting documents submitted and filed with the



Board.

Remediation - the removal, reduction or neutralization of substances, Wastes or hazardous materials from a site so as to prevent or minimize any adverse effects on the environment now or in the future.

Seepage - includes any Water or Waste that drains through or escapes from any structure designed to contain, withhold, divert or retain Water or Waste.

Sewage - all Toilet Wastes and Greywater.

Sewage Disposal Facilities - the Engineered Structures and areas designed to contain and treat Sewage.

Spill Contingency Plan - a document, developed in accordance with Indian and Northern Affairs Canada's *Guidelines for Contingency Planning* that describes the set of procedures to be implemented to minimize the effects of a spill.

Sump - a man-made pit or natural depression in the earth's surface used for the purpose of depositing Waste that does not contain Toxic Material, such as non-toxic drilling Waste or Sewage, therein.

Surveillance Network Program (SNP) - a monitoring program established to define environmental sampling and analysis requirements, to collect water quality data, and to assess Discharge quality, Licence compliance, and potential impact to the environment.

Traditional Knowledge - the cumulative collective body of knowledge, experience and values built up by a group of people through generations of living in close contact with nature. It builds upon the historic experiences of a people, and adapts to social, economic, environmental, spiritual and political change.

Tailings - the materials rejected from the mill after the recoverable valuable minerals have been extracted.

Toilet Wastes - all human excreta and associated products, but does not include Greywater.

Unauthorized Discharge - the release, Discharge or spill of any Water or Waste not authorized under this Licence.

Waste - Waste as defined by Section 1 of the *Waters Act*.

Wastewater - any Water that is generated by activities or originates on site and contains Waste and includes, but is not limited to, runoff, Seepage, or Minewater.

Waste Management Plan (WMP) – a document, developed in accordance with the Board's *Guidelines for Developing a Waste Management Plan* that describes the methods of Waste management from Waste generation to final disposal.



Waste Rock - all unprocessed rock materials, except ore and Tailings, which are produced as a result of mining and exploration operations.

Waste Rock Cover - the areas and associated infrastructure designated to encapsulate Waste Rock.

Watercourse - a natural Watercourse, body of water or water supply, whether usually containing water or not, and includes Groundwater, springs, swamps, and gulches, as defined in the Northwest Territories Waters Regulations.

Water Licence Inspector - an Inspector designated by the Minister under section 9 of the *Waters Act*.

Waters - any inland water, whether in a liquid or frozen state, on or below the surface of the land in the Northwest Territories.

Water Use - a use of Water as defined in section 51 of the Act.



PART B: GENERAL CONDITIONS

1. The Licensee shall ensure that a copy of this Licence is maintained on site at all times.
2. The Licensee shall take every reasonable precaution to protect the environment.
3. The Licensee shall take every reasonable effort to consider and incorporate any scientific and Traditional Knowledge that is available to the Licensee.
4. All references to policies, guidelines, codes of practice, statutes, regulations, or other authorities shall be read as a reference to the most recent versions, unless otherwise denoted.
5. The Licensee shall ensure all information submitted to the Board:
 - a) Is in a form acceptable to the Board;
 - b) Is in accordance with the Mackenzie Valley Land and Water Board's *Document Submission Standards*; and
 - c) Includes a section within each submission which identifies where the pertinent requirements of this Licence are addressed.
6. The Licensee shall review the plans, programs, studies, and manuals annually, or as directed by the Board, and make any necessary revisions to reflect changes in operations. All revised plans, programs, studies, and manuals shall be submitted to the Board, for approval, at least 60 days, unless otherwise specified, prior to implementing any proposed updates or changes in the approved plan, program, study, or manual, and shall be accompanied by a brief summary of the changes made. All revised plans, programs, studies, and manuals shall be presented in a format consistent with the Board's *Standard Outline for Management Plans*.
7. The Licensee shall act in accordance with all submissions approved pursuant to the conditions of this Licence, including such revisions as may be made from time to time as per the conditions of this Licence, and as approved by the Board.
8. If any submission is not approved by the Board, the Licensee shall revise the submission according to the Board's direction and resubmit it for approval. Each revised submission shall include a list of material revisions.
9. If any date for any submission falls on a weekend or holiday, the Licensee may submit the item on the following business day.
10. The Licensee shall adhere to the Schedules, which are annexed to and form part of this Licence, and any changes to the Schedules as may be made by the Board.
11. The Licensee shall adhere to the **Surveillance Network Program**, which is annexed to and forms part of this License, and any changes to the Surveillance Network Program as may be made by the Board.
12. The Schedules, the Surveillance Network Program, and any compliance dates specified in this Licence may be changed at the discretion of the Board.



13. Prior to establishing, activating, or moving any **Surveillance Network Program** stations, the Licensee shall post signs to identify Surveillance Network Program stations. All signs shall be located and maintained to the satisfaction of an Inspector.
14. The Licensee shall install, operate, and maintain meters, devices or other such methods used for measuring the volumes of Water and Waste discharged to the satisfaction of an Inspector.
15. Beginning March 31, 2018, and no later than every March 31 thereafter, the Licensee shall submit an **Annual Water Licence Report** to the Board. The Report shall be in accordance with Schedule 1, item 1.
16. The Licensee shall act in accordance with the **Engagement Plan**, once approved.



PART C: CONDITIONS APPLYING TO WATER USE

1. The Licensee shall only obtain fresh water for the Project, from the Great Bear Lake, Camsell River, Contact Lake, Smallwood Lake, Silver Lake and Whale Lake, unless otherwise approved by the Board.
2. The daily quantity of fresh Water withdrawn from all water sources shall not exceed 299 cubic metres.
3. Prior to obtaining Water from a licensed Water source, the Licensee shall post a sign to identify the Water intake. All signs shall be located and maintained to the satisfaction of an Inspector.
4. The Licensee shall minimize the total amount of Waters used by the Project using appropriate water conservation methods, such as but not limited to, recycling of Process Water.
5. The Licensee shall maintain water uptake logs for all withdrawals/all utilized water sources and make them available at the request of an Inspector. The water uptake logs shall include the following information: identification of water source, volume of water withdrawn in cubic meters, cumulative uptake per source, time of uptake, date of uptake, and contractor and employee identification.



PART D: CONDITIONS APPLYING TO WASTE AND WATER MANAGEMENT

1. The Licensee shall manage Waste and Water with the objective(s) of minimizing the impacts of the Project on the quantity and quality of Water in the Receiving Environment through the use of appropriate mitigation measures, monitoring, and follow-up actions.

Management Plans

2. The Licensee shall act in accordance with the **Waste Management Plan**, once approved.
3. Within 60 days prior to commencement of remedial activities, the Licensee shall submit a revised **Waste Management Plan** to the Board for approval. The Plan shall meet the objectives listed in Part D, item 1, include all components outlined in the Board's *Guidelines for Developing a Waste Management Plan*, and shall also be in accordance with Schedule 2, item 1.
4. The Licensee shall act in accordance with the **Sediment and Erosion Control Plan**, once approved.
5. Within 60 days prior to initiating remedial activities, the Licensee shall submit to the Board for approval, a **Sediment and Erosion Control Plan**. This Plan shall address all Remediation activities, including all areas of Water flow and Discharge, the Construction and repair of roads and Water crossings; excavations and borrow pits; disposal practices; and site management. The Plan shall meet the objectives listed in Part D, item 1 and shall be in accordance with Schedule 2, item 2.
6. The Licensee shall act in accordance with the **Landfarm Management Plan**, once approved.
7. Within 60 days prior to Landfarm Construction, the Licensee shall submit to the Board for approval, a **Landfarm Management Plan**. The Plan will include an outline of the Construction design approach, treatment methodology, monitoring requirements, soil testing requirements with QA/QC, and criteria for soil management. The Licensee shall not commence Construction of the Landfarm until the Board has approved the Plan. The Plan shall meet the objectives listed in Part D, item 1 and shall adhere to the Board's *Guidelines for Developing a Waste Management Plan*.
8. The Licensee shall act in accordance with the **Water Quality Monitoring Plan**, once approved.
9. Within 60 days of following issuance of this Licence, the Licensee shall submit to the Board for approval, a **Water Quality Monitoring Plan**. This Plan shall address all water quality monitoring including pre-Remediation, Construction, and post-Construction monitoring plans. The Plan shall meet the objectives listed in Part D, item 1 and be in accordance with Schedule 2, item 3.
10. Within 90 days following issuance of this Licence, the Licensee shall submit to the Board, for approval, a **Geochemical Verification Program**. This plan shall detail how the Licensee will verify geochemical test results of Waste Rock, Tailings, and Landfill, Waste Rock and Tailings



cover material. The Plan shall meet the objectives listed in Part D, item 1 and be in accordance with Schedule 2, item 4.

Discharge Location and Rates

11. The Licensee shall direct all Sewage and Grey Water to the Sewage Disposal Facilities, or as per the approved Waste Management Plan, or as otherwise approved by the Board.
12. The Licensee shall direct Process Water effluent to be Discharged to the Receiving Environment as per the approved Waste Management Plan, or as otherwise approved by the Board.
13. The Licensee shall Discharge Water from the Landfarm as identified in the approved Landfarm Management Plan.

Effluent Quality Criteria (EQC)

14. All Sewage and Grey Water effluent discharged from the Project at the Surveillance Network Program Stations S15L8-001 (1) and S15L8-001 (2) shall meet the following effluent quality standards:

Parameter	Maximum Grab Concentration
Suspended Solids	100 mg/L
Oil and Grease	5 mg/L
BOD ₅	100 mg/L
Fecal Coliforms	1 x 10 ⁴ CFU/100mL
pH	6 - 9

15. If, during the period of this Licence, the concentration of any sample of Sewage and Grey Water effluent from the Sewage Disposal Facilities exceeds the requirement specified in condition Part D, item 14, the Licensee shall implement the contingency plan as per the Waste Management Plan referred to in Part D, item2.
16. All Process water effluent discharged from the Process Water treatment plant at the Surveillance Network Program Station S15L8-001 (3) will meet the following effluent quality standards:

Parameter	Maximum Grab Concentration
Volatile Hydrocarbons	15 mg/L
pH	6 - 9
Extractable Hydrocarbons	5 mg/L
Non-aqueous phase liquid/free product	Not present
Phenols	20 µg/L
Arsenic (total)	100 µg/L
Copper (dissolved)	200 µg/L
Cadmium (dissolved)	10 µg/L
Mercury (total)	0.6 µg/L
Nickel (dissolved)	200 µg/L
Lead (dissolved)	50 µg/L



Zinc (total)	1 mg/L
Chromium (total)	100 µg/L
Cobalt (dissolved)	50 µg/L
Total Suspended Solids	30 mg/L

17. If, during the period of this Licence, the concentration of any sample of Process water effluent from the Process Water treatment plant exceeds the requirement specified in condition Part D, item 16, the Licensee shall implement the contingency plan as per the Waste Management Plan referred to in Part D, item 2.
18. The Waste discharged shall have a pH between 6 and 9, and no visible sheen of oil and grease.
19. The Licensee shall not deposit raw, untreated Sewage on the land surface.
20. All Waste Discharged by the Licensee from the Landfarm at SNP station S17L8-002 (14I) a, b, c shall have a pH between 6.0 and 9.0 and meet the following EQC:

Parameter	Maximum Grab Concentration
Volatile Hydrocarbons	15 mg/L
Extractable Hydrocarbons	5 mg/L
Oil & Grease	5 mg/L, non-visible
Non- Aqueous Phase Liquid/Free Product	Not Present
Total Arsenic	100 µg/L
Dissolved Cadmium	10 µg/L
Total Chromium	100 µg/L
Dissolved Cobalt	50 µg/L
Dissolved Copper	200 µg/L
Dissolved Lead	50 µg/L
Total Mercury	0.6 µg/L
Dissolved Nickel	200 µg/L
Total Zinc	1000 µg/L
Phenols	20 µg/L
Polychlorinated Biphenyl (PCBs)	1000 µg/L

21. Waste from the Landfarm that does not meet the requirements specified in Part D, item 20, shall be managed as per the Waste Management Plan referred to in Part D, item 3.



22. All Waste discharged from the Ho Hum Wetland TCA to Moose Bay at SNP Stations S17L8-002 7A and 7B shall have a pH between 6.0 and 9.0 and meet the following EQC:

Parameter	Maximum Grab Concentration
Total Aluminum	0.8 mg/L
Total Arsenic	1 mg/L (7A) / 0.2 mg/L(7B)
Total Copper	0.02 mg/L
Total Lead	0.02 mg/L
Total Nickel	0.1 mg/L
Total Silver	0.004 mg/L
Total Zinc	0.04 mg/L
Ammonia as N	10 mg/L
Nitrate as N	10 mg/L
Nitrite as N	0.8 mg/L
Total Suspended Solids	30 mg/L
Oil and Grease	5 mg/L (non-visible)



PART E: CONDITIONS APPLYING TO MODIFICATIONS

1. The Licensee may, without written approval from the Board, carry out Modification(s) to the existing or planned undertakings provided the following requirements are met:
 - a) The Licensee has notified the Board and an Inspector, in writing, of such proposed Modification(s) at least 60 days prior to beginning the Modification(s);
 - b) The Modification(s) do not place the Licensee in contravention of either the Licence or the Act;
 - c) The Board has not, during the 60 days following notification of the proposed Modification(s), informed the Licensee that further information is required or that a review of the proposal will require more than 60 days;
 - d) An Inspector has authorized the proposed Modifications and provided a letter of notification to the Board; and,
 - e) The Board has not rejected the proposed Modification(s).
2. Modification(s) for which all of the conditions referred to in Part E, item 1, have not been met, may only be carried out only with written approval from the Board.
3. The Licensee shall submit to the Board, within 90 days of completion of the Modification(s), an **As-built Report**, which shall include final as-built drawings and specifications of the modified structure, stamped and signed by a Professional Engineer, plans and drawings of the Modification(s) referred to in this Licence within ninety (90) days of completion of the Modification(s).



PART F: CONDITIONS APPLYING TO CONSTRUCTION

1. The Licensee shall ensure that all structures intended to contain, withhold, divert, or retain Water or Waste are designed, constructed, and maintained to prevent escape of Waste to the Receiving Environment.
2. The Licensee shall ensure that all Engineered Structures intended to contain, withhold, divert, or retain Water or Waste and which meet the definition of a dam under the Dam Safety Guidelines are designed, constructed, and maintained to meet or exceed the Dam Safety Guidelines.
3. The Licensee shall ensure that all Engineered Structures are constructed and maintained following the recommendations of the Professional Engineer responsible for the design, including but not limited to, recommendations regarding field supervision and inspection requirements.
4. The Licensee shall maintain Construction records and geochemical records of Construction materials for all Engineered Structures and make them available at the request of the Board or an Inspector.

Final Detailed Construction Plan and As-built Reports

5. A minimum of 60 days prior to the commencement of Construction of any Engineered Structures intended to contain, withhold, divert, or retain Water or Waste, the Licensee shall submit to the Board, a **Final Detailed Construction Plan**. The Plan shall be in accordance with Schedule 3, item 1.
6. The Licensee shall ensure that the Engineered Structures identified in Part F, item 5, are constructed in accordance with the Final Detailed Construction Plan.
7. A minimum of 10 days prior to the commencement of Construction of the Engineered Structures identified in Part F, item 5, the Licensee shall provide written notification to the Board and an Inspector. Notification shall include the name and contact information for the site manager.
8. The Licensee shall submit to the Board, for approval, 90 days prior to cover Construction, a **Tailings and Waste Rock Cover Design Plan**. The Licensee shall not commence Construction until the Board has approved the Plan. The Plan shall meet the objectives listed in Part D, item 1 and Schedule 3, item 2.
9. Within 90 days of the completion of the Construction of the Engineered Structures identified in Part F, item 5, the Licensee shall submit an **As-Built Report** which shall include as-built drawings of the structures, documentation of field decisions that deviate from the Final Detailed Construction Plan, and any data used to support these decisions to the Board.



Inspection of Structures and Facilities

10. The Licensee shall conduct regular inspections of all Engineered Structures during periods of active Remediation. The inspections are to be completed weekly or more frequently, as directed by an Inspector. Records of these inspections shall be kept for review upon request of an Inspector.
11. The Licensee shall ensure that geotechnical inspections of all Engineered Structures are conducted annually, during the summer months, by a Professional Engineer and following any unforeseen extreme events (such as earthquakes, flooding, cracks, sinkhole formation, etc.). The Licensee shall:
 - a) Provide written notification to an Inspector a minimum of two weeks prior to the Professional Engineer's annual inspections; and
 - b) Within 90 days of completing the inspection, the Licensee shall submit the Professional Engineer's full **Geotechnical Inspection Report** to the Board. The Report shall include a covering letter from the Licensee outlining an implementation plan to respond to any recommendations made by the Professional Engineer, including a rationale for any decisions that deviate from the Professional Engineer's recommendations.



PART G: CONDITIONS APPLYING TO CONTINGENCY PLANNING

1. The licensee shall ensure that petroleum products, hazardous material and other Waste(s) associated with the Project do not enter any Waters.
2. The Licensee shall act in accordance with the **Spill Contingency Plan**, once approved.
3. Within 60 days prior to commencement of remedial activities, the Licensee shall submit to the Board, for approval, an updated Spill Contingency Plan.
4. If, during the period of this Licence, an Unauthorized Discharge of Waste occurs, or if such a Discharge is foreseeable, the Licensee shall:
 - a) employ the appropriate Spill Contingency Plan;
 - b) report the incident immediately via the (24) Hour NWT Spill Report Line. Currently the number is (867) 920-8130;
 - c) report the Unauthorized Discharge of Waste to the Inspector and the Board within (24) hours; and
 - d) submit to a Water Licence Inspector, a detailed report on each occurrence not later than thirty (30) days after initially reporting the event.
5. The licensee shall report spills to the NT-NU 24-hour Spill Report Line (867) 920-8130, fax (867) 873-6924, and/or e-mail spills@gov.nt.ca in accordance with the *NT-NU Spill Reporting Protocol*, the *NT-NU Spill Report Form*, and the *Instructions for Completing the NT-NU Spill Report Form*.



PART H: CONDITIONS APPLYING TO CLOSURE AND RECLAMATION

1. The Licensee shall submit to the Board, 6 months prior to completion of Water Quality Monitoring as detailed in Part D, item 9, a **Long-term Monitoring Plan**. The Licensee shall not move from Water Quality Monitoring into Long-Term Monitoring until the Board has approved the Plan. The Plan shall meet the objectives listed in Part D, item 1 and shall be in accordance with Schedule 4, item 1.
2. A minimum of 90 days prior to the Reclamation of any site roads, or bridges, the Licensee shall submit to the Board, for approval, a **Final Reclamation Plan** which includes, but is not limited to:
 - a) Details of decommissioning the site roads, culverts, bridges, airstrips, and associated infrastructure used for the Project;
 - b) Details of decommissioning borrow sources; and
 - c) Details of re-establishing drainages impacted by site or winter roads and road-crossings associated with historic and present use of the site.
3. The Licensee shall carry out progressive Reclamation of areas as soon as is reasonably practicable.
4. The Licensee shall act in accordance with the approved **Remedial Action Plans**.

SAHTU LAND AND WATER BOARD



Witness



**Larry Wallace
Chairman**



Annex A: Surveillance Network Program (SNP)
Annexed to Water Licence S17L8-002
Department of Indian Affairs and Northern Development -
Contaminants and Remediation Division –
Great Bear Lake Sites Remediation Project

Part A: Reporting Requirements

1. The effective date of this Surveillance Network Program (SNP) is July 25, 2017.
2. The Licensee shall, unless otherwise requested by the Inspector, include all of the data and information required by the Surveillance Network Program in the Licensee's Annual Water Licence Report, which shall be submitted to the Board by March 31st of the year following the calendar year being reported. The Report shall include, but not be limited to the following:
 - a) Electronic and tabular summaries of all data and information generated under the SNP, including rationale for SNP stations where samples were not collected and results and interpretation of quality assurance/quality control procedures;
 - b) Graphical summaries and interpretation of the analytical results from the SNP samples collected at the points of compliance (SNP stations S15L8-001 (1), S15L8-001 (2) and S15L8-001 (3) compared to the EQC under Part D of this Licence;
 - c) An explanation of any actions taken in response to any exceedances of the EQC;
 - d) Information regarding the calibration and status of the meters and devices referred to in Part B, item 14 of this Licence;
 - e) The coordinates of all SNP stations, including an updated map identifying the locations of all the SNP stations; and
 - f) A tabular summary of cumulative Water Use.
3. More frequent sample collection may be required at the request of an Inspector.
4. All sampling, sample preservation, and analyses shall be conducted in accordance with methods prescribed in the *Standard Methods for the Examination of Water and Wastewater* at the time of analysis, or by other such methods approved by an Analyst.
5. All analyses shall be performed in a laboratory accredited by the Canadian Association for Laboratory Accreditation (CALA) for the specific analyses to be performed or as approved by an Analyst.
6. Prior to the collection of SNP samples, the Licensee shall submit to the Board and an Analyst, a Quality Assurance and Quality Control Plan, which shall include a list of techniques that will be used to collect and analyze samples collected under the SNP, for the purposes of quality assurance and quality control. The Analyst shall provide a recommendation to the Board. The Licensee shall not commence Construction until the Analyst has approved the Plan.
7. The Licensee shall adhere to the Quality Assurance and Quality Control Plan, once approved, and shall annually review the Plan and make any necessary revisions to



reflect changes in Operations or as directed by the Board. Revisions to the Plan shall be submitted to the Board for a decision.

8. If the Quality Assurance and Quality Control Plan is not approved by the Analyst, the Licensee shall revise the Plan according to the Analyst's direction and re-submit it to the Analyst for a decision.



Part B: Site Descriptions and Monitoring Requirements

1. The location of sampling sites is subject to approval of an Inspector.
2. The sampling locations and monitoring requirements are as follows:

SNP Station S15L8-001 (1) (from 2015 licence)

Description	Treated Sewage effluent prior to Discharge
Location	Camp Operations
Sampling Frequency	Prior to Discharge; monthly during Discharge
Sampling Parameters	Total Suspended Solids; BOD ₅ ; Fecal Coliforms; pH
Rationale for Station	To characterize Sewage effluent and ensure effluent meets the criteria listed in Part D, item 14.
Status	Active

SNP Station S15L8-001 (2) (from 2015 licence)

Description	Treated Greywater prior to disposal
Location	Camp Operations
Sampling Frequency	Prior to Discharge; monthly during Discharge
Sampling Parameters	Total Suspended Solids; BOD ₅ ; Fecal Coliforms; pH
Rationale for Station	To characterize Sewage effluent and ensure effluent meets the criteria listed in Part D, item 14.
Status	Active

SNP Station S15L8-001 (3 a, b, c, d, ...) (from 2015 licence)

Description	Treated Process Water prior to disposal
Location	Camp Operations
Sampling Frequency	Prior to Discharge
Sampling Parameters	As per Part D, item 16. Total and dissolved metals listed in per Part D, item 16. Total Suspended Solids (TSS); Standard ^a ;
Rationale for Station	Characterize Process Water and ensure effluent meets the criteria list in Part D, item 16
Status	Active



SNP Station S15L8-001 (4) (from 2015 licence)

Description	Camsell River Intake
Location	Camp Operations
Sampling Frequency	Prior to use; monthly during use
Sampling Parameters	Quantity
Rationale for Station	To measure the quantity of water used.
Status	Active

SNP Station S15L8-001 (5) (from 2015 licence)

Description	Great Bear Lake Intake
Location	Camp Operations
Sampling Frequency	Prior to use; monthly during use
Sampling Parameters	Quantity
Rationale for Station	To measure the quantity of water used.
Status	Active

SNP Station S17L8-02 (6)

Description	Contact Lake Intake
Location	Camp Operations
Sampling Frequency	Prior to use; monthly during use
Sampling Parameters	Quantity
Rationale for Station	To measure the quantity of water used.
Status	Active

SNP Station S17L8-002 (7A)

Description	Ho Hum Tailings Containment Area (TCA) – Corresponding with station T-8
Location	Silver Bear – Terra Mine
Sampling Frequency	Annually when inactive; biweekly during open water season when Remediation is occurring
Sampling Parameters	As Part D, item 22. Total Suspended Solids (TSS); Standard a,
Rationale for Station	To monitor the quality of TCA Discharge to Moose Bay to ensure the Effluent Quality Criteria listed in Part D, item 22 are met.
Status	Active



SNP Station S17L8-002 (7B)

Description	Moose Bay – Corresponding with station T-10
Location	Silver Bear – Terra Mine
Sampling Frequency	Annually when inactive; biweekly during open water season when Remediation is occurring
Sampling Parameters	As Part D, item 22; Total Suspended Solids (TSS); Standard ^a ;
Rationale for Station	To Identify the potential influence of the quality of TCA Discharge on Moose Bay to ensure the effluent quality criteria listed in Part D, item 22 are met
Status	Active

SNP Station S17L8-002 (8C)

Description	Hermandy Lake – Corresponding with station NO-7
Location	Silver Bear – Northrim Mine
Sampling Frequency	Annually when inactive; monthly during open water season when Remediation is occurring
Sampling Parameters	Non-aqueous phase liquid/free product; Total Suspended Solids; Standard ^a ; Total Metals ^b ; Hydrocarbon ^c ;
Rationale for Station	Tailings with Hermandy Lake
Status	Active

SNP Station S17L8-002 (9D)

Description	Camsell River – Corresponding with station NO-6
Location	Silver Bear – Northrim Mine
Sampling Frequency	Annually when inactive; monthly during open water season when Remediation is occurring
Sampling Parameters	Non-aqueous phase liquid/free product; Total Suspended Solids; Standard ^a ; Total Metals ^b ; Hydrocarbon ^c ;
Rationale for Station	Current estimated Seepage point of Hermandy Lake to Camsell River (additional station required when original Discharge pathway restored)
Status	Active



SNP Station S17L8-002 (10E)

Description	Norex Waste Rock – Corresponding with station Norex-3
Location	Silver Bear – Norex Mine
Sampling Frequency	Annually
Sampling Parameters	Non-aqueous phase liquid/free product; Standard ^a ; Total Metals ^b ; Hydrocarbon ^c ; Total Suspended Solids;
Rationale for Station	Monitor water from adit and Waste Rock
Status	Active

SNP Station S17L8-002 (11F)

Description	Camsell River – Corresponding with station NX-12
Location	Silver Bear –Norex Mine
Sampling Frequency	Annually
Sampling Parameters	Non-aqueous phase liquid/free product; Standard ^a ; Total Metals ^b ; Hydrocarbon ^c ;
Rationale for Station	Monitor potential Discharge from Waste Rock and adit
Status	Active

SNP Station S17L8-002 (12G)

Description	Tailings Pond – Corresponding with established station CL-3
Location	Contact Lake Mine
Sampling Frequency	Annually when inactive; monthly during open water season when Remediation is occurring
Sampling Parameters	Non-aqueous phase liquid/free product; Standard ^a ; Total Metals ^b ; Hydrocarbon ^c ;
Rationale for Station	Outflow of Tailings pond
Status	Active



SNP Station S17L8-002 (13H)

Description	Contact Lake – Corresponding with established station CL-26
Location	Contact Lake Mine
Sampling Frequency	Annually when inactive; monthly during open water season when Remediation is occurring
Sampling Parameters	Non-aqueous phase liquid/free product; Standard ^a ; Total Suspended Solids; Total Metals ^b ; Hydrocarbon ^c
Rationale for Station	Discharge of Tailings pond to Contact Lake
Status	Active

SNP Station S17L8-002 (14I) a,b,c, etc.

Description	Landfarm Discharge water
Location	Landfarm at Silver Bear Mines, Sawmill Bay and El Bonanze/Bonanza
Sampling Frequency	Prior to any Discharge
Sampling Parameters	As per Part D, item 20. Standard ^a ; Total Suspended Solids; Total Metals ^b .
Rationale for Station	Monitor quality of water proposed for Discharge from the Landfarm to ensure it meets the criteria outlined in Part D, item 20.
Status	Active

Footnotes:

^a Standard: pH, conductivity, hardness, sulphate

^b Total Metals = Total elemental analysis by ICP-Mettals of ICP-MS 24 element scan: include all elements in Total Metals. includes all elements in Total Metals plus Antimony (Sb), Arsenic (As), Barium (Ba), Bismuth (Bi), Cesium (Cs), Chromium (Cr), Lithium (Li), Thallium (TI), Titanium (Ti), Uranium (U), & Vanadium (V).

^c Hydrocarbon: PHC (F1-F4) and BTEX

SAHTU LAND AND WATER BOARD



Witness



**Larry Wallace
Chairman**



Schedule 1
Part B: General Conditions

1. The **Annual Water Licence Report** referred to in Part B, item 15, shall include, but not be limited to, the following information:
 - a) The monthly and annual quantities in cubic metres of fresh water obtained from all sources;
 - b) A summary of engagement activities conducted in accordance with the approved **Engagement Plan**, in Part B of this Licence, undertaken during the previous calendar year and shall include a brief description of activities planned for the forthcoming year;
 - c) A summary of activities conducted in accordance with the approved **Waste Management Plan**, required in Part D of this Licence, undertaken during the previous calendar year, including:
 - i. A summary of updates or changes to the process or facilities required for the management of Waste;
 - ii. The monthly and annual quantities in cubic metres of each and all Waste(s) discharged; and
 - iii. Any other item as directed by the Board.
 - d) A summary of activities conducted in accordance with the approved **Sediment and Erosion Control Plan**, as required in Part D of this Licence, including:
 - i. A description of any erosion susceptible areas encountered, and a summary of activities undertaken to prevent or mitigate erosion;
 - ii. A report of the performance of erosion mitigations applied in previous years, if applicable; and
 - iii. Any other item as directed by the Board.
 - e) A summary of Construction activities conducted in accordance with Part F of this Licence, undertaken during the previous year calendar year;
 - f) An itemized list indicating the names, uses and quantities of all substances which were used during the Remediation and reclamation operation;
 - g) A summary of all Remediation and reclamation activities as they relate to Water Use and Waste disposal;
 - h) Tabular summaries of all data generated under the "Surveillance Network Program";
 - i) A list of Unauthorized Discharges;
 - j) A summary of all monitoring results and any Action Level exceedances in accordance with the approved **Water Quality Monitoring Plan** referred to under Part D, item 9 and Schedule 2, item 3.
 - k) A summary of activities conducted in accordance with the approved **Spill Contingency Plan**, required in Part G of this Licence, undertaken during the previous calendar year, including:
 - l) A camp set-up schematic for each phase;
 - m) A summary of all Remediation and reclamation activities carried out at each site during the previous calendar year, including progress made to develop the schedule for Phase II implementation, and a description of any work planned by the Licensee for the upcoming year;
 - n) Any revision to the **Engagement Plan**, once approved by the Board;
 - o) Any revisions to the **Spill Contingency Plan**, once approved by the Board;
 - p) Any revisions to the **Waste Management Plan**, once approved by the Board;
 - q) Any revisions to the **Sediment and Erosion Control Plan**;



- r) Any revisions to the **Water Quality Monitoring Plan**;
- s) Any revisions to the approved **Remedial Action Plan(s)**;
- t) Any geotechnical inspection reports, as appendices to the Annual Water Licence Report;
- u) Any other details on Water Use or Waste disposal requested by the Board by March 31st of the year being reported; and
- v) A map depicting all the SNP Stations with GPS locations.



Schedule 2
Part D: CONDITIONS APPLYING TO WASTE AND WATER MANAGEMENT

1. The **Waste Management Plan**, referred to in Part D, item 3 of this Licensee shall meet the objectives listed in Part D, item 1, include all components outlined in the Board's *Guidelines for Developing a Waste Management Plan*, and include, but not be limited to, the following:
 - a) The development and management of excavation areas (trenches, quarries, borrow sources, and overburden) so as to eliminate or minimize the risk of potential for Acid Rock Drainage and Metal Leaching;
 - b) The consolidation and disposal of Tailings, including the quantity of Tailings to be consolidated, the location of disposal, and confirmatory sampling plans for the site of origin;
 - c) The collection and disposal of impacted sediment, including the amount of sediment moved and the location of sediment disposal;
 - d) The collection and disposal of metal impacted soils, including the quantity to be collected, the location of disposal, and confirmatory sampling plans for the site of origin;
 - e) The collection and disposal of petroleum hydrocarbon (PHC) contaminated soils, including the quantity to be collected, the location of disposal, and confirmatory sampling plans for the site of origin;
 - f) Details of how Groundwater will be managed in areas where Tailings, impacted sediments, and metals-impacted soil area removed;
 - g) Details of how Groundwater and free-product will be managed in areas where free product is identified during PHC contaminated soil excavation; Details of how PHC contaminated Groundwater will be delineated and treated;
 - h) The sampling and Discharge of portal and trench Water into soak-away Sumps, including the quantity of Water to be Discharged, and the location of the Sumps and the surrounding environment;
 - i) A Wastewater management plan, addressing the management of all Seepage and leachate Waters from all Engineered Structures intended to contain, withhold or divert Waste or Waters, including the management of Water from the equipment decontamination facility and any contact Water; and
 - j) Any other item as directed by the Board.
2. The **Sediment and Erosion Control Plan**, referred to in Part D, item 5 of this Licensee shall include, but not be limited to, the following:
 - a) The details of erosion and sediment control measures implemented prior to, during and after Reclamation activities are completed, until all disturbed areas are completely stabilized;
 - b) The details of Water management during excavation;
 - c) A monitoring program that ensures the effectiveness and maintenance of all sediment and erosion control measures, stabilization and re-vegetation success; and
 - d) A contingency plan that will be undertaken in the event that sediment and erosion issues are identified.
3. The **Water Quality Monitoring Plan**, as referred to in Part D, item 9 of this Licence, shall meet the objectives listed in Part F, item 1 and include, but not be limited to:
 - a) A description, with appropriate site maps or diagrams, of monitoring locations, types of instrumentation used, and frequency of monitoring;



- b) The location of collection and methods of monitoring and sampling any Seepage, leachate or runoff from the Landfill, including monitoring parameters, frequency, and a rationale for the above;
- c) The location of collection and methods of monitoring and sampling any Seepage, leachate or runoff from the Landfarm, including monitoring parameters, frequency, and a rationale for the above;
- d) Details on the confirmatory sampling plans for the site of origin of all former Sewage, Tailings and impacted soils;
- e) The collection, monitoring and sampling of Waste Rock storage areas, including monitoring parameters, frequency, and a rationale for the above;
- f) The collection, monitoring and sampling of all excavation areas (trenches, quarries and overburden), including monitoring parameters, frequency, and a rationale for the above;
- g) The location of Groundwater monitoring wells, including monitoring parameters, frequency, and a rationale for the above. This shall include, but not be limited to:
 - i. Wells established around the Landfills;
 - ii. Landfarms;
 - iii. Waste Rock storage area; and
 - iv. Tailings and soil containment area;
- h) The location of collection and methods of monitoring and sampling any Seepage and leachate Waters from any other Engineered Structure intended to contain, withhold or divert Waste or Waters;
- i) The location of collection and methods of monitoring and sampling of all down-gradient surface waters. This shall include, but not be limited to:
 - i. Mine site areas;
 - ii. Landfills;
 - iii. Landfarms;
 - iv. Waste Rock storage areas;
 - v. Former Sewage, Tailings and impacted soil storage areas;
 - vi. Soak-away Sumps for trench and portal Water;
 - vii. Sewage and Greywater Sumps or Discharge areas;
 - viii. The equipment decontamination facility; and
 - ix. Any other Water Discharge location.
- j) The location of collection and methods of monitoring and sampling of all impacted sediments left in-situ
- k) A description of the quality assurance and quality control measures followed for each monitoring type
- l) Proposed locations for all specific Surveillance Network Program stations, including, but not limited to:
 - i. Exact location of each sampling station;
 - ii. Parameters to be analyzed;
 - iii. Frequency of monitoring; and
 - iv. Rationale for all of the above.
- m) An **Adaptive Management Plan**. This Plan shall include, but not be limited to:
 - i. A description, including detailed rationale, of the monitoring endpoints (Action Levels) for each parameter monitored;
 - ii. A description of response actions (contingency plans) to be carried out if the Action Levels are exceeded; and
- n) Any other item as directed by the Board



4. The **Geochemical Verification Program**, referred to in Part D, item 10 of this Licence, shall meet the objectives listed in Part D, item 1 and include, but not be limited to:

- a) A summary of findings from geochemical characterization studies (Acid Rock Drainage/Metal Leaching potential) on the Waste Rock, Tailings, borrow sources, cover material, and overburden;
- b) Criteria for defining PAG, non-PAG and Metal Leaching materials with supporting rationale;
- c) Criteria for defining high, moderate, and low risk Waste Rock with supporting rationale;
- d) Sampling and testing methods for the Geochemical Verification Program with supporting rationale;
- e) Sampling locations and collection methodology for follow-up verification testing with supporting rationale;
- f) Timing and frequency of verification sampling;
- g) Quality assurance and quality control measures; and
- h) A contingency plan in the event of increasing trends in Metal Leaching or acid generation potential.



Schedule 3
PART F: CONDITIONS APPLYING TO CONSTRUCTION

1. The **Final Detailed Construction Plan**, referred to in Part F, item 5 of this Licence shall include, but not be limited to, the following information:
 - a) A description of the facilities to be constructed, including proposed locations;
 - b) Relevant background information, including the data from geotechnical and geochemical investigations, the results of programs to characterize soil, rock, Groundwater, ground ice, and ground temperature conditions to the depth expected to be affected by the proposed facilities, beneath the footprint of all containment and runoff control structures, as deemed adequate by the Professional Engineer responsible for the design;
 - c) Quantities and the physical and geochemical characteristics of materials required for Construction;
 - d) Design drawings and specifications of Engineered Structures, stamped by a Professional Engineer;
 - e) Stability analyses;
 - f) Construction considerations, including timing, sequencing, and a schedule;
 - g) Operations and maintenance requirements; and
 - h) A Quality Control Plan stamped by a Professional Engineer, a component of which includes a plan for a Professional Engineer to supervise and field check Construction activities.

2. The **Tailings and Waste Rock Cover Design Plan**, referred to in Part F, item 8 of this Licence shall include, but not be limited to, the following:
 - a) A cover design alternatives analysis;
 - b) A design, with supporting analysis, and description of the purpose of each component of the cover system;
 - c) For-Construction drawings stamped and signed by an Engineer;
 - d) The Construction and materials specifications for the cover system;
 - e) The Construction and materials quality assurance and quality control program for the cover;
 - f) The details for a monitoring program to assess cover performance, oxygen ingress into Tailings or Waste Rock, net infiltration into Tailings or Waste Rock, and solids and pore Water geochemistry and Seepage quality;
 - g) The details of how the monitoring program will assess cover settlement and performance;
 - h) The details of how the monitoring program will confirm design assumptions;
 - i) A contingency plan outlining measures to be implemented should cover failure occur and if final cover performance does not achieve cover performance criteria;
 - j) Identification of the source of cover materials; and
 - k) Design details of the borrow pit.



Schedule 4

Part H: CONDITIONS APPLYING TO CLOSURE AND RECLAMATION

1. The **Long-term Monitoring Plan**, referred to in Part H, item 1 of this Licence, shall meet the objectives listed in Part D, item 1 and shall include, but not be limited to, the following:
 - a) A summary of mitigation measures in place to prevent, reduce, or manage potential environmental impacts;
 - b) A list of all components to be monitored;
 - c) A map and attached table or detailed legend illustrating monitoring and sampling locations;
 - d) A description, including detailed rationale, of the site-specific monitoring activities required to identify impacts from Project-related activities;
 - e) A description of monitoring protocols, methodologies, parameters, and frequency specific to each type of monitoring identified in Item (d) above;
 - f) A description of the quality assurance and quality control measures followed for each monitoring type;
 - g) A description, including detailed rationale, of the monitoring endpoints (Action Levels) for each parameter monitored;
 - h) A description of response actions (contingency plans) to be carried out if the Action Levels are exceeded; and
 - i) Any other item as directed by the Board.

