



P.O. Box 1500
4923 – 52nd Street - Gallery Building
Yellowknife, NT X1A 2R3

May 25, 2017

Ms. Bonnie Bergsma, Regulatory Specialist
Sahtu Land and Water Board
Box 1
Fort Good Hope, NT X0E 0H0

RE: Great Bear Lake Sites Remediation Project – Water Licence Renewal Application

Dear Ms. Bergsma,

Indigenous and Northern Affairs Canada (INAC) - Contaminants and Remediation Division's (CARD) is pleased to provide the attached application for a Water Licence renewal to replace current Water Licence S15L8-001 for the Great Bear Lake (GBL) Sites Phase II Remediation Project. The current Water Licence expires July 23, 2017 and INAC respectfully requests a new seven year licence be issued prior to expiration by the Sahtu Land and Water Board (SLWB).

Please note that CARD has also submitted a request for renewal for the associated Land Use Permit at the project site (S09D-001).

Contents of Application

In addition to this cover letter, the Water Licence application package includes a series of appendices (documents produced/provided in support of the application) and annexes (stand-alone deliverables which may be consulted for additional information if necessary). An itemized list of the application package is provided as follows:

- Completed Application Form – Includes updates, remedial activities conducted to date, pending remedial work and environmental considerations
- Appendix A: Sahtu Land Use Plan Conformity Table – The GBL Sites Phase II Remediation Project Application as assessed against the requirements of the Sahtu Land Use Plan
- Appendix B: Site Maps – General overview maps, site specific maps (1:50k) and mineral title maps
- Appendix C: Proposed Transportation Route Maps - Proposed access routes for the project sites
- Appendix D: Summary of Previous and Pending Remediation Activities – Tables summarizing the remedial progress and remaining work items for each project site
- Appendix E: Detailed Design Drawings – Design drawings for each of the sites, documenting the remedial scope and general requirements
- Appendix F: Engagement Plan and Log – Description of the commitments and approach to engagement and log of activities conducted to date
- Appendix G: Spill Contingency Plan – Outlining the minimum standards for spill contingency planning at the project sites





- Appendix H: Waste Management Plan – Provides the general approach and minimum standards for waste management at the project sites
 - Appendix I: Wildlife Management Plan – Presents approaches to minimize impacts to wildlife, manage wildlife incidents and response approaches
 - Appendix J: Proposed Mitigation Measures for Winter Road and Barge Activities – Supplemental list of mitigation measures to reduce environmental effects of barge and road transport
 - Appendix K: List of Studies and Reports – Provides complete listing of studies and reports at the GBL Sites
-
- Annex A-1: Silver Bear Mines Remedial Action Plan with Project Update
 - Annex A-2: Contact Lake Mine Remedial Action Plan with Project Update
 - Annex A-3: El Bonanza Mine Remedial Action Plan with Project Update
 - Annex A-4: Sawmill Bay Remedial Action Plan with Project Update
 - Annex A-5: Development of Clean-Up Criteria for Petroleum Hydrocarbons for Silver Bear, Contact Lake and El Bonanza Sites
 - Annex A-6: 2010 Completion Report for Great Bear Lake Sites – Phase I Remediation
 - Annex A-7: 2011 Completion Report for Great Bear Lake Sites – Phase I Remediation
 - Annex A-8: Proposed Long-Term, Status of the Environment and Construction Monitoring Plans
 - Annex A-9: Site-Specific Target Level for Arsenic in Surface Waters Associated with the Terra Mine Wetland

Preliminary Screening

The scope of work has not changed and no new activities are proposed. In keeping with these factors, CARD respectfully requests that the Board consider the license renewal to be exempt from a Preliminary Screening as per as per Part 5 Exemption List Regulations in the Mackenzie Valley Resource Management Act and Regulations.

Application Fee

With respect to the application fee, under the *Mackenzie Valley Land and Resource Management Act*, it states that "7. *This Act is binding on Her Majesty in right of Canada or a province, except that Her Majesty in right of Canada is not required to pay any fee prescribed by regulations made under paragraph 90.3(1)(k) or subparagraph 90.3(2)(a)(i).*"

Contaminated Site Considerations

Remediation of contaminated sites presents unique considerations during planning processes. For example, unlike greenfield developments at which the location of work activities may be selected to accommodate setbacks and other similar restrictions, the remedial actions at historic sites must address environmental concerns and physical hazards where found, including proximal to aquatic waterbodies. Similarly, the temporary camps required to complete site remediation will be installed within the footprint of historic operations. While these footprints may be within modern setbacks, this approach will prevent incremental clearing and subsequent impacts.

CARD has reviewed recent SLWB and Mackenzie Valley Land and Water Board (MVLWB) Terms and Conditions for Water Licences to identify any deviations which may be required to successfully remediate the GBL Sites. CARD requests the board to consider the following:

- Remedial work is required to naturalize shorelines and remove potential contaminant sources





adjacent to and/or within aquatic water bodies. CARD requests that the remedial work identified within the Remedial Action Plans (RAPs) are provided with a setback exemption.

- As with other contaminated site remediation projects, CARD will install temporary camp facilities within the disturbed footprint of the historic operations. CARD requests the original 30 m setback distance from aquatic waterbodies and will provide a Camp Methodology and Location Plan to ensure the Inspector and SLWB are aware of all proposed camp locations.
- Fuel storage areas will in some locations be required near to float plane and barge/boat docking areas. Daily transport of fuel to/from these locations is estimated to be a greater potential risk than proper fuel storage. CARD request an allowance to permit fuel storage within these select locations and will employ secondary containment (e.g. insta-berms).
- Recent Water Licence Terms and Conditions for similar CARD remediation projects have in some cases requested additional reports and plans beyond the scope of the Federal Contaminated Sites Action Plan approach. Should additional information be required by the SLWB, CARD requests notification to first assess the extensive database of site-specific studies conducted to date.

Surveillance Network Program

The SLWB has indicated a preference to increase the scope of the Surveillance Network Program (SNP) at the GBL Sites. The MVLWB Water and Effluent Quality Management Policy (2011) was reviewed by CARD to identify SNP objectives and potential sampling locations. As stipulated within the aforementioned policy, “SNPs are designed to aid the proponent and the regulators in ensuring that waste management activities are being effective”. This indicates a focus on waste discharge which may be actively managed and the direct receiving environments. This contrasts with larger monitoring programs (e.g. Water Quality Monitoring Programs, Long-Term Monitoring Programs), which aim to monitor effects of a project on the wider receiving environment. In keeping with these objectives, CARD presents recommended SNP stations presented in Table 1 for SLWB consideration. Where possible, these stations have been selected to correspond with established sampling locations with extensive datasets.

The recommended frequencies within Table 1 refer to “inactive” and “active” periods. Due to the wide spatial distribution of the GBL Sites, this terminology has been used to denote the periods of active remediation at the individual site, during which increased monitoring is suggested. Stations recommended for inclusion in the SNP will also be incorporated in the Water Quality Monitoring Plan and presented within both associated reports.





Table 1 – Proposed SNP Sampling Locations

Site	Station	Location	Rationale	Frequency
Camp Operations	S15L8-001 (1) From 2015 Permit	Treated sewage effluent prior to disposal	Characterize waste effluent	Prior to discharge; monthly during discharge
Camp Operations	S15L8-001 (2) From 2015 Permit	Treated greywater prior to disposal	Characterize waste effluent	Prior to discharge; monthly during discharge
Camp Operations	S15L8-001 (3) From 2015 Permit	Treated process water prior to disposal	Characterize waste effluent	Prior to discharge
Camp Operations	S15L8-001 (4) From 2015 Permit	Camsell River intake	Potable water source	Prior to use; monthly during use
Camp Operations	S15L8-001 (5) From 2015 Permit	Great Bear Lake intake	Potable water source	Prior to use; monthly during use
Silver Bear – Terra Mine	New Station A	Ho Hum Tailings Containment Area (TCA) – Corresponding with station T-8	TCA discharge to Moose Bay required to enhance wetland	Annually when inactive; monthly when active
Silver Bear – Terra Mine	New Station B	Moose Bay – Corresponding with station T-10	Identify potential influence of TCA discharge	Annually when inactive; monthly when active
Silver Bear – Northrim Mine	New Station C	Hermandy Lake – Corresponding with station NO-7	Tailings within Hermandy Lake	Annually when inactive; monthly when active
Silver Bear – Northrim Mine	New Station D	Camsell River – Corresponding with station NO-6	Current estimated seepage point of Hermandy Lake to Camsell River (additional station required when original discharge pathway restored)	Annually when inactive; monthly when active
Silver Bear – Norex Mine	New Station E	Norex Waste Rock – Corresponding with station Norex-3	Monitor water from adit and waste rock	Annually
Silver Bear – Norex Mine	New Station F	Camsell River – Corresponding with station NX-4A	Monitor potential discharge from waste rock and adit	Annually
Contact Lake Mine	New Station G	Tailings Pond – Corresponding with established station CL-3	Outflow of Tailings Pond	Annually when inactive; monthly when active
Contact Lake Mine	New Station H	Contact Lake – Corresponding with established station CL-26	Discharge of Tailings Pond to Contact Lake	Annually when inactive; monthly when active
Soil Treatment Areas	New Station I a,b,c....(to be determined)	Soil Treatment Areas at Silver Bear Mines, Sawmill Bay and El Bonanza/Bonanza	Identify any constituents of concern in water discharged from the soil treatment area	Prior to any discharge





It is important to note that at select GBL Sites there is no clear driver for SNP sampling based on results of earlier monitoring programs or the absence of an effluent source (e.g. Smallwood/Graham Vein, Sawmill Bay and El Bonanza/Bonanza Mine). While not included within the SNP, these sites would still be assessed at least annually before, during and immediately following remediation, as will be detailed within the Water Quality Monitoring Plan. In addition, Construction Monitoring will be conducted during active remediation to identify any potential effects from remedial activities.

Determination of Effluent Quality Guidelines (EQGs) in many cases will require detailed interpretation of regional background concentrations and planned remedial activities. CARD has in part based remedial decision making on the results of Human Health and Ecological Risk Assessments (HHERAs) conducted for the individual properties and has used this information to develop the Site-Specific Target Level for Arsenic in Surface Waters Associated with the Terra Mine Wetland (Annex A-9). CARD respectfully requests additional consultation with the SLWB during derivation of the site EQGs to facilitate use of these scientifically derived criteria at select locations.

The Water Quality Monitoring Plan and Report will be submitted to the SLWB by June 29th, 2017 as per the extension request.

Community Engagement

CARD understands the importance of consultation with local communities and stakeholders and has presented a log of these activities within the Engagement Plan and Log (Appendix F). An additional community meeting is planned in mid-June to summarize the scope of the GBL Sites Phase II Remediation Project, provide status updates and present general timelines.

Project Schedule

Table 2 – Proposed Project Schedule

Task	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Approvals and Procurement												
Permit Renewals	Light Grey											
Funding Approvals	Dark Grey											
Contracting/Procurement	Dark Grey	Dark Grey	Dark Grey									
Remediation												
Mobilization			Light Blue									
Active Remediation			Blue	Blue	Blue	Blue	Blue					
Demobilization							Dark Blue	Dark Blue				
Monitoring												
Monitoring - Baseline	Light Green	Light Green										
Monitoring - Construction			Light Green	Light Green	Light Green	Light Green	Light Green					
Monitoring - Post-Construction								Dark Green	Dark Green	Dark Green	Dark Green	Dark Green
Monitoring - Status of Environment												Dark Green

The schedule for the future phases of the project is subject to Treasury Board funding approvals.





However, INAC anticipates the project could be initiated as early as January 2019, as described in the cover letter. SLWB will be provided with information once there is more certainty in the project schedule.

Currently, it is envisioned that the GBL Sites Phase II Remediation Project may require upwards of five years to complete. It is assumed that shutdown will occur annually over the winter (approximately five months).

If the SLWB has any questions or concerns, please do not hesitate to contact the designated Project Manager, Ms. Candace DeCoste by email at Candace.DeCoste@aandc.gc.ca or by phone at 867-669-2461 or the Project Officer, Ms. Dinah Elliott by email at Dinah.Elliott@aandc.gc.ca or by phone at 867-669-2665.

Respectfully Submitted,

Carey Ogilvie
Senior Manager
Contaminants and Remediation Division





P.O Box 1
 Fort Good Hope, NT
 X0E 0H0

Tel: 867-598-2413 Fax: 867-598-2325
 www.slwb.com

APPLICATION FOR A NEW WATER LICENCE, AMENDMENT OF LICENCE, OR RENEWAL OF LICENCE

Application/Licence No: S15L8-001 (Renewal)
 (amendment or renewal only)

<p>1. Name and Mailing Address of Applicant</p> <p>Carey Ogilvie Senior Manager Contaminants and Remediation Division (CARD) Department of Indian and Northern Affairs Canada Northwest Territories Region P.O. Box 1500 4923 – 52nd Street Yellowknife, NWT X1A 2R3 Telephone: (867) 669-2405 Fax: (867) 669-2700</p>	<p>2. Address of Head Office in Canada if Incorporate</p> <p>Same as 1.</p>
--	--

3. Location of Undertaking (Describe and attach a map, indicating watercourses and location of any proposed waste deposits).

The Great Bear Lake Sites (GBL Sites) Remediation Project refers collectively to the remediation activities required at the abandoned historic industrial properties 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 site. Location maps for each of the sites are provided in **Appendix B**, and detailed site maps in **Appendix E** (Drawings C01 to C07). Site coordinates are provided in Table 1 below.

Table 1 Great Bear Lake Sites Coordinates

Site	Latitude	Longitude
Silver Bear Mines		
Terra Mine	65° 36' 16.56" N	118° 7' 11.23" W
Northrim Mine	65° 35' 47.35" N	117° 58' 38.54" W
Smallwood Mine	65° 34' 56.54" N	117° 56' 38.91" W
Norex Mine & Graham Vein Mine	65° 35' 22.13" N	117° 58' 0.12" W
Contact Lake Mine	65° 59' 37.36" N	117° 48' 0.63" W

El Bonanza/Bonanza Mine	66° 0' 14.89" N	118° 4' 23.91" W
Sawmill Bay	65° 43' 8.54" N	118° 55' 57.77"W

The GBL Sites are located on or adjacent to the eastern shore of Great Bear Lake, within the Sahtu Region of the Northwest Territories. The now abandoned sites are all within the boundaries of the Sahtu Dene and Metis Comprehensive Land Claim Agreement and a portion of the Silver Bear Mines also overlap with the Tłı̨ch̨o M̨owhì Gogha Dè Njìjèè Boundary. The sites are 400-440 km north-northwest of Yellowknife, 175-220 km north of Gamètì and 215-275 km east of Déljne (the nearest community within the Land Claim).

4. Description of Undertaking (Describe and attach plans)

PROJECT OVERVIEW AND APPROACH

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. INAC’s portfolio of contaminated sites in the north originates from private sector mining, oil and gas activities, government, military activity and other users of the land dating back over half a century, many years before the environmental impacts of such activities were adequately understood. The abandoned GBL Sites are amongst these legacy properties. Under the Contaminated Sites Management Program (CSMP), the INAC Contaminants and Remediation Division (CARD) aims to remediate the GBL Sites to improve environmental conditions and reduce environmental/safety risks. In support of the GBL Sites Remediation Project, INAC is applying to the Sahtu Land and Water Board (SLWB) for renewal of the “Type B” Water Licence and “Class A” Land Use Permit.

The GBL Sites have been the subject of numerous assessments and studies to characterize the nature of environmental contamination and hazards. INAC’s efforts to date have included Environmental Site Assessments, Hazardous Material Surveys, Risk Assessments and focused geochemical studies to name a few. Efforts culminated in the production of Remedial Action Plans (RAPs) for each of the project sites. The RAPs summarized site conditions, interpreted results of sampling/assessment, evaluated remedial options and presented the selected remedial approach. The RAP for each site serves as the primary guidance document for remedial activities and site management. The remedial actions have been selected based on guidance from technical experts and with input from community members to identify preferences and environmental considerations. All project activities presented within this Water Licence (WL) application have been presented to communities for consideration and input. Documentation of community engagement activities may be found within the Engagement Log provided in **Appendix F**. The RAPs have also been reviewed by the Federal Contaminated Site Action Plan (FSCSAP) expert reviewers: Environment and Climate Change Canada (ECCC), Department of Fisheries and Oceans Canada (DFO) and Health Canada. INAC worked closely with these expert reviewers to address their concerns and issues prior to the finalization of the RAP for each site. Following the finalization of the RAPs, the project advanced to the detailed design and engineering stage which resulted in minor

updates to several of the concepts that were presented in the RAPs. In support of this WL application, any updates to the RAPs have been included within a cover page, highlighting refinement of remedial approaches and progress to date. These documents may be found for each of the project sites within **Annex A-1, A2, A3 and A4.**

Remediation of the GBL Sites was initially envisioned as a three-phase project: Phase I to address environmental and health and safety issues which would not require mobilization of heavy equipment at Contact Lake Mine, El Bonanza/Bonanza Mine and Sawmill Bay; Phase II to address all other remedial work at Contact Lake Mine, El Bonanza/Bonanza Mine and Silver Bear Mines; and Phase III to address all outstanding remedial work at Sawmill Bay.

Phase I was successfully completed by INAC in 2010-2011 and is detailed in the respective completion reports (**Annex A-6 and A-7**). A 2016 Barrel Program was also conducted to remove all drums with residual fuels from the GBL Sites.

The aforementioned Phase II and Phase III programs have now been consolidated, and a single remedial program will be used to complete site remediation. All future work will be implemented under the title of the GBL Sites Phase II Remediation Project. The scope of remedial activities remains consistent with earlier WL applications and renewals (S15L8-001), and represents simply consolidation of two work plans into one.

With any government funded project there remains a potential for policy changes or funding limitations which require amendment to project timelines. This may include the division of the scope of work into discrete phases to allow project progression or to improve opportunities for land claimants. Such changes may alter the structure of the delivery of the remedial programs; however, will not alter the technical scope of work or environmental considerations/management detailed within this WL application. Should any project approach or timeline changes be anticipated, the SLWB will be notified.

The scope of work as detailed within this WL application will ultimately be implemented by a contractor on behalf of INAC. While the GBL Sites Phase II Remediation Project scope of work has been defined, the specific approach used to accomplish these tasks will be determined by the remedial Contractor. For the project to benefit from the construction knowledge, local understanding, skills and cost savings that a specialized contractor can contribute. Allowing the remedial contractor to tailor an approach is therefore essential; however, INAC will take all appropriate measures to require environmental protection and compliance throughout the project. This includes various contract mechanisms and the presence of a Departmental Representative (DR) on-site to monitor and ensure compliance with the contract.

SITE OVERVIEW

The abandoned Silver Bear Mines were underground mining properties that produced primarily silver, copper and bismuth and were in operation from 1969 to 1985. Located in the Camsell River area, the mine sites are situated near the southeast corner of Great Bear Lake. Refer to Drawings C02 through C04, C08 through C12, C24 through C29, and S01 through S05, **Appendix E** for detailed site plans. The Remedial Action Plan (RAP) found in **Annex A-1** may be consulted for additional project details.

Contact Lake Mine is located on Contact Lake, approximately 265 km east of Déljñę and 12 km east of the abandoned El Bonanza/Bonanza mines. The now abandoned mine site was originally an underground silver mine during the 1930s but was also mined for uranium in 1949/50. Refer to Drawings C06, C16 through C18, and S09 through S10, **Appendix E** for detailed site plans and a complete summary of the site conditions and remedial actions are provided in the RAP within **Annex A-2**.

The former El Bonanza/Bonanza Mines are located on the Dowdell Peninsula, approximately 430 km northwest of Yellowknife on the east coast of Great Bear Lake (approximately 10 km southwest of Port Radium and 12 km west of Contact Lake Mine). The sites were mined for silver from 1934-1936, 1956-1957 and in 1965. Refer to Drawing C05, C13 through C15, S06 through S08, **Appendix E** for detailed site plans and the RAP for additional information (**Annex A-3**).

Sawmill Bay is located approximately 65 km southwest of Port Radium, along the northern section of the Leith Peninsula at the eastern end of Great Bear Lake. Now abandoned, the site was first established as a sawmill in the 1930's, after which it was used for barging and air transportation of uranium ore from Port Radium (1940's-1950). It was subsequently used for various military activities (1950s) and later as a fishing lodge (late 1950s to 1987). The site covers approximately 2038 ha (20 km²) which extends from the beach landing on the south shore of the bay, to the lodge area, to the two intersecting airstrips located approximately 1,000 m inland from the tip of the bay. Refer to Drawings C07, C19 through C23, and S11 through S14, **Appendix E** for detailed site plans and the RAP in **Annex A-4** for additional information.

SITE ACCESS

None of the GBL sites are road accessible and the access approach will be selected by the Contractor. Proposed transportation routes are illustrated in Figure 1 and Figure 2 of **Appendix C**. It is anticipated that the Contractor will likely apply a hybrid option of the two presented, utilizing the Government of the Northwest Territories (GNWT) winter road to Déljñę and barge across Great Bear Lake. This was the access route chosen for the Port Radium remediation work. **Appendix J** lists the proposed mitigation measures for winter road and barge activities for the remediation project. The SLWB will be notified of the Contractor's preferred access approach, though submission of a Mobilization and Demobilization Plan.

Maintenance, upkeep, and in select areas, upgrades will be required for the site access roads. This is especially important to facilitate transport of the equipment and debris/building materials between the main sites and barge landing areas, for further transport to the non-hazardous waste landfill at Terra Mine. The onsite access roads will be upgraded during the summer season between July and September every year. Maintenance would consist of road grading, installation of culverts and temporary docks. The access road to El Bonanza mine (from the airstrip to site) will require the installation of a culvert across the wetland area at the outfall of Silver Lake. Also, the route to the Bonanza mine may require some infrastructure such as temporary dock construction. New winter roads connecting each site may also be required.

OVERVIEW OF PROJECT ACTIVITIES

The following sections present a summary of the remedial activities planned for the GBL Sites Phase II Remediation Project, as well as documenting the remedial activities conducted to date.

Extensive assessment and study of the Great Bear Lake Sites was conducted prior to designing the remedial programs; however, there is always some level of inherent uncertainty when managing historic sites. The historic operations did not generally document all site activities and in the decades since abandonment it may be difficult to find or fully characterize all aspects of the site without significant environmental disruption not justified during the assessment phase. It is therefore important that any remedial program have the flexibility to respond to new or changing concerns, such as subsurface conditions exposed during earthworks. This will allow the remedial program to address all site concerns appropriately, regardless of whether it was within the initial scope. The SLWB will be notified of any incremental activities required beyond the scope presented.

MINE OPENINGS

A large number of underground mine openings are found at the Silver Bear Mines, with a lesser number at Contact Lake Mine and El Bonanza/Bonanza Mine (no mining activities occurred at Sawmill Bay). Some of the vertical openings (shafts, raises and open stopes) are uncovered and present significant fall hazards for people and animals. Horizontal openings (adits and portals) present risks if deliberately entered, from both poor air quality and unstable conditions. Unlike the aforementioned underground openings, there was limited surface mining at the GBL Sites. A shallow "open pit" is found at Terra Mine and a mined trench/pit at Northrim Mine.

Active management of the risks from the mine openings was selected for all sites during community consultations. This is consistent with legislation, as the Northwest Territories Mine Health and Safety Regulations specify that all underground openings to surface must be sealed before a mine is permanently closed and provide basic design criteria for the capping of shafts and raises. Each opening

must be sealed in a manner that meets the regulations and achieves the requirements for strength and durability, while remaining cost-effective. The selected method must not risk the safety of workers installing the seal (physical and air quality hazards). The closure methodology selected for the mine openings was generally consistent across the GBL Sites, and summarized as follows:

- Shafts/Vent Raises: Install engineered concrete cap;
- Portals and Adits: Install backfill with local waste rock;
- Open Stopes: Backfill with local waste rock where accessible; and,
- Open Pit: Backfill open pit/mined trench at Graham Vein with local waste rock and backfill adit/stope at base of Terra “open pit”.

A listing of the GBL Sites mine openings and selected closure approach is provided in Table 2 below.

Table 2 Selected Remedial Approach for Mine Openings

Site	Mine Opening	Remedial Approach
Silver Bear Mines	17 Vertical Openings (shafts and vent raises)	Install engineered concrete caps
	12 Horizontal Openings (portals and adits)	Install backfill of opening with local waste rock
	6 Open Stopes	Backfill with local waste rock
	2 Open Pits/Mined Trenches	Backfill open pit/mined trench at Graham Vein with local waste rock and backfill adit/stope at base of Terra “open pit”.
Contact Lake Mine	1 Horizontal Opening (Adit)	Install backfill of opening with local waste rock
	2 Vertical Openings (One Shaft and One Raise)	Install engineered concrete caps
	1 Open Stope	Chain link fence around open stope
El Bonanza/Bonanza Mine	1 Horizontal Opening (Adit) at site, plus Bear Portal 2.5 km to the east	Install backfill of opening with local waste rock
	3 Vertical Openings (Shafts)	Install engineered concrete caps at accessible openings and cap #1 Shaft in a safe manner.

At nearly all locations the general approach discussed above will be employed; however, there are select mine openings at which a revised approach is required due to access limitations, worker safety, ground conditions or the absence of hazards. This includes the “open pit” at Terra Mine (in fact a side cut from a natural cliff face requiring closure of adit and stopes), the open stope at Contact Lake Mine (blasting concerns indicate fencing is preferred option) and the El Bonanza No. 1 Shaft (access constraints may require fencing or a foam seal). Summaries of these challenges and the revised approach are provided in the associated site RAPs (**Annex A-1, A-2 and A-3** respectively).

Closure of the openings will employ a “design/build” contract approach, requiring the contractor to provide Engineered Backfill and Engineered Cap Design Drawings. This may include evaluation of alternative cap technologies if determined appropriate and successful in meeting the remedial objectives of closure. Following review of submissions by the Departmental Representative, the engineered drawings and designs will be submitted to the Government of the Northwest Territories Mines Inspector for review and approval.

Geotechnical inspections will be implemented on a routine frequency after closure to confirm the ongoing structural integrity of the closures and identify any corrective measures required. The scope of these activities will be outlined in the Geotechnical Inspection Plan.

WASTE ROCK

Waste rock is located at all individual Silver Bear Mine sites. Overall, there is more than 450,000 m³ of waste rock; however, only approximately 10-20% has the potential to generate acid. Despite this theoretical potential, the waste rock has been on the surface for 30-50 years and appears to be having minimal effects on local water quality in the lakes and rivers of the area. This is illustrated by the low levels of metals and sulphate in lakes where waste rock has been placed in and adjacent to (SO₄ level is typically <20 mg/L).

Waste rock quantities at the Contact Lake Mine are limited (approximately 30,000 m³) in keeping with the nature and scale of past operations (exploration, minimal mining). Remedial issues are minor and related to small areas where the rock exhibits slightly elevated gamma radiation levels and runoff water with elevated metal content.

Volumes of waste rock are smaller still at the El Bonanza/Bonanza Mine. The waste rock at El Bonanza Mine is located in two piles (combined volume ~3,000 m³), a portion of which extends into Silver Lake to a depth of approximately 1 m. The waste rock pile at the Bonanza Mine (~600 m³) is located immediately adjacent to the Bonanza shaft. The water quality at both the El Bonanza and Bonanza Mine meet all CCME criteria (2008 SENES Supplement Assessment Report for El Bonanza).

Remedial approaches for the management of waste rock were designed based on the geochemical and radiological risks presented from the materials and the impacts on downstream receptors. As detailed in the RAPs, extensive study of the waste rock and downstream waterbodies has been implemented by specialized consultants and academic institutions to formulate technically sound, practical and effective remedial solutions where necessary. Table 3 presents the selected remedial approaches agreed to during community consultations and tailored to the specific waste rock deposit. The overarching approach of the remedial measures is to reduce surface water interaction with the waste rock. The sole exception is the installation of a cover to reduce gamma radiation from small areas of Contact Lake Mine waste rock. Design drawings provided in **Appendix E** may be consulted for additional detail.

Water quality monitoring will be conducted downstream of the waste rock deposits during construction and post-construction to confirm the effectiveness of remedial measures. Geotechnical inspections will be implemented on a routine frequency after remediation to confirm the ongoing structural integrity of the remedial works. The scope of these activities will be outlined in the Water Quality Monitoring Plan and Geotechnical Inspection Plan respectively.

Table 3 Selected Remedial Approach for Waste Rock

Site	Remedial Approach
Silver Bear Mines - Terra	Minimize drainage through the piles by diverting surface runoff flows around the sites where appropriate, use of natural attenuation in wetlands to provide ongoing treatment of the drainage, and removal of non-hazardous debris to the non-hazardous landfill.
Silver Bear Mines – Northrim	Waste rock currently located by the Camsell River will be relocated to near the leachate pond to cover tailings.
Silver Bear Mines – Norex	Open channels will be used to direct surface water away from the waste rock.
Silver Bear Mines – Graham Vein and Smallwood	Problematic waste rock will be used to backfill the trench at Graham Vein.
Contact Lake Mine	Areas with Elevated Radiation Levels – Cover grid areas where the 10 m by 10 m grid average exceeds 250 µR/h to reduce the grid average for these areas to below 250 µR/h.
	Impacted Waste Rock Runoff Water – Improve surface grading at, and in the vicinity of, the toe of the waste rock pile to minimize off-site runoff contact with the mine waste rock and eliminate standing water at the toe of the waste rock pile.
El Bonanza/Bonanza Mine	Leave the waste rock pile as is unless the rock is used for other purposes such as sealing the adit opening.

TAILINGS

Tailings are located at Silver Bear Mines (Terra, Northrim and Norex only) and at Contact Lake Mine. Most of the tailings at Terra Mine are located under water in Ho Hum Lake Tailings Containment Area (~500,000 t). Two small areas of tailings (~2,200 m²) are exposed above water on the north side of the TCA. The quality of water in Ho Hum Lake TCA contains elevated concentrations of arsenic and copper above the Canadian Council of Ministers of Environment – Freshwater Aquatic Life (CCME-FAL) guidelines but levels remain well below Federal Metal Mining Effluent Regulations (MMER) that would apply to discharges from an operating mine and tailings area.

At Northrim Mine, the exposed tailings and smelter waste covers approximately 1,600 m². Two small areas of exposed tailings are located at the north and south-east corner of Hermandy Lake TCA, adjacent to the Leachate Pond (covering ~150 m²). Most of the tailings produced at Northrim Mine lie under

water in Hermandy Lake TCA (10,000 t). Metal loadings from the tailings have not to date (and would not be expected to) have a significant effect on the water quality of Hermandy Lake TCA. However, a small deposit of what appears to be smelter process waste and tailings lies exposed just south of the Leachate Pond. This material contains high levels of some soluble metals and may contribute to elevated metal concentrations in the Leachate Pond and the man-made discharge from Hermandy Lake TCA, which is routed through the pond. Tailings are also located under water in the Camsell River, close to the dock; however, no effects on water quality in the river were identified.

A portable mill operated at Norex for a brief period and produced approximately 1,100 t of tailings that were reportedly discharged towards the Xeron Pond near Graham Vein. However, sampling has failed to identify tailings in the pond. Tailings in or near Xeron Pond may influence the current water quality; however, this appears to be a limited impact.

From a review of the operating history of Contact Lake Mine, it is known that approximately 200 m³ of the 2400 m³ gravity mill feed that had been stockpiled below the waste rock pile were not processed (i.e. ore) and remain on-site. In addition, tailings are scattered on surface between the former mill site location and the edge of the tailings pond (approximately 1,000 m³). Exposed tailings exhibit slightly elevated gamma radiation; however, the risk assessment found no potential risks from radiological aspects. In contrast, metal concentrations in the tailings were a potential concern.

A natural pond exists down gradient of the Contact Lake Mine into which tailings were deposited using unconfined gravity discharge during operation and erosion of tailings during and after operation. As a result of the tailings and impacted water flowing into the pond, the pond sediments exhibit tailings characteristics and the pond water quality exceeds CCME-FAL guidelines for select metals, although at a lower level than the incoming surface runoff water. Although the water quality guidelines were exceeded in the pond, the Contact Lake receiver is not being impacted (i.e., water quality measured at the shoreline of Contact Lake below the tailings pond meets all water quality criteria).

Remedial approaches for the management of tailings were designed based on the geochemical risks presented from the materials and the impacts on downstream receptors. Table 4 presents the selected remedial approaches agreed to during community consultations and tailored to the specific geochemistry and setting of the tailings deposits.

Table 4 Selected Remedial Approach for Tailings

Site	Remedial Approach
Silver Bear Mines – Terra	Ho Hum TCA Exposed Tailings: These tailings will be covered with waste rock and/or soil to reduce potential for contact with people and animals. The tailings cover will also include geotextile. See Drawings C08, C24, C28 and C29 in Appendix E for more details.
	Ho Hum TCA Submerged Tailings: Leave the tailings in place and enhance the former Upper Wetland, which was degraded when the Ho Hum TCA water level was artificially raised in 2004. The wetland may serve as a long-term and practical

Site	Remedial Approach
	<p>approach to “polish” discharges from the Ho Hum TCA. Wetland enhancement will require modification of ground conditions (e.g. weirs) and will provide stability, regulate water flow, and minimize fish passage into Ho-Hum TCA from Moose Bay. The Upper Wetland will be enhanced by permanently lowering water levels within Ho-Hum TCA by approximately 1 m. This will create conditions that are favourable for the natural re-establishment of native plant species (e.g., sedge, horsetail and willow) within the Upper Wetland. Consideration is also being given to augmenting the existing growth medium within the Upper Wetland with peat or other organics, followed by active revegetation. The spillway and wetland enhancement considerations have been discussed with DFO and EC and their comments have been incorporated into the design of the spillway.</p>
Silver Bear Mines – Northrim	<p>Exposed Tailings: Exposed tailings will be covered and the smelter waste excavated and disposed of at a licensed off-site management facility. See Drawing C10 in Appendix E for more details.</p>
	<p>Submerged Tailings: Leave the tailings in the river in-situ and to restore the drainage to the former outlet of Hermandy Lake TCA. This will be achieved by backfilling a portion of the Leachate Pond and removing the dyke at the former outlet of the lake. See Drawings C10 and C32 in Appendix E for more details.</p>
Silver Bear Mines - Norex	<p>Given the minor effect on water quality, the proposed plan is to leave Xeron Pond undisturbed.</p>
Contact Lake Mine	<p>Exposed Tailings: Cover in-situ to minimize potential exposures to elevated metal concentrations; improve drainage to minimize surface water contact with the tailings and subsequent metal release into the environment.</p>
	<p>Submerged Tailings: Leave as is (risk manage and monitor) and control source of additional metals entering into the pond by covering the tailings above the pond where practical. Drainage channels designed through the waste rock to minimize the standing water.</p>

Water quality monitoring will be conducted downstream of the tailings deposits to confirm the effectiveness of remedial measures. Geotechnical inspections will be implemented on a routine frequency to confirm the ongoing structural integrity of the remedial works. The scope of these activities will be outlined in the Water Quality Monitoring Plan and Geotechnical Inspection Plan respectively.

BUILDINGS, EQUIPMENT AND INFRASTRUCTURE

Camps and operational infrastructure was constructed at each of the GBL Sites. At Contact Lake Mine, El Bonanza/Bonanza Mine and Sawmill Bay, operations were small and the number of structures minimal. These generally consisted of camp facilities (cabins, kitchens, outhouses, etc.); headframes, mine dry buildings, powder shacks and core shacks (at mining properties only); and support structures such as powerhouses, maintenance shops and offices. While a small number of metal quonset huts were erected, most buildings were timber framed structures constructed on site. Many of the structures at

Contact Lake Mine, El Bonanza/Bonanza and Sawmill Bay have either collapsed or partially collapsed in the decades since abandonment. However, some standing buildings remain which may present tempting but unstable shelter for wildlife or site visitors.

Alternatively, Silver Bear Mines contains substantially more buildings and infrastructure and is many decades newer. The majority of buildings are found at Terra Mine and are steel framed/clad structures with concrete foundations and floors. These include the mine ventilation and compressor plants, the freshwater pumphouse, the crusher building, and the largest complex on site, which includes the assay lab, processing plant, power house, main warehouse, changing rooms, and offices. Most of the smaller shops and storage sheds are timber framed and timber sided, with steel roofs. The camp buildings include timber structures built on site and ATCO trailer complexes. The buildings at Silver Bear are typically in better condition than other sites, though have been unmaintained for decades and are deteriorating.

Structures present physical hazards in their current state and as they deteriorate further in the future. Hazardous building materials have also been documented and sampled, including lead amended paints, polychlorinated biphenyl (PCB) amended paint, wood treated with pesticides (Dichlorodiphenyltrichloroethane or DDT) and asbestos containing materials (ACMs) such as insulation, floor tiles and pipe wrap.

The primary concern in considering remedial action for buildings and equipment is the safety of people who may visit the sites and wildlife which may opportunistically use structures. The following remedial approach was agreed to during community consultations and will be applied consistently across all sites:

- Demolish all buildings/infrastructure after removal of hazardous materials and dispose of non-hazardous debris in an approved manner.

Prior to demolition, all hazardous building materials will be removed from structures, consolidated and transported to a licensed off-site hazardous waste management facility (see Hazardous Waste section below). Non-hazardous building materials will be managed in an engineered landfill to be constructed at Terra Mine (see Non-Hazardous Waste section below). ACM building materials will be double bagged and placed in one corner of the onsite landfill, clearly marked by the Contractor. Upon receipt of a Northwest Territories Burn Permit, untreated and unpainted wood will be burnt in consolidated piles or in-situ for select timber-frame structures. Burn ash will be sampled and where failing to meet disposal criteria, will be transported to a licensed off-site hazardous waste management facility.

During the 2010 GBL Sites Phase I Remediation Project the majority of buildings at the Contact Lake Mine and El Bonanza/Bonanza Mine were demolished. The Contact Lake Mine headframe, hoist house shed, quonset and outhouse remain, in addition to the headframe at both El Bonanza and Bonanza, the Building #2A shop and dilapidated cabin at Bear Portal. Hazardous building materials were shipped to a licensed off-site management facility, with the exception of ACMs which were double bagged and remain at the sites. Non-hazardous debris was consolidated into stockpiles awaiting transport to the

Terra Mine landfill. Unpainted untreated wood was burned under permit and the ash sampled for management. No building or infrastructure demolition was conducted at Sawmill Bay or Silver Bear Mines.

During the GBL Sites Phase II Remediation Project, the remaining buildings and infrastructure will be demolished and materials managed per the selected remedial option.

NON-HAZARDOUS WASTES

The GBL Sites contain a significant amount of non-hazardous waste, the greatest volume of which is found at Terra Mine. These materials are in consolidated waste disposal areas, scattered around site or will be generated during building/infrastructure demolition. At the Silver Bear Mines, the volume of non-hazardous material that would be generated from demolition of the buildings and collection of equipment and debris from the storage yards was estimated just over 16,000 m³, plus an additional 6,750 m³ from former waste disposal sites (i.e., surface dumps) and 2,000 m³ of scattered refuse. Primary materials are steel, wood, and concrete, with lesser quantities of plastics, rubber, glass, insulating materials and paper products. Significantly smaller volumes of material are found at the Contact Lake Mine, El Bonanza/Bonanza Mine and Sawmill Bay site.

The following remedial option was selected for all sites and agreed to during consultations:

- Consolidate non-hazardous waste and transport to the non-hazardous waste landfill at Terra Mine.

A portion of the mill/campsite area at the Terra Mine site has been selected as a candidate site for the new non-hazardous waste landfill. The landfill will be placed at the highest impacted part of the site where the former camp and tank farm were located. The landfill will be enhanced with a top liner so that limited infiltration of water will occur. Refer to Drawings C25 and C26 in **Appendix E** for more details. This decision is not reflected in the Silver Bear RAP but has been accepted by the community as it is the highest and driest point at the site and is located in an impacted area (see Engagement Log in **Appendix F**). The Terra Mine Landfill will accept non-hazardous wastes from all GBL Sites.

Materials with lead-amended paint applications that are below leachable criteria will also be placed in the landfill. This may include vehicles, equipment, drums and dismantled tanks (once residual fuels/hazardous materials removed and articles cleaned). These decisions were made based on precedent practice at other Federal Contaminated sites, including the abandoned mine sites Tundra and Discovery. As with Discovery, the top liner will be installed over the landfill to minimize any water infiltration through the landfill. Water quality monitoring will be done around the landfill to ensure that no contaminants are leaching from the landfill. Geotechnical inspections will be implemented on a

routine frequency to confirm the structural integrity of the landfill. The scope of these activities will be outlined in the Water Quality Monitoring Plan and Geotechnical Inspection Plan respectively.

In 2010 the following activities were conducted during the GBL Sites Phase I Remediation Program:

- Contact Lake Mine: Scattered surface debris and debris <0.5m depth at waste disposal sites was consolidated in stockpiles. After building demolition, non-hazardous building debris was added to these stockpiles.
- El Bonanza/Bonanza Mine: Scattered surface debris and all debris at waste disposal sites was consolidated in stockpiles. After building demolition, non-hazardous building debris was added to these stockpiles.
- Sawmill Bay: Scattered surface debris and debris <0.5m depth at waste disposal sites was consolidated in stockpiles. No building demolition occurred. Approximately 10,800 empty drums were crushed and stockpiled.
- Silver Bear: No activities conducted.

The GBL Phase II Remediation Program will include transporting the stockpiled non-hazardous materials from these sites to the Terra Landfill (after the completion of building demolition and consolidation of material in surface dumps). Also included will be very minor volumes (<3 m³) of debris from Bear Portal, Contact Lake Portal and Mystery Island (within the general project area). Non-hazardous materials at all Silver Bear properties will be consolidated in the Terra Landfill. Any submerged debris removed from Sawmill Bay will also be consolidated for management at the Terra Landfill.

HAZARDOUS WASTES

At the Silver Bear Mines there is a considerable inventory of potentially hazardous waste materials that include batteries, lead paint, old lime and residual mill reagents, with lesser volumes identified at the Contact Lake Mine, El Bonanza Mine and Sawmill Bay. Hazardous building materials include DDT impacted wood, lead and PCB amended paints, ACMs (select insulation, tiles, pipe wrap, window sealant, drywall tape, etc.) and transformers. Vehicles, equipment, tanks, drums and various mine infrastructure may also have lead-amended paint exceeding leachable lead criteria for the Terra Mine Landfill and require off-site management as a hazardous material. Based on technical evaluations, community consultations and design refinements, the following remedial options were selected:

- *Designated Substances / Hazardous Materials* – Remove and dispose of in a designated licensed facility for hazardous materials; and
- *Asbestos* – Remove and dispose at Terra Mine non-hazardous landfill.

All hazardous materials (with the exception of ACMs) will be shipped off-site in accordance with the Transportation of Dangerous Goods Regulations (TDGR) to a licensed disposal facility. ACM building materials will be double bagged and placed in one corner of the onsite landfill, clearly marked by the Contractor.

The GBL Phase II Remediation Program will include the consolidation and off-site management of all remaining hazardous materials at the Contact Lake Mine (remaining buildings only), El Bonanza/Bonanza Mine (remaining buildings only), Sawmill (all buildings) and Silver Bear (debris and buildings).

Blasting caps have been found at the abandoned mine sites. INAC retained a former mines inspector to conduct a survey of the sites, to locate any remaining blasting caps, which were subsequently removed/destroyed. However, the possibility exists that additional blasting caps are still present on the sites. During debris clean-up, personnel will be made aware of this hazard and appropriate steps to be taken, should a blasting cap be found.

HYDROCARBON IMPACTED SOIL

Significant hydrocarbon impacts were identified at Silver Bear Mines, primarily of the waste rock lay-down areas, around the mine sites (approximately 30,000 m³). As a result of the long history of industrial and military activity at Sawmill Bay, soils in some parts of the site are also contaminated with hydrocarbons from fuel oil, lubricating oils and gasoline (approximately 11,000 m³). Alternatively, at the Contact Lake Mine only limited areas and quantities of hydrocarbon impacted soils and waste rock were identified (approximately 29 m³). At El Bonanza/Bonanza Mine hydrocarbon impacted soils were identified near several buildings, one of the dumpsites, the drum storage area at El Bonanza and the airstrip (approximately 2,000 m³). As was agreed in community consultations, these impacted soils will be remediated with an approach tailored to the nature of contaminants.

As the mine sites are remote and access is extremely limited, generic CCME criteria for hydrocarbon impacts in soil are very conservative given they assume regular access to the sites. Site-specific clean-up criteria for hydrocarbon impacted soils have therefore been developed for the Silver Bear sites and those criteria will be applied to all Great Bear Lake sites. These criteria were reviewed and accepted by a Technical Review Team, ECCC and a Hydrocarbon Working Group which was made up of various experts including independent hydrocarbon specialists, ECCC and INAC. The site-specific criteria are summarized in Table 5, and the full report available in **Annex A-5**. Note that separate criteria were developed for Sawmill Bay, as there was the potential for longer exposure because of the presence of a former lodge and because of the type of soil at Sawmill Bay (sand).

Soil impacted with light F1 and F2 hydrocarbon fractions (gasoline/diesel mobile fractions) will be excavated and treated on-site in windrow treatment areas (i.e. landfarms). More stringent criteria for F2 mobile fractions have been established for areas that are in close proximity to water bodies (within 30 m). This ensures that the water bodies on-site will be protected to a FAL Criteria. Excavation in near shore areas will be completed in accordance with Best Management Practices (e.g. use of silt screens, Sediment and Erosion Control Plans), will follow DFO recommendations and will be monitored as indicated in the associated Water Licence application. Soil impacted with F3 and F4 hydrocarbon fractions (heavier lube oils/non-mobile fractions) will either be covered in place (Contact Lake Mine and

El Bonanza/Bonanza Mine) or excavated and placed in the non-hazardous Terra Mine landfill as intermediate fill (Silver Bear).

Table 5 Site-Specific Clean-up Criteria for Hydrocarbon Impacted Soil at GBL Sites

PHC Fraction	Surficial Soils Clean-Up Value			Subsurface Soils Clean-Up Value	
	Soil < 30m to Waterbody	Soil > 30m from Waterbody	Mine Rock – Only Dermal Contact No Ecological Pathways	Clean-up Value (mg/kg) for PHC < 30m to Waterbody	Clean-up Value (mg/kg) > 30m from Waterbody
F1 (C6 to C10)	400	400	940	1290	30,000
F2 (>C10 to C16)	300	800	13,000	330	30,000
F3 (>C16 to C34)	10,300	10,300	30,000	30,000	30,000
F4 (>C34)	18,500	18,500	30,000	30,000	30,000
Total PHC	30,000	30,000	30,000	-	-
Type A	29,000	29,000	30,000	-	-
Type B	11,000	11,000	30,000	-	-
Sawmill Bay					
F1 (C6 to C10)	30	30		30	30,000
F2 (>C10 to C16)	250	250		300	30,000
F3 (>C16 to C34)	2,700	2,700		30,000	30,000
F4 (>C34)	4,500	4,500		30,000	30,000
Total PHC	7,500	7,500		-	-
Type A	7,200	7,200		-	-
Type B	330	300		-	-

The Hydrocarbon Working Group met and visited the site to determine the best treatment locations. Hydrocarbon treatment areas at Terra Mine are to be located on part of the airstrip (adjacent to Ho-Hum TCA) and at the mill area. These locations were picked as they were the only areas on-site that were flat and large enough. All treatment areas will be lined and bermed appropriately to minimize surface and subsurface hydrocarbon infiltration to adjacent water bodies as per ECCC Federal Guidelines for Landfarming Petroleum Hydrocarbon Contaminated Soils, Dec, 2005 (Drawing C08, C27 and C32, **Appendix E**). The Norex and Smallwood treatment areas will be situated on the waste rock pads (Drawings C11 and C12 and C32, **Appendix E**). A treatment area will also be constructed at the El Bonanza/Bonanza airstrip and former tank farm area (Drawing C14, **Appendix E**) and used to treat F1-F2

impacted soils from El Bonanza/Bonanza Mine and from Contact Lake Mine. Sawmill Bay requires a separate treatment area to be constructed on the access road (Drawing C19 and C21, **Appendix E**).

A Landfarm Management Plan will also be developed by the Contractor to outline the design approach, treatment methodology, monitoring requirements, soil testing requirements and criteria for soil management. Water quality monitoring will be done around the treatment area to confirm that no contaminants are leaching and geotechnical inspections will be implemented on a routine frequency to confirm structural integrity. The scope of these activities will be outlined in the Water Quality Monitoring Plan and Geotechnical Inspection Plan respectively.

Human Health and Ecological Risk Assessments (HHERAs) conducted at each of the individual GBL Sites were used to identify risks to humans and animals using the sites. Based on these findings, remediation of metal enriched soil was not recommended. However, where soil within waste disposal areas, underlying hazardous materials (e.g. lead batteries) or in areas of chemical use (e.g. pesticides) exceed applicable criteria, soils will be excavated for off-site management.

Heavy metal and radiological contamination from uranium ore was identified at discrete areas of Sawmill Bay. Responsibility for any residual radioactive soils on the Sawmill Bay site now rests with Atomic Energy Canada Limited (AECL), though was formerly with Natural Resources Canada (NRCan). A program was conducted in 1997 to remove licensable radioactive materials from the site; however, ongoing assessment and/or remedial activities may be required (e.g. soil, barge). In February, 2013 a radiological risk assessment was completed based on existing radiological data for the site. The report concluded that for seasonal casual use (e.g. hunting, outfitters camp), the site does not pose a human health risk based on international/national protection criteria, nor does it pose an ecological risk. In summary, it is INAC's understanding that the current uranium and radiation levels fall within the industrial land use guideline of CCME. AECL will maintain responsibility for managing materials and for communication with communities and the SLWB.

In 2010, a small volume of PHC-impacted soil at the Sawmill Bay airstrip was shoveled into polyethylene liner bags, placed into drums and transported to Yellowknife for approved disposal. These clean-up efforts were conducted at discrete areas due to recent spills from drums (i.e. did not include historic contamination).

DRUMS, TANKS AND RESIDUAL FUELS

More than 10,000 drums and numerous above-ground storage tanks were identified at the GBL Sites, many of which contained residual fuel, other products (e.g. glycols) or fuel/product mixed with water. Based on these considerations, the following remedial option was selected:

- *Drums and Fuel Storage Tanks* – Dispose of contents (in accordance with relevant guidelines) and drums/ tanks at Terra Mine non-hazardous landfill.

The community agreed to have the barrels collected, cleaned and crushed during the GBL Sites Phase I Remediation Project. In 2010, a total of 8,235 empty drums were consolidated and crushed at the Sawmill Bay site, including 34 from Contact Lake Mine and 76 El Bonanza/Bonanza Mine. Crushed drums were placed with the non-hazardous debris stockpiles. The remaining 2,590 drums contained some residual liquid product. In 2011, drums with liquid were consolidated based on disposal requirements set in the Abandoned Military Site Remediation Protocol, laboratory results and visual observations. The emptied drums were washed within the drum processing area (a lined box). The process water was treated with an oil-water separator which resulted in two liquid streams: treated water and process waste. The process waste was consolidated, while the treated water was either held in temporary holding bladders and sampled for discharge or recycled back into the washing system. The treated water was discharged in accordance with the requirements set in the Water Licence. A total of 202 drums containing product and process waste were removed from site in 2014, followed by removal of an additional 950 drums in 2016. It is believed that all drums with residual product have been removed from the GBL Sites, though some residual sludge remains in the tanks.

During the GBL Sites Phase II Remediation Project, any residual fuel and fuel/product mixtures will be managed per Phase I protocols and shipped off-site for disposal in a licensed facility. Empty drums (once washed if containing product) will be crushed and managed within the Terra Mine landfill, as will dismantled tanks with lead paint applications below leachable criteria. If exceeding criteria, materials will be managed per hazardous materials and shipped to a licensed off-site hazardous waste management facility.

DOCKS

Three docks are found at the Silver Bear Mines on the Camsell River; one at Terra, one at Northrim and one at Norex. A dilapidated dock and sand crib is also associated with the Contact Lake Mine and is found along the shore of the East Arm of Great Bear Lake. The docks are in disrepair and some contain contaminated soils/wood. The following remediation options were agreed to during community consultations:

- *Dock and crib structures* – remove and dispose of these structures and debris in a landfill

The plan is to remove the docks with minimal disturbance to the surrounding sediments and stabilize the shorelines. The docks will be excavated to the original shoreline and stabilized with rock fill (where necessary). If soil around the docks is contaminated with hydrocarbons (e.g. Northrim), the soil will be removed and treated per hydrocarbon impacted soils. Steel and other non-hazardous waste will be disposed of in the Terra Mine landfill. The excavation would be inundated with water from the river and rigorous methods would be necessary to prevent releases of sediment or hydrocarbons to the river. These would include silt curtains, oil absorbent booms, the application of Best Management Practices

(e.g. Sediment and Erosion Control Plan), consultation with DFO and monitoring as indicated in the associated Water Licence application.

Water quality monitoring will be conducted during and following dock removal. Geotechnical inspections will also be implemented on a routine frequency to confirm the structural integrity of the shoreline. The scope of these activities will be outlined in the Water Quality Monitoring Plan and Geotechnical Inspection Plan respectively.

AIRSTRIPS

Historic airstrips are found at Silver Bear Mine (Terra and Smallwood), El Bonanza/Bonanza (at shore of Great Bear Lake) and Sawmill Bay. While unmaintained, the airstrip at Terra Mine and Sawmill Bay are still used to access the sites. The airstrips at Smallwood and El Bonanza/Bonanza are overgrown and no longer in use.

The remedial plan is to leave the El Bonanza/Bonanza and Smallwood airstrips as is to continue natural revegetation. For the Terra Airstrip and Sawmill Bay airstrip, intermittent use may be required during and following remediation (to support long-term monitoring). The RAPs identified a preference to also leave these airstrips as is and Transport Canada will be consulted to identify requirements when use is no longer required.

ROADS AND CULVERTS

GBL Site roads are constructed from local borrow materials and waste rock to varying degrees, though all are considered to pose little environmental risk. Culverts are found at discrete locations, many of which would only carry ephemeral water during freshet or major precipitation events. Roadways will be required to access the sites during the remediation program and in some locations upgrades or additional culverts may be necessary.

The remedial approach for the roads is to remove the culverts and to allow the roads to naturally revegetate. DFO has been consulted and will continue to be consulted to assure any new culverts installed or culverts removed at closure would be done with Best Management Practices and fisheries approval where required. Considerations will include proper stream channel design, fish passage (if required with DFO input), and long-term stability of the stream bed and banks at each location. If roads are upgraded for use, they will be scarified and left to naturally revegetate at completion of the remedial works.

CAMP FACILITIES

Completion of the GBL Sites Phase II Remediation Project will require operation of a field camp. Upon selection, the Contractor will be required to submit a Camp Methodology and Layout Plan (either as a standalone document or part of the comprehensive Work Plan), to be provided to the SLWB. In the interim, INAC has estimated a camp size of approximately 20-50, in operation for seven months per year for five years.

The remedial Contractor will ultimately be responsible for the design and implementation of camp facilities, pending INAC review. The camp will be located in relatively close proximity to the remedial work. Given the scope of work at Terra Mine is substantially larger than the other project sites and there is considerable existing camp infrastructure, it is assumed the Contractor will use this location for the new primary camp (projected capacity of 20-50 personnel). Due to the existing camp's overlap with the proposed non-hazardous waste landfill to be constructed and the need to demolish the former mine/camp buildings, the Contractor may elect instead to establish a new camp. The most probable location would on the main Terra Mine site, adjacent to the large pit area. The location must not interfere with remediation activities and facilities must be removed at the completion of work activities.

Satellite camps at the other sites may operate concurrently or in sequence. The temporary satellite camps may also act as a base for the remediation project when the existing central camp at Terra Mine is being demolished. Satellite camps are predicted to be 10-15 persons or less and would be composed of temporary structures.

Camps will be placed on areas cleared during historical operations. As much as possible, camp facilities will be located greater than 100 m from a waterbody. However, at some sites the most suitable cleared area is less than this distance (e.g. El Bonanza/Bonanza).

5. Type of Undertaking.

- | | | | |
|-----------------------|-------|------------------|----------------------|
| 1. Industrial | _____ | 5. Agriculture | _____ |
| 2. Mining and Milling | _____ | 6. Conservation | _____ |
| 3. Municipal | _____ | 7. Recreation | _____ |
| 4. Power | _____ | 8. Miscellaneous | ✓ <u>Remediation</u> |

6. Water Use

- | | | | |
|------------------------------|---------|-----------------------|---------|
| To obtain water | _____ ✓ | Flood control | _____ |
| To cross a watercourse | _____ ✓ | To divert water | _____ ✓ |
| To modify the bed or bank of | | To alter the flow of, | |

a watercourse

✓

or store water

✓

Other (describe):

Water use will be required for camp facilities (potable water, kitchen use, toilets and ablution); dust suppression on roadways, in support of remedial activities (e.g. washing, concrete mixing) and fire suppression.

7. Quantity of water involved (litres per second, litres per day or cubic meter per year), including both quantity to be used and quality to be returned to source.

The water anticipated water sources, source volumes and purpose of use are summarized in Table 6 below.

Table 6 Water Sources, Volumes of Purpose of Use

Source	Source Volume	Purpose of Use
Great Bear Lake	Approx. 2.24 trillion m ³ *	For work activities and operation of potential satellite camps at Sawmill Bay and El Bonanza/Bonanza Mines.
Camsell River	Approx. 3.08 billion m ³ /yr *	For work activities and the main camp at Terra Mine.
Contact Lake	Approx. 20 billion m ³	For work activities and operation of a possible satellite camp at Contact Lake Mine
Other Lakes	To be determined in field	Where work activities require use of water (e.g. concrete mixing at vertical mine closures); or satellite camps.

* SENES Consultants Limited. 2008. Contact Lake Mine – Remedial Action Plan.

Water use will depend largely on the remedial approach selected by the Contractor and will be influenced by any reuse, recycling or reduction techniques employed. The estimated daily water quantities are indicated below for each type of use:

- Camp Use: <15 m³/day;
- Dust Suppression: <50 m³/day;
- Cleaning: <5 m³/day;
- Concrete Mixing: <20 m³/day; and
- Other Industrial Use: <10 m³/day

The estimated volumes above are daily maximums and actual use is expected to be lower. At no point will water use exceed the 300 m³ per day threshold of a “Type B” Water Licence, except in the unlikely event of emergency fire response. The workers would be on-site for approximately 7 months each year (210 days), requiring total water use of approximately 21,000 m³ /year.

All water use will be tracked, including the following minimum information: identification of water source, GPS location of water withdrawal, volume of water withdrawn per trip in cubic meters,

cumulative uptake per source, time of uptake, date of uptake and contractor/employee identification. Water intake hoses will be equipped with screens to prevent the entrainment or impingement of fish (per DFO Freshwater Intake End-of-Pipe Fish Screen Guideline).

8. Waste deposited (quantity, quality, treatment and disposal)

The waste materials which require management during the GBL Sites Phase II Remediation Project are within two general streams:

- Legacy Site Waste: These materials were generated during original operation of the now abandoned sites and in keeping with remedial objectives, will be managed to improve site conditions.
- Project Generated Waste: The GBL Sites Phase II Remediation Project will generate discrete waste during camp operation and remedial activities.

The sections below discuss the general waste management approach for both Legacy Site Waste and Project Generated Waste.

Legacy Site Waste

Additional detail on the management approach for legacy site waste is provided in Section 4 of this application. The RAPs for each of the project sites have been designed in part to manage the legacy waste and may be consulted for options analysis and technical considerations (**Annex A-1, A-2, A-3 and A-4**).

Unpainted/Untreated Wood

No new deposition will occur and efforts focus on management/reduction of unpainted and untreated wood found as surface debris and within buildings. The Contractor will be required to obtain a Government of the Northwest Territories (GNWT) Burn Permit before commencing work and comply with the GNWT guidance document Municipal Wastes Suitable for Open Burning (1993). The Contractor will also be required to outline any associated management measures, including fire prevention. All residual ash will be sampled and managed per hazardous or non-hazardous materials as indicated.

During the 2010 GBL Sites Phase I Remediation Program, approximately 1,450 m³ of unpainted/untreated wood was burned in piles or in-situ (for select timber frame structures). The GBL Sites Phase II Remediation Project will complete these activities, addressing all remaining unpainted/untreated wood at the project sites (approximately 3,000-5,000 m³).

Non-Hazardous Waste

Includes metals, glass and other non-hazardous debris from waste disposal areas, scattered refuse, building/infrastructure demolition and vehicles/equipment (once stripped of fuel/product and hazardous materials). An engineered landfill will be constructed at Terra Mine to receive non-hazardous waste and double bagged ACMs from all GBL project sites. It is estimated that approximately 27,000 m³ of materials will be managed in the landfill. Routine geotechnical monitoring and inspections will be conducted to confirm stability and downgradient monitoring implemented to confirm there are no leaching concerns (e.g. surface water and groundwater if present).

Hazardous Materials

Includes hazardous materials from waste disposal areas, scattered refuse, chemical use/storage, building infrastructure demolition and vehicles/equipment. All hazardous waste will be packaged and shipped per the *Transportation of Dangerous Good Act* to a licensed hazardous waste management facility. These approaches will be provided in the Contractor's updated Waste Management Plan, to be provided for SLWB review and approval.

Impacted Soils

Soils impacted by light fraction hydrocarbons (F1-F2) will be treated in on-site engineered treatment facilities (i.e. landfarms). It is estimated that approximately 43,000 m³ of impacted soils will be treated at the treatment facilities. Inspections will be conducted to confirm the stability of the temporary treatment facilities, monitoring implemented to confirm the lined facilities are not discharging to the environment and soil testing conducted before soil removal. The scope of these activities will be outlined in the Landfarm Management Plan to be provided by the Contractor and submitted to the SLWB for review and approval.

Waste Rock and Tailings

Management strategies for the historic mineral wastes has been designed for individual deposits based on geochemistry, setting, receiving environment and community consultation. The selected approaches detailed in the RAPs include covers, improved drainage to reduce water infiltration, wetland enhancement and other in-situ measures to minimize metal leaching and acid rock drainage concerns. The success of these remedial measures will be measured by conducting ongoing geotechnical inspections and monitoring downstream environments.

Ho Hum TCA Discharge

As discussed within the RAP and previous sections of this application, enhancement of the Upper Wetland between Ho Hum TCA and Moose Bay was identified as a preferred option by technical advisors

and communities. Given the wetland is currently partially submerged, this approach will require lowering the water level of the TCA by approximately 1 m, thereby resulting in the discharge of an additional 300,000 m³ to Moose Bay. The lowering of water levels and the associated discharge are necessary to re-establish the conditions that existed prior to the wetland being submerged and degraded in 2004. Discharge will be conducted over a single season, apply enhanced sediment and erosion controls and frequent monitoring. Additional discussion on potential impacts and controls are provided in Section 10.

Project Generated Waste

Additional detail of the Project Generated Waste stream is provided in the attached Waste Management Plan (**Appendix H**). Upon contract award and selection of a remedial approach, the Contractor will be required to submit an updated and refined Waste Management Plan, including methodologies and specific equipment requirements. All waste will be segregated and managed per the categories discussed below and incorporate means to reduce waste (e.g. source reduction, reuse, recycling and treatment). The following general approaches will be used for waste management:

- *Incineration:* Applicable materials will be incinerated to minimize the volume of project generated waste requiring disposal. For camp wastes, the Contractor will be required to provide a dual chamber, forced air, fuel fired incinerator to site which meet applicable requirements outlined in the Waste Management Plan.
- *Recyclable Materials:* All materials appropriate for normal recycling produced during camp operations (i.e. empty food cans, plastics) will be bagged and shipped opportunistically on backhauls to an appropriate recycling facility.
- *Transfer to an Approved Facility:* All hazardous waste as well as any material which cannot be incinerated or recycled will be packaged and shipped to licensed facilities for disposal. Examples include any scrap material generated, vehicle components (e.g. anti-freeze and tires), aerosol cans, batteries, contaminated materials from spill response and waste oil. Storage and shipment of these materials to licensed facilities will be in accordance with the *Transportation of Dangerous Goods Act*.

The GBL Sites Phase II Remediation Project will generate two discrete wastewater streams to be tested, treated (if necessary) and discharged:

- *Camp Wastewater:* Greywater (ablution, general use), kitchen sumps/traps and blackwater (sewage).
- *Process Wastewater:* Water used for washing and decontamination, such as washing drums, tanks, equipment, soil and non-hazardous waste before deposition in the on-site landfill.

Based on water consumption detailed in Section 8, it is expected that total wastewater discharge from both streams will not exceed 80 m³/day. Treatment systems will be provided for wastewater as necessary to meet discharge criteria provided in the Water Licence. Testing will be conducted prior to discharge and at regular frequencies during discharge.

Tested effluent will be released onto the ground at a location reviewed and accepted by the Departmental Representative that is a minimum of 30 m from natural drainage courses and 100 m from fish bearing waters. As much as possible, discharge locations will be a minimum of 100 m from all waterbodies; however, given that camp facilities must be erected within the pre-existing footprint of the historic operations, a minimum setback of 30 m may be required in select locations. Similarly, work activities at shoreline infrastructure (e.g. removal of docks) must be completed within these setback distances. Discharge locations will be selected to minimize erosion (bedrock outcrops or sumps if necessary).

In keeping with other small INAC-CARD remediation camps, the Contractor may select between alternate approaches to management of sewage waste at the satellite camps, including Incinolet toilets, Pacto-type toilets, discharge to sumps or incineration. The proposed methodology will be provided within the Contractor's updated Waste Management Plan.

9. Other persons or properties affected by this Undertaking (give name, mailing address and location). Attach a list if necessary.

For a record of the persons or properties affected by this Undertaking and the engagement of these groups and individuals, please refer to the attached Engagement Plan and Engagement Log, provided in **Appendix F**.

10. Predicted environmental impacts of Undertaking and proposed mitigation.

Overview

The GBL Sites Phase II Remediation Project has been designed to provide a net positive effect to land and water systems. Any impacts during the remediation program are anticipated to be small relative to the overall benefit. In addition to anticipated effects, there is always a potential for unplanned events or incidents. The probability of unplanned events and the potential impacts they may incur will be reduced through planning and the application of environmental management plans.

The Contractor will be responsible for a number of submittals relating to environmental protection and tailored to the specific remedial approach selected. The following plans will be requested of the Contractor or provided by INAC and submitted to the SLWB:

- *Mobilization and Demobilization Plan*: To be provided 60 days prior to site mobilization. Outlines Contractor's general access approach and confirmation of permit/licence requirements.
- *Work Plan*: To be provided 60 days prior to initiating project activities and include remedial scope and approach, Camp Methodology and Location Plan, projected project schedule and overview of environmental management considerations.

- *Waste Management Plan*: Interim plan provided in **Appendix H**. Updated plan to be provided by the Contractor to meet licence/permit requirements and tailored to the remedial approach.
- *Spill Contingency Plan*: Interim plan provided in **Appendix G**. Updated plan to be provided by the Contractor to meet licence/permit requirements and tailored to the remedial approach.
- *Wildlife Management Plan*: Plan provided in **Appendix I**, outlining preventive and response measures to be employed to minimize impacts to wildlife at the project sites.
- *Sediment and Erosion Control Plan*: To be provided by the Contractor 60 days prior to initiating remedial activities. Overall objective will be to prevent and manage erosion and specifically address the protection of water bodies, water courses and aquatic species.
- *Soil Remediation Plan*: To be provided by the contractor 60 days prior to landfarm construction. Will outline the general construction approach, treatment methodology, soil testing requirements (with QA/QC), soil management approach and monitoring requirements.
- *Water Quality Monitoring Plan*: Updated plan providing summarizing monitoring results, expanded construction/post-construction monitoring requirements, stations, frequency, methodology and QA/QC to be provided June 29, 2017 (per earlier SLWB Issuance). The 2016 Water Quality Monitoring Report is provided in **Annex A-9**.
- *Long-Term Monitoring Plan*: Overview plan provided in **Annex A-8**. Updated plan providing stations, frequency, methodology, QA/QC and adaptive management framework to be provided six months prior to completion of Construction/Post-Construction monitoring as detailed in the Water Quality Monitoring Plan.
- *Geotechnical Inspection Plan*: Summary level overview of geotechnical inspection and monitoring requirements for infrastructure. To be provided 60 days prior to commencement of year one activities.

In addition, INAC and PSPC will monitor the work being completed by the Contractor(s) during each phase of the project.

Water

The GBL Remediation Program contains limited in-water work and no significant effects to surface water receivers or groundwater are anticipated. It is important to note that there are no anticipated effects from water use given volumes as detailed in previous sections are small and water intake hoses will be equipped with screens to prevent the entrainment or impingement of fish (per DFO Freshwater Intake End-of-Pipe Fish Screen Guideline). Overall, the remedial measures have been designed to improve water quality, restore original flow pathways and are not expected to affect water quantity. However, management measures will be required to minimize potential effects during the following:

- *Dock Removal and Shoreline Work*: Dock removal is required at Contact Lake Mine and Silver Bear Mines. These bank modifications are intended to restore natural conditions. Since some of the soils in the areas around the docks and dock walls are currently contaminated with hydrocarbons, the removal of the soil will enhance the materials of the shoreline over the long

run. Similarly, other shoreline work is required to improve environmental conditions, including regrading waste rock, placement of covers and removal of debris. However, these activities have the potential to result in the suspension of sediments to the water column or release of contaminants during excavations. The Sediment and Erosion Control Plan will include the Contractor's management measures when conducting shoreline and in-water work (e.g. silt curtains, booms). Water monitoring will take place in and around the silt curtains and best management practices, recommended by DFO, will be followed.

- Channel Restoration: At Northrim Mine, the natural discharge route from Hermandy Lake was altered for tailings storage. As part of the GBL Sites Phase II Remediation Project, the original drainage path will be restored. This initiative has been extensively studied and designed to reduce the flow of water through waste materials which are causing increased metal loadings. Efforts will require application of the Sediment and Erosion Control Plan and monitoring.
- Culverts: Culvert installation may be required during road upgrades to support remedial activities. These culverts will be removed at the completion of the project, as will the culverts installed during operation of the historic sites. Many of these culverts will carry no water in the summer/fall months and may be removed with little effects to water systems. Other culverts (e.g. between Mile Lake and Silver Lake at El Bonanza) will require management to prevent migration of suspended sediments or impacts to downstream receiving environments and receptors. Consultation with DFO has been ongoing to ensure best practices are employed and the Sediment and Erosion Control Plan will outline the management measures for this work.
- Barging: The Contractor will likely elect to use barges in various phases of the remedial program. While a common approach at northern contaminated sites, all transport presents a potential for spill of operational fuel or material being transported. To mitigate these risks, all personnel supervising or operating equipment via marine routes will be properly certified, experienced, and follow the regulations specific to the industry. The Contractor will be required to provide a Mobilization and Demobilization Plan, including details of the barging operation and additional spill contingency measures provided by the operator.
- Ice Road: Should the Contractor elect to use an ice road, management measures must be implemented to prevent effects to water systems. Federal/territorial legislation as well as permit and licence conditions will be adhered to. Such conditions include but are not limited to, minimum snow cover for winter roads, maximum vehicle weights, use of only water or snow in ice bridge construction, speed limits to reduce wave height to shore, dogleg of approaches to portages, v-notch or remove snow fills snow fills and prohibition of cutting a stream bank. Additional mitigation measures for road activities are discussed in **Appendix J**.
- Groundwater Considerations: With the exception of Sawmill Bay, the GBL Sites are dominated by exposed bedrock and topographically controlled groundwater regimes. The flat topography and sandy soils at Sawmill Bay present a different groundwater regime. Given the remedial activities are designed to remove contaminant sources and thereby reduce loadings, there is limited risk to groundwater systems. Adherence to the Waste Management Plan (**Appendix H**) and Spill Contingency Plan (**Appendix G**) will reduce potential effects to groundwater systems.

Groundwater monitoring was proposed during construction and long-term monitoring programs (**Annex A-8**), and will be further refined in the updated plans.

- **Ho Hum TCA Discharge:** Improvements to the Ho Hum Wetland will require lowering the water level in the Ho Hum TCA by 1 m, equalling approximately 300,000 m³ of discharge to Moose Bay. For context, current annual discharge from the TCA is approximately 388,000 m³. Water in the TCA exhibits elevated concentrations of multiple parameters including arsenic, copper, lead, titanium, strontium and uranium, along with sulfate and other major ions. Of these parameters, arsenic represents the greatest potential environmental concern. The average arsenic concentrations in the Ho Hum TCA from 2007-2013 is approximately 66 µg/L (**Appendix A-9**), though statistical maximums are approximately 78-84 µg/L (**Annex-A1**). For reference, the current maximum authorized arsenic concentration for an operating mine under the Metal Mining Effluent Regulations (MMERs) is 500 µg/L (monthly mean concentration). While the MMERs do not apply to mines such as GBL Sites that ceased commercial production prior to 2002, the limits are informative when compared to the discharge concentrations of the Ho Hum TCA water.

Summer flow rates of the Camsell River are approximately 9.5 billion L/day and the incremental discharge during lowering of Ho Hum TCA to Moose Bay represents only 0.032% of Camsell River flows. Assuming discharge over a single season, the rate of discharge would be approximately 35 L/s. Potential erosional effects at this rate may be easily managed through the application of intake and discharge controls, to be clearly identified within the Contractor's Work Plan and Sediment and Erosion Control Plan.

In an effort to account for site specific conditions, the Project Team developed a site-specific target level (SSTL) for arsenic in surface water. For additional information, the complete report is provided in **Annex-A9**. SSTLs are risk-based acceptable levels of contaminants (e.g., arsenic) that are not expected to result in adverse effects to humans and ecological receptors, based on the assumed receptor characteristics and exposures from the site. The recommended arsenic SSTL for water at the outlet of the wetland was 78µg/L. It was recommended that the SSTL be applied to average annual measurements, to be confirmed with routine monitoring or additional studies if exceeding these levels.

It should be noted that over the past number of years, the arsenic concentrations at the inlet and outlet of the wetland have essentially measured below the SSTL. This is expected to remain consistent during lowering of the Ho Hum TCA and no impacts are predicted. To ensure these assumptions hold true, enhanced Surveillance Network Protocol (SNP) monitoring has been recommended during discharge. This would include sampling before discharge and weekly thereafter within the TCA and at a monitoring station in Moose Bay (downstream approximately 200m to characterize water flowing in Moose Bay and toward the Camsell River). Following discharge activities, detailed water and sediment monitoring will be conducted per the Water Quality Monitoring Plan.

Land

Given the project sites are former industrial properties and remedial efforts are focused within these disturbed areas, there will be minimal incremental impacts to the land. However, there is the potential to impact land systems during select activities which must be managed appropriately. These potential effects and mitigation measures are as follows:

- Spills: May be released from fuel storage/transfer facilities, camp or vehicles/equipment. Risks may be mitigated using the management and response approaches detailed within the Spill Contingency Plan (**Appendix G**).
- Borrow Source Excavation: Borrow source excavation will result in disturbance of the land in these discrete areas, vegetation clearing and potential risks to permafrost. Measures which will be employed to minimize these effects include, scheduling considerations (e.g. avoiding spring thaw to reduce equipment impacts); minimizing borrow requirements (i.e. waste rock where possible); segregation of surficial organic soils for use in restoring and grading borrow areas to prevent pooling water and subsequent permafrost degradation; backfilling/grading of excavations; promoting drainage; use of protective materials (e.g. mats) in soft ground conditions and applying measures outlined in the Sediment and Erosion Control Plan (e.g. silt fencing where necessary).
- Discharges: Camp facilities will require discharge of camp wastewater and process wastewater. These treated effluents will be discharged to land systems. Effects will be mitigated using the approaches detailed in the Waste Management Plan (**Appendix H**). Effluent will be tested before and during discharge to ensure compliance with criteria. Discharge locations will be selected to prevent erosion, sedimentation or overland flow to aquatic systems.
- Roads/Earthworks: Earthworks and vehicle operation in some areas of the sites will have the potential to result in the atmospheric suspension of fine particulate matter (i.e. dust). Dust suppression will be employed by spraying water from approved sources. There may be new road upgrades to the existing access routes within the sites. The Contractor will be required to submit a Mobilization and Demobilization Plan detailing these activities and measures to mitigate potential impacts.

Flora and Fauna

Management of effects to local biota will be conducted throughout the GBL Sites Phase II Remediation Project. This includes the following:

- Flora: Given the scope of remedial work is within previously cleared areas, there are not expected to be significant impacts to local flora. A small amount of clearing may be required of overgrown roadways, when accessing remote areas of the site and during borrow source extraction. The Contractor will be required to minimize stripping of topsoil and vegetation; protect vegetation as much as possible; and seek approval from INAC before clearing. No self-propelled machinery will be used for clearing and any vegetation will be cut no more than 20 cm above ground surface. Any brush/debris will be segregated from standing timber.

- ***Fauna:*** Potential risks to wildlife include disruption during site activities, habituation from camp activities and interaction with workers or vehicles/equipment. The risks from these activities may in most cases be mitigated with active management as explained within the attached Wildlife Protection Plan (**Appendix I**).

Socio-Economic

The socio-economic effects accruing from the remediation program will be positive. To enhance regional socio-economic benefits, the contractor will be required to submit a socio-economic plan that will include the contractor's commitments to provide Aboriginal employment, sub-contracting and training. In addition to Aboriginal benefits, the project is anticipated to continue providing significant contracting and employment opportunities for northerners.

Archaeological and Heritage

The Prince of Wales Northern Heritage Center (PWNHC) was contacted to provide additional information and data of the site areas. A search was performed on the PWNHC archaeological database to determine if there were any archaeological sites located within the areas of the abandoned sites, and one was identified at Sawmill Bay. However, should borrow source extraction be required in previously undisturbed areas, evaluation will be required to determine if archaeological assessment is required.

A burial site found near Sawmill Bay has been documented (e.g. GPS coordinates and pictures were taken). This information was provided to PWNHC so the information could be placed in the database. Earlier discussions with the SLWB concerning the burial site determined that work activities will not interfere with the site and the remedial activities may continue as planned.

Each RAP was also reviewed by the PWNHC. The PWNHC requested that photographs be taken of each mining building and equipment at each of the abandoned sites. These photographs were taken and submitted to the Center for record updating. There were no heritage interests identified by PWNHC. However, heritage interests were identified by the Northwest Territories Mining Heritage Society. INAC is working with this organization to address the items that were highlighted and the Contractor will be required to remove these materials from site for preservation.

Worker orientation will include specific training in archaeological preservation. Workers will be instructed to stop work immediately if an archaeological site is identified/suspected and notify the Supervisor and Departmental Representative. A buffer area will be established to prevent disruption and coordinates/photos collected. With the exception of notifying project/territorial archaeologists, this information will be kept confidential. Workers will be informed that archaeological sites are protected by law and disruption or removal of artifacts is prohibited.

11. Contractors and sub-contractors (names, addresses and functions). Attach a list if necessary.

The contract for the remediation activities has not yet been awarded; however, once determined, the Contractor information will be provided to the SLWB. This will include submission of a Work Plan detailing their remedial approach, list of primary staff, subcontractors and personnel number estimates, to be provided to the SLWB. In the interim, INAC has estimated personnel numbers based on similar remedial projects:

- Approximately 20 to 50 people will be on site for the field program. Depending on the preferred approach of the Remedial Contractor, this may be within a single camp or at certain times involve relocation of some staff to smaller satellite camps.
- The workers would be on site for approximately 7 months each year with an estimated maximum of (30-50 people x 210 days) 4,200 to 10,500 person days per year.
- It is estimated that the project may require upwards of five years upon commencement, with a total of 21,000 to 50,000 person days over the entire project.

12. Studies undertaken to date. Attach a list if necessary.

Please refer to **Appendix K** for a full inventory of the studies undertaken to date at the GBL Sites.

13. Proposed time schedule.

Start date: July 23, 2017

Completion date: July 23, 2024

The schedule for the future phases of the project is subject to Treasury Board funding approvals. However, INAC anticipates the project could be initiated as early as January 2019, as described in the cover letter. SLWB will be provided with information once there is more certainty in the project schedule.

Currently, it is envisioned that the GBL Sites Phase II Remediation Project will require upwards of five years to complete. It is assumed that shutdown will occur annually over the winter (approximately five months).

Name (print): _____ Signature: _____

Title (print): _____ Date: _____

Currently, it is envisioned that the GBL Sites Phase II Remediation Project will require upwards of five years to complete. It is assumed that shutdown will occur annually over the winter (approximately five months).

Name (print): SENIOR MANAGER Signature: C. Ogilvie
Title (print): CAREY OGILVIE Date: MAY 25/17

Please make all cheques payable to "Receiver General for Canada"

With respect to the application fee, under the *Mackenzie Valley Land and Resource Management Act*, it states that "7. This Act is binding on Her Majesty in right of Canada or a province, except that Her Majesty in right of Canada is not required to pay any fee prescribed by regulations made under paragraph 90.3(1)(k) or subparagraph 90.3(2)(a)(i)."

FOR OFFICE USE ONLY

Application Fee Amount: \$ _____ Receipt No: _____

Water Use Deposit Amount: \$ _____ Receipt No: _____