



Contaminants and Remediation Directorate
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May 25th, 2015

Ms. Sabrina Sturman, Regulatory Specialist
Sahtu Land and Water Board
Box 1
Fort Good Hope, NT X0E 0W0

**RE: Great Bear Lake Remediation Project - Water License Application Renewal
S09L8-001**

Dear Ms. Sabrina Sturman:

Please find enclosed a copy of Aboriginal Affairs and Northern Development Canada (AANDC) – Contaminants and Remediation Directorate's (CARD) application for a water license renewal to replace the current Water License S09L8-001 for the Great Bear Lake Project, respectfully submitted to the Sahtu Land and Water Board for its consideration.

The current Water License expires July 25, 2015. We are requesting that a new seven year water license be issued prior to expiration and be valid until July 25, 2022. The scope of work has not changed, no new activities are proposed, and an amendment to the license will not be required. 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)."*

As the scope remains unchanged 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.

In addition, please find enclosed Meeting Notes that discusses the Water License and Land Use Permit S09D-001 Terms and Conditions, respectfully submitted for its consideration.

Please note that CARD has submitted an extension request for the associated Land Use Permit S09D-001 expiring on July 25, 2015 to the Sahtu Land and Water and has notified all aboriginal stakeholders of the Land Use Permit extension request.

If you have any questions or concerns, please do not hesitate to contact me at (867) 669-2461 or by e-mail at Candace.Decoste@aandc-aadnc.gc.ca or Stanley Yee at (867) 669-2452 or by e-mail at Stanley.Yee@aandc-aadnc.gc.ca.

Respectfully submitted,

Candace DeCoste

Candace Decoste
A/Project Manager
Contaminants and Remediation Directorate (AANDC)

cc. Carey Ogilvie, Senior Manager, AANDC

Encl. (12) Meeting Minutes - January 19, 2012
 Water License Application
 Appendix A - Design Drawings
 Appendix B - Maps
 Appendix C - Contractor Submission Requirements
 Appendix D - Summary of Proposed Remediation Activities
 Appendix E - Meeting Minutes
 Appendix F - Site Specific Clean Up Criteria
 Appendix G - Water Quality Monitoring Program
 Appendix H - Transport Route
 Appendix I - Proposed Mitigation Measures
 Appendix J - Draft Specifications



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

Application/License No: SD9L8-001
 (amendment or **renewal only**)

<p>1. Name and Mailing Address of Applicant</p> <p>Candace Decoste, Acting Project Manager Contaminants and Remediation Directorate Aboriginal Affairs and Northern Development Canada – NT Region P.O. Box 1500 Yellowknife, NT X1A 2R3</p> <p>Fax: (867) 669-2721 Telephone: (867) 669-2461</p>	<p>2. Address of Head Office in Canada if Incorporate</p> <p>Same as above.</p> <p>Acting Project Manager: Candace Decoste</p>
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3. Location of Undertaking (Describe and attach a map, indicating watercourses and location of any proposed waste deposits).

The abandoned Silver Bear Mines are located approximately 390 km north of Yellowknife, Northwest Territories. The mines are all within 2 km of Rainy Lake, part of the Camsell River, which drains into Great Bear Lake just north of the Silver Bear Mines. The Camsell River, with a drainage area of 31,000 square km, is the largest single tributary of Great Bear Lake. The nearest communities are Déline, 250 km west of the mines on the western shore of Great Bear Lake, and Gamèti, 166 km to the south. The land and water in the Silver Bear Mines area have traditionally been used by the people who live in these communities. The mines are situated within the Sahtu settlement area and the overlap area with the Tłı̄chq Mq̄whì For this reason, residents of the communities of Délı̄nq̄ and the Tłı̄chq communities have assisted with development of the remediation plan and will be sharing economic benefits.

The abandoned Contact Lake Mine site is located in the Northwest Territories, 425 km northwest of Yellowknife, along the eastern shores of Great Bear Lake within the vicinity of Echo Bay. More specifically, the mine site is located approximately 500 m north of the northeast shore of Contact Lake, which flows to Moody Lake and drains to Conjuror Bay of Great Bear Lake. The site lies within the boundaries of the Sahtu Dene and Metis Comprehensive Land Claim Agreement. The nearest community in the Land Claim is Délı̄ne, approximately 263 km to the west.

The abandoned El Bonanza and Bonanza Mines are located on the Dowdell Peninsula of Great Bear Lake. The site is approximately 435 km north-northwest of Yellowknife, 9 km southwest of Port Radium and 12 km west of the abandoned Contact Lake Mine. Situated within the boundaries of the Sahtu Dene and Métis Comprehensive Land Claim Agreement, the nearest potentially affected community is Délı̄ne, approximately 260 km to the west, on the shores of Great Bear Lake.

The abandoned site at 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. Situated on the edge of the Canadian Shield, the site comprises 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. The site lies within the boundaries of the Sahtu Dene and Metis Comprehensive Land Claim Agreement.

All site locations are illustrated in Drawing C01, in **Appendix A**. See Drawings C02 through C06 in **Appendix A** for more detailed maps of Terra, Northrim, Norex, Smallwood, Graham Vein, El Bonanza/Bonanza and Sawmill Bay Sites. Please note that although the Drawings are labeled as 99% Complete, this is not the case and they should be considered draft. Maps of all site locations are available in **Appendix B**.

	<u>Latitude</u>	<u>Longitude</u>
Silver Bear Mines		
Terra Mine	65.6042° N	118.1153° W
Northrim Mine	65.6011° N	117.9669° W
Smallwood Mine	65.5667° N	117.9333° W
Norex Mine & Graham Vein	65.5833° N	117.8932° W
Contact Lake Mine	65.9833° N	117.8000° W
El Bonanza/Bonanza Mine	66.0078° N	118.1306° W
Sawmill Bay	65.7206° N	118.9206° W

4. Description of Undertaking (Describe and attach plans)

This water license application is being submitted in support of activities required to remediate the abandoned Silver Bear Mines (Terra, Northrim, Norex, Graham Vein and Smallwood), the abandoned Contact Lake Mine, the abandoned El Bonanza Mine and Bonanza Mine and the abandoned Sawmill Bay Site.

The remediation work is described in three phases. Work will be completed as funding becomes available. Phase I entails mostly debris cleanup of drums, hazardous material removal and some building demolition of the Contact Lake, El Bonanza/Bonanza and Sawmill Bay sites (no building demolition at Sawmill Bay). The work falling under Phase I was completed in 2010 and 2011 to address immediate environmental and health and safety issues at the sites, and to provide employment for the local land claimant people. Work for this phase was completed in 2010 and 2011. For the remediation details, refer to the *2010 Completion Report for Great Bear Lake Sites Remediation – Phase I Remediation of Sawmill Bay, Contact Lake, El Bonanza, and Bonanza, NWT*; and *2011 Completion Report for Great Bear Lake Sites Remediation – Phase I Remediation for Sawmill Bay, NWT* for general overview of the remediation activities attached as an annex.

Phase II is the largest component of the remedial work and involves the major remedial work at the Silver Bear Mines, in particular:

- Landfill construction,
- Placement of tailings cover and excavation of tailings,
- Decontamination and demolition of buildings,
- Collection of non-hazardous wastes and placement in landfill,
- Disposal of hazardous wastes,
- Treatment of hydrocarbon-impacted soils, and
- Removal of docks.

Phase II will also include the remaining works to be completed at Contact Lake and El Bonanza/Bonanza, in particular:

- Closure of mine openings,
- Placement of cover and/or re-grading surface of waste rock storage areas,
- Placement of cover over tailings (where necessary),
- Removal of dock and fuel storage tank from East Arm of Great Bear Lake (Contact Lake),
- Removal and disposal of fuel storage tanks and drums on shore of Great Bear Lake (El Bonanza), and
- Excavation (if necessary) and treatment of hydrocarbon-impacted soils.

Phase III deals with the completion of remedial work at Sawmill Bay which includes building demolition and contaminated soil excavation and treatment.

At the time of this application, the work for Phases II and III has yet to be awarded; contracts for these works will be procured through PWGSC. The successful contractors will complete the remediation work in accordance with the conditions of the Water Use License.

Details of the work phases can be found in the documents “Silver Bear Mines Remedial Action Plan March 2008”, the “Contact Lake Mine Remedial Action Plan March 2008”, the “El Bonanza Mine Remedial Action Plan March 2008”, and Remedial Action Plan (RAP) for Sawmill Bay May 2010, attached as an Annex. A two page summary is provided in **Appendix D**. A summary of each RAP is provided below. The remediation options below were the result of best practices, community input and evaluation against agreements upon remediation goals.

The remediation of the Great Bear Lake Sites will be in accordance with all applicable regulations (e.g. Canadian Council of Ministers of the Environment (CCME), Environment Canada Storage Tank Systems for Petroleum Products and Allied Petroleum Products on Federal Lands or Aboriginal Land Regulations, GNWT Environmental Protection Act on Used Oil and Waste Fuel Management Regulations).

Silver Bear Mines (Terra, Northrim, Norex, Graham Vein and Smallwood)

All remediation items described below for Silver Bear will be completed during Phase II of the remediation project. Refer to Drawings C02 through C04, C08 through C12, C20 through C21, and S01 through S06, **Appendix A** for detailed site plans.

Waste Rock

Waste rock is located at all the mine sites. Overall, there is more than 450,000 m³ of waste rock of which approximately 10-20% has the potential to generate acid. The waste rock has been on the surface for 30-40 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). The proposed plan is to 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 and the backfilling with clean fill. Refer to Drawings C08 through C11, **Appendix A** for more details on areas of waste rock to be removed and drainage pathways.

Tailings and Water Quality

Tailings are located at 3 mine sites. Tailings are in some cases acid generating and may contain elevated levels of metals. The proposed plan to remediate these areas and reduce risks is described below:

- Terra Mine-Ho Hum Lake TCA (Tailings Containment Area) – approximately 2,200 m² of 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 have a geosynthetic liner. See Drawings C08, C20 and C25 in **Appendix A** for more details.

- Terra Mine-Ho Hum Lake TCA – ~500,000 t (metric tonne) of submerged tailings. The plan is to leave the tailings in place and to restore the former upper wetland which was degraded when the lake level was raised. An upper weir above the existing dyke will be constructed, which will control water levels through the upper wetland. The existing downstream weir will be re-graded and the ends of the existing culvert will be capped with removable caps. These actions will provide stability, regulate water flow, and minimize fish passage into Ho-Hum Lake from Moose Bay. The wetland between the two weirs will be enhanced by placing peat and planting a native plant species (i.e. sedge) in the wetland. This is intended to enhance natural wetland formation and attenuation of arsenic. The spillway and wetland enhancement was discussed with DFO and EC and their comments have been incorporated into the design of the spillway.
- Northrim Mine has approximately 1,600 m² of exposed tailings and smelter waste in and around the Leachate Pond. Exposed tailings will be excavated and removed as hazardous materials since battery debris was found to be mixed in with the tailings. The leachate pond will be partially backfilled. The smelter waste will be excavated and disposed off-site, at a southern licensed facility (details will be provided later, by the Contractor). See Drawing C09 in **Appendix A** for more details.
- Northrim Mine also has approximately 10,000 t submerged tailings. The majority of these tailings were deposited in Hermandy Lake TCA, but a small quantity was also deposited in the Camsell River near the dock. The current drainage from Hermandy Lake and Camsell River is man-made. Water quality results show that as the water flows through the leachate pond, it is picking up contaminants. The proposed plan is to leave the tailings in the river and to restore the drainage to the former outlet of Hermandy Lake TCA. This will be achieved by backfilling a portion of Leachate Pond and removing the dyke at the former outlet of the lake. See Drawings C09 and C25 in **Appendix A** for more details.
- Norex - A portable mill operated at Norex for a brief period and produced approximately 1,000 t of tailings that were discharged towards the Xeron Pond near Graham Vein. Sampling has failed to identify the tailings in the pond. Given the minor effect on water quality, the proposed plan is to leave Xeron Pond undisturbed.

Buildings and Equipment

The existing buildings are deteriorating and are a safety hazard. Some buildings contain equipment, materials and residual chemicals. The proposed plan is to decontaminate the buildings and equipment as appropriate, salvage or recycle any equipment or material of value, and demolish and dispose of all buildings and structures.

Non-hazardous Wastes

The Silver Bear sites include a substantial amount of debris strewn throughout the various mine sites. This material, along with non-hazardous demolition debris and wastes from existing

debris disposal sites will be placed in a new non-hazardous landfill site for disposal. A portion of the mill/campsite at Terra Mine site has been selected as a candidate site for the new non-hazardous waste landfill. The new non-hazardous landfill at Terra Mine 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 C21 and C22 in **Appendix A** 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 (November 25, 2008 Meeting Minutes, available in **Appendix E**). The landfill will accept non-hazardous wastes from all sites including Contact Lake, El Bonanza, Bonanza and Sawmill Bay. The total amount of debris identified by Rescan in the demolition report (Rescan 2005a) is approximately 18,000 m³. This does not include general debris dispersed around the sites (~2,000 m³) and waste from the existing landfill sites (~6,750 m³).

All non-hazardous wastes will be placed in this landfill. Asbestos will be double bagged and placed in one corner of the landfill, clearly marked by the Contractor. Materials painted with lead paint that are not above leachable criteria will also be placed in the landfill. 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. Also, water quality monitoring will be done around the landfill to ensure that no contaminants are leaching from the landfill.

Blasting caps have been found at the abandoned mines sites. AANDC retained a former mines inspector to conduct a survey of the sites, to locate any remaining blasting caps. These blasting caps were subsequently removed. 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.

Hazardous Wastes

There is a substantial inventory of waste materials that include batteries, lead paint, old lime and residual mill reagents. All hazardous materials (with the exception of asbestos) will be shipped off site in accordance with the *Transportation of Dangerous Goods Regulations* (TDGR) to a licensed disposal facility. Residual fuels found on site have been analyzed. If residual fuels meet the GNWT Environmental Protection Act criteria in the Used Oil and Waste Fuel Management Regulations, they will be incinerated. If they do not meet the criteria, they will be either filtered and re-sampled or shipped off-site for disposal in a southern licensed facility. Hazardous waste disposal facility details will be provided by the successful Contractor and can be submitted to the SLWB if required.

Roads

The site has approximately 18 km of roads. These roads are constructed from local borrow materials and waste rock to varying degrees. The RAP for the roads is to remove the culverts

and to allow the roads to naturally re-vegetate. Many of the roads may also require upgrading as part of the reclamation program. The Department of Fisheries and Oceans Canada (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.

Waste Disposal Sites

Terra Mine has three surface waste disposal sites. Norex, Graham Vein and Smallwood have no defined disposal areas. The plan for Terra is to excavate the old waste disposal sites and relocate the non-hazardous waste to the new landfill. The new landfill is described above, in the “Non-hazardous Wastes” section. A preliminary estimate of the waste to be relocated is 6,750 m³ from the waste disposal sites and 2000 m³ of general refuse strewn about the sites.

The soil from the small waste disposal sites will be stockpiled and sampled to determine if any contamination is present. If there is contamination present and depending on the contaminant, appropriate treatment and disposal will be determined from the sampling. For instance, if the lead concentration of the leachate coming from the soil stockpile is above the criteria of 5 mg/L stated in the TDGA, the soil will be shipped off site with the other hazardous materials.

Hydrocarbon Impacted Soils

There are extensive hydrocarbon impacts, primarily of the waste rock lay-down areas, around the mine sites. Approximately 30,000 m³ of hydrocarbon impacted soils have been identified during the site assessments. As the mine sites are remote and access is extremely limited, generic CCME criteria for hydrocarbon impacts in soil are very conservative, as they assume regular access to the sites. Site-specific clean-up criteria for hydrocarbon impacted soils have been developed for the Silver Bear sites and those criteria will be applied to all sites. These criteria were reviewed and accepted by a Technical Review Team, Environment Canada and a Hydrocarbon Working Group which was made up of various expertises including independent hydrocarbon specialists, Environment Canada and AANDC. The site-specific criteria are summarized in Table 1, and the full report available in **Appendix F**. Note that separate criteria were developed for Sawmill Bay, as there was the potential for longer exposure because of the presence of a lodge and because of the type of soil at Sawmill Bay (sand).

Table 1: Summary of Clean Up Criteria for Use at Silver Bear, Contact Lake and El Bonanza/Bonanza Mines

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	Clean-up Value (mg/kg) for PHC < 30m to Waterbody	Clean-up Value (mg/kg) > 30m from Waterbody

			Pathways		
F1 (C ₆ to C ₁₀)	400	400	940	1290	30,000
F2 (>C ₁₀ to C ₁₆)	300	800	13,000	330	30,000
F3 (>C ₁₆ to C ₃₄)	10,300	10,300	30,000	30,000	30,000
F4 (>C ₃₄)	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	-	-

Soil impacted with F1 and F2 hydrocarbon fractions (gasoline/diesel mobile fractions) will be excavated and treated on site in windrow treatment areas. 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 Freshwater Aquatic Life Criteria (Refer to Site-Specific Criteria Paper located in **Appendix F**). Excavation in near shore areas will be completed in accordance with Best Management Practices, will follow DFO recommendations and will be monitored appropriately (See the Water Quality Monitoring Plan found in **Appendix G**). Soil impacted with F3 and F4 hydrocarbon fractions (heavier lube oils/non-mobile fractions) will either be covered in place or excavated and placed in the non-hazardous waste landfill as intermediate fill.

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 (Drawing C07, **Appendix A**). 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 Environment Canada Federal Guidelines for Landfarming Petroleum Hydrocarbon Contaminated Soils, Dec, 2005 (Drawing C09, **Appendix A**). The Norex and Smallwood treatment areas will be situated on the waste rock pads (Drawings C10 and C11, **Appendix A**).

Airstrips

There are two airstrips at the site: the Terra Mine airstrip currently being used by AANDC and local exploration companies, and; the Smallwood mine airstrip which has been abandoned and is partially overgrown with vegetation. The RAP is to leave the Smallwood airstrip as is and to follow Transport Canada requirements for abandonment of the Terra airstrip once it is no longer required to service reclamation activities.

Docks

There are three docks on wooden piers on the Camsell River; one at Terra, one at Northrim and one at Norex. The plan is to remove the docks with minimal disturbance to the surrounding sediments and stabilize the shorelines. If soil around the docks are contaminated with hydrocarbons (e.g. Northrim), the soil will be removed and treated. Excavation in near shore areas will be done in accordance with Best Management Practices, will follow DFO recommendations and will be monitored appropriately (See the Water Quality Monitoring Plan in **Appendix G**).

For removal of the docks, the docks will be excavated to the original shoreline and the new shoreline stabilized with rock fill. Hydrocarbon contaminated fill would be remediated along with other contaminated soils excavated on site. Steel and other waste material would be disposed in the on-site 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, and oil absorbent booms and curtains.

Contact Lake Mine

All remediation items described below for Contact Lake will be addressed during Phase II of the remediation project. Refer to Drawings C06, C14 through C16, and S10 through S11, **Appendix A** for detailed site plans.

Waste Disposal Areas

In 2010, non-hazardous surface debris and hazardous material were collected and transported to an established non-hazardous debris stockpile or an established hazardous debris stockpile on site. Hazardous material consisted of old batteries, and asbestos containing material. However, DDT impacted wood was transported to Yellowknife via Sawmill Bay. All hazardous materials were double bagged. Thirty-four empty drums from Contact Lake were moved to Sawmill Bay for crushing and 25 drums remain on site. The former surface waste disposal sites at the Contact Lake Mine contained domestic debris, primarily tin cans, an assortment of metal, wood, and drum debris. In addition to these 3 sites, debris is located across the site. The maximum volume of material to be collected and taken to the non hazardous landfill (located at Terra Mine) is estimated to be 1400 m³ (the minimum is estimated to be 400 m³, which assumes burning of some wastes). The following remediation option was agreed to during community consultations:

- **Waste disposal areas** - consolidate waste and debris and transport to the non-hazardous waste landfill at Terra along with some contaminated soil and demolition debris. Any hazardous wastes encountered will be packaged and shipped off site in accordance with TDGR.

During Phase I, drums were collected and consolidated on site. Surface domestic debris and hazardous debris were collected and consolidated in a non-hazardous and hazardous waste disposal stockpiles. Thirty-four empty drums from Contact Lake were moved to Sawmill Bay for

crushing and 25 drums remain on site. During Phase II, the non-hazardous waste would be transported to the non-hazardous landfill at Terra Mine for disposal.

Blasting caps have been found at the abandoned mines sites. AANDC retained a former mines inspector to conduct a survey of the sites, to locate any remaining blasting caps. These blasting caps were subsequently removed. 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 noted.

Buildings and Infrastructure

In 2010, buildings were demolished (except the headframe, hoist house shed, Quonset, and outhouse) and building wastes were collected and consolidated. The timber frame buildings were stripped of materials and burnt in accordance with burn permit attached in **Appendix J**. The burnt ash was covered with poly-liner. The issues associated with the Contact Lake buildings and infrastructure revolves around the potential physical hazards these features present in their current state and as they deteriorate further in the future. The following remediation option was agreed to during community consultations:

- **Buildings** – the preferred remediation approach is to demolish the buildings after removal of any designated substances, and dispose of demolition debris/residue in an approved manner.

During Phase I, most buildings were demolished and the building wastes were collected and consolidated in a non-hazardous stockpile. During Phase II, the wastes would be transported to the non-hazardous landfill at Terra Mine for disposal. The remaining buildings on site will be addressed during future remedial work.

The following remediation items will be addressed in Phase II:

Mine Openings

The issues associated with the Contact Lake Mine openings revolve around the potential physical hazards associated with deliberate entry into horizontal openings and the potential for falling risks associated with vertical openings. The following remediation options were agreed to during community consultations, with the exception of the open stope closure:

- **Adit** - backfill the adit entrance with local waste rock;
- **Shaft and raise** – cap the existing vertical openings; and,
- **Open stope** – alternative cap (not concrete) or fencing if cap is not possible.

In regard to the open stope, the original community preferred option was to blast and collapse the surface opening of the exposed stope (See Contact Lake RAP for consultation meeting minutes). A review was completed by a professional mining engineer to determine whether blasting and collapsing would remove the physical hazard of falling. The study found that blasting may not completely fill the stope and that voids could be left creating a potential falling

hazard and the requirement to return to the site. Blasting would also reduce the stability of the stope and the final opening would be approximately three times the original width. The study also discusses the health and safety issues involving the uncertainty and guesswork associated with drilling and blasting an open stope.

Using an alternative method for capping the opening will be considered such as plugging the open stope with a foam fill or capping with metal sheeting (similar methods proposed for closing the vent raise). The construction company that secures the remediation work will be required to design a cap (design build). A review of the cap design and possible detailed analysis will be required to assess the proposed capping method to determine if it is technically viable for such a large area and acceptable to regulatory authorities. If assurance of a permanent seal cannot be provided by capping the open stope, fencing would be required around the open stope to the edge of the cliff face. However, it is not recommended to continue the fencing down the face of the cliff. AANDC will present and discuss the selected remedial option with the community to ensure that the community understands the closure challenges and the remedial option.

AANDC met with the community at a second consultation and explained the results from the study done by the professional mining engineer (November 25, 2008 Meeting Minutes, available in **Appendix E**).

Waste Rock

Waste rock quantities at the Contact Lake Mine are limited (estimated to be in the range of some 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.

The following remediation options were agreed to during community consultations:

- **Areas with elevated radiation levels** – cover or re-grade the 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; and,
- **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.

Options for potential cover material include using local waste rock with lower radiation levels, using relocated waste rock from areas below the main waste rock pile (see discussion below), or materials from borrow areas adjacent to the site.

Surface Tailings

From a review of the operating history it is known that some 200 m³ of the 2400 m³ gravity mill tailings that had been stockpiled below the waste rock pile were not processed (called ore) and remain on site. In addition to this amount, an unknown quantity of residual tailings remains scattered on surface between the former mill site location and the edge of the tailings pond. These residual tailings are in some cases found as a very shallow layer on surface as associated with runoff and erosion deposition, in other areas in thicker layers of about 200 mm, while in other areas in small piles. The total surface area below the mill and the pond are approximately 2 ha over most of which tailings can be assumed to be present based on the gamma radiation reading. Assuming an average depth of 5 cm over this area would result in an estimated quantity of approximately 1000 m³ of tailings being present.

Remedial issues associated with the tailings include slightly elevated gamma radiation and elevated metal concentrations. Based on industry best practice and community agreement, the following remediation options were agreed to:

- **Residual surface tailings** – leave undisturbed and cover tailings (where practical) to minimize potential exposures through metal uptake in vegetation and soil to reduce the risk to small terrestrial animals; and,
- **Surface water** – improve drainage to minimize surface water runoff contact with the tailings so as to reduce potential metal release into the environment.

Submerged Tailings

A natural pond exists down gradient of the mine into which tailings have been deposited as a result of unconfined gravity discharge during operation and erosion of tailings during and after operation. Field observations indicate that the tailings remain on surface at the up gradient edge of the pond as well as within the pond. As a result of the tailings and impacted water flowing into the pond, the pond sediments exhibit tailings characteristics and the pond water quality exhibits exceedances of CCME guidelines (for protection of aquatic life), although at a lower level than the incoming surface runoff water. The following remediation option was agreed to during community consultations:

- **Tailings pond** – leave as is (risk manage and monitor) and control source of potential additional metals entering into the pond by covering the tailings above the tailings pond where practical. Drainage channels are being designed through the waste rock to minimize the standing water, which was found to have the highest levels of metals.

Although the water quality guidelines were exceeded in the pond, the Contact Lake receiver is not being impacted (water quality measured at the shoreline of Contact Lake below the tailings pond meets all water quality criteria). An estimation of potential loadings of metals and radionuclides to Contact Lake from the mine site (discussed in Section 4.9 of the Contact Lake RAP) also supports this conclusion as contributions attributable to the mine were determined to be a small fraction of the applicable criterion (e.g. site drainage could contribute up to 1.9% of the arsenic criterion and 2.4 % of the copper criterion). Removing the submerged tailings to mitigate an unlikely potential effect would do more harm than good, as it would result in

significant impacts on the pond itself and likely result in the mobilization of tailings and the release of impacted tailings water containing elevated contaminants to Contact Lake. The community felt strongly that the tailings should not be disturbed.

East Arm Fuel Storage Area and Dock Area

In 2010, a fuel storage tank was labeled with a unique identifier number and a wooden dock was dismantled along the shore of the East Arm of Great Bear Lake. The fuel storage tank is essentially empty but contains some residual oily water. The dock is in a state of disrepair including the remaining sand filled crib. Sediments in the immediate vicinity of the dock have been impacted by past activities. A sediment and benthic study (2008 SENES Supplemental Assessment Report for Contact Lake) showed that contamination was localized to the dock area and that the benthic community in the area had recovered. This was determined due to the fact that the organisms and abundance were not significantly different than that of the background location sampled in the study. It was thought that a thin layer of clean sediments had settled on the contaminated sediments which was enough to promote the growth of a healthy benthic community.

The following remediation options were agreed to during community consultations:

- **Fuel storage tank** – demolish and dispose of tank after removal and disposal of oily water;
- **Miscellaneous debris** – pick up miscellaneous on land debris and in water debris and dispose in a consolidated disposal area;
- **Dock and crib structures** – remove and dispose of these structures and debris in a landfill; and,
- **Impacted sediments** – leave as is as any intervention would do more harm than good.

Disposal of the tank, dock, boiler and equipment and miscellaneous debris will be at the non-hazardous waste disposal site at Terra Mine. The disposal of oily water in the tank will be conducted in accordance with the GNWT Environmental Protection Act, Used Oil and Waste Fuel Management Regulations (2003). Asbestos-containing material is present in the boiler, so it will double-bagged and placed in the new landfill at Terra.

During Phase I, the wooden dock was dismantled. The storage tank will be addressed during future remedial work.

Hydrocarbon Impacted Soils

Limited areas and quantities of hydrocarbon impacted soils and waste rock exist at the mine and related areas. Site-specific criteria developed for the Silver Bear sites will be applied at all sites.

Miscellaneous Debris

In 2010, surface debris was consolidated, and transported to stockpiles. The debris situated on a steep cliff or extending beyond 0.5 below depth, the debris was left. Large metal debris objects were also left in place. Approximately 248 m³ of surface debris was collected and burned. The burnt ash was covered with poly-liner. As with other abandoned mine sites, miscellaneous equipment and debris remain at the Contact Lake Mine site including steel cables, tracks, drill steel, bars, as well as miscellaneous mine and surface equipment. There is also a limited amount of debris along the Contact Lake shoreline. The quantities of these materials are small being in keeping with the limited size and nature of the former exploration and mining activities. The following remediation option was agreed to during community consultations:

- **Miscellaneous debris** - consolidate on land and shoreline waste and debris in a landfill along with some contaminated soil and building debris.

During Phase I, surface debris was consolidated by hand and transported to established nonhazardous stockpiles. The remaining debris that could be not collected was left and will be address during future remedial work.

Roadways

Partially overgrown site roads connect the camp at Contact Lake to the mine and to the fuel depot area at the East Arm of Great Bear Lake. There are no known culverts located at this site. There are limited environmental issues associated with these roads. The following remediation option was agreed to during community consultations:

- **On site roads** – after completion of the remedial works, remove any culverts (if they are encountered) and return drainage to natural conditions then leave the road as is for natural re-vegetation.

The remediation plan for culvert removal will be developed, if needed, to ensure proper stream channel design, fish passage (if required), and long-term stability of the stream bed and banks at each location. The work will be designed with input and review by the Department of Fisheries and Oceans Canada.

If roads are upgraded for use, they will be scarified and left for natural re-vegetation at completion of the remedial works.

EI Bonanza and Bonanza Mines

All remediation items described below for EI Bonanza and Bonanza will be addressed in Phase II of the remediation project. Refer to Drawing C05, C13, S07 through S09, **Appendix A** for detailed site plans.

Waste Disposal Areas

In 2010, non-hazardous surface debris were collected and transported to an established nonhazardous debris stockpile on site. Hazardous material, such as batteries, DDT impacted wood, and one transformer were collected and shipped to Yellowknife via Sawmill Bay. The former waste disposal sites at the El Bonanza Mine contained discarded food cans, scrap metal, rubber hoses, glass, wood stoves, drums, drums (used as wood stoves), tin cans, wood and glass. There were miscellaneous debris located near the former Blacksmith Shop, the mine sites and the airstrip, at Bonanza. In addition, seventy-six empty drums from El Bonanza were moved to Sawmill Bay for crushing and approximately 108 drums remain on site.

Based on the consultation process the preferred remedial approach was as noted below:

- **Waste disposal areas** - consolidate waste, debris and some contaminated soil found in the dump areas and dispose in the landfill in accordance with current waste disposal regulations.

During Phase I, surface domestic debris were collected and consolidated in a non-hazardous waste disposal stockpiles. During Phase II, the non-hazardous waste would be transported to the non-hazardous landfill at Terra Mine for disposal.

Buildings and Infrastructure

In 2010, all buildings were demolished (except the head frame at both El Bonanza and Bonanza remain, and Building #2A shop) and building waste were collected and consolidated. The buildings were stripped of previously identified hazardous materials. These materials included the DDT-impacted wood of the window sills and door frames of the warehouse and bunkhouse at El Bonanza, painted wood, previously identified asbestos containing materials, as well as general refuse located within the buildings. Buildings and unpainted wood were burnt in accordance with burn permit attached in **Appendix J**. The burnt ash piles were covered.

The issues associated with the El Bonanza and Bonanza buildings and infrastructure revolve around the potential physical hazards these features present in their current state and as they deteriorate further in the future. The following remediation option was recommended agreed to during community consultations:

- **Buildings** – to demolish the buildings after removal of any designated substances (such as DDT impacted window sill, painted surfaces, etc...) and dispose of demolition debris/residue in an approved manner.

During Phase I, most buildings were and the building wastes were collected and consolidated in a non-hazardous stockpile. During Phase II, the wastes would be transported to the non-hazardous landfill at Terra Mine for disposal. The remaining buildings on site will be addressed during future remedial work.

Mine Openings

The issues associated with the mine openings revolve around the potential physical hazards associated with deliberate entry into horizontal openings and the potential for falling risks associated with vertical openings. The following remediation options were agreed to during community consultations:

- **Adit** backfill the adit entrance with local waste rock;
- **Shafts** – concrete cap the easily accessible vertical openings. Cap the No. 1 Shaft in a safe manner.

Given that No. 1 shaft is located on the edge of a cliff, capping or sealing construction approaches that minimize the need for equipment travel up to the top of the hill will need to be considered in the final design. In the event that all approaches are deemed unacceptable, either technically or for other reasons, fencing may be the only alternative

Waste Rock

At El Bonanza, the waste rock is located in two piles (combined volume ~3,000 m³), one adjacent to the No. 1 adit and the other adjacent to the No. 2 shaft. A portion of the second pile 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 sites meet all CCME criteria (2008 SENES Supplement Assessment Report for El Bonanza).

The following remediation option was agreed to during community consultations:

- **Waste rock** - leave the waste rock pile as is unless the rock is used for other purposes such as sealing the adit opening.

Airstrip and Fuel Storage Tank Area

The El Bonanza Mine includes, in addition to the two mine sites areas, a short gravel and stone abandoned airstrip located approximately 1.5 km southwest of the El Bonanza Mine on the shore of Great Bear Lake. A number of fuel storage tanks also remain in this area including, two 100,000 L vertical above-ground storage tanks and two 40,000 L above-ground storage tanks lying on their sides. In 2010, the fuel tanks were labeled with unique identifier number. As well, 76 empty drums from El Bonanza were moved to Sawmill Bay for crushing and approximately 108 drums remain on site. Out of the 108, four drums with product were containerized in 2014.

The following remediation option was agreed to during community consultations:

- **Fuel storage tank** – demolish and dispose of tank after removal and disposal of contents (in accordance with relevant guidelines); and

- **Drums and miscellaneous debris** – dispose of drum contents (in accordance with relevant guidelines) and pick up and dispose of drums and miscellaneous debris in a consolidated disposal area (non-hazardous landfill at Terra).

During Phase I, drums were collected and consolidated on site. The storage tanks will be addressed during future remedial work.

The tanks that have leachable lead paint will be removed from site according to TDGA regulations.

PCB and Hydrocarbon Impacted Soils

In 2010, a limited amount of PCB contaminated soil was found around a transformer at the powerhouse were collected and shipped to Yellowknife via Sawmill Bay for disposal. In addition, the transformer was also be removed and shipped to Yellowknife via Sawmill Bay for disposal. Limited areas and quantities of hydrocarbon impacted soils were identified near several buildings, one of the dumpsites and the drum storage area at El Bonanza and the airstrip. Based on the consultation process, the tentative preferred remedial approaches were identified to be consistent with the Contact Lake (and Silver Bear) approach, which considered:

- **Impacted Soils** – Cover in place or excavate and treat (dependent on hydrocarbon fraction).

During Phase I, PCB impacted soil from underneath the El Bonanza transformer were collected and disposed in Yellowknife. Site-specific clean-up criteria for hydrocarbon impacted soils have been developed for the Silver Bear sites and those criteria will be applied to all sites.

Miscellaneous Debris

In 2010, surface debris was consolidated, and transported to stockpiles. Materials noted included scrap metal in the form of equipment components and parts, piping and steel rods, drums and containers, miscellaneous metal fragments, and various mining and motorized equipment components. The following remediation option was agreed to during community consultations:

- **Miscellaneous debris** - to collect and consolidate waste and debris in a landfill (non-hazardous landfill at Terra) along with some contaminated soil and building debris.

During Phase I, surface debris, and non-hazardous debris waste were collected by hand and transported to the established non-hazardous stockpile. During Phase II, the non-hazardous waste would be transported to the non-hazardous landfill at Terra Mine for disposal.

Blasting caps may be found at the El Bonanza and Bonanza properties. AANDC retained a former mines inspector to conduct a survey of the sites, to locate any remaining blasting caps. These blasting caps were subsequently removed. 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 noted.

Roadways and Culverts

Partially overgrown onsite roads connect the mine sites to Great Bear Lake and to each other. There are limited environmental issues associated with these roads.

Two culverts exist at the inlet and outlet of Silver Lake. Debris is found in and around the culverts including both wood and logs in the culverts and steel drums in front of the culvert outlet. A representative from the Department of Fisheries and Oceans (DFO) visited the site in August 2005. During this site visit, juvenile grayling were observed in Mile Lake and near the mouth of the stream immediately downstream of the mine site. The small creeks and marshes to the west of the site, which connect Mile Lake to Great Bear Lake, are likely important fish spawning, rearing, and feeding habitats.

The culvert that connects Mile and Silver lakes likely forms a significant barrier for fish migration in the spring and possibly year-round. The DFO recommended that the culvert be removed to fully re-establish connectivity between the two water bodies and that the closure plans be developed to ensure proper stream channel design, fish passage, and maintenance of the current water level in Mile Lake. Since that recommendation was made by DFO there have been meetings with DFO on the design of the channel that has been agreed on.

The following remediation option was agreed to during community consultations:

- ***Onsite roads and culverts*** – after completion of the remedial works, remove any culverts and return drainage to natural conditions then leave the road as is for natural re-vegetation.

If roads are upgraded for use, they will be scarified in accordance with mining regulations (Ontario Regulation 240/00) and left for natural re-vegetation at completion of the remedial works. If additional culverts are found along former roads, they will be removed and plans for remediation will ensure proper stream channel design, fish passage (if required), and long-term stability of the stream beds and banks at each location. Wherever possible, fish habitat enhancement features will be incorporated into the remediation design.

Sawmill Bay Site

Sawmill Bay is an abandoned site that 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. Situated on the edge of the Canadian Shield, the site comprises 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. The site lies within the boundaries of the Sahtu Dene and Métis Comprehensive Land Claim Agreement. The remediation items described below for Sawmill Bay form part of Phase II of the remediation project. Refer to Drawings C07, C17 through C19, and S12 through S14, **Appendix A** for detailed site plans.

Building and Infrastructure

In 2010/11, the buildings at Sawmill Bay were boarded up and left intact. The Sawmill Bay site has been abandoned for some time; therefore buildings and infrastructure are eroding and, in many cases, unstable, presenting a physical hazard to humans and wildlife using the area. Although paints used on interior and exterior surfaces of the buildings are weathered, some paint still remains, and has been found to contain lead and/or PCBs. Asbestos was used as insulation in isolated locations. Metal-constructed “Quonset hut”-type buildings are deteriorating. Some buildings have completely collapsed or have been removed, but others remain standing and provide tempting, but unstable, shelter for wildlife or community members visiting the site.

The following remediation option was agreed to during community consultations:

- ***Buildings and Infrastructure*** – Demolish the buildings after removal of any designated substances (e.g. hazardous materials) and dispose of in Terra non-hazardous landfill.

During Phase I, buildings were boarded up to restrict access. During Phase II, buildings will be demolished, collected and consolidated and would be transported to the non-hazardous landfill at Terra Mine for disposal.

Impacted Soils

In 2010, PHC-impacted soil was shoveled into polyethylene liner bags and placed into drums. The drums contain impacted soil were transported by barge to Déljñę and subsequently transported by plane from Déljñę to Yellowknife for disposal. As a result of the long history of industrial and military activity at Sawmill Bay, soils in some parts of the site are primarily contaminated with hydrocarbons from fuel oil, lubricating oils and gasoline. Extensive sampling and analysis has largely delineated these impacts, as well as those resulting from residual heavy metal and radiological contamination from uranium ore. These soils are a chemical hazard and present potential risks to human health and the local ecology, and in some areas may act as a source of contamination to surface and ground waters, and lake sediments. Discrete, low-level radiological impacts have also been delineated and are generally co-located with metal-impacted areas.

The following remediation option was agreed to during community consultations:

- ***Gasoline and Diesel Spills (F1/F2)*** – Excavate and treat on site in windrow treatment areas.
- ***Heavy Oil Spills (F3/F4)*** - Scarify soil to help the fuel break down

During Phase I, PHC-impacted were collected and transported to Yellowknife for disposal. Any remaining impacted soil will be addressed during future remedial work. Site-specific clean-up criteria for hydrocarbon impacted soils have been developed for the Silver Bear sites and those criteria will be applied to all sites.

Drums Caches, Fuel Storage Tanks and Residual Fuels

In 2010 and 2011, the fuel storage tank was labeled with a unique identifier number, and a barrel program took place on site to address the estimated 10,500 fuel drums (barrels) on site. In total, 10,425 drums were crushed in 2010 and 2011 and placed with the non-hazardous debris stockpiles. The remaining 2590 drums contained some residual liquid and testing showed that most contained only water, while others contained some hydrocarbon product or a mix of product and water. Drums with liquid were consolidated, tested, and the drums classified as non-hazardous were washed and crushed on site and placed in the non-hazardous stockpile. Drums with hazardous liquids were transported to the airstrip drum cache for disposal. In 2014, 202 drums containing drum product and process waste were removed from site. In total, 18 drums remain on-site at Sawmill Bay of which 2 drums remain from the consolidation activities, along with the historic cache of 16 drums located north of the former old airstrip. Overall, the consolidation of drum contents were grouped based on the disposal requirements of the Abandoned Military Site Remediation Protocol, where drum contents with a flash point of <25oC were pumped into new drums for off-site disposal. The remaining drums with product were washed within the drum processing area within a lined box. The process water was then pumped into a white holding tank for treatment system that contains 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 License.

The remediation options were discussed during community consultations that took place on October 28 and November 25, 2008 (minutes available in **Appendix E**). The community agreed to have the barrels collected, cleaned and crushed during Phase I of the remediation.

The following remediation options were agreed to during community consultations:

- **Fuel Storage Tank** – Dispose of tank contents (in accordance with relevant guidelines) and dispose of tank at Terra non-hazardous landfill; and
- **Drums** – Dispose of drum contents (in accordance with relevant guidelines) and dispose of drums at Terra non-hazardous landfill.

During Phase I, empty drums were consolidated, crushed and placed in a non-hazardous stockpile on site. Drums with non-hazardous liquid were washed and crushed on site and placed in the non-hazardous stockpile. Most of the drums with hazardous liquids were transported to Yellowknife for disposal. The remaining 18 drums and fuel storage tank at Sawmill Bay will be addressed during future remedial work. During Phase II, the crushed drums and fuel storage tank would be transported to the non-hazardous landfill at Terra Mine for disposal.

Designated Substances / Hazardous Materials

In 2010, hazardous materials were collected and consolidated in a temporary established hazardous debris stockpile and were transported to Yellowknife for disposal. In total, 3

transformers in steel overpacks, 5 m³ of DDT impacted wood, PCB impacted soil from underneath the El Bonanza transformer, and 70 old batteries were shipped from Sawmill Bay to Yellowknife for disposal. 20 old car batteries contained within plastic bags, and 15 old paint cans remain on site and were placed in the bermed and lined hazardous debris stockpile adjacent to the Power House for future remedial work. Asbestos-containing material was double-bagged and placed in adjacent non-hazardous debris stockpiles. Previous site assessments have identified hazardous building materials in the form of lead- and PCB-amended paint on interior and exterior building surfaces, abandoned machinery and equipment, and fuel drums. Asbestos was used at the site to insulate pipes, boilers and furnace areas, and unused asbestos was present in the workshop/storage area. Other potentially hazardous materials include small bottles of chemicals inside buildings in the lodge area, and batteries.

The following remediation option was agreed to during community consultations:

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

During Phase I, hazardous material were collected and consolidated in a temporary hazardous debris stockpile. Some hazardous materials were shipped to Yellowknife for disposal. The remaining hazardous debris were contained and will be addressed in future remedial work.

Waste Disposal Areas

In 2010, non-hazardous surface debris material were collected and transported to an established non-hazardous debris stockpile. The former waste disposal sites at Sawmill Bay contained wood debris, used fuel drums, metals debris, vehicle parts, food wastes, construction debris and other miscellaneous items are found throughout the site. One large waste pile is located to the south of the lodge area, and smaller piles have been found throughout the airstrip area, near the main drum cache and south of fishing dock/plane fuselage area. Waste disposal areas contain mostly non-hazardous materials, but there is a small amount of hazardous materials that will need to be separated from the non-hazardous waste materials, removed from the site and disposed of in a licensed facility (see above section). Some materials are partially or completely buried. The following remediation option was agreed to during community consultations:

- **Waste Disposal Areas** – Consolidate non-hazardous materials and dispose at Terra non-hazardous landfill.

During Phase I, non-hazardous surface debris were collected and consolidated in a nonhazardous stockpile. During Phase II, the non-hazardous waste would be transported to the non-hazardous landfill at Terra Mine for disposal

Machinery, Heavy Equipment, and Miscellaneous

Several abandoned vehicles and pieces of heavy equipment (e.g. generators, appliances, and an airplane fuselage) have been left at the site, as well as old docks and a sunken barge in the

shoreline area. Some submerged debris is also present around the beach landing area, e.g. barrels, pipes and other scrap metals. The following remediation option was agreed to during community consultations:

- **Equipment and Miscellaneous** - Consolidate and dispose at Terra non-hazardous landfill.

Disposal of equipment and miscellaneous debris will be at the non-hazardous waste disposal site at Terra Mine.

Submerged Debris

The same two scenarios are possible for remediation of submerged debris as for terrestrial debris. Different remediation issues apply, however, to submerged debris (i.e. disturbance of sediments, potential removal of fish habitat, navigational hazards and potential for chemical hazards to surface waters). For this reason, options for disposal of sunken debris will be considered separately from terrestrial machinery, equipment and miscellaneous items.

The following remediation option was agreed to during community consultations:

- **Submerged Debris** - Consolidate and dispose at Terra non-hazardous landfill; and
- **Sunken Barge** – Leave as is if no radiological impacts are present, otherwise consolidate and dispose at Terra non-hazardous landfill.

Disposal would involve some disturbance of sediments and possibly a small area of fish habitat in the short term, in the longer term the area would naturally return to its original condition. Further, since sedimentation processes appear to be very slow, at least in this area of Great Bear Lake, it is likely that removal of debris would only disturb surficial sediments. Removal of these items would eliminate any possible future contributions of metals to the surface water and sediments from this source. Any hazardous materials recovered from sediments would need to be disposed of in an appropriate facility. Any potential radiological impacts will be addressed by NRCan.

Surface Water, Sediment and Groundwater

Sediments in the vicinity of the sunken barge in Sawmill Bay were contaminated with (total) chromium, and PHCs were detected at low levels in sediments up to 5 m from shore throughout AEC 5 with one exceedance of the applied criteria. PHCs were also detected in groundwater.

Sediments may be contaminated with petroleum hydrocarbons from barrel caches and fuel handling areas, and this in turn may affect benthic invertebrates and aquatic macrophytes, as well as the fish that feed on them. Without sediment-specific criteria, however, it is not clear to what extent these organisms may be affected. NRCan will determine whether additional testing of sediments will be required to assess potential radioactive impacts underneath the barge. If such impacts are present, remedial options will be addressed by NRCan in conjunction with the local community, and presented in a separate document.

The following remediation option was agreed to during community consultations:

- **Surface Water** – Remove waste debris and excavation of contaminated soil;
- **Groundwater** - Remove waste debris and excavation of contaminated soil.
- **Sediment** – Leave as is for natural recovery.

Roadways and airstrip

The roadways and airstrip at Sawmill Bay consist of natural fill materials which pose little environmental risk. With time, they will re-vegetate naturally, although scarification may accelerate the natural re-vegetation process. One crossing had an old barrel culvert and wooden boards/planks across it and the other crossing with a culvert was approximately 25-50 meters further up the road towards the beach landing area.

The following remediation option was agreed to during community consultations:

- **Roads** – Leave as is with removal of culverts; and
- **Airstrip** - Leave as is with removal of culverts.

Water Usage

Quantity

Over the course of the remediation program, fresh water will be required for several activities such as general camp use, dust suppression and cleaning. For Phase III, water will be drawn from the McTavish Arm of Great Bear Lake (Sawmill Bay) whereas for Phase II, water will come from the Camsell River (Terra Mine). Water taken for use at Contact Lake and El Bonanza/Bonanza is expected to be minimal. The anticipated volumes and/or quantities of water based on activity usage are listed below:

- Camp use: <10 m³/day
- Dust suppression: <50 m³/day
- Cleaning: <100 m³/day
- Concrete mixing: <25 m³/day

We are requesting that the proposed winter road, presented in **Appendix H** be permitted under the land use permit for Phase II so that the contractor can access the sites in the winter (via permitted winter road). Water will be required for the land crossings. The water would be taken mostly from Great Bear Lake. The estimated total amount of water that will be used for the construction of the winter road is 2722 m³ each way for a total of 5444 m³ of water required for the mobilization and demobilization during Phase II. The locations that water will be taken from and the amount of water taken (one way) are as follows:

Great Bear Lake

- 65 31 06.679 °N, 121 38 47.595 °W (544.4 m³)
- 64 57 57.171 °N, 121 27 54.138 °W (544.4 m³)

- 65 20 23.716 °N, 119 29 38.284 °W (816.6 m³)

Water Flow Alteration

Water flow at Hermandy Lake will be altered during the remediation. The preferred remedial plan for the Hermandy Lake TCA includes re-establishing the drainage to the former outlet of Hermandy Lake TCA to minimize metal releases to the environment by reducing water flow through the contaminated area. The RAP outlines the preferred method as backfilling a portion of Leachate Pond. The fill will likely be waste rock. Advantages of filling in the leachate pond are that the combined discharge quality from Hermandy Lake TCA/Leachate Pond area would likely be improved. The discharge would be re-routed through the wetland marsh which would enhance natural attenuation, metal releases to the Camsell River would likely be reduced and any risks posed to wildlife by the Leachate Pond would be minimized. Re-establishing the natural draining route of Hermandy Lake will be a permanent consequence of the proposed remediation plan. Discussions have taken place with DFO and no concerns were raised with the design of the Hermandy Lake drainage.

Modification of banks/beds

Water course banks and beds will be altered during the removal of the docks. There are minimal environmental impacts expected during the excavation of the docks and dock walls. Since some of the soils in these areas (around the docks and dock walls) are currently contaminated with hydrocarbons, the removal of this soil will enhance the materials of the shoreline in the long run. The removal of the existing docks and dock walls as well as other remediation activities along the lakes' shorelines has the potential to result in the suspension of sediments to the water column. Potential impacts associated with suspended sediments will be mitigated through the use of sediment curtains in all areas where shoreline work is being performed. Water monitoring will take place in and around the silt curtains (Refer to "Water Monitoring Plan" of the Water License). Best Management Practices, recommended by DFO, will be followed. DFO representatives will be invited out to the sites during the near shore water works. There are also discussions underway with DFO in regards to the restoration of vegetation along the shoreline, particularly at the Terra and Northrim docks on Camsell River. This work is anticipated to enhance the waterfront and stabilize the shoreline material.

Potential Impacts to Water

The land use activities will play a minor role in controlling the potential future discharge of deleterious substances (i.e. leachate from acid generating waste rock runoff) to the local water bodies which includes Great Bear Lake. The remediation project is being done to decrease the chance of influx of deleterious substances to the adjacent water bodies within the area of the abandoned sites. Specific activities that will assist in reducing the impacts associated with historic operations include:

- Placement of a cover over the exposed tailings (Terra Mine HoHum Lake TCA, Northrim Mine Leachate Pond area, Contact Lake) to limit the seepage of metals into the surrounding water bodies including Great Bear Lake;
- Leave submerged tailings undisturbed but restore outlet drainage and wetland systems by lowering water level, rebuilding and/or removing dykes and repairing wetland area (Terra Mine HoHum Lake TCA, Northrim Mine Hermandy Lake TCA/Camsell River) to assist with treatment and seepage of metals to the surrounding water bodies
- Collection and disposal of selected deposits of tailings through which overland flow to Great Bear Lake is occurring;
- Collection and treatment of petroleum hydrocarbon contaminated soil to limit seepage into water bodies in the area as well as Great Bear Lake; and,
- Removal of existing dockwalls and shoreline features and creation of a more natural transition between the land and surrounding water bodies including Great Bear Lake.
- Removal of barrels and tanks following the removal of their contents. Removal of the barrel and tank contents will be in accordance with GNWT Regulations.

All applicable legislations and best management practices will be followed. Representatives from regulatory authorities (e.g. INAC, EC, GNWT ENR and DFO) will be invited out to the sites during the remediation, especially during the near shore water works. The removal of the existing dock walls as well as other remediation activities along the lakes' shorelines has the potential to result in the suspension of sediments to the water column. Potential impacts associated with suspended sediments will be controlled through the use of sediment curtains in all areas where shoreline work is being performed. Water monitoring will take place in and around the silt curtains. Refer to the Water Monitoring Plan in **Appendix G** for further details.

Sewage and Process Water Treatment

Prior to the opening of the camp facilities, the Contractor shall submit water quality tests that have been previously performed on the water body. Following the startup of the camp facilities, water samples will be collected from both the source and treatment facility on a weekly basis and analyzed by a CAEAL accredited laboratory. The water source and/or treatment system must meet the limits specified by Health Canada in the Guidelines for Canadian Drinking Water Quality (GCDWQ). Refer to Section 1.2 of Specification 01 54 00 — Camp Facilities (**Appendix J**) for the regulatory requirements for the potable water system.

Waterless toilets will be used during each phase of remediation. The amount of sanitary and grey water generated from the camp will be minimal. The effluent from the waterless toilets will be incinerated. The grey water from the camp will be tested to ensure that it meets the Sewage Discharge criteria listed below in Table 2 prior to discharge (obtained from Section 1.6 of Specification 01 54 00 - Camp Facilities of the draft specifications for the Environmental Remediation at Great Bear Lake Sites located in **Appendix J**).

Table 2: Parameter Maximum Allowable Concentrations for Sewage Treatment

Parameter	Concentration Limit
pH	6-9
Mineral Oil and Grease	5 mg/L and non visible
Total Suspended Solids	180 mg/L
Biological Oxygen Demand, BOD	120 mg/L
Fecal Coliforms	10,000 CFU/dL

A process water treatment facility will be designed by the Contractor and will be capable of treating all process water generated from camp operations. Process water includes wash water, water from dewatering excavations, and water that has come in contact with contaminants. The process water treatment facility will be capable of removing oil, suspended solids, particulates, and asbestos fibres, and filtering water through a 5-micron particulate filter prior to discharge. Section 1.6 of Specification 01 35 15— Special Procedures for Contaminated Sites (**Appendix J**) provides details on the effluent quality that has to be met prior to discharge. Treated process water effluent shall meet the following requirements as listed in Table 3 below.

Table 3: Parameter Maximum Allowable Concentrations for Process Water Treatment

Parameter	Concentration Limit
Volatile Hydrocarbons	15 mg/L
Extractable Hydrocarbons	5 mg/L
Non-Aqueous Phase Liquid / Free Product	Not present
Phenols	20 µg/L
pH	6-9
Arsenic (total)	100 µg/L
Cadmium (dissolved)	10 µg/L
Chromium (total)	100 µg/L
Cobalt (dissolved)	50 µg/L
Copper (dissolved)	200 µg/L
Lead (dissolved)	50 µg/L
Mercury (total)	0.6 µg/L
Nickel (dissolved)	200 µg/L
Zinc (total)	1000 µg/L

Water Quality Monitoring

AANDC CARD has conducted routine monitoring of at the mine sites since 2003 (Silver Bear) and 2006 (Contact Lake and El Bonanza/Bonanza). A summary of the programs conducted at each site is provided in the report entitled “Great Bear Lake Sites Proposed Long Term, Status of the Environment and Construction Monitoring Plans”, available in **Appendix G**.

Additional Studies

Other pilot or research tests may also be required in order to develop, finalize, or refine, the details of the Remediation Plan, as well as conduct progressive reclamation of the site. Studies may include the excavation of additional test pits to delineate petroleum hydrocarbon contaminated soil. The Contaminants and Remediation Directorate, Indian and Northern Affairs Canada requests that there be sufficient flexibility within the license to accommodate this kind of work, which would be small in both scale and in duration.

5. Type of Undertaking.

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

6. Water Use

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

Other (describe): _____

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.

Water will be used for camp use, dust suppression and cleaning. Given the phase approach for the remediation work, camps will be located at Terra Mine and Sawmill Bay and potentially at Contact Lake and El Bonanza/Bonanza during the times remedial work is taking place at the mine site. The camps at El Bonanza/Bonanza and Contact Lake will both be small and set up only temporarily. For Phase I, the water source was the McTavish Arm of Great Bear Lake (Sawmill Bay Site), as it will be for Phase III, while for Phase II, water will come from Camsell River (Terra Mine). Estimated water quantities are indicated below for each use:

For phase II and III

- Camp use: <10 m³/day
- Dust suppression: <50 m³/day
- Cleaning: <100 m³/day
- Concrete mixing: <25 m³/day

Phase II: It is anticipated that approximately 30 to 50 people will be on site for the field program. The workers would be on site for approximately 7 months each year with an estimated maximum of (30-50 people x 210 days) 6300 to 10,500 person days per year with a total of 18,900 to 31,500 person days over the entire project.

Phase III: It is anticipated that approximately 20 people will be on site at any one time during the field program. The workers will be on site for approximately 3 months with an estimated maximum of (20 people x 90 days) 1800 person days.

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

During Phase I, all non-hazardous debris was collected and consolidated in 2010 and 2011. During Phase II, the debris would be transported to the non-hazardous landfill at Terra Mine. Construction of this landfill will occur during Phase II. **The Contractor(s) retained for the remediation work will be responsible for the design of each project specific Waste Management Plan that will comply with federal, territorial, and anti-pollution laws, ordinances, codes, and regulations before submission to the Board for approval prior to commencement of site activities.**

Non-Hazardous

The non-hazardous solid waste generated from the camps (organic waste, paper, cardboard, and recyclables) and remedial work (debris, wood) will be collected and transported to the newly constructed non-hazardous waste landfill located at the Terra Mine site. Location of the new non-hazardous waste landfill is situated where the former camp and tank farm were previously situated, at the highest impacted part of the site. A geo-synthetic liner will be placed on top of the non-hazardous waste landfill to minimize water infiltration.

Acceptable solid wastes to be sent to the non-hazardous waste landfill are identified as follows:

- Organic waste (food) and Household garbage (food cans)
- Paper/Cardboard (office paper, shipping boxes)
- Plastics (PVC)
- Recyclables (aluminum beverage cans, tetra packs, plastic bottles)
- Wood (non-lead painted)

All waste sent to the non-hazardous waste landfill will be separated into piles as dictated in the waste segregation program that has been in place for the past three seasons. The waste

segregation program is a part of the site orientation presentation given to all site workers and visitors by the Site Manager.

Only those non-hazardous wastes identified as acceptable for burning and land filling will be burned and land filled at the facility. The remaining items will be removed from the site.

Plastics and recyclables will be separated from the waste stream that will be burned. Recyclables will be placed in separate storage containers and shipped off site (via backhaul flight) to be disposed of at the recycling depot in Yellowknife. All other plastics (e.g. PVC) will be disposed of in the non-hazardous landfill or removed from site.

Wooden material that is not treated or painted may be **burned** (burn permit would be obtained by successful Contractor prior to any burning on-site). Drum contents treated according to the GNWT Waste Fuel Management Regulations. Hazardous materials will be shipped off site in accordance to TDGR to a licensed disposal facility. Depending on the hydrocarbon fraction, the contaminated soil will either be treated on-site in windrow treatment areas (F1 and F2) or covered in place and/or excavated and stored in the non-hazardous waste landfill as intermediate fill (F3 and F4). Hydrocarbon-impacted soils that cannot be managed *in-situ* will also be stored at this site. A summary of the waste quantities for each mine site is shown below with full details provided in the individual RAPs.

Only combustible non-hazardous waste (organic, household garbage, paper and cardboard) will be burned in the incinerator (Westland CY-1020) located at the landfill. Burning of the combustible non-hazardous waste will occur after every meal and will be in accordance to the manufacturers' instructions (in order to minimize the amount of contaminants entering the air). The resulting incinerator ash will be tested to ensure that it meets the guideline criteria. If the ash meets the guideline criteria, it will be land filled. If it does not meet the criteria, then it will be 'properly containerized', stored in sealed salvage drums (to prevent wildlife from accessing it) prior to being flown off site.

Materials deemed to be at risk for incineration such as small batteries (AA, C, D), aerosol cans of cooking spray and insect repellent will be shipped off-site. As well, materials that contain lead or other hazardous chemicals (e.g. lead-painted wood, mercury) will not be burned. Note that there are no mercury containing materials (e.g. thermometers, fluorescent lamps, button batteries, thermostats, manometers, switches and relays) as part of the waste stream at this site.

An incineration management system has been developed for the burning of all acceptable site waste. Site workers will be trained by the site manager in proper incineration protocols. At all times, site workers will follow proper procedures for the burning of non-hazardous waste in the incinerator. An independent environmental audit was conducted of the camp operations at Silver Bear during the 2008 field season and no concerns were raised with respect to the incineration practices.

Hazardous

All hazardous materials collected from the mine sites will be packaged and shipped off site to a licensed disposal company in accordance with TDGR.

Sewage

Sewage will be collected from the main camp, and treated on-site at a sewage treatment facility. The Contractor(s) retained for the remediation work will be responsible for design and operation of the facility. It is stated in the draft specifications that the Contractor(s) has the option of using waterless toilets. A process water treatment facility will also be designed by the Contractor(s) and will be capable of treating all process water generated from camp operations. Process water includes wash water, water from dewatering excavations and water that has come in contact with contaminants. The process water treatment facility will be capable of removing oil, suspended solids, particulates, and asbestos fibres, and filtering water through a 5-micron particulate filter prior to discharge. Effluent discharge criteria and additional details on the sewage and process water treatment systems can be found in **Section 6 – Table 2** of this Water License application above.

Silver Bear

Table 2: Estimated Quantities of Waste from Silver Bear Mines

Material	Quantity (m³)
Demolition Debris	
• Terra	16,250
• Northrim	750
• Norex	950
• Smallwood	150
Subtotal	18,100
Terra Waste Disposal Sites	6750
Miscellaneous Refuse/Scrap	2000
Total (to landfill)	26,850

Contact Lake

Table 3: Estimated Quantities of Waste from Contact Lake Mine

Material	Quantity (m³)
DDT Impacted Wood	2
Asbestos-containing materials	5
Wood debris	
• Non-lead impacted (assume no burning)	800
• Non-lead impacted (assume burning, 5%)	20

residual	
• Lead-impacted (cannot burn)	90
• Dock Wood (cannot burn due to water content)	70
General Debris	200
Metal impacted with lead paint	10
Total	
• Maximum to landfill	1177
• Minimum to landfill	397

El Bonanza/Bonanza

Table 4: Estimated Quantities of Waste from El Bonanza/Bonanza Mines

Material	Quantity (m³ unless specified)
DDT impacted wood	2
PCB impacted soils	0.1
Asbestos-containing materials	1
Wood debris	
• Non-lead impacted (assume no burning)	450
• Non-lead impacted (assume burning, 5% residual)	20
General Debris	200
Metal impacted with lead paint	9
Total	
• Maximum to landfill	661
• Minimum to landfill	231

Sawmill Bay

Table 5: Estimated Quantities of Waste from Sawmill Bay Site

Material	Quantity (m³ unless specified)
Metal-impacted Soil	~975
Soils with low level radiation	1125
Asbestos-containing materials	170
Wood debris	
• Lead impacted	657
Metal Debris (trucks, boats, tractors, heavy equipment, engines, sunken barge and airplane fuselage)	
• Non-hazardous	417
Painted concrete	47
Non-hazardous building contents	2457
Used fuel drums	~12,700 drums

Contents of drums (fuel/water mixture)	100,000 L
Total (to landfill)	3044

Note: The total area of all waste dumps identified and investigated to date (i.e. those located near the airstrip, in the main lodge area and near the main barrel cache) is estimated to be 5,137 m². This estimate does not include random debris, barrels, vehicles or equipment scattered around various parts of the site.

Other wastes

Table 6: Estimated Quantities of Petroleum-Impacted Materials

Product	Quantity (m³ unless specified)
Hydrocarbon Product/Impacted Liquid	
• Silver Bear	139
• Contact Lake	4
• El Bonanza/Bonanza	1.8
• Sawmill Bay	100
Total	245
PHC Impact Soils	
• Contact Lake	180
• El Bonanza/Bonanza	451
• Sawmill Bay	>17,000
Total	>17,000

Note: Hydrocarbon product and impacted liquids will be incinerated as long as criteria are met. Impacted soils will be treated as per RAP.

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

Silver Bear Mines:

The communities of Déljñę and Gamètì (beneficiaries of the Sahtu and Tłıchq Settlement Areas) have assisted with the development of the remediation plan for the Silver Bear Mines via many avenues.

Over the past five years, people from Déljñę have participated in the water quality and environmental investigations at Silver Bear. The results of these investigations have been presented to the communities of Déljñę and Gamètì each fall and meetings have been held in each community to understand people's concerns with the abandoned mine sites.

Over the summer of 2007, representatives of the local communities formed a committee to review potential options for reclamation of the site. Community participants included members from Déljñę because they are within the Déljñę District of the Sahtu Settlement Area and members from Tłıchq representing each community because the sites are within the Mqwhi Gogha Dè Njı̀tłèè area.

The community representatives have toured all of the sites and participated in the remedial action plan workshops to rank the remediation options. A key consideration in the workshops was the selection of goals and objectives for the Silver Bear Remedial Plan. The goals and objectives were adapted from a previous program and agreed to by all parties. From the workshops, the communities have provided input as to their preferred options, options that are acceptable and options that are unacceptable. These reviews provided key input to the development of the RAP.

Major meetings and presentations have included:

- June 26th, 2007: Presentation to the Déljñę community on background information regarding the RAP and site conditions at the Silver Bear Sites.
- July 12 and 13, 2007: Meeting with the community representative committee in Yellowknife to provide site overviews, issues and concerns and discuss the methods, goals and objectives for evaluation of the options for the RAP.
- August 22 to 24, 2007: Site visit to Silver Bear Mines by the community committee representatives from Déljñę, Gamètì, Behchokö and Whatì. This visit included a meeting to review goals and objectives and initiate the review of the options for the RAP.
- September 5 and 6, 2007: Meetings in Déljñę with the community committee representatives to continue with the review of the options for the RAP.
- September 17-19, 2007: Meetings in Yellowknife with the community committee representatives to continue with the review of the options for the RAP.

Traditional Knowledge studies have been completed with elders, hunters and trappers, residing in both Déljñę and Gamètì, who use the area around the Silver Bear Mines. This information has been used to focus remediation efforts and identify environmental risks on site.

Contact Lake Mine:

The community involvement and consultation process for the Contact Lake Mine site was undertaken to ensure that the community of Déljñę was included in all aspects of the work leading up to the remediation of the Contact Lake Mine site. Local people were hired to work at the site as bear monitors and to help collect samples throughout the site assessment phase of work. Local people were interviewed so that an understanding of the historical and future land uses of the area could be determined. The remediation team from Déljñę was created at the request of AANDC so that formal decision making could be done by the local people. The formal consultation process was initiated in February of 2007 when the first meeting took place in Déljñę.

Major meetings and presentations have included:

- February 2007: Presentation to and discussion with the Chief and Council of Déljñę community on physical and environmental site issues of Contact Lake.

- June 2007: Consultation meeting with the community of Déljñę to present and discuss physical and environmental site issues of Contact Lake.
- September 2007: Site tour for Déljñę Remediation Team to become more familiar with the scope and scale of the proposed remediation plan.
- November 2007: Evaluation meeting to present, discuss and decide upon remediation options for the site.
- February 2008: Public presentation by Déljñę Remediation Team (with support from AANDC team members) that presented preferred remediation options to community and asked for feedback on the information.

EI Bonanza/Bonanza Mine:

The community involvement and consultation process for the EI Bonanza Mine site was undertaken to ensure that the community of Déljñę was included in all aspects of the work leading up to the remediation of the EI Bonanza Mine site. Local people were hired to work at the site as bear monitors and to help collect samples throughout the site assessment phase of the work. Local people were interviewed so that an understanding of the historical and future land uses of the area could be determined. The remediation team from Déljñę was created at the request of AANDC so that formal decision making could be done by the local people. The formal consultation process was initiated in February of 2007 when the first meeting took place and involved Chief and Council. In June of 2007, presentations were made at a community meeting in Déljñę, and in September of 2007, the Déljñę remediation team was taken to the site for a familiarization and awareness tour.

Major meetings and presentations have included:

- February 2007: Presentation to and discussion with the Chief and Council of Déljñę community on physical and environmental site issues of EI Bonanza.
- June 2007: Consultation meeting with the community of Déljñę to present and discuss physical and environmental site issues of EI Bonanza.
- September 2007: Site tour for Déljñę Remediation Team to become more familiar with the scope and scale of the proposed remediation plan.
- December 2007: Evaluation meeting to present, discuss and decide upon remediation options for the site.
- February 2008: Public presentation by Déljñę Remediation Team (with support from AANDC team members) that presented preferred remediation options to community and asked for feedback on the information.

Sawmill Bay

The community involvement and consultation process for the Sawmill Bay site was undertaken to ensure that the community of Déljñę was included in all aspects of the work leading up to the remediation of the Sawmill Bay site. Details of the community consultation are included in the RAP, which will be submitted to the Sahtu Land and Water Board at a later date. However, the

community has indicated that they agree with the decision to proceed with debris and drum clean-up in the 2009 contract as per minutes from the meetings on October 28 and November 26, 2008, available in **Appendix E**).

Major meetings and presentations have included:

- October 27 and 28, 2008: Consultation meetings with the Déljñę leadership (includes Chief and council, Charter Community, Renewable Resource Council, and Deline Land Corporation) to discuss procurement of the Sawmill Bay Site (discussions led to the development of the Phased approach to remediation).
- November 26, 2008: Consultation meetings with the Déljñę leadership to present and further discuss physical and environmental site issues at Sawmill Bay.

Community Consultation

The members of the Remediation Teams, as well as other people involved in the consultation process for all sites are listed here.

Members of the Déljñę Remediation Team are:

Tommy Betsidea – Déljñę Land Corporation
Dolphus Baton - Déljñę First Nation
Michael Neyelle – Déljñę First Nation
Hughie Ferdinand – Déljñę First Nation
Jimmy Dillon – Déljñę Renewable Resource Council
Joe Tetso– Déljñę Land Corporation
Chris Yukon – Déljñę Renewable Resource Council
Alfred Taniton - Déljñę Band

Members of the Tłjchq Remediation Team are:

Alphonse Apples – Gamètì
Eddie Erasmus – Behchokö
Louis Wediwim – Whatì
Jimmy Codzin – Wekweètì
Jolene Husky – Behchokö
Maurice Lavalee
Paul Euler - with Louis Azzolin (Terra Firma Consulting)

Members of Déljñę Community to attend September 5/6, 2007 meeting:

Raymond Tutcho – Chief Déljñę First Nation
Maurice Neyelle – Déljñę First Nation
Greg Baptiste – Déljñę Land Corporation
Joe Blondin – Déljñę First Nation
Dolphus Tutcho – Déljñę Renewable Resource Council
Be’sha Blondin – Consultant

Community Liaison, AANDC/CARD:
George Lafferty

Community Liaison Sahtu Sites, Déljñę First Nations
Orlena Modeste

Additional engagement activities are documented in the Engagement Plan, provided in **Appendix E**.

10. Predicted environmental impacts of Undertaking and proposed mitigation.

Since the goal of the Great Bear Lake Mines Remediation Project is to remediate the sites, there are very few negative environmental impacts predicted – it is the mitigation that we are proposing. The focus of the Remediation Plans is to mitigate the current impacts on the sites due to the abandoned mining operations.

Impacts were minimal during Phase I, since only drum and debris clean-up and small building demolition took place. The majority of the work will be taking place during Phase II, when most of these impacts may occur.

The preferred remedial plan for the Ho Hum Lake TCA includes leaving the tailings in place and restoring the former upper wetland which was degraded when the lake level was raised. An upper weir above the existing dyke will be constructed, which will control water levels through the upper wetland. The existing downstream weir will be re-graded and the ends of the existing culvert will be capped with removable caps. These actions will provide stability, regulate water flow, and minimize fish passage into Ho-Hum Lake from Moose Bay. The wetland between the two weirs will be enhanced by placing peat and planting a native plant species (i.e. sedge) in the wetland. This is intended to enhance natural wetland formation and attenuation of arsenic. The spillway and wetland enhancement was discussed with DFO and EC and their comments have been incorporated into the design of the spillway and the monitoring that will take place.

The preferred remedial plan for the Hermandy Lake TCA includes re-establishing the drainage to the former outlet of Hermandy Lake TCA to minimize metal releases to the environment by reducing water flow through the contaminated area. Exposed tailings will be excavated and removed as hazardous materials since battery debris was found to be mixed in with the tailings. The leachate pond will be partially backfilled. The smelter waste will be excavated and disposed off-site, at a southern licensed facility. See Drawing C09 in **Appendix A** for more details. The discharge would be re-routed through the wetland marsh which would enhance natural attenuation, metal releases to the Camsell River would likely be reduced and any risks posed to wildlife by the Leachate Pond would be minimized. Re-establishing the natural draining route of Hermandy Lake will be a permanent consequence of the proposed remediation plan.

Even though Contact Lake TCA pond will be left in place, there will be disturbance to the area during the consolidation and covering of the up-gradient surface tailings, which may cause unwanted impacts down-gradient in Contact Lake. No impacts have been noted to date, in Contact Lake. Being a relatively small pond, the levels of the contaminants would not warrant treatment of the water. The highest levels for metals were detected up-gradient of the Contact Lake TCA pond. This area will be mitigated by creating drainage channels so that the water is in minimal contact with the waste rock. In addition, a portion of the waste rock and tailings will be covered to cut off those up-gradient sources.

Water quality of El Bonanza meets all CCME criteria; therefore, cleanup will be focused on the on-land remedial work such as the removal of buildings, etc. There are two culverts that are located at the inlet and outlet of Silver Lake that may present a potential obstruction to fish migration. On DFO's recommendation, these culverts will be removed following completion of the remedial work.

There are minimal environmental impacts expected during the excavation of the docks and dock walls. Since some of the soils in these areas (around the docks and dock walls) are currently contaminated with hydrocarbons, the removal of this soil will enhance the materials of the shoreline in the long run. There are discussions underway with DFO in regards to the restoration of vegetation along the shoreline, particularly at the Terra and Northrim docks on Camsell River. This work is anticipated to enhance the waterfront and stabilize the shoreline material. Further details of dock removal are provided in the Section 4, Description of Undertaking at Silver Bear Mines, under the subheading "Docks".

In some cases, historical land crossings may be used which will minimize brush cuttings and other negative effects to the surrounding environment. The historical land crossings follow along the southern shoreline of Great Bear Lake to the Silver Bear Mine sites. Although one such area will cross into the interim protected Grizzly Bear Mountain Area, using the historical crossing should minimize any impact to the area. The proposed mitigation measures for winter road and barge activities during the construction period are included in **Appendix I**. Additional information concerning preventative measures for these activities will be submitted in the work plan when the contracts are awarded.

A Spill Contingency Plan (SCP) for the proposed remediation activities is to be developed in accordance with AANDC's *Guidelines for Spill Contingency Planning, April 2007*, available in **Appendix L**. Following the award of the contract, the actual SCP for the proposed remediation works will be developed by the Contractor and submitted to the Inspector for final review prior to beginning mobilization to the sites. The requirements for the Contractor's SCP are listed in Section 1.17 of Specification 01 35 32 — Site Specific Health and Safety Plan (**Appendix J**).

Monitoring is a key element in successfully remediating this site. Monitoring will be used to determine whether the remedial strategies implemented have been successful and allow us to make modifications to ensure that the environment is being protected. A proposed Water Quality Monitoring Plan is attached and can be found in **Appendix G**.

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 and will be undertaken in three phases. Phase I was completed in 2010 and 2011, which entailed mostly debris cleanup of drums, hazardous material removal and some building demolition of Contact Lake, El Bonanza/Bonanza and Sawmill Bay sites (no building demolition at Sawmill Bay). Phase II is the largest component of the remedial work and will be completed over three years. Phase III deals with the completion of remedial work at Sawmill Bay which includes building demolition and contaminated soil excavation and treatment. Like the first phase, the third phase will be completed over one season. The Contractor(s) retained for the remediation work will be responsible for the design of each project specific Waste Management Plan that will comply with federal, territorial, and anti-pollution laws, ordinances, codes, and regulations before submission to the Board for approval prior to commencement of site

The contract will be tendered through Public Works and Government Services with supervision from AANDC. Once awarded and work is planned, contact information will be provided to the inspector. Each phase of the remediation project will be tendered separately. The camp and remediation activities will be tendered as one package for each phase. A list of the documents required for submission by the successful Contractor is outlined in the draft specifications for the Environmental Remediation at Great Bear Lakes Sites. The summary table is provided in **Appendix C**.

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

The following studies have been undertaken to date:

Annex – Remedial Action Plan (RAP)

CARD INAC and SEINES Consultants Limited, Silver Bear Mines Remedial Action Plan. March 2008.

CARD INAC and SENES Consultants Limited. Contact Lake Mine Remedial Action Plan. March 2008.

CARD INAC and SENES Consultants Limited. El Bonanza Mine Remedial Action Plan. March 2008.

CARD INAC and Franz Environmental Inc. Sawmill Bay Remedial Action Plan. May 2010.

Traditional Knowledge and Traditional Environmental Knowledge Studies

Silver Bear Mines Remedial Action Plan, Contact Lake Mine Remedial Action Plan and El Bonanza Mine Remedial Action Plan – All remedial action plans contain a section related to the traditional knowledge of the area in which the mining activity has taken place.

Gagos Social Analysts Incorporated and Lands Protection Department, Tłıchǫ Government. 2013. *Denison Ice Road Tłıchǫ Knowledge Study*. Prepared for Aboriginal Affairs and Northern Development Canada. By Allice Legat.

Indian and Northern Affairs Canada (AANDC) 2005a. *Traditional Environmental Knowledge-Silver Bear Properties, Great Bear Lake, NWT, July-August 2005*. Report to Contaminants and Remediation Directorate, AANDC, for the Sahtu Land and Water Board. By J. Vandermeer.

Joachim Obst, AED Consulting 2007. *Summary Report of a Questionnaire on the Cultural Land Use, Wildlife Use and Observations in the Silver Bear Mines Area Before and After 1970*. Prepared for Indian and Northern Affairs Canada (AANDC). January. (Previously referred to as Supporting Document N).

Joachim Obst, AED Consulting 2006. *Field Report on a Reconnaissance Survey of Birds Nesting in Abandoned Structures and Waste Sites at the Silver Bear Mines, Northwest Territories, in July 2006*. Prepared for Indian and Northern Affairs Canada (AANDC). October. (Previously referred to as Supporting Document L).

SENES Consultants Ltd. and Déljıne Renewable Resources Council. 2012. *Denison Road Traditional Knowledge Study*. Prepared for the Déljıne Remediation Office and Déljıne First Nation

Archaeological and Historical Information

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. No archaeological sites were found in any areas of the abandoned sites. Therefore, a license is not required for the proposed remediation work.

The burial site found near Sawmill Bay was documented (e.g. GPS coordinates and pictures were taken). This information was provided to PWNHC so the information could be placed in the database.

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 so they could update their records. There were no heritage interests identified by PWNHC.

Heritage interests were identified by the Northwest Territories Mining Heritage Society. INAC is working closely with the NWT Mining Heritage to address these items that were highlighted.

Other Studies

AED Consulting 2007. Summary Report of a Questionnaire on Cultural Land Use, Wildlife Use and Observations in the Silver Bear Mines Area before 1970. Report to Contaminants and Remediation Directorate, AANDC, January.

EBA Engineering Consultants Ltd. 2006a. *Geotechnical Evaluation for Remediation of Silver Bear Mines*. Prepared for Indian and Northern Affairs, Yellowknife, NT, Canada. February. (Previously referred to as Supporting Document F).

EBA Engineering Consultants Ltd. 2006b. *Overburden Assessment Silver Bear Mines Northwest Territories*. Prepared for Public Works and Government Services Canada. April. (Previously referred to as Supporting Document G).

EBA Consultants Limited (EBA) 1993a. *Site Characterization and Environmental Assessment of Seven Abandoned Mine Sites in the NWT, Volume I and II*.

EBA Consultants Limited (EBA) 1993b. *Environmental Assessment of the Abandoned Contact Lake Mine Site*. Prepared for Public Works Canada, Architecture and Engineering Services Branch. March.

Elbow Creek 2005. *Laboratory Water Treatability Test Results, Silver Bear Mine Site, Draft Progress Report*. March 2005.

Environmental Sciences Group (ESG), Royal Military College of Canada and the Low-Level Radioactive Waste Management Office (LLRWMO), AECL. 1997. *An Environmental Assessment of Sawmill Bay, NWT*

FRANZ Environmental Inc. and EcoMetrix Incorporated, 2007. Preliminary Quantitative Risk Assessment (PQRA), Sawmill Bay site, Northwest Territories. Prepared for Contaminants and Remediation Directorate, Indian and Northern Affairs Canada. December.

FRANZ Environmental Inc. and EcoMetrix Incorporated, 2008a. Phase IIIA Environmental Site Assessment, Sawmill Bay – SM204, Northwest Territories. Prepared for Contaminants and Remediation Directorate, Indian and Northern Affairs Canada. March.

FRANZ Environmental Inc. and EcoMetrix Incorporated. 2008b. Screening-Level Risk Assessment (SLRA), Sawmill Bay – NM 180, Final Report. Prepared for Contaminants and Remediation Directorate, Indian and Northern Affairs Canada. March.

Gartner Lee Limited 2005. *Summary of Water, Sediment, and Soil (Tailings) Data for Contact Lake*. Prepared for Indian and Northern Affairs Canada. May.

Golder Associates 2006. *Drum Sampling and Product Inventory Program*. Prepared for Public Works and Government Services Canada. March. (Previously referred to as Supporting Document E2).

Golder Associates Limited (Golder) 2005. *Enhanced Phase I Environmental Site Assessment (El Bonanza Mine)*.

Indian and Northern Affairs Canada (AANDC) and SENES Consultants Limited 2008a. *Contact Lake Mine Remedial Action Plan*.

Indian and Northern Affairs Canada (AANDC) and SENES Consultants Limited 2008b. *El Bonanza Mine Remedial Action Plan*.

Indian and Northern Affairs Canada (AANDC) 2007. *Silver Bear Mines Remediation Plan – Hydrologic Monitoring Program 2006*. 28 June. (Previously referred to as Supporting Document H). Indian and Northern Affairs (AANDC) 2006a. *Mine Site Reclamation Guidelines for the Northwest Territories*.

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Water Quality Monitoring

AANDC CARD has conducted routine monitoring of at the mine sites since 2003 (Silver Bear) and 2006 (Contact Lake and El Bonanza/Bonanza). A summary of the programs conducted at each site is provided in the report entitled "Great Bear Lake Sites Proposed Long Term, Status of the Environment and Construction Monitoring Plans", available in **Appendix G**.

13. Proposed time schedule.

Start date: July 26, 2015_____ Completion date: July 25, 2022_____

Period of operation (includes time to cover all phases of project work applied for, including restoration)

The remediation work will be completed in three phases as described in Section 4 of this water license application. The immediate need to renew the water license and extend the land use

permit is the proposed risk management activities to complete a drum removal program at the Silver Bear sites in 2015/16. At this time, CARD is unable to provide tentative schedules for the future phases of the remediation program, as they are subject to Treasury Board funding approvals. An update will be provided to the Board once there is more certainty in the project schedule.

- 2010/11 - Phase I was completed and entailed mostly debris cleanup of drums, hazardous material removal and some building demolition of Contact Lake, El Bonanza/Bonanza and Sawmill Bay sites.
- 2015/16 – Consolidation and removal of drums at Silver Bear sites, refine implementation schedule for Phase II and III of remediation.
- 2016/17 – Preparation for Land Use Permit renewal
- Phase II, the largest component of the remedial work, involves the major remedial work for the Silver Bear Mines (e.g. mine closure, non-hazardous waste landfill construction) and the remaining works to be completed for Contact Lake and El Bonanza/Bonanza.
- Phase III deals with the completion of remedial work at Sawmill Bay which includes more building demolition and impacted soil excavation and treatment.

Name (print):___Candace Decoste_____ Signature:_____

Title (print): Acting Project Manager_____ Date: _____

Please make all cheques payable to “Receiver General for Canada”

FOR OFFICE USE ONLY

Application Fee Amount: \$_____ **Receipt No:** _____

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