

Northern Mine Decommissioning – Case Study of Remedial Works for Closure of Port Radium, Canada’s Original Uranium Mine - 10397

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ABSTRACT

This paper provides a case study perspective on key aspects of the remedial activities associated with closure of the former Port Radium Mine site located on the east side of Great Bear Lake, Northwest Territories. The paper provides a brief overview of the process followed to identify environmental and risk management issues, identify remedial objectives and options, develop associated construction specifications and contract documents, and implement the construction works. The case study provides insight into the technical, logistical, and physical challenges associated with implementation of remedial works in northern remote locations and the approach and activities undertaken to meet these challenges.

BACKGROUND

SENES Role

SENES Consultants Limited (SENES) has been involved with the Port Radium mine and vicinity sites since 2000. Initial efforts included undertaking various environmental assessments on under the direction of the Canada-Déline Uranium Table (CDUT) a co-operative initiative to ensure that environmental conditions at the site were appropriately characterized, that site issues defined, and that appropriate remedial plans were developed for the site. Following five years of site assessment and remedial planning, that included consultation with chief and council, as well as extensive community engagement, a final Remedial Action Plan (RAP) was prepared [1]. This document formed the basis for the remedial engineering designs, contract and specifications, as well as project cost estimates for the work. SENES was subsequently retained by Public Works and Government Services Canada (PWGSC) on behalf of the Department of Indian and Northern Affairs Canada, to provide engineering supervision services for the remedial site works. SENES is currently carrying out the long term monitoring program for the remediated site.

Location and History

For the purposes of this paper the “Port Radium” site is considered to consist of three closed mines located on the eastern shores of Great Bear Lake in the Northwest Territories, approximately 440 km north of the City of Yellowknife and 265 km east of the Community of Déline (see Fig. 1a).



Fig. 1a. Map showing location of Port Radium.

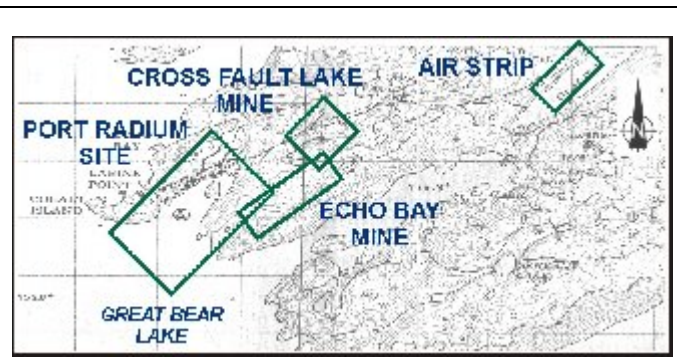


Fig. 1b. Port Radium Mine Site Key Plan.

Fig.1. Location and Vicinity Maps.

The three mines include: the original Port Radium mine located on Labine Point, the Echo Bay mine located at end of Labine Bay and the Cross Fault Lake mine, located about 2 km in-land from Great Bear Lake (see Fig. 1b). After initial mining in the 1930's, the mine sites were operated through a crown corporation (Eldorado Mining and Refining) from the 1940's until the 1960's.

The mineral claims were transferred to Echo Bay Mines Ltd. in 1964, which operated the Echo Bay mine to 1974, and then re-worked the Port Radium mine to 1982.

The Port Radium was initially established as a radium mine, but uranium and silver subsequently became the main minerals of interest. In the early days of radium and uranium mining, ore was transported by boat and barge across the waterways while in later years, ore/concentrate was transported off-site via barge to Sawmill Bay and transported to southern Canada by air transport.

The mines have undergone two prior decommissioning programs. The first was completed in 1962 by Eldorado Mining and Refining, and included the decommissioning of the underground mines and removal of some of the major equipment but left the mill and camp site. The second program was done by Echo Bay Mines Ltd. in 1982 at which time most of the mine site structures were demolished, equipment removed, shafts and adits secured, and some areas with elevated gamma radiation were covered with waste rock. In both cases, the decommissioning was carried out to the standard of the day. The remaining structures included several small sheds and cabins at Port Radium and Echo Bay and a headframe and cabins at Cross Fault Lake.

After cessation of operation, the sites had returned to the Government of Canada, which had custodial responsibility for the existing environmental liabilities on the property. The Contaminants and Remediation Directorate (CARD) of Indian and Northern Affairs Canada (INAC) currently manages activities at the site.

Community Concerns

As a result of past activities both at the site and in association with ore/concentrate transportation, the community of Déline expressed significant concerns about any existing or potential environmental contamination, in particular concerning past, present or potential future exposure to radiation as well as other sources of contamination related to the operation of the mines. The community of Déline brought these concerns to national attention in the late 1990s, and the Crown and Déline agreed to move forward in a collaborative manner. As part of this agreement, the Crown formed an interdepartmental committee between INAC, Health Canada, Natural Resources Canada, as well as GNWT Health and Social Services with INAC taking the lead. CDUT was formed to carry out studies under the advice of the Déline Chief and Council and the interdepartmental committee to provide a joint process by which the people of Déline could have their concerns addressed.

The CDUT operated from 2000 to 2005 and made twenty-six recommendations which were accepted by the Déline Chief and Council and INAC. Under the direction of the CDUT, a RAP was developed by SENES that presented the CDUT's preferred options for remediation at the site. The remedial action plan was the outcome of a unique, wide ranging, and intensive co-operative effort between Canada and Déline that consolidated the results of five years of efforts including environmental site investigations, human health and ecological risk assessments, iterative presentations of potential remedial options, and integrated these scientific principles with traditional knowledge and community values.

The remedial action plan for the site comprised the following physical works; closure of the vertical and horizontal mine openings present at the three mine sites; installation of an engineered cap over the former Silver Point Tailings Containment Area; demolition of the structures remaining on-site; management of designated substances such as asbestos applications; construction of a landfill to contain the demolition debris; placement of a cover over areas identified as having elevated gamma radiation levels, recovery and management of petroleum impacted soils encountered on-site and undertaking a verification program to confirm that the concerns associated with radioactive and petroleum hydrocarbon (PHC) impacts had been appropriately mitigated.

THE LIFE CYCLE OF THE PROJECT

As with any project, there first has to be a challenge or problem to solve. The challenge in this case was defined as the desire of Déline and the Crown to ensure that the Port Radium site was decommissioned in a manner that minimizes its potential impact on animals, the environment and human health and safety. To this end, the remedial program was undertaken in eight stages similar to any other civil or remediation project, namely:

1. define existing or potential concerns through site assessment and investigation;
2. develop remedial options, evaluate preliminary engineering plans and costs, and present the preferred action plan;
3. develop cost estimates based on the preferred remedial option;
4. prepare final remedial engineering and tender documents;

5. commence bidding process, evaluate the submitted bids, and award the work to the most qualified bid;
6. undertake the remedial works;
7. prepare closure documentation and present findings to project stakeholders at completion of the closure works; and,
8. implement post remedial short and long term monitoring as identified in the RAP and outlined in licensing requirements.

The first three stages of the Port Radium remedial project were completed by SENES under the direction of the CDUT commencing in 2001 through to 2005. The site characterization work focused on the afore-mentioned issues and the results can be found in a series of SENES reports [2, 3, 4, 5, 6] while the RAP, which was prepared on the basis of these investigations, can be read in more detail in reference SENES/CDUT 2005 [1]. Stages 4 to 7 were undertaken under the direction of PWGSC who retained SENES to oversee the preparation of the Class A remedial cost estimate, the remedial tender documentation, assist with the tendering process, and provide contract supervisory services for the duration of the remedial program. The final stage of the project will be undertaken once the remedial program for the Port Radium site has been completed. A more detailed discussion of the work items involved under the various stages of the project is presented in the following sections.

DETAILS ON RESPECTIVE STAGES OF THE WORK

Stage 1 – Site Assessment and Characterization

As part of the CDUT's mandate, it oversaw the necessary site investigation programs to determine the extent of the environmental concerns that pertain to the Port Radium mine. The 2001 and 2003 site investigations were used to develop the human health and ecological risk assessments and remedial options [2, 3, 4, 1]. Information on the findings of these programs was provided to the Chief and Council through various forums including public meeting and CDUT presentations commencing in 2002 through to 2005. In summary, the results of the investigation work showed that while minor risks existed, additional remedial work could be carried out, in keeping with the As Low As Reasonably Achievable - Economic Factors Considered (ALARA-EFC) principal, to reduce potential site risks and reduce site hazards in keeping with today's decommissioning standards with respect to radiological, chemical, and hazard exposures associated with soil impacted by poly-halogenated compounds (PHC's), designated substances, remnant structures, horizontal and vertical mine openings, and cleanup of residual debris.

Stage 2 – Remedial Action Plan

Further to the findings of the 2004 and 2005 site assessments, SENES prepared a remedial options discussion report that reviewed a range of remedial options available to address the environmental and physical concerns identified. This process included a review of the initial concepts by the Crown, preparation of cost estimates for various remedial options, community presentations to outline what was being considered and gain community input and feedback on the remedial options. The results of the dialogue between all the stakeholders was captured in the document entitled *Port Radium Mine Remediation Plan* [1]. The details of the remedial action plan can be found in the aforementioned report.

Stages 3 & 4 – Preparation of Engineering and Tender Package and Class A Cost Estimate

Once the detailed scope of work was agreed to by the project stakeholders and the technical aspects of the work assessed and the detailed design completed, the preparation of the technical specifications in the National Master Specification (NMS) format was relatively straight forward. With the exception of the environmental components, the preparation of the specifications was no different than for a conventional demolition and earthworks project. The one change that did take place during the development of the technical specifications was the Treasury Board directive to convert from the old NMS specification to the new 2004 format. This was the first tender package prepared by PWGSC Western Region using the new format and thus both the PWGSC and SENES teams responsible for the preparation of the specifications had to work through the new technical sections, which were named and numbered so that these sections could be used in future works. A copy of the project Table of Contents can be found in the project tender documents [7].

As with most projects, the specifications were developed over a period of time with milestones set for review periods. Review submissions were provided at the 75% and 99% completion intervals. Some of the challenges faced in completing the submissions included: the evolving NMS number system and methodology for defining the basis of payment and scope of work which resulted in multiple changes to the description of work and potential additional work; the lack of detailed topographic mapping for baseline engineering site plans for some of the work areas; as well as the uncertainty surrounding site potential mobilization/demobilization approaches and how to include this in the specification (e.g. should a winter road specification be included or not). While it was understood that the scope of work was not be entirely defined at the time that the specifications were started, it is normally expected that by the 90% completion stage that the majority of the issues between the project stakeholders are resolved. Due to the complexity of the multiple interests associated with this unique site this was not the case for all project aspects which resulted in significant challenges to the project team.

In addition to the considerations noted above, the development of the specification also required time for feedback by the project stakeholders reviewing the specifications submissions. Given the change from the earlier version of the NMS specifications to the new 2004 version, and also the care needed to be undertaken during the review process by the Crown in keeping with its due diligence and risk management assessment process required additional time to complete as compared to private sector remediation projects and multiple iterations of the specification. Once the specifications were completed to the satisfaction of the stakeholders and issued for construction, a complete set of tender documents was prepared for distribution to the marketplace for bidding. Initial estimates of potential costs associated with various approaches and activity levels to decommission the Port Radium mine site proper were developed as early as 2001. These estimates were revised over time to reflect the inclusion of additional sites and the selection of the final remedial action plan recommendations.

The Class A cost estimate was prepared once 99% of the specifications were completed. The process involved taking the individual tasks, as defined under the different sections of the specifications, and developing the costs for the work. A first principles approach was used for

this work with anticipated crew sizes, equipment and duration of work estimates made based on corporate experience with similar remedial projects. The largest uncertainty for SENES in preparing the Class A cost estimate was not with respect to the actual on-site work components, but rather with the approach to mobilization and winterization of equipment. The issues that needed to be considered included whether or not to mobilize using winter roads, and if so, which of two routes would be utilized, and what allowance and risk premium to apply for weather conditions. Cost estimates for mobilization and demobilization were considered explicitly as separate line items that could be used in the estimate as appropriate. Weather related aspects were accounted for in the cost estimate by applying a multiplier to the work. The other major uncertainty was related to winterization costs for stranded major equipment components which are directly related to equipment inventory, the work schedule, and the manner in which the contractor would choose to mobilize/demobilize from the site.

For the purpose of the estimates we made assumptions in all of these areas in the absence of a contractor bid and schedule. In addition, no formula was specified for calculation of winterization rates for the work. This was an area with potential for a large spread in bid prices to exist between what was estimated and what was submitted in a tender bid price.

Stage 5 – Tender Period Support

Once the tender documentation has been presented to the market place it is standard industry practice to have a site visit and bidder's conference where the owner, in this case the Crown, can present information on the site and give the contractors bidding on the work a chance to see the site conditions to better understand the scope of work detailed in the tender documents. It was initially anticipated that the remedial site works would be initiated by the winter of 2006 and as such a site visit was coordinated by PWGSC in the fall of 2005. At this time, the potential bidders were given the opportunity to visit the site prior to bidding on the work. As part of the site visit the Port Radium mine and the Echo Bay sites were visited; however, the group did not get to Cross Fault Lake due to the time required to visit the other sites and the fact that access to the mine site was across water. Due to a variety of reasons, it was decided to delay the release of the project tender package until the fall of 2006 for work in 2007.

As part of the tender process, a bidder's conference was held on 6 November 2006 in Yellowknife. This conference was hosted by INAC and PWGSC with SENES providing expert advice. Representatives from the Land Claimant Group which included the Chief of Déline First Nations and the President of the Déline Land Corporation were in attendance at the bidder's conference. At the bidder's meeting, the project team and stakeholders were introduced, the particulars of the contracting process were explained along with the bid evaluation process, and details of the technical specifications and RAP were presented by both the PWGSC project manager and SENES staff. The attendees were also provided with a pictorial overview of the mine sites along with photographic details and verbal descriptions of the various components of the work referenced within the photographs provided by SENES staff. Following the review of the work and the presentation, the floor was opened to questions from the contractors. These questions along with the applicable answers were recorded and a complete set of questions and answers from the bidder's conference were formally prepared as a stand alone document that was issued as an addendum to the tender documents.

After the business of the bidder's conference was concluded, the floor was opened to Mr. Leroy Andre, President of the Déline Land Corporation, to give a presentation to the contractor's present regarding the aboriginal benefits plan within the evaluation criteria for the remediation tender package and the desire of the Déline community to see that the remedial works were carried in accordance with the recommendations of the CDUT and outlined the abilities of the people of Déline and the opportunities available to contractors who were interested in partnering with the community in preparing their respective bids and carrying out the work. While this presentation by Mr. Andre of the Land Corporation at the bidder's meeting was not typical of more conventional private sector remediation or construction projects with which we were familiar, it illustrated the commitment of project participants to ensure that the interests of the people of Déline in being part of the solution were clearly articulated during the contracting process. One of the objectives of the Contaminated Sites Management Policy (August 2002) is "to promote the social and economic benefits that may accrue to First Nations, Inuit and northerners when carrying out activities required by this policy". This issue is further discussed later in this paper under the heading of Aboriginal Considerations.

A short period of time after the bidder's meeting the prospective contractors submitted their bids to PWGSC as per their contracting process. SENES staff members were not part of the team that evaluated the respective bids submitted to the Crown and as such we can not comment on the particulars of how the marking was assigned for the bid evaluation. It is our understanding that the bids were evaluated on the basis of technical merit, staff and equipment availability, the methodology outlined for the remedial work, the project schedule, aboriginal content (consistent with the Sahtu Dene Comprehensive Land Claim Agreement) and cost as outlined in the supply arrangement documentation provided by PWGSC as part of the bid package. The evaluation of the respective bids was undertaken by the Crown, who on the basis of the marks achieved by the respective contractors, selected Aboriginal Engineering Limited (AEL) as the prime contractor for the Port Radium contract.

During a separate and subsequent bidding process the SENES team was selected as the Consultant to provide site supervisory services, on behalf of PWGSC, for the remediation contract. The SENES team primary objective was to ensure that the contractor met its contractual obligations and that the implementation of the remediation program was met the overall project goals. As discussed in the next Stage, -SENES staff, pursuant to the kick-off meeting, were involved in all supervisory aspects of the remediation work implementation.

Stage 6 – Implementation of the Work

The implementation of the project involved: a kick-off meeting to introduce the stakeholders to the project team; review and adjustment of the project schedule; completion of the required contractual submissions (including an inventory of materials remaining on site); initial mobilization to the site; completing the work required in a sequence that in theory should make the best use of the labour, equipment and materials on site to complete the work in the most time effective manner; and, once the work is completed to the satisfaction of the owner, demobilization from the site. In the case of northern projects the logistics of getting labour, equipment and material to these remote mine sites is often one of the most critical and costly

aspects of the work. Comments on each of these aspects are provided below.

Prior to the SENES team being retained to provide resident engineering services a kick-off meeting for the project took place in Yellowknife in early January 2007. PWGSC chaired the meeting with INAC and AEL in attendance. The meeting introduced the project team, defined the roles and responsibilities of key personnel, set out the lines of communication and project status, updated and reviewed proposal costs, contracting requirements, submittals and set future meetings.

Prior to the contractor mobilizing their forces to the site, all the contract submissions required at this phase of the project were submitted to PWGSC. SENES staff, on behalf of PWGSC, completed a detailed review of the submittals and worked out any required changes with the prime contractor (AEL). This component of the work took upwards of three months to complete to the satisfaction of the project engineer, with some submittals, such as the project health and safety plan, requiring multiple iterations to ensure that the conditions of the contract as set out in the technical specifications were satisfied.

Once the issue of the submittals was addressed, the contractor's full attention was set upon mobilizing to the site. For the Port Radium project, the contractor selected the option of mobilizing their equipment and materials via Déline to take advantage of the existing winter roads which are constructed for the community each year. The intent was to use lands within Déline as a staging area prior to the next stage of the mobilization. From this staging area, rather than construct an expensive winter road across Great Bear Lake (the Lake) the contractor chose to bring a sectional barge to Déline by which large equipment and bulk materials would be shipped across the Lake once the ice had thawed (see Fig. 2a).



Fig. 2a. Port Radium Barge Mobilization.

Fig. 2b. Ice on Great Bear Lake June 2007.

Fig.2. Mobilization.

The contractor also planned to contract a barge that already operated on the Lake by Plummer's Lodge. The concern with this approach from the outset of the work was how this method of mobilization would impact the schedule of work given the already short construction season in the north. The contractor had submitted a 120 day schedule as part of their bid, however, due to the concerns with when the ice might come off the lake, the contractor was asked to provide both a best case and worst case scenario schedule. As it turned out the ice did not come off the lake until mid July and the barge mobilization did not commence until late July 2007 (see Fig. 2b).

The challenges that arose from this hurdle were related to the sequence of work and which pieces of equipment and materials were most critical to the completion of the work given the three to four day turn around for each barge trip. The contractor established their priorities and mobilized the materials accordingly.

Although the contractor could not mobilize the majority of their heavy earthmoving equipment and hydraulic shovels until the ice was off the Lake, this did not prevent the contractor from commencing the work. To the credit of the contractor, they mobilized via aircraft to the site as soon as possible. In late May 2007, the contractor was on site setting up their soft camp and started the remedial works that could be done manually and through the use of small equipment that could be airlifted. This work included asbestos abatement work at Port Radium and Cross Fault Lake, general cleanup and demolition of the small structures. Once the airstrip at Glacier Lake was in good enough condition to allow a Buffalo Aircraft to land, a rubber tired backhoe (completely stripped down) was brought to site and reassembled (see Fig. 3a). The backhoe arm, bucket, cab and chaises were dismantled at the Buffalo air base and flown to Port Radium in three flights. Mechanics were flown to the sight to re-assemble the backhoe, requiring helicopter assistance for mounting the cab assembly. With this piece of equipment, the mine openings at the Port Radium and Echo Bay mine sites could be investigated and the design process for the respective mine caps started (see Fig. 3a).



Fig. 3a. Small Equipment Mobilization.



Fig. 3b. Cross Fault Lake Headframe Demolition.

Fig. 3. Mobilization and Demolition.

During the initial phases of the camp set up the contractor working with SENES staff undertook the necessary material inventory and waste audit work required under the terms of the contract. At this time the detailed demolition schedule and audit, a hazardous material audit, and a waste disposal Workplan for removal of hazardous materials off-site was submitted.

The early mobilization allowed the contractor's initial labour force to carry out the designated substance removal prior to the bulk demolition and earthmoving works. ATV and ATV trailers were also airlifted to the site to permit transport to and from the 7 km to 10 km worksite. As the nature of the remaining onsite mine structures was mostly wooden, including the Cross Fault Lake headframe, the structure demolition was carried out largely by the initial labour force (see Fig. 3b).

In parallel to the initial mobilization and field work, in early June 2007, the contractor conducted a 6-week Heavy Equipment Operator (HEO) training program in Déline. The training program, partially funded by INAC, was undertaken to provide suitable operators from the Déline community. Trainees were instructed on the operation of the heavy equipment being staged in Déline. As a part of the training program beautification projects were completed for the community.

The first barge run arrived at the site on 26 July 2007. The arrival of the heavy equipment signaled the start of the bulk remedial works including:

- placement of the radiation cover;
- demolition of the remaining structures;
- construction of mine openings;
- installation of engineered cover at Silver Pt.;
- mitigation of the PHC impacts; and,
- fencing of the crown pillar areas of concern.

Fig. 4 provides some photographs of the remedial works.



Fig. 4a. Asbestos Abatement CrossFault Lake.



Fig. 4b. Capping of Mine Opening.



Fig. 4c. Engineered Cap at Silver Point.



Fig. 4d. Crown Pillar Fencing Dumpy Lake.

Fig. 4. Remedial Works Underway.

Throughout the course of work the contractor's workforce was comprised mostly of individuals from the local community of Déline. Typically, the workforce composition included the contractor's field engineer, superintendents, mechanic, site medic and surveyor whom were non-aboriginal northern workers, and the remaining workers including foremen, HEO trainees, labourers, camp staff and wildlife monitors were Déline First Nations people from Déline. The overall social and economic benefit to the community of Déline was understood to be very positive. Younger workers received valuable training in construction/site-remediation projects and the process allowed members of the community first hand participation in the reclamation of the storied land. The project provided the Déline residents with job opportunities and a change to gain some training in remedial works and as such this was a significant benefit to the local community.

Logistical and physical challenges associated with the remoteness of the remedial site were observed throughout the duration of the project work. The harsh northern winter conditions did not permit cost-effective remedial work beyond the short summer months. As seen during the Port Radium Remedial Program, the late ice break-up on Great Bear Lake delayed the mobilization of the full equipment fleet via barge until July 2007 thus reducing the effective work schedule further to only eleven weeks. Given the shortened construction season and the prohibitive mobilization costs it was imperative that sufficient resources be allocated to the work in order to ensure the completion of the remedial work in one field season. In order to achieve this timeline, additional equipment and parts were mobilized to the site so as to minimize equipment down time during the course of the field program; however, this effectively increased the project costs. Throughout the duration of the Port Radium Remedial Program equipment breakdowns and associated down time due to the limited supply of spare equipment parts resulted in the work sequence having to be rearranged thus introducing inefficiencies to the work program and project schedule.

Based on this case study, it is important to prioritize contract risks during the proposal evaluations. The use of the barge mobilization saved significant mobilization costs, but was subject to Lake break-up and that presented little float in the project schedule to account for delays or extension to the work. However, the barge demobilization will not occur until July 2008, giving allotment for the remaining work to be completed. Therefore, if project completion schedules have time flexibility and do not have significant cost implications, unlike typical urban site remediation projects, the priority of risks as seen in Port Radium can be accommodated as long as shareholders recognize and communicate to that effect.

Stage 7 - Closure Reporting

The closure reporting for the Port Radium Remediation Contract included a combination of regulatory submissions required for INAC to close out permits such as the land use permits and quarry permit and completion of a report that summarizes the work undertaken on site with reference to the requirements of the technical specifications for the work which were developed with a mind to address the concerns outlined in the project RAP.

The summary report for the project also addressed contract issues such as aboriginal content and material quantities and identified where the work completed differed from the technical specifications with an explanation as to why these changes were necessary. In completing the contract work the contractor prepared As-Built drawings for the site using site surveys to provide the necessary level of detail on the site drawings. These As-Built drawings were included in the report. Quality Control and Quality Assurance documents were also discussed and appended to the report. The summary report also included the radiation survey confirming that areas of elevated gamma radiation had been appropriately covered with soil and/or rock meeting the remedial requirements for the site.

Stage 8 - Monitoring Program:

As with most projects, whether construction or remedial in nature, there is typically a warranty or monitoring period during which the site is monitored to ensure that the works are performing as intended. For the Port Radium mine a specific post closure Long Term Monitoring (LTM) program had been developed by SENES for INAC in support of INAC's application for a Waste Nuclear Substance License (WNSL) from the Canadian Nuclear Safety Commission (CNSC) for long term monitoring of the site. The LTM program involves assessing the state of the remedial works through periodic inspections of the site as well as water sampling in and around the site area, to ensure that the remedial works are providing the level of protection expected from the design.

Other areas outside the limits of the WNSL are also inspected and sampled as part of the LTM to confirm that the closure works have addressed the issues of concern in these areas. An example of this is the monitoring of the crown pillars in the Port Radium area. The condition of the crown pillar at the Echo Bay mine site as well as the Dumpy Lake area of the Port Radium mine site which have been fenced off, will require continued monitoring as the costs involved in decommissioning these parts of the abandoned mines are prohibitively expensive given the limited potential for harm to human to wildlife in the area.

ABORIGINAL CONSIDERATIONS

The Port Radium mine site has long been a legacy site in the Sahtu settlement lands. As a result of the past mining and associated industrial activities and with concerns brought to the forefront by the Sahtu aboriginal communities, as discussed in the earlier sections, the formation of the CDUT was intended to identify issues and develop paths forward to address these issues. The concerns raised by the community were articulated through the CDUT process which identified both human health and ecological concerns and the desire of the community to actively participate in the planning and implementation of remediation action associated with the site. The RAP was developed under the guidance of the CDUT with the inclusion of traditional knowledge and risk based ecological and human health assessment. Significant community consultation was carried out and documented in the INAC Mine Remediation Plan.

As discussed earlier, INAC policy for northern work mandates social and economic benefit to local communities. The participation of Déline workers during the course of the site investigation as well as the remedial program has gone a long way in providing the residents

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with valuable experience in site remediation projects and help with the overall day-to-day understanding and acceptance of the remediation program for the Port Radium site.

From our perspective we believe that the people of Déline, including the community leaders, were well informed of the progress of the work with the community liaison officer present during the planning process and during most of the construction progress meetings held either on site or via teleconference. To our knowledge this system worked well and allowed the community a chance to keep informed with respect to the progress of the remedial activities throughout the duration of the project. The effect of such communication was immeasurable with respect to assisting the community deal with their legacy issues as they concern the Port Radium site.

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