

Early Progress in Building Confidence and Partnerships with Northern First Nations and Communities in Low-Level Radioactive Waste Remediation Projects in Canada - 11321

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ABSTRACT

In 1982, the Government of Canada established the Low-Level Radioactive Waste Management Office (LLRWMO) as Canada's agent for the management of historic low-level radioactive waste. Occurrences of historic waste have been discovered across Canada. The LLRWMO has conducted remediation activities in Port Hope, ON, Toronto (Scarborough), ON, Vancouver (Surrey), BC, Fort McMurray, AB, Tulita, NT, and various other locations across the country.

At this time, a key area of focus for the LLRWMO is putting in place a strategy to address sites in Canada's north that were contaminated, long ago, by the spillage of radioactive ores in transport. The contamination is located along what is known as the Northern Transportation Route, a 2200 km long route of lakes, rivers and portage points beginning at the former Port Radium site on Great Bear Lake, NT and extending to Fort McMurray, AB.

To carry out its work in the north, the LLRWMO is adapting methods of community engagement and technical approaches that have led to successful remediation projects in Canada's southern regions. Adjustments are being made to meet the realities of the north. Those realities include the challenges of Canada's northern geography and environment and the need for understanding the ways of northern peoples. Currently, dialogue has begun with three First Nations and communities in order to plan the remediation of sites located along the Slave River in the South Slave Region and on the shores of Great Bear Lake and the Great Bear River in the Sahtu Region.

This paper will present the challenges of planning and advancing the remediation of these northern contaminated sites and the approaches that are being used to address those challenges.

INTRODUCTION

Since its establishment in 1982, the LLRWMO has achieved success in the remediation of historic radioactive waste in multiple communities across Canada [1]. Historic waste is defined for policy purposes as low-level radioactive waste (LLRW) that was managed in the past in a manner no longer considered acceptable but for which the owner cannot reasonably be held responsible and for which the federal government has accepted responsibility for its long-term management.

Established as a separate unit of Atomic Energy of Canada Limited (AECL), the foundation of the LLRWMO has been technical competence in the area of low-level radioactive waste management. However, the key to its successes has been the LLRWMO's ability to adapt an approach of community engagement that involves confidence building and partnering in a variety of communities.

This is a matter of communications style and the actions taken by the parties involved, mutually or independently, yet in a consensus mode. Confidence develops as partners deliberate together on solutions to solving mutual problems and confidence grows as a record of achievement accumulates.

Of necessity and with experience, this approach has supplanted traditional approaches from the 1980's that relied solely on prescriptive technical solutions. Waste management and environmental remediation practice has progressed from a Decide-Announce-Defend (DAD) model of implementation in Canada, through early stages of community engagement and empowerment, to a model of community partnering and volunteerism.

The key challenge to successful resolution of waste management and environmental remediation issues is defining a long-term management approach that is technically and environmentally robust and has public confidence. Furthermore, the process of safe remediation has also been important. The context has always included environmental and health concerns. Usually there is a need for the parties to establish a common knowledge in order to successfully communicate and problem solve together. These remain reoccurring needs as locations, geography and cultural settings change.

Experience to date has included work undertaken in southern and northern Canada at Scarborough (Malvern), Port Hope, Fort McMurray, Fort Smith, Bell Rock, Hay River, Tulita, Sawmill Bay and the Deline area. Stakeholders have included individual land owners and users, communities, municipalities, provincial and territorial bodies, organizations, Métis people and First Nations. NRCan and the LLRWMO's latest efforts in environmental remediation and long-term waste management are taking place in Canada's north. While the fundamentals remain the same-finding technically and environmentally robust solutions that have public confidence, the working environment provides its own physical, environmental, and social challenges and opportunities.

HISTORY OF ORE HAULS AND CONTAMINATION ALONG THE NTR

The Northern Transportation Route (NTR) was the 2200 km marine and portage route used, beginning in the 1930s, to haul pitchblende ore from the Port Radium Mine in Canada's Northwest Territories to the community of Waterways (today Ft. McMurray) in the province of Alberta. The ore was then shipped approximately another 3000 km, by rail, to Port Hope, Ontario in southern Canada on the shores of Lake Ontario, where it was refined, initially, for its radium content that was used in medical treatments and, later, for its uranium content. At times, aircraft were used to transport ores from the nearby Sawmill Bay airstrip to the South. Figure 1 shows the location of the NTR in Canada.

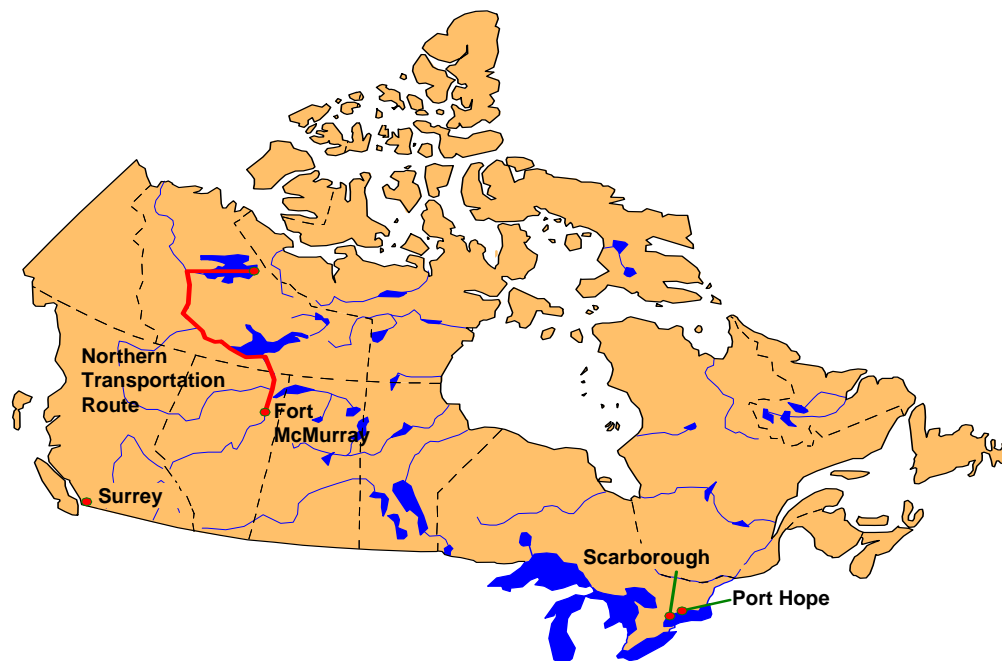


Fig.1. The Northern Transportation Route.

Communities Impacted

Since the beginning of mining operations at Port Radium, the Dene people of the Sahtu (Great Bear Lake area) provided crucial support services to the mine and in the transportation of goods to and from the site [2]. The families that traditionally lived and traveled on that side of the lake were among the first Dene to work for the Port Radium mine. They provided lumber for fuel and building material, as well as fresh meat and fish to the increasing numbers of non-Dene living there. These services were provided until the closure of Port Radium as a uranium mine in 1960. Dene families did not reside at the mine but stayed nearby, sometimes in close proximity to the site. While the men did most of the work as loggers and hunters, women worked alongside their husbands, hauling logs, preparing meat and making clothes and crafts to sell at Port Radium.

Dene people also played an indispensable role in the seasonal transportation of goods to and from the mine. Goods as well as ores were barged across the Great Bear Lake to the head of the Great Bear River, and then transferred to smaller, river-going vessels. Portages along the river necessitated the transfer of freight across land and back onto boats. This labour was done manually until 1950, when the work became somewhat easier with the introduction of pallets and forklifts. Dene men worked as “ore carriers” at these sites along the Great Bear River during the months when the lake and river were passable (July-September), and their families often lived at the sites with them. Others worked as deckhands and river-boat pilots.

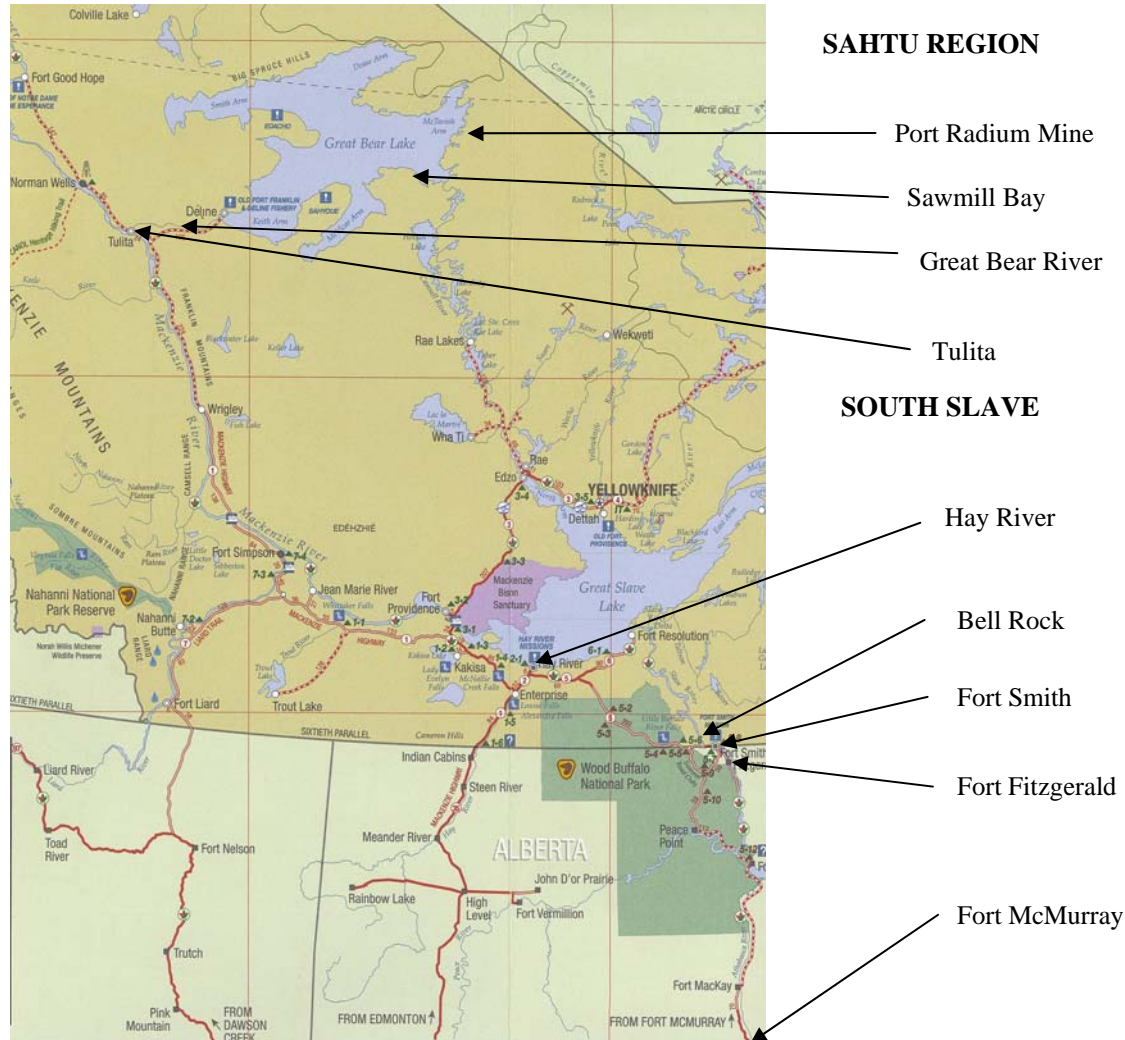


Fig. 2. Sahtu and South Slave Sites on the NTR.

During the period from the 1930s to the 1960s, the ore was shipped by barge from the eastern shore of Great Bear Lake, Northwest Territories, through a system of lakes and rivers to docking sites at Waterways, Alberta. The route traverses many communities and jurisdictions.

Contamination occurred at several points along the NTR, typically as a result of accidental spillage of materials, primarily at the transfer points and portages where the ore was moved from one form of transportation to another. Beyond the contamination of lands along the NTR, there also was contamination of equipment—boats, barges, and aircraft, used for the haul. Such transportation equipment was used and stored at scattered locations in the North. Most of the equipment from these earlier times is now out of service and sites have been abandoned.

In the early 1990s, the LLRWMO identified a number of uranium ore-contaminated sites along the NTR. This contamination was centred in two areas of the NTR: the Sahtu Region in the north in the vicinity of Great Bear Lake; and the South Slave Region along the Slave River in the south. It was also found at Fort McMurray – the terminus of the NTR. Figure 2 illustrates the NTR and the locations of contamination in the Sahtu and South Slave regions.

Formal dialogue has now begun with three Dene First Nations and communities planning the remediation of sites located along the Slave River in the South Slave Region and on the shores of Great Bear Lake and the Great Bear River in the Sahtu Region.

Early Fact Finding and Discovery

In September 1991, consultants were retained by the Low-Level Radioactive Waste Management Office to conduct a radiological assessment of suspected radioactive contamination at specific sites in Fort Franklin (now Deline) and Yellowknife, Northwest Territories. The sites were suspected to have been contaminated by uranium ore being transported from the Port Radium mine.

The LLRWMO had been contacted, in the spring of 1991, by the Inuvik Regional Health Board (IRHB) to provide technical assistance in determining the possible presence of radioactive contamination at two associated sites: 1) at the former Northern Transportation Company Limited (NTCL) Bear River Landing dock; 2) and the nearby merchant vessel Radium Gilbert aground in a small bay some 1 to 2 km from Deline. The Radium Gilbert had been used to pull barges loaded with uranium ore across Great Bear Lake. The former NTCL Bear River Landing dock at the head of the Great Bear River was located where the Radium Gilbert's cargo was unloaded and transferred to smaller barges for the trip down the Great Bear River.

A preliminary radiological survey of the Radium Gilbert by IRHB staff in 1989 had found above background gamma radiation levels in certain areas of the vessel. The LLRWMO was asked by the IRHB to conduct a comprehensive radiation survey of the vessel and determine the nature of the contamination (if any) and what steps were needed to resolve the problem. In addition, discussions with a former crew member from the Radium Gilbert identified the potential for contamination on a dock in Yellowknife that was constructed with barges that reportedly once hauled uranium ore. Technical assistance to resolve this potential problem was also requested.

Consultants conducted radiological investigations at the Deline sites and inspected the dock at Yellowknife during September 1991. Rock with elevated levels of radioactivity, used as aggregate in the concrete floors of the toilet areas and shower stall, was found to be the source of the above background gamma radiation levels on the Radium Gilbert. A surface gamma survey of the Bear River Landing dock and surrounding area identified isolated point sources of elevated gamma radiation, due to spillage of uranium ore; however, no contamination was found on the timbers of the dock. In Yellowknife, two NTCL “200” series steel barges were found in use as floating docks by a local yacht club. The steel construction of the barges and their long-term exposure to the elements made it highly unlikely that radioactively contaminated material was present on the barges.

The discoveries of elevated radioactivity levels on the Radium Gilbert vessel and at the Bear River Landing prompted a review of the entire historic uranium ore transportation network in the Northwest Territories by the LLRWMO and its consultants. Through discussions with NTCL in Edmonton and museum staff at Norman Wells and Fort Smith, the details of the historic uranium transportation system from the Port Radium Mine on the east shore of Great Bear Lake to the rail head at Waterways (now Fort McMurray) Alberta were established. Through a progressive series of discussions, open houses and meetings over time with many local individuals and groups in NTR communities, much local information and many clues were discovered revealing the history, events, and practices of the time and potential locations of interest for investigation.

In August and September 1992, consultants under contract to the LLRWMO conducted radiological investigations of 10 vessels, three former warehouse sites, two portages, seven dock/transfer sites, one outside ore storage area, and a number of steel barges used by the NTLC for the transportation of the uranium ore. No low-level radioactive contamination was found on any of the vessels or steel barges. However contaminated building materials and/or soil were found at most of the dock/transfer, warehouse, and storage sites [3]. Discrete pieces of uranium ore were also found. The LLRWMO continues to actively monitor these NTR sites as part of its management of the contaminated soils to ensure soils are safely managed, are not further distributed and do not impact the public or the environment.

REMEDICATION OF SITES TO DATE

Subsequent to the initial discovery of contamination along the NTR, the LLRWMO initiated its program of gamma radiation surveys at potential transfer points along the NTR. Coincident with these surveys the LLRWMO removed and consolidated contaminated soil from certain properties in Tulita, Fort Smith, Hay River and Fort McMurray. The contaminated material, where consolidated locally, was placed in temporary storage mounds where annual inspections are conducted by the LLRWMO to demonstrate good management and a safe environment for local residents. Small volumes of licensable material were also removed from Hay River in 1998 and from Sawmill Bay in 1997. As well, two radium “300” series barges were decontaminated in Hay River resulting in the removal of three sea containers of waste in 2003. An updated status report including these NTR activities was prepared in 2005 [4]. Remedial activities at Tulita, Fort Smith and Fort McMurray are presented below.

In each of the communities where remediation is required, the same general approach is applied. At some communities the sequence of steps is still underway. The steps generally include, as appropriate: initial fact finding and consultation, environmental surveys and waste delineation, interim selective removal or consolidation and finally, planning and implementation of full remediation and long-term management. Each of the steps involve consultation and joint planning with community stakeholders. It is recognized that the initial consolidation mounds, such as the early cells or mounds at Tulita and Fort Smith, were a short term solution to the contamination problem and that a more comprehensive and longer-term approach to the management of the contaminated material is necessary.

Generally the remedial approach is aimed at gaining appropriate control and putting in place appropriate management of the contaminated materials as soon as possible, reflecting the appropriate level of concern and response. Often, at very low contaminant concentrations or when contaminants are not likely to be accessed or inadvertently relocated or distributed, interim measures and identification are sufficient to meet environmental and social needs in the short term. Full remediation for the long term can be planned and optimized subsequently. Also, removal of licensable levels of contaminants, whether removed early or removed later as part of the long-term remediation strategy, is a practice that is used to advantage. The LLRWMO currently manages a number of mounds of residual or marginally contaminated soils in Canada resulting from this practice. Such engineered mounds of stored material of no regulatory concern (or Below Regulatory Concern-BRC) can be maintained easily and impact local community settings in only the most minimum way, even in the long-term.

Remediation at Tulita, NT

During the 1992 inspection of transfer points along the NTR by the LLRWMO it was discovered that during a wintering-over period in the Hamlet of Tulita in the early 1940s, handling and storage activities resulted in the spillage of uranium ore, thereby contaminating soils on two private properties in the community. This material was being transported along the NTR from the mine site at Port Radium when conditions on the Mackenzie River kept it from being barged to the rail head at Fort McMurray, Alberta.

The location of the material, its accessibility, its concentration level and the likelihood of its redistribution indicated the need for prompt action. Approximately 200 m³ of uranium ore-contaminated soils were removed from these private properties and placed in temporary mound storage at the old landfill site near the Tulita airport, in 1992. The mound was purpose built by the LLRWMO solely for this material. It was inspected by the LLRWMO and the Canadian Nuclear Safety Commission (CNSC) on a regular basis thereafter, pending a future long-term management approach for the contained soils. Assistance from local individuals and authorities was instrumental in the success of this activity.

Subsequently, as an interim management step in 1999, sorting of mound materials enabled the removal of licensable material (significantly less than one cubic metre) to storage at an LLRWMO facility at Chalk River Laboratories (CRL), Chalk River, ON. In the fall of 2001, the remediation of approximately 300 m³ of soils from the same two properties was undertaken and recovered material was added to the mound.

The next steps at Tulita are discussed later in this paper. Highlights include the establishment of the Tulita Uranium Working Group in 2000 and the successful Tulita Disposal Project undertaken in the years 2006 through 2009, which saw the removal of the waste from the community.

Remediation at Fort Smith, NT

In the fall of 1999, the LLRWMO provided technical support to the Town of Fort Smith during its demolition of a former NTCL warehouse building located within the municipal boundary. Approximately 100 m³ of uranium ore-contaminated building materials were segregated and transported to a newly constructed, dedicated temporary storage mound (constructed, operated and monitored by the LLRWMO) located at the Town of Fort Smith municipal landfill site.

In September of 2001 the LLRWMO, assisted by a local contractor, excavated and removed approximately 125 m³ of uranium ore-contaminated soil from three previously identified impacted private properties and a section of a municipal roadway, in Fort Smith. The contaminated soil was transported to an expanded LLRWMO operated temporary storage mound located at the local municipal landfill site.

In September of 2010 the LLRWMO, working with the Town of Fort Smith Planning Department and again assisted by a local contractor, completed the excavation and removal of approximately 60 m³ of uranium ore-contaminated soil from the municipal roadway mentioned above. The soil was transported to the expanded temporary storage mound at the Fort Smith municipal landfill site. The remedial work was completed in conjunction with the Town of Fort Smith's 20 year road maintenance program. This was a noteworthy event given that this contaminated soil was recovered from the last known occurrence of historic waste contamination in the developed area of the town.

Remediation at Fort McMurray, AB - The NTR Terminus

Remediation work in Fort McMurray first began in 1992. Between 1993 and 1996, the LLRWMO excavated and removed mildly contaminated soil including a small quantity of licensable material (approximately 100-150 m³) from eight riverside properties in the Lower Town and Waterways areas. Licensable material was

segregated and shipped to the LLRWMO licensed storage facility at CRL, Chalk River, ON. Non-licensable material was moved to a purpose built cell at the local municipal landfill site.

The completion of the Fort McMurray Historic Uranium Cleanup Project in the summer of 2003 marked the resolution of a decade-long endeavour to clean up and safely manage approximately 42,500 m³ of marginally contaminated soil from several sites in this northern Alberta city. The Waterways property, the last site to be remediated, is now part of the community's public park and trail system.

The Long-Term Management Facility (LTMF) housing the non-licensable material is a dedicated, secure storage cell constructed of a compacted clay liner, leachate collection and management systems and an engineered cover. The LTMF is located approximately 2 km south of Fort McMurray within the boundaries of the local municipal landfill. The facility is monitored on an annual basis by the LLRWMO.

The LLRWMO continues to provide annual inspections of selected sites along the NTR. This is in addition to the ongoing annual monitoring and analysis of groundwater, leachate, gamma radiation surveys and slope stabilization studies (conducted every five years) at the Fort McMurray LTMF. This program is conducted pursuant to the Agreement between the LLRWMO and the Regional Municipality of Wood Buffalo [5]. While the site is not licensed, it remains of interest to the CNSC and it receives yearly, from the LLRWMO, the annual monitoring report for the storage facility.

PARTNERING AT TULITA, NT

Over the period 1992 through 2009, partnering at Tulita included joint involvement of government and community stakeholders in the initial waste discoveries, residential site remediations, initial waste storage and in the final removal of the waste from the community. It included engagement of community leaders, participation of the property owners affected and readiness of local contractors and construction services in this remote community. Involvement included appointment of community members to the Tulita Uranium Working Group beginning in the year 2000 and interface with the Tulita Disposal Project beginning in the year 2006.

Tulita Uranium Working Group

In 1999, when the Canada-Deline Uranium Table (CDUT) [2] was established to deal with health and environmental issues related to the Port Radium mine, Tulita stakeholders were not participants. At that time, expressions of local concern in Tulita were heard regarding health and safety and the stigma associated with the location of the temporary mound. In 2000, Canada, represented by the LLRWMO, and community leaders in Tulita established the Tulita Uranium Working Group (TUWG) to research and recommend solutions for the removal of uranium ore-contaminated soil from this former uranium ore transportation route community.

The TUWG recommended additional surveys and additional soil removal to temporary storage near the Tulita airport. This work was conducted by the LLRWMO in September of 2001. The TUWG also recommended that “a long-term solution be sought that involves moving the uranium-contaminated soil out of the Tulita District”. These recommendations were also reflected subsequently in the support and involvement of the territorial government and its request to senior levels at NRCan for action.

In the period between the announcement of these recommendations and their implementation through the Tulita Disposal Project, many challenges were overcome. These included a range of factors including the distance of Tulita from the LLRWMO's operation centre in southern Ontario, the remoteness of the location, the severe local weather, accommodation availability and cost, as well as contracting costs, the logistics of having to rely on winter roads, and particularly the quick decision-making required when the primary disposal option collapsed.

Activities to Prepare for Disposal

In 2005, the Government of Canada accelerated the search for a solution to disposal of the uranium ore contaminated soil contained within the temporary storage mound in Tulita. In the fall of 2006, the LLRWMO, at the request of NRCAN, teamed with a local contractor to place the entire contents of the mound into 755 bulk bags.

The five-week field project isolated the contaminated soil from the environment in a new temporary storage mound in a bulk bag stockpile, ready for load and transport out of the Tulita community. This work was carried out in anticipation of transporting the bulk bag inventory to the former Port Radium Mine on the eastern shore of Great Bear Lake. Indian and Northern Affairs Canada (INAC) was working with the community of Deline to plan for remediation of the Port Radium mine site in the summer of 2007. This INAC project at Port Radium offered an opportunity to dispose of the bulk-bagged uranium-contaminated soil from Tulita in the winter of 2007.

The community of Deline, however, did not accept the disposal of uranium-contaminated soil from Tulita as part of the Port Radium remediation project. Therefore, the LLRWMO, after considering a variety of options developed an alternative approach to disposing of the 755 bulk bags of uranium-contaminated soil from Tulita. In 2008, the LLRWMO identified disposal at a licensed facility in the USA as the most cost-effective option for removing the material from Tulita for safe and secure disposal.

Tulita Disposal Project

In 2008, between September and November, the bulk bags containing an estimated 867 cubic metres of uranium-impacted soil were removed from Tulita and transported by road and barge up the Mackenzie River and across Great Slave Lake to a marine terminal in Hay River, NT. From there, the material was transported by rail to a licensed hazardous and radioactive waste treatment and disposal facility in the USA. The final shipment of the waste was received at the U.S. facility in January 2009 [6]. A major milestone was achieved with the final transfer of this bagged uranium-ore contaminated soil.

Community Consultations

When the soil in the mound near the Tulita airport was repackaged in 2006, community consultation in the Tulita area was conducted prior to and throughout the five-week project. All federal, territorial, aboriginal and local stakeholders were involved.

In 2008, the LLRWMO and NRCAN prepared a communications plan with input from INAC, the Government of the Northwest Territories and other key stakeholders and agencies. This plan highlighted the project objectives and provided a communications methodology to assist in achieving the objectives.

Prior to launching the final phase of the Tulita Disposal Project, stakeholders were contacted by letter, e-mail and phone during the 2008 April to August period. Plans and schedules were adjusted to accommodate stakeholder and service provider needs. For example, at the request of the Hamlet of Tulita, initiation of phase one of the project was delayed by a week to accommodate a community event that tripled the hamlet's population over that period.

Planning activities included site visits and teleconferences by LLRWMO technical staff and consultants. Often these activities included briefings to community stakeholders such as the Mayor and Council, Dene and Métis leaders and the Tulita Land Development Corporation.

Between 2008 August and 2009 February, six update fact sheets were sent to over 40 stakeholders. While in Tulita, project staff conducted briefings arranged through personal contacts and also met with key

stakeholders, e.g.: Tulita Band Council, Government NT, local officials and affected citizens. To allay the concerns of one of the owners of the properties previously contaminated, LLRWMO staff conducted a follow-up gamma radiation survey of the original family home still located on the property that had been remediated in 1992 and 2001.

The successful conclusion of the Tulita Disposal Project fulfills a long-standing commitment by the Government of Canada to remove historic LLRW from this community. In response to the final Tulita Disposal Project update, grateful responses were received from numerous Tulita community leaders. On 2009 March 5, in comments addressed to the Legislative Assembly of the Northwest Territories, the Member of the Legislative Assembly for the Sahtu expressed the appreciation of the residents of Tulita and the Sahtu region to: the Government of the Northwest Territories; the Department of Environment; and to the Department of Natural Resources, for the removal of the contaminated soil from the community.

The chronology of resolution to uranium ore-contaminated soils in Tulita included:

- 1930s to 1960s – Great Bear and Mackenzie Rivers used for the transportation of uranium ores to railhead in Fort McMurray, Alberta.
- 1940s – Uranium ore bags spend winter in Tulita, prior to shipment south to rail head in Fort McMurray and on to Port Hope, ON for refining.
- 1992 - inspection of transfer points along the NTR by the LLRWMO identified spilled uranium ore in Tulita (then Fort Norman).
- 1992 fall – Remediation of Tulita residential properties, creating temporary storage mound near airport.
- 1999 – Sorting of mound removed licensable material to storage at LLRWMO facility at Chalk River Laboratories, ON.
- 2000 – LLRWMO and community leaders in Tulita establish the Tulita Uranium Working Group to research and recommend solutions for removal of uranium ore-contaminated soil from the community.
- 2001 fall – Removal of additional soils from previously remediated residential properties.
- 2006 summer – Tulita Disposal Project planning begins.
- 2006 fall – Transfer of mound contents to bulk bags and placement in new temporary storage stockpile.
- 2007 February – Community of Deline does not accept proposed Port Radium disposal option.
- 2008 Spring – LLRWMO arranges alternate disposal option in USA.
- 2008 September 25 – Load last bulk bag of contaminated soils to barge in Tulita.
- 2008 fall – Transport of bulk bags from Tulita to Hay River followed by transfer to USA.
- 2009 January 19 – Last bulk bags arrive at US disposal facility.

ADVANCING THE NEXT PHASE OF REMEDIATION IN THE NORTH

Completion of the Tulita Disposal Project was well-received by the local community as reflected in comments made in the Legislature of the Northwest Territories. The success also created increased expectations in the remaining communities with remaining identified contamination. The Government of Canada continues to be committed to the remediation of the remaining contamination.

Remaining contamination exists at sites in both the South Slave Region and in the Sahtu Region. Consideration of cleanup options for these areas had begun in 2007, prior to the completion of the Tulita cleanup, when NRCan and the LLRWMO convened a meeting of all government stakeholders in Yellowknife to discuss contamination issues and the process for moving forward on these remaining cleanups.

Since that time, local communities have also come forward again expressing interest and some urgency in advancing the cleanup. This has led to community meetings with community leaders and others in both the Sahtu and the South Slave over the past year. Interest is rising and progress is being made.

Partnering in the Sahtu Region

In the Sahtu, a region at the northern end of the NTR, the primary historic waste sites of interest include the land at Sawmill Bay, and shoreline sites along the Great Bear River. Work at Tulita, another Sahtu community is complete.

Partnering in the Sahtu Region has begun. Recent fact-finding meetings held in 2010 October in Deline have been a significant step in advancing planning. These meetings have been used to update the information collected initially in the early 1990s on the status of contamination at Great Bear Lake and Great Bear River sites. Reengagement of the Tulita community is expected soon with regard to any shared interest they may have in Great Bear River sites remediation.

In parallel, government partnering has been advancing as NRCan and INAC have been supportively advancing common issues, and as other federal, provincial and territorial stakeholders have been involved. Discussions have been focussed on early activities at the Sawmill Bay site where INAC is advancing a Remedial Action Plan to remediate hydrocarbon and other contamination.

The LLRWMO, in addition to undertaking the fact-finding meetings seeking information on past historic waste spill sites, has also participated in the INAC Remedial Action Plan exercise at Sawmill Bay. Now that there has been a relationship established with the local community, there is an opportunity to move forward on discussions pertaining to historic waste remediation options. This process to-date has moved forward step by step as individuals, organizations, roles, and issues have been brought to the table. Greater confidence will grow as milestone achievements are made.

Partnering in the South Slave Region

In the South Slave, the primary historic waste sites of interest have been identified at Fort Fitzgerald, Bell Rock and Hay River. Remediation work in the developed area of the Town of Fort Smith is now complete.

Community engagement in this region has now begun. Good progress has been made at initial meetings with representatives of the Smith's Landing First Nation beginning in May 2009, concerning contamination in the Fort Fitzgerald area. Similarly, good progress has been made at initial meetings in June 2010 with Salt River First Nation concerning Bell Rock area sites.

A track record of success in remediation has been established locally in the Town of Fort Smith where the final known contamination associated with ore hauls was removed from a roadbed in the developed area of the municipality in September 2010. This last remaining known pocket of uranium ore-contaminated soils was moved to the dedicated cell for such materials operated by the LLRWMO at the municipal landfill site property.

Looking to the future, the organizational framework and approach to community involvement and joint planning is expected to become defined. Local preferences and past experience will influence the approach to remediation planning and its implementation. Already, concerns identified are typical of concerns initially raised in other communities.

LESSONS LEARNED

From Surrey, BC, to Toronto, ON, the LLRWMO has been involved in historic low-level radioactive waste projects where the communities held definite ideas about how the waste should be managed. The success in the remediation of historic radioactive waste in communities across Canada has been highly dependent on building confidence with the involved communities in a deliberately incremental and carefully designed process. In all of these cases, the importance of cultivating early stakeholder involvement was key in building

the necessary confidence that would result in the implementation of cleanup solutions. It is also important that partnering organizations and stakeholders have clearly understood their contributing roles and have exhibited co-operative problem solving behaviours. Building and maintaining a community's confidence requires constant commitment, significant resources, and mutual effort. Below we discuss how past experience is guiding the confidence building and partnering process with respect to two low-level historic waste clean up projects going forward: 1) the NTR project and how it is reflecting the findings of the Canada-Deline Uranium Table; and 2) the Port Hope area cleanup experience.

NTR Interface with CDUT Findings

The initiative by the LLRWMO, on behalf of NRCan, advancing the discovery, remediation planning and subsequent management of wastes from remediation of historic ore haul routes and sites along the NTR began in the 1990s and continues to the present day.

Related to the LLRWMO's activities in the north, is work that was undertaken by Indian and Northern Affairs Canada (INAC) and the associated Canada Deline Uranium Table (CDUT) which focused on the remediation of contamination at mining and other sites in the Sahtu Region, including at the Port Radium Mine site. The remediation at the Port Radium Mine site was completed in 2008 though other CDUT sites require further attention and are being advanced by INAC.

The CDUT Action Plan [2] developed to guide the remediation of the Port Radium Mine site and area, provides key principles for successful co-operation. In the small close-knit communities in the north, further environmental remediation planning and implementation brings together the same people who have been engaged in past efforts. The LLRWMO, NRCan and INAC are advancing the separate initiatives cooperatively. In the past two years, joint participation in meetings in the Sahtu Region at Deline have been the norm.

The 26 recommendations presented in the final CDUT report include several of direct relevance to environmental remediation and community sensitivities along the historic ore haul routes of the NTR. These include the following:

CDUT Recommendation 1:

“TK [Traditional Knowledge] should be incorporated into the implementation of CDUT recommendations, such as the design of a site remediation and long-term monitoring plan and continued healing activities.”

CDUT Recommendation 19:

“The remediation of the Port Radium mine site and the sites along the Northern Transportation Route is important for the psychological healing of community members and should be undertaken as soon as possible.”

CDUT Recommendation 20:

“The community's role in future man-made activities and development in and around the waters of Great Bear Lake should be maximized. Increased community participation in environmental management and policy decisions will ensure that traditional and local knowledge are enshrined in resource management practices, and will ensure that the people of Deline play a central role in the stewardship of their natural environment.”

These recommendations are relevant as the LLRWMO continues its work in the north, and are currently being incorporated in the design phase as work goes forward.

Port Hope Experience 1982-2008

The bulk of Canada's historic waste is located in the Port Hope area of south-eastern Ontario. The LLRWMO has been active in that community since the mid 1980s conducting small-scale cleanups and operating interim waste management programs [7]. In 2001, NRCan and the LLRWMO successfully negotiated a legal agreement between Canada and the local communities that established the terms and conditions for the cleanup and long-term management of the local waste [8]. The agreed approach for the cleanup was driven by the communities themselves and involves local long-term management in engineered mounds. The specific approaches developed by the communities forms the basis of the legal agreement. At this time, a major initiative is underway in the Port Hope area to implement the legal agreement, eventually establishing long-term management facilities and undertaking final remediation activities. Since 2008, this initiative is being advanced by a separate project management office, the Port Hope Area Initiative Management Office.

The LLRWMO initiatives in Port Hope, Ontario established a track record of successes locally, provided knowledge and resources, identified common objectives, involved local participants, sought volunteerism, and initiated continuing engagement for the long term. It was found important to identify leaders and organizational stakeholders early, to partner in engaging the public at large and to effectively coordinate communication programs and project implementation initiatives.

The Port Hope Area Initiative experience illustrates how a community relations program built on proactive communications and varied community involvement techniques can build confidence and community support for a project. Given the complex factors that influence people's interpretation and acceptance of risk, an effective communications strategy addresses the public's need for substantive information through a transparent and accountable process that legitimizes concerns. An effective communication strategy encourages an ongoing exchange of information so, as the process moves through information-gathering to decision-making, communication channels remain open for reporting back, clarifying and checking to make sure stakeholders understand what has been done, why and by whom.

To address the challenges of communicating the specific nature of the risks that will be faced during the cleanup, waste transportation and facility construction phase, a participatory approach to communications planning is useful. Communications activities maintain public awareness of project activities by presenting open, transparent and accessible information. Environmental stewardship is demonstrated through community and public involvement in project monitoring.

Participative Approaches to the Low-Level Radioactive Waste Policy-Making Process

The LLRWMO communications method focuses on a social learning approach, maximizing the benefits of having a fully engaged and interested public by working in an open and cooperative fashion. Effective community relations reflect an understanding of the needs of local communities and demonstrates a proactive approach to integrating stakeholder participation culminating with a partnership for the implementation of the solution. Community meetings and workshops, kitchen table discussions and storefront information offices in malls or on main streets offer crucial opportunities for two-way communication that responds to local concerns. Preliminary discussions, early contact, and clear identification of needs and concerns of local stakeholder groups, are also factored into the community engagement techniques common to LLRWMO projects across Canada.

During the last years, institutional experiments with respect to the governance of low-level radioactive waste have exercised a notable influence in the way the policy problem of the low-level radioactive waste has been defined. The "social feature" of the policy issue has been widely acknowledged and added to the more veteran attributes: technological, environmental and engineering. Psychology, sociology, political science, and ethics generated an interdisciplinary approach and provided the social dimension necessary for understanding key-concepts such as: public acceptance, engagement, confidence, trust, participation and risk governance. The "participatory turn" [9] aimed to build bridges between scientific methods and democratic procedures,

contributing to the design of new institutions and generating new behavioural patterns between citizens, specialists, stakeholders and policy makers.

There are a handful of recent models to help understanding the complex relationship between the social and the technocratic aspects in policy making for radioactive waste. Discussions are necessarily broad, as each situation is unique. The Forum on Stakeholder Confidence [10] **Forum on Stakeholder Confidence. Nuclear Energy Agency/Organization for Economic** and TRUSTNET [11] of the European Commission are examples of forums.

The Forum for Stakeholder Confidence (FSC) was created by the Organization for Economic Cooperation and Development / Nuclear Energy Agency's Radioactive Waste Management Committee in 2000 to enable the sharing of international experiences, specifically to address the societal dimension of radioactive waste management. The FSC highlights the success of partnership approaches in countries such as Belgium, Finland and Canada (and many of the projects referred to herein). The common components of this methodology include: 1) voluntarism, specifically with respect to the site selection process; 2) the right to veto (formally or not) granted to the affected community; 3) collaboration with local stakeholders in facility design/ project implementation – this often includes the development of independent expertise by local groups or NGOs, which can then influence the implementation work; 4) the provision of a community benefits package, with emphasis on sustainable development in the affected community or region.

In Canada, the participatory approach continues to be used by the LLRWMO (as described in project-specific detail above). The use of this approach in Canada has helped to achieve a balance between stakeholder representation, stakeholder participation, and project progress and implementation. One of the challenges of the process is understanding and evaluating what constitutes fair representation. Another is the ongoing need to enable stakeholder engagement through training and outreach activities.

A report on “risk governance “prepared for the European Commission [11] suggests that trust , viewed as a relationship between individuals within an existing or emerging group, takes place in circumstances where individuals rely on people they trust to accomplish significant projects involving significant risks for them.

Similar to FSC findings, stakeholders involved in the decision-making process have identified that trust is multidimensional including: impartiality, continuous willingness to share accurate information, competence and communication skills. Organizational characteristics of successful institutions involved in such processes include: self-determination; clarity of roles and interests; public ownership; devoted and adequate funding; an internal learning culture that would consent to practices and beliefs to be reviewed; high levels of skill and competence in relevant areas, including stakeholder interface and communication; strong internal relations and cohesion; and, general devotion, commitment and enthusiasm.

When it comes to the mandate-related features of the institutions involved in successful remediation projects of historic radioactive waste, it is worthwhile to mention: clear definitions of roles and responsibilities; a well-expressed institutional individuality and vision; and, an outstanding operational record.

Risk governance also emphasizes that the behaviour of the implementing institution is important in cultivating trust in the context of different knowledge, beliefs, interests, values, and views. Behavioural characteristics consist of, but are not limited to: a genuine respect for each other's roles; commitment to transparency, openness, clearness, and truthfulness; reliability; eagerness to involve others in a continuous partnership and dialogue; willingness to listen to and respond to stakeholders' concerns; readiness to involve others when needed; dedication to an active search for dialogue, willingness to listen to and respond to stakeholders' concerns; humbleness and acknowledgement of limits; high level of commitment, motivation and devotion by staff; coherence with organizational goals; priority on stakeholder interface; a policy of continuous improvement; and, a willingness to bring into play allies, third-party persons, or independent spokespersons.

Generally, there has been a shift from stakeholder meetings/consultation carried out by implementing stakeholder toward the partnership approach. This is reflected in the more active role an affected community is expected and able to take: an affected community (or region) has the right to guide and provide input into many aspects of a project, from design to implementation. Each community requires a different and unique approach to ensure that value (and development) is sustainably added to a host community during the collaborative process.

CONCLUSIONS

For almost 30 years the LLRWMO has implemented environmental remediation solutions to address Canada's historic low-level radioactive waste problems. These projects have been conducted across a vast and varied geography that takes in the far reaches of Canada's north as well as populated urban centres in southern Ontario. The LLRWMO has carried out cleanups in remote areas where supplies were nonexistent and weather was so extreme it impeded work. In other communities, soil investigation and removal has taken place in densely populated neighbourhoods while residents stayed in their homes and went about their daily activities.

Regardless of the situation, common to every project has been a steadfast commitment by the LLRWMO to work cooperatively with communities to develop locally acceptable waste management solutions that address the unique needs of the affected stakeholders.

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REFERENCES:

- [1] “Memorandum of Understanding (MOU) between Department of Energy Mines and Resources Canada and Atomic Energy of Canada Limited concerning Co-Operation in funding the Low-Level Radioactive Waste Management Office”, (1990).
- [2] CANADIAN-DELINE URANIUM TABLE. “The CDUT Final Report Concerning Health and Environmental Issues Related to the Port Radium Mine”, (2005).
- [3] SENES CONSULTANTS LIMITED, “Phase I, II and III Investigations of the Historic Northern Uranium Network in the Northwest Territories and Northern Alberta”, (1994).
- [4] AMEC EARTH & ENVIRONMENT, “Status Report for the Historic Northern Transportation Route”, (2005).
- [5] “An Agreement between the Corporation of the City of Fort McMurray and Atomic Energy of Canada Limited”, (1993).
- [6] LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT OFFICE, “Tulita Disposal Project, Completion Report”, (2009).

- [7] LLRWMO, “Safe Community Co-existence with Long-Term Low-Level Radioactive Historic Waste Contamination in Canada–Port Hope Example”, (2011).
- [8] “An Agreement for the Cleanup and the Long-Term Safe Management of Low-Level Radioactive Waste Situate in the Town of Port Hope, the Township of Hope and the Municipality of Clarington”, (2001).
- [9] Saurugger, S. “The social construction of the participatory turn: the emergence of a norm in the European Union”, (2010).
- [10] Forum on Stakeholder Confidence. Nuclear Energy Agency/Organization for Economic Cooperation and Development, “Partnering for Long-term Management of Radioactive Waste: Evolution and Current Practice in Thirteen Countries”, (2010).
- [11] European Commission, "The TRUSTNET Framework: A New Perspective on Risk Governance", Project Report, (2000).