

# **ACTION PLAN**

## **TO ADDRESS CONCERNS RAISED BY THE COMMUNITY OF DÉLINE ABOUT RISKS TO HUMAN AND ENVIRONMENTAL HEALTH FROM EXPOSURE TO RADIATION AND HEAVY METALS FROM THE FORMER PORT RADIUM MINE, GREAT BEAR LAKE (NWT)**



©Morris Neyelle – Mouth of the Great Bear River

**PREPARED BY**

**THE CANADA-DÉLINE URANIUM TABLE**

**FOR**

**THE DÉLINE BAND CHIEF AND COUNCIL  
AND  
THE MINISTER OF DIAND**

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## EXECUTIVE SUMMARY

Mining operations took place at Port Radium, Northwest Territories almost continuously between 1932 and 1982. Radium, uranium and silver ores were mined and milled at various times at this site which is approximately 265 kilometres east of the small Dene community of Déline, the original inhabitants of the Great Bear Lake area. From 1942 to 1960, a uranium mine was operated at the site by then Crown-owned Eldorado Mining and Refining. The site was decommissioned as a privately-owned silver mine in 1982. However, past mining operations have raised community concerns about potential contamination of their environment and about Déline residents' exposure to radiation.

The purpose of this three year Action Plan is to describe, scope and recommend studies and activities that, when completed, will provide the information necessary to enable the Canada-Déline Uranium Table (CDUT) to make informed decisions about the long-term management of the Port Radium mine site and any ongoing community health requirements relating to the mine site (past or present).

The CDUT was formed by Canada and Déline in October 1999 with the mandate to resolve the human health and environmental issues surrounding the Port Radium mine. The CDUT is comprised of representatives from the community of Déline and from the Department of Indian Affairs and Northern Development (DIAND). DIAND is acting on behalf of the Déline/Port Radium Interdepartmental Committee which is composed of representatives from DIAND, Health Canada, Natural Resources Canada and the Government of the Northwest Territories Health and Social Services.

The CDUT hosted an Experts and Community Workshop in Déline in October 2000. The major goal of the workshop was to provide a framework for an Action Plan that will guide the CDUT in addressing human and environmental health and related community issues in Déline. Ten scientific experts were selected, by consensus by the CDUT, and invited to the workshop to address questions and issues about Port Radium. The following disciplines were represented:

1. Health Physics
2. General Human/Community Health
3. Epidemiology
4. Oncology
5. Wildlife and Aquatic Health
6. Environmental Fate and Pathways Analysis of Radionuclides and Metals
7. Mine Site Remediation (Uranium/Heavy Metals)
8. Use of Traditional Knowledge in Health and Environmental Studies
9. Risk Assessment/Management
10. Risk Communication

This Action Plan recommends several discrete environmental and human health studies and activities to address the community's concerns. The overall objectives of these studies are:

1. to test whether the health of the Déline people is being or will be affected by contamination from the Port Radium site;
2. to verify that the fish, plants and animals in the Port Radium area have levels of chemical and radioactive elements that are safe to eat and that animals are not harmed by exposure to these potential contaminants;
3. to provide information about the mine site to enable the CDUT to do what is necessary to stop the release of contaminants from the Port Radium mine site in the long-term;
4. to provide the healing that has long been sought by the widows of ore carriers, elders and families directly affected during the period that they lived at Port Radium.

It must be stressed that the recommended studies and activities are clearly linked, and must be carried out in a stepwise and coordinated way. These project linkages are identified in each project description, and the sequencing illustrated in the project schedule. In summary, the studies and activities include:

- Gathering of existing historical, environmental and community health information.
- Traditional Knowledge
- Site Assessment
- Ecological Risk Assessment
- Community Health Assessment
- Epidemiology
- Human Health Risk Assessment (past and present)
- Medical Surveillance of Identified Risk Groups
- Risk Communication and Education
- Community Healing Initiatives
- Community Capacity Building

The Action Plan activities are, for the most part, designed to conclude within a three year time frame. The health assessment and surveillance will identify if further health initiatives are needed. It is anticipated that site clean-up and containment options will be developed and the preferred option selected in three years, but any site clean-up and containment will probably not occur for five years.

The cost estimates for the studies and activities were developed from the Experts and Community Workshop and further refined through follow-up with the experts and utilization of comparable studies in the north. These cannot be perceived as project-level estimates, but rather planning estimates of anticipated costs associated with the implementation of the Action Plan components. The table below shows the overall planning estimates for all studies, activities and project management and support elements.

**Summary of proposed budget requirements for the three year Action Plan**

Recommended Study/Activity	Proposed Budget (\$K)			TOTALS
	Year 1	Year 2	Year 3	
Gather Port Radium Archival Material	50.0			<b>50.0</b>
Traditional Knowledge	247.9	155.6		<b>403.5</b>
Environmental Studies	951.5	236.5	165.0	<b>1353.0</b>
Human Health Studies	494.1	446.0	167.2	<b>1107.3</b>
Community Healing	145.0	145.0	145.0	<b>435.0</b>
Risk Communication and Education	122.5	87.5	51.6	<b>261.6</b>
Core Capacity Requirements (Déline and DIAND)	801.3	801.3	801.3	<b>2403.9</b>
Project Management	140.0	160.0	160.0	<b>460.0</b>
<b>TOTALS</b>	<b>2952.3</b>	<b>2031.9</b>	<b>1490.1</b>	<b>6474.3</b>

This budget does not include costs associated with:

1. regulatory requirements for the work (e.g., licensing, environmental assessment);
2. actual clean up costs - the cleanup options will be developed and one selected; and
3. any on-going uranium-related health initiatives (e.g., surveillance) beyond three years.

In order to directly address the community’s concerns, the studies and activities are described below as they relate to the five principal areas of concern:

1. Effects on ore carriers (past)
2. Effects on people who lived at or near the mine site (past)
3. Effects on Déline residents (present and future)
4. Safety of the environment (present and future)
5. Mine site clean-up and containment (future)

**Steps to Address the Potential Effects on Ore Carriers**

- Identification of individuals who worked transporting the ore
- Physical examinations at health centre and follow-up
- Health survey of problems, concerns, needs
- Identification and analysis of health outcomes of these individuals
- Potential dose reconstruction, based on exposure pathway model and requiring information such as ore properties, handling practices and working conditions, living conditions, work history (jobs, time in each job), diet, other health determinants

- Exposure assessment (what do the dose estimates mean?)
- Healing exercises developed in community health assessment
- Effective communication of health information and other project information

### **Steps to Address the Potential Effects on People Who Lived on or Near the Site**

- Identification of individuals and families who worked at the site or lived nearby
- Physical examinations at health centre and follow-up
- Health survey of problems, concerns, needs
- Identification and analysis of health outcomes of these individuals
- Potential dose reconstruction based on exposure pathway model and requiring information on living conditions, diet, other health determinants
- Potential exposure assessment (what do the dose estimates mean?)
- Healing exercises developed in community health assessment
- Effective communication of health information and other project information

### **Steps to Address Potential Present-Day Effects on Residents of Déline**

- Health survey of problems, concerns, needs
- Development of a present-day exposure pathway model, based on existing information and residents' input
- Estimate of present-day potential levels of radiation and metals exposure to residents, based on environmental sampling of dietary items, natural radiation measurements in the community, consideration of non-environmental sources
- Potential exposure assessment (what do the dose estimates mean?)
- Healing exercises developed in community health assessment
- Effective communication of health information and other project information

### **Steps to Address the Safety of the Environment**

- Gather all known information about the mine and its operations
- Gather traditional knowledge and oral histories about the mine site and immediate area
- Identify contaminants of concern, pathways into the environment and key receptors
- Identify the extent of area impacted by the mine
- Assess the risks to people while at the site
- Quantify levels of exposure(s) to key receptors
- Assess potential effects of exposure to receptors
- Characterize the risk

## Steps to Address Mine Site Clean-up and Containment

- Further to the site assessment and ecological risk assessment, clean-up and containment and monitoring options can be developed
- Canadian Nuclear Safety Commission, under its new regulations, will also provide direction to the clean-up and containment efforts
- Applicable regulatory requirements (e.g., under the MVRMA) for site work will also impact any clean-up and containment work

The health and environmental studies will produce a lot of information that is required for the stakeholders to decide what further actions need to be taken to address the concerns. This is not to say that specific actions are not being taken throughout this action plan; some specific actions for individuals and the community within this action plan include:

- health needs of individuals are being addressed directly, with medical surveillance and follow-up;
- healing is recognized as important to individuals and the community, and steps are being taken to begin a healing process immediately;
- community involvement in the studies is recommended in each proposed action; this will help the community be informed, up-to-date and have a greater level of understanding of and support for the information produced;
- community capacity development is an important consideration, and to the extent possible, jobs, training and economic benefits are built into these studies; and
- the communication strategy which will be developed and implemented will help the community with understanding the information produced, will assist with healing, and the materials produced will serve as a lasting reference for the future.

The decisions that need to be taken, upon the collection of all existing materials and the information resulting from the health and environmental studies, include:

- What should be done about the mine site with regard to clean-up and containment?
- What should be done about licensing and ongoing monitoring of the mine site?
- What steps need to be taken for ongoing health care for individuals?
- How do we go forward with questions about historical exposure?

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# 1. INTRODUCTION

The present document is the culmination of one year of developing and planning studies and activities in order to resolve longstanding concerns held by the community of Déline about the past, present and future health and environmental impacts of the former Port Radium mining operations. The issues surrounding the Port Radium mine were brought forward by the Déline Uranium Committee in the mid to late 1990's. As a result, a Minister's meeting with the Committee in June 1998 led to the preparation of three draft papers to: 1) produce terms of reference for structuring a Déline/Canada Committee; 2) collectively identify the types of health and environmental assessments required to address the community's concerns; and 3) engage a fact-finder(s) to establish a common understanding on the factual information relating to Déline's concerns. While this was an important step in proceeding with the Port Radium issue the process was stalled for nearly one year until August 1999, when an informal meeting between Canada and Déline led to Canada asking the Déline Dene Band Council to indicate formal support for a new cooperative process. This was accomplished in September 1999 by the passing of a Band Council Resolution (BCR 003-99) which highlighted the three main areas of concern to the community:

1. clean-up and containment of the Port Radium site;
2. health and environmental studies and long-term monitoring; and
3. compensation.

With the BCR, the Band mandated a joint process with Canada to address these concerns. In October 1999, the Canada Déline Uranium Table (CDUT) was formed. The CDUT is comprised of representatives from the community of Déline and from the Department of Indian Affairs and Northern Development (DIAND). DIAND is acting on behalf of the Déline/Port Radium Interdepartmental Committee which is composed of representatives from DIAND, Health Canada, Natural Resources Canada and the Government of the Northwest Territories Health and Social Services. The preparatory work of the CDUT led to the visit of the Honourable Robert Nault to Déline in January 2000. At that time, Minister Nault and Chief Leroy Andre formally endorsed the joint process.

In March 2000 the first full CDUT meeting was held in Déline. For the purpose of ensuring that members of the joint table share common language with respect to some basic principles required for future work a series of workshops, open to the general public, were organized. These were:

1. **Traditional Knowledge** – With this two-day workshop the CDUT members were able to develop an appreciation for the need to proceed with studies that integrate scientific and traditional knowledge.
2. **Fundamentals of Radiation** – Since radiation exposure and cancer are two of the main concerns of the community of Déline, this day long workshop taught the CDUT the basics of different sources and forms of radiation exposure and related some of this information to the possibility of developing various cancers.
3. **Environmental and Health Risk Assessment and Communication** – Risk assessment is a process for examining available scientific information and attempting

to make appropriate decisions and policies to prevent or minimize harm to the environment and human health. This two-day workshop was of considerable benefit to the table as a means of focusing the approach to developing the CDUT's Action Plan. The workshop provided a comprehensive overview of environmental and health risk assessment, including definitions, principles and methods, as well as risk communication issues. At its conclusion it became apparent to everyone that the problems and issues they wished to address had to be clear before undertaking any type of formal risk assessment.

Subsequently, the CDUT held a facilitated workshop in May 2000 to discuss the issues and concerns that should be considered in determining the risk problem(s) to potentially be addressed. The purpose of this workshop was to have the CDUT members produce a preliminary list of questions that would form the basis of discussion for a future Experts and Community Workshop and that would provide a foundation for the present three-year Action Plan (see Section 9.0 – Appendix). During the workshop, it was identified that the issue of overriding concern was the *potential risk to human health from exposure to the radiation from the former Port Radium mine*. This issue has three components:

1. Human health risk – Is there a present-day health risk? What is the source of the hazard? How much were Déline residents exposed to this hazard, as transport workers or site workers, from travel to or near the site, from eating traditional food, from using canvas ore bags or other contaminated materials, or other environmental vectors?
2. Ecological risk – What are the effects of mine contamination on ecosystem health, at the site and off site? How far away from the site does contamination exist, and at what levels? What are the vectors or pathways of contamination, and what is the prognosis for the transport and fate of existing contaminants? Will the contaminants continue to spread and what will be the effect of this?
3. Effect on the community – What has been the impact of contaminants, and of the perception of contaminants, on the economic, social, and cultural health of Déline? What can be done about this?

While these components are distinct, Figure 1.1 demonstrates how they are also interrelated, complex and multi-faceted. The scientific aspects of the problem are intricately linked with the emotional distress of the community. Issues identified at that time as requiring actions included an Experts and Community Workshop, health and environmental studies, clean-up and containment of uranium tailings (and the mine site in general), as well as the integration of traditional knowledge. These actions would in turn result in the desired outcomes for the process, including improved health and healing for the community.

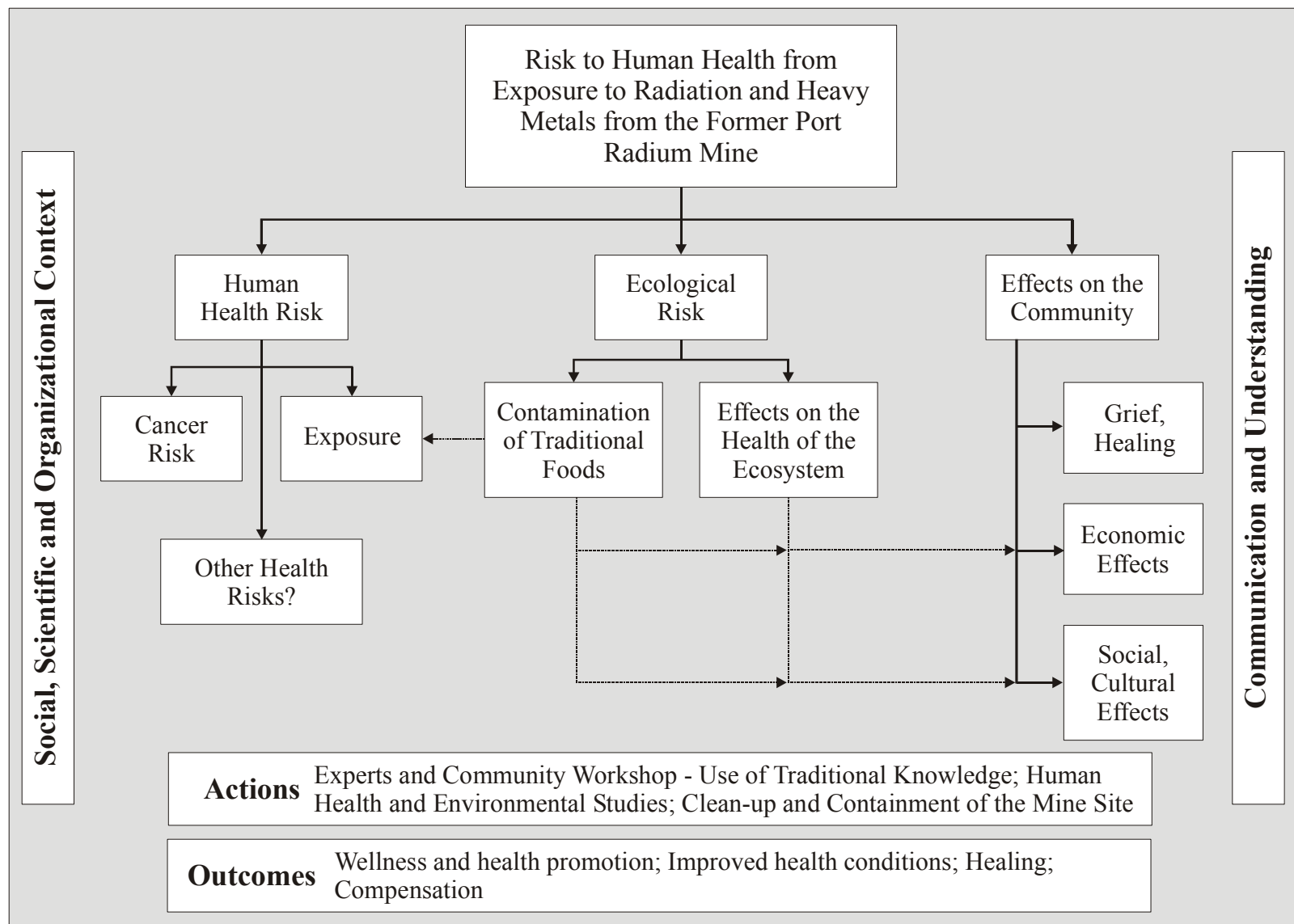


Figure 1.1. Schematic summary of the principal concerns identified by Déline and the CDUT (adapted from Jardine 2000)

Recognizing the need for an integrated approach to address the multidisciplinary aspects of the Port Radium issue, the CDUT hosted an Experts and Community Workshop in Déline in October 2000. The major goal of the workshop was to provide a framework for the present three-year Action Plan. The studies and activities described in this document (taken in most instances directly from the experts' recommendations and further developed by the CDUT) will contribute to the resolution of concerns about Port Radium uranium mining activities and any continuing effects resulting in releases of contaminants from the mine site. The overall objectives of these studies are:

1. to test whether the health of the Déline population has been, is being or will be affected by contamination from the Port Radium site;
2. to verify that the fish, plants and animals in the Port Radium area have levels of chemical and radioactive elements that are safe to eat and that animals are not being harmed by exposure to these potential contaminants;
3. to provide information about the mine site to enable the CDUT to do what is necessary to stop the long-term release of contaminants from Port Radium; and
4. to provide the healing that has long been sought by the widows of ore carriers and the elders and families directly affected during the period that they lived at Port Radium.

This Action Plan should be considered a living document; it will evolve as research questions are answered and new issues or research questions come forward. By following the studies and activities outlined in this document, the CDUT will be able to make informed decisions about the long-term management of the Port Radium mine site and any ongoing community health requirements relating to the mine site (past, present or future). It is also important to emphasize that all work should be conducted with the objective of rebuilding the confidence of the Dene to carry out traditional activities without real or perceived threat from the Port Radium mine site. The implementation of this three-year Action Plan cannot detail long-term activities and costs such as regulatory requirement exercises (e.g., environmental assessment of chosen clean-up and containment option), the site clean-up and containment activities and future monitoring until more information is known. Planning and costing for these activities will require an additional work plan and budgeting exercise.

## 2. BACKGROUND

In this chapter the history of the mine and the nature of the environmental problems at the site are outlined; more detailed technical information can be found in the references listed in the text. The Experts and Community Workshop, which contributed greatly to the development of this Action Plan, is described in Section 2.2. Finally, six overall guiding principles for carrying out the activities in this Action Plan are discussed. These guiding principles were selected for their recurrence in discussions from March 2000 to present, and broadly reflect the importance of carrying out the proposed work activities in active partnership with the community of Déline.

### 2.1. The Site

The abandoned Port Radium mine site is located on a peninsula on the eastern shore of Great Bear Lake in the Northwest Territories (66°05'N; 118°02'W) (Figures 2.1 and 2.2). The terrain is rocky with soil cover and vegetation concentrated in small ravines and depressions. The region is within the discontinuous permafrost zone; the latter reaching depths of up to 100 meters. Port Radium lies approximately 265 kilometres east of the small Dene community of Déline, the original inhabitants of the Great Bear Lake area.

The geology of the site is dominated by the Port Radium sandstone and siltstone formation with northeasterly-trending faults containing high-grade pitchblende ore veins. There were two distinct types of ore at Port Radium: a high silica-gangue type pitchblende; and a carbonate barite gangue type pitchblende which also contained silver (Traill 1932).

Mining operations took place at Port Radium almost continuously between 1932 and 1982. Radium, uranium and silver and copper were mined at different times at this site. The site was discovered by Gilbert Labine in 1929-30 and the site was mined for radium-containing pitchblende until 1940. From 1942 to 1960, a uranium mine was operated at the site by then Crown-owned Eldorado Mining and Refining. The site was utilized by Echo Bay Mines from 1964 to 1982 as a silver mine. The site was decommissioned and reverted to federal Crown lands in 1982. The mine openings have been sealed and most of the buildings demolished except for the old RCMP cabin and a few small outbuildings at the lake landing and the airstrip. The past mining operations have raised community concerns about potential contamination of their environment and about human exposure to radiation.

Several separate environmental studies were conducted at the site, which included various combinations of surface water, fish, soil and sediments sampling (Falk 1972; Moore and Sutherland 1981; Kalin 1984; Hatfield 1985; Lafontaine 1994; Macdonald 1998). DIAND commissioned Golder Associates (Swanson 1995) to assess the data from the Kalin, Hatfield and DIAND/DFO fish and water data from 1994. The Golder report says that because of the different sampling and analytical methodologies and timeframes, it is very difficult to compare the data from the different studies and thus be able to identify any

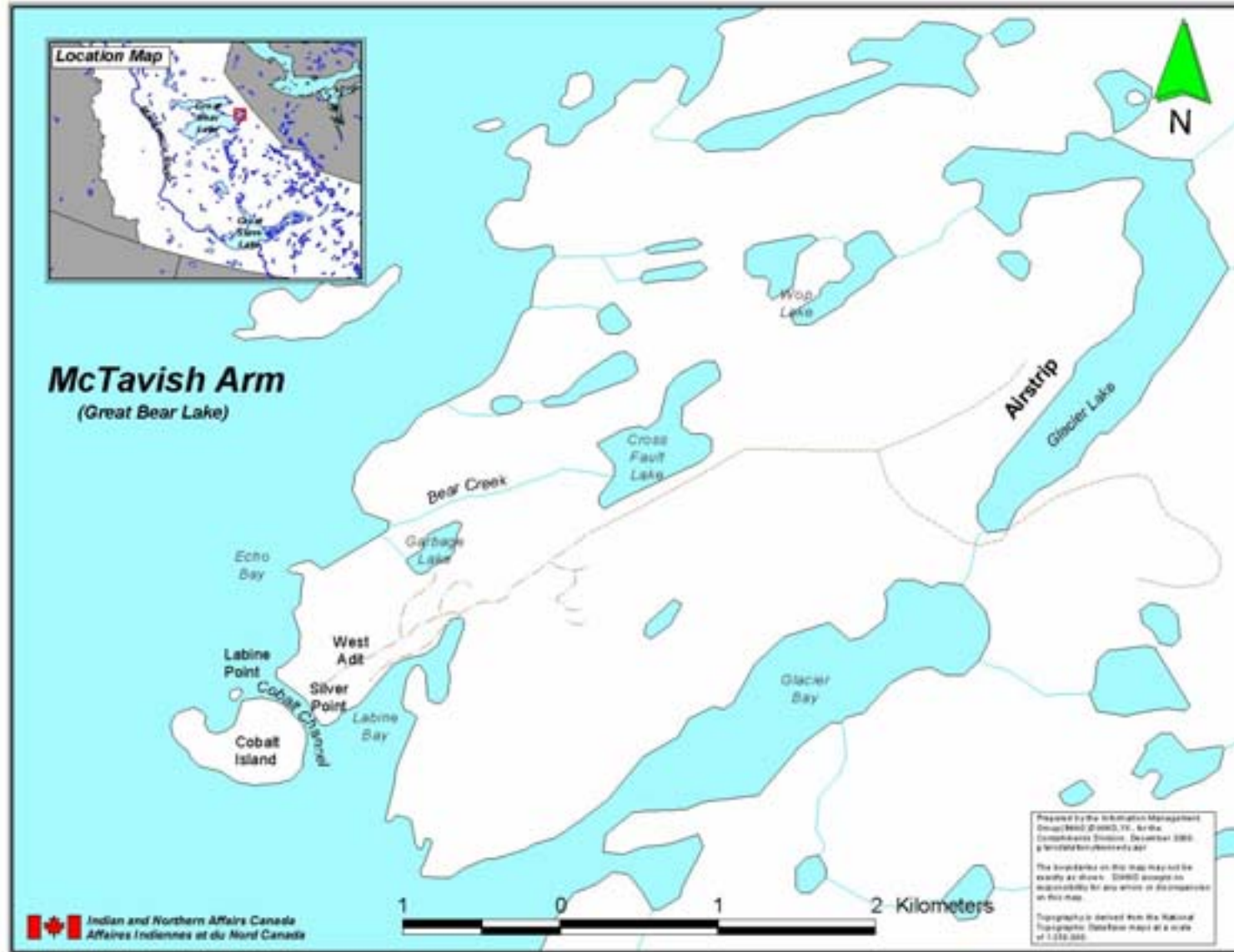


Figure 2.1. Location of Port Radium





**Figure 2.2. Aerial photo (1972) of the Port Radium mine site indicating the tailings deposition areas used during the uranium and silver mining operations**

trends. Swanson recommended a carefully considered monitoring program be developed to support a risk assessment of the site.

Gamma and radon surveys have been carried out. A comprehensive gamma survey was carried out by Golder Associates in 1999 (Johnstone and Swanson 1999). CDUT members collected some runoff water samples in spring 2000. The CDUT also commissioned a field program in winter 2000-2001 (SENES Consultants Ltd.) which sampled buried land-based tailings, waste rock, water and sediment; gamma and radon measurements were also taken. The report will be available in August 2001.

Based on the ore mineralogy, potential contaminants include uranium and its natural radioactive decay products (thorium-230, radium-226, bismuth-214, lead-210, etc.), as well as, arsenic, cobalt, lead, copper, zinc, iron, nickel, and manganese. The potential hazard of contaminants migrating from abandoned tailings at Port Radium must still be determined.

### **2.1.1 Tailings Areas**

As shown in Figure 2.2, the tailings deposition areas include:

- Silver Point – Silver tailings placed before 1974; this appears to be on-land deposition which migrated into Cobalt channel. The total area based upon Kalin (1984) is approximately 2.5 ha. Much of the tailings are covered and substantial quantities are in Great Bear Lake. This area appears to be over the area formerly containing uranium-bearing waste excavated by Eldorado for mineral recovery.
- Radium and Murphy Lakes – These dry basins contain primarily tailings from uranium production. Overflows from Murphy Lake also flowed down Murphy Creek and likely into Murphy Bay. These tailings areas occupy about 3 ha and have been covered with waste rock.
- West Adit – Appear to be uranium tailings likely spilled from the mill. The area covers about 0.3 ha at the base of a waste rock pile from silver mining.
- Garbage/McDonough Lake – This area was primarily used for silver tailings but was also used for refuse/scrap metal/used equipment disposal. The total lake area is about 6 ha with water covering a substantial portion of the surface.

In addition to the tailings there are substantial quantities of waste rock from uranium and silver mining. The various mills and processes used a variety of ores and thus produced a broad range of tailings. The uranium production produced a total of 910,000 tons of tailings with an average head grade of 0.75% U<sub>3</sub>O<sub>8</sub>. Some of these tailings remain in Great Bear Lake. Silver, nickel, lead, cobalt and copper were also extracted in concentrates and shipped from the site. Silver production ran from 1964 until 1982. Total quantity of silver tailings is likely in the range of 800,000 tons (140 tons/day for 18 years).

The measured gamma fields and radium content of the uranium tailings are very low and not consistent with the grade of the uranium mined at the site. This suggests that

much of the uranium tailings are buried at depth and covered over by waste rock and/or silver tailings (Knapp 2000).

### **2.1.2 Tailings Runoff/Seepage Quality**

There is a substantial historic data file on water quality in Garbage Lake but little data on tailings water discharges from other areas before 1984. For the most part metal levels in Garbage Lake are elevated with respect to background but levels are not generally high as compared with mine effluent discharge limits. For example, the water in Garbage Lake contained 0.13 to 0.54 mg/L uranium with levels of arsenic, copper, iron, lead, nickel and zinc all typically less than 0.1 mg/L. Levels offshore in Great Bear Lake are typically lower than levels measured in Garbage Lake.

The review by Golder Associates Ltd. (Swanson 1995) reports that uranium was found at elevated levels in ponded water or runoff from Silver Point tailings and the West Adit tailings and waste rock. Uranium, arsenic and cobalt levels of several mg/L were measured in Silver Point tailings and one sample from the West Adit. These earlier reports of elevated metals levels in runoff have been since duplicated by Macdonald (1998) and CDUT members (May 2000). The land-based tailings and waste rock appear to be a significant source of surface water contamination. Radium 226 levels are low in most areas with all measurements less than drinking water standards.

## **2.2. Experts and Community Workshop**

The Experts and Community Workshop was held in Déline from October 23-27 2000. Ten scientific experts were selected, by consensus by a working group of CDUT participants, and invited to the workshop to address the questions and issues generated during previous community workshops, according to their respective areas of expertise. The invited experts and their research interests are:

Dr. Ronald Brecher	Risk Assessment/Management
Ms. Cindy Jardine	Risk Communication
Mr. Randy Knapp	Mine Site Remediation (Uranium/Heavy Metals)
Dr. Victor Clulow	Environmental Fate & Pathways Analysis of Radionuclides & Metals
Dr. Colin Macdonald	Wildlife and Aquatic Health
Dr. Rafik Gardee	General Human Health
Dr. John Mclaughlin	Epidemiology
Dr. Doug Chambers	Health Physics
Dr. Raul Urtasun	Oncology
Dr. Peter Usher	Use of Traditional Knowledge in Environmental and Health Studies

### **2.2.1. Goal**

The major goal of the workshop was to provide the recommended framework for an Action Plan that will guide the CDUT in addressing human health, environmental health and related community issues in Déline.

### **2.2.2. Specific Objectives**

The specific objectives for the experts participating in the workshop were:

- To prepare preliminary papers on the feasibility, scope and state of knowledge of the issues.
- To present and discuss these position papers and issues with other experts and members of the CDUT.
- To make recommendations on the feasibility and priority of undertaking studies to address these issues.
- To specifically examine means for community involvement and active participation in the studies.
- To prepare a framework for an Action Plan that includes timelines, resources and integration of components.

The workshop started with an opening ceremony and introductions of Chief Leroy Andre, Déline Land and Financial Corporations president John Tutcho, the expert panel, the Action Plan developer, Déline's Science Advisor, the workshop facilitator, as well as representatives from the CDUT, GNWT Health and Social Services, DIAND, Natural Resources Canada, and Health Canada. For the first two days, expert panel members gave presentations on how each of their areas of expertise can contribute to address the community's concerns. The Déline community members were invited to ask questions as well as to share their concerns and experiences. During the third day, the experts met to discuss priority studies and make recommendations.

This Action Plan is the result of the workshop discussions as well as the priorities and recommendations suggested by the various experts. The workshop report and proceedings (including final expert position papers and transcripts) are available from the CDUT.

### **2.3. Guiding Principles for Implementing the Action Plan**

The guiding principles outlined below were discussed informally and formally at the March 2000 workshop, the May 2000 community scoping session, the October Experts and Community Workshop and other CDUT meetings. The importance of embracing these principles in the proposed work items will be seen in the level of community understanding and acceptance of the work, and hopefully, in the longer term, in the building of trust between the community and the government.

### 2.3.1. Communication

The primary tenet of risk communication is the right of people and communities to participate in decisions that affect their lives and those of the people they care about. Open and interactive collaboration and communication with all interested and affected parties in the early stages of problem formulation and solution development for environmental risk problems is critical so that public values can inform and influence the shaping of risk management strategies. Participation of the community must be part of the Action Plan to ensure that the issues being addressed meet the needs of everyone involved. It is important that all perspectives of the risk (scientific, social, cultural, economic, legal and political) be acknowledged and incorporated into the risk management decision-making process. As such, the model for risk assessment and management (Figure 2.3) that the CDUT has adopted as its guide for resolving the Port Radium issues is directed by community concerns. The figure illustrates what has been accomplished by the CDUT and where we are in the overall risk assessment and management process. There is more work yet to do in those areas identified at the Experts and Community Workshop (identified by the dark boxes), but the importance of starting with and addressing the community concerns and the work required to do this is clearly shown.

Planned and carefully conducted communication at the beginning and throughout the process will ensure that community information needs are identified and met, and that everyone understands the results generated. Furthermore, the key to keeping the community engaged is to ensure that they have input at all stages of the risk assessment, particularly in the problem formulation stage (accomplished during the May 2000 Scoping Exercise). Communication and promotion of understanding are fundamental to all the issues and concerns identified, and should encompass all issues. Risk communication is thus viewed as an “umbrella” for the issues identified. It is absolutely necessary to ensure that the potential effects of the mine site on the environment is well understood by the community. Communication issues are usually unique to specific communities and situations. Communication and information needs must be based on the knowledge, beliefs and expectations of all interested and affected parties. The ability to “bridge” the gap between scientific and technical risk assessment information and stakeholder understanding of the issues is key to successful communication. It is also critical to ensure that communication mechanisms (format, channels, timing) are appropriate and effective for the communities involved.

The process of identifying factual information needed to address the issues, and clarifying what questions science and TK can answer and what they cannot, was addressed through the Experts and Community Workshop. Based on the recommendations from this workshop, and the present Action Plan, Canada and Déline, through the CDUT, will identify and agree on how to obtain the information required. In the final steps, the scientific and TK information will be combined with other relevant information and used to either guide decision-making or if necessary to re-frame the problem and risk management goals.

## Framework for Resolving Port Radium Issues

*Using Déline's goals and concerns to guide the use of technical information in risk management decision-making*

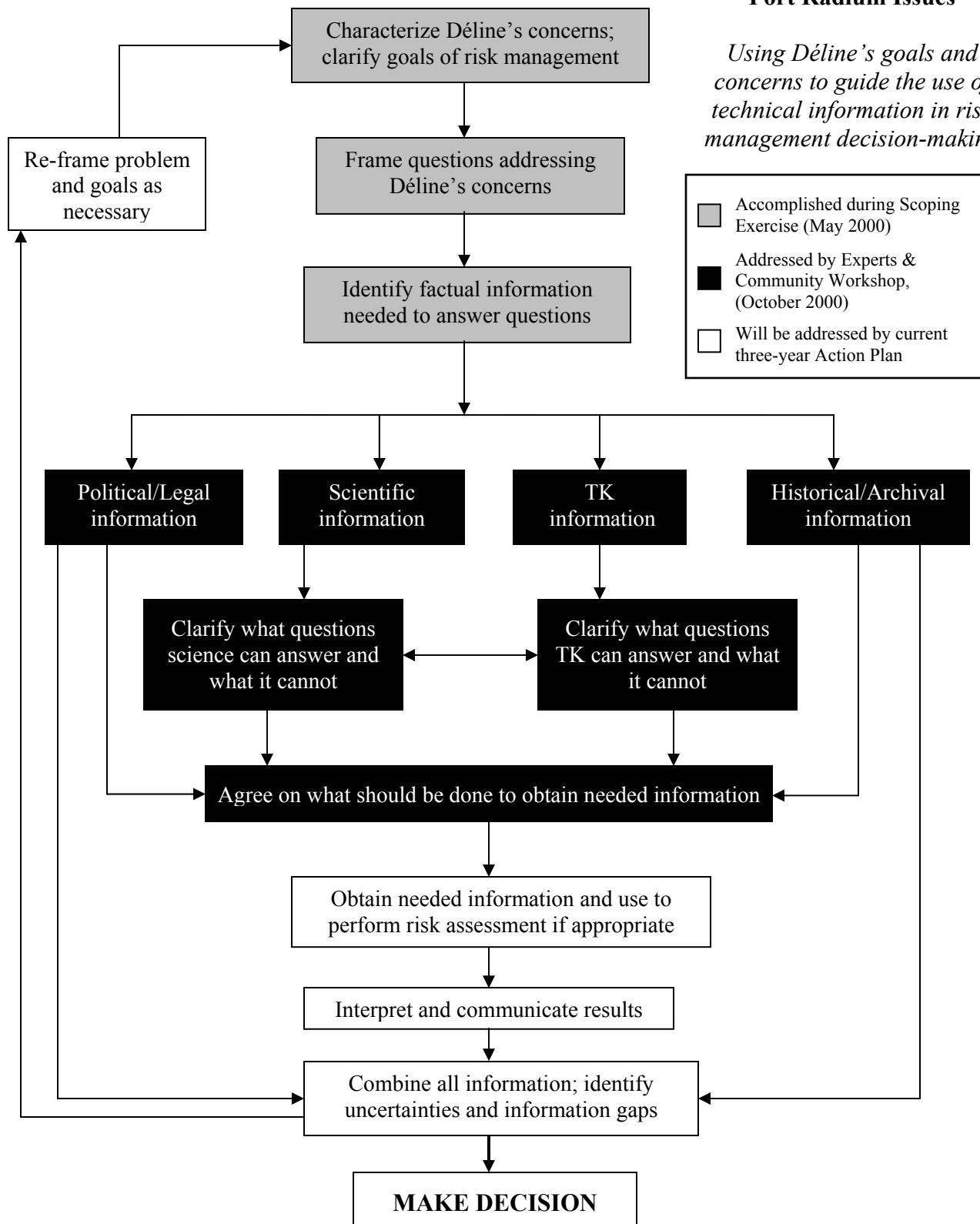


Figure 2.3. Framework for resolving Port Radium issues (modified from Jardine 2000)

### 2.3.2. Need for Community Healing

For the Sahtu Dene and Metis, Port Radium is a powerful, and dangerous place. The uranium mined there was used in the United States for nuclear weapons research before and after the Second World War and was consequently used in the development of atomic bombs such as those detonated over Japan during the Second World War. It is also believed to have been responsible for many deaths due to cancer in the community of Déline. George Blondin (1990) recorded an ancient story prophesying the grim legacy of Somba K'e:

*"In the old days, the Sahtu Dene used to travel across the lake towards the Barrenlands every summer, to hunt caribou. Some of these Dene hunters were paddling near the shore on the east side of Sahtu (where Port Radium is today) and they came to a place where rocky cliffs rise high over the water. Like all Dene, they believed it was bad medicine to pass in front of this rock: it was said that loud noises came from within it. These particular hunters pulled their canoes out of the water, but decided not to portage.... instead they camped near the cliff. During the night everybody was awakened by the singing of the medicine man... In the morning, when the medicine man stopped singing the people at last spoke to him... "Why did you sing all night...?"*

*"I foresaw many things and I was disturbed," replied the medicine man... The medicine man told them of his strange vision. "I saw people going into a big hole in the ground -strange people, not Dene. Their skin was white... [and] they were going into a hole with all kinds of ... tools and machines... On the surface where they lived, there were strange houses with smoke coming out of them... I saw ... big boats with smoke coming out of them, going back and forth on the river. And I saw a flying bird -a big one. They were loading it with things..."*

*"I watched them and finally saw what they were making with whatever they were digging out of the hole -it was something long, like a stick. I wanted to know what it was for -I saw what harm it would do when the big bird dropped this thing on people -they all died from this long stick, which burned everyone... But it isn't for now; it's a long time in the future. It will come after we are all dead".*

The community of Déline is severely affected by the issues addressed during the workshop. Not only is the presence of the Port Radium mine in their traditional territory threat to them, but their past experiences as mine workers, ore carriers or families living near or at the mine site had important repercussions on the entire community. The concerns are particularly related to human health but also to the health of their environment. The Dene rely strongly on their environment for their survival and their connection with the land is strongly reflected in their language and spiritual culture: *"If the land, the water, the fish, the caribou are healthy, us Dene people will be healthy"*. The Great Bear Lake area is the larder of the Dene peoples to whom traditional food is essential. *"The environment is worth a lot of money for us"* says Charlie Neyelle, the spiritual leader of the community. *"We have to find solutions to heal the soul, the mind, the land and the wildlife"*.

Chief Leroy Andre expressed during the Experts and Community Workshop that several years were spent by the community trying to find answers to their problems but that the government was not receptive to the urgency of the situation and did not want to take responsibility for what happened. During the course of the workshop, several community members shared their fears and concerns. One of the most critical issue

appears to be the reestablishment of trust between the Déline Dene and the government of Canada. Even though an official promise to 'heal the land' was made, the community remains skeptical. More than twenty years after the mine closure, little activity was deployed to address their concerns and several questions are still unanswered. The need for an acknowledgement of the problem and an official apology from the government was raised by several members of the Dene community and appears to be a potential significant contributor to their healing process.

At the end of the workshop, the scientists acknowledged that there were still a lot of troublesome issues about what happened in the past and questions about health and the environment. The concerns were separated into four main issues, addressing different time periods:

1. Effects on ore carriers (past);
2. Effects on people who lived at or near the mine site (past);
3. Effects on Déline residents (present and future);
4. Safety of the environment (present and future); and
5. Mine site clean-up and containment (future).

### **2.3.3. Community Involvement**

Involvement of the community is essential to improve community capacity development and should be part of all processes and studies. Of primary importance is the role of the Dene in the planning, implementation and interpretation of the studies. Science education programs related to the issues have to be developed and provided to the community. In addition to acquiring a better understanding of the results of the studies, the Dene people will acquire knowledge and expertise that will help them to make critical decisions concerning their land. There may be opportunities to cooperate with schools or other organizations to allow credits to be given for some science education activities. Community involvement is also necessary for establishing communication methods and developing effective communicators. The results of the studies must be understood at the community level after all of the outside expertise has gone. By having people involved in the studies, the information about the studies will reside there and be passed by word of mouth as well as through written communications materials.

Community participation in the collection and provision of traditional knowledge, particularly key community leaders/elders, is crucial for gathering information to support other environmental and health studies. Community input in human health research is particularly important. This type of community participation will influence the healing process. By having the community involved in the studies from the outset, the healing process will thus be incorporated into the various study approaches. Finally, to the extent possible, the community should participate in the collection of environmental data. This will help to ensure the credibility of any subsequent exposure assessment as well as to provide training to the community with respect to carrying out future sampling programs. Laboratory and field work training will provide them with important skills that will allow



them to evaluate the state of their own environment. The possibilities for the community to be involved is considered within each research study presented in this report. While community involvement can be relatively important in some projects, it is almost absent in others where specific expertise is needed.

#### **2.3.4. Role of Traditional Knowledge**

Traditional Knowledge (TK) is based on both personal experience and learning that comes from sharing experiences with others or is passed on from one generation to another. People who have made their living from the land over many years are generally the best sources of TK because they have the greatest range of observations about the environment over space, time, and circumstance. Although these observations are generally unrecorded and uninstrumented, they are of a kind and frequency that field scientists or other observers rarely if ever can equal, and especially for retrospective or reconstruction purposes, cannot be obtained any other way.

It is helpful to distinguish Traditional Ecological Knowledge (TEK) as a specific aspect of TK, and further to distinguish three categories or types of TEK that will help answer the questions of concern:

*Type 1. Factual knowledge about the environment*

This includes both specific empirical observations about the environment (both personal and as told by others), and explanations based on association or inference from observed phenomena.

*Type 2. Factual knowledge about past and current use of the environment*

This includes self-declared facts about personal activities, and oral history based on the activities and knowledge of others, living or dead.

*Type 3. Values about the environment and people*

This includes culturally based value statements about how things should be, or about the "right way"; moral or ethical statements about how to behave with respect to animals and the environment, and about standards of human health and well-being.

These are underpinned by a fourth type, the knowledge system, by which information derived from observation, experience, and instruction is organized to provide explanations and guidance.

TEK can help to address the main issues identified by the CDUT as follows:

1. Human health – TEK (type 2) can help to answer all of the exposure questions because most activities of Déline people that would have exposed them to contaminants; e.g., work, travel, diet, have only been partially recorded and can only be recovered from the memories of people alive today. However TEK cannot tell us about the actual medical hazard posed by any particular contaminant, because TEK cannot perceive or measure the hazard in any direct way.

Consequently, TEK can provide essential information, but not all of the information, required to assess risk (hazard plus exposure). TEK (type 1) could also provide more information about observed symptoms and possible associations with activities leading to exposure, again because many of these facts are not otherwise recorded.

2. Ecological health – TEK (type 1) can contribute to the assessment of ecological health, chiefly because of peoples' specialized local knowledge of the actual workings of the pathways or vectors of contaminants: lake currents, winds, groundwater, animal movements and habits.
3. Community health – TEK (types 2 & 3) can provide important information about human perceptions of hazard and risk, which are important with respect to community health and individual well-being, as well as about the actual effects of these perceptions on people. Type 2 TEK provides peoples' knowledge of what has actually happened in the community and how or why they believe those things might be related to contaminants, and Type 3 provides the benchmarks against which to measure these effects from the peoples' own point of view, and therefore enables understanding of the significance of these effects, and what to do about them.

To meet the objectives of the CDUT, TK must be carefully grounded in time and space: what happened, where it happened, when it happened, and who saw it happen. It is essential to design and conduct studies that ensure authenticity and verifiability of information, and to provide quality assurance and control to the greatest degree possible.

One priority should be that the oral record is not lost, therefore the immediate emphasis should be on working with elders. This probably means assigning priority to the TK studies and interviews to document exposure through work and travel history, and ecological knowledge to help with prognosis of contaminant pathways and fate.

### **2.3.5. Approach to Study Design and Integration**

An important consideration for the CDUT is the design of the studies to be undertaken. Because of the interdisciplinary and linked nature of the studies, the importance of the study design and the ability to achieve objectives cannot be understated. It was strongly recommended that all studies pay attention to research objectives and design up front. A poorly thought-out project will yield much less value than a well-designed and considered one, and cost a lot more to fix at the end, if indeed it can be fixed at all. Furthermore, all of the planned work should be done in close consultation with the community and with close regard to traditional knowledge principles/protocols.

One of the key challenges with respect to the usefulness of available information is its ability to be queried and combined in meaningful ways to answer specific questions. In

other words, even if information is "available", it must be "accessible" to be of practical benefit. A significant amount of information and data on the Déline community and the Port Radium mine site were accumulated during the years but need to be gathered, organized and evaluated before undertaking any other studies. GIS technology would be a very valuable tool for making information accessible and to combine the different kinds of information required in a multidisciplinary study. The acquisition of a data base management system such as a GIS was proposed by some of the experts.

Because these studies are built with strong linkages between the various components, it is important to ensure that there is coordination amongst the various study elements. For example, pathway analysis (for a health risk assessment) will have considerable overlap in data needs with the biology and uptake studies as well as with site characterization. This should be considered when the details of study protocols and planning are done, and should be considered in the overall budget.

It was also suggested that a Quality Assurance /Quality Control (QA/QC) program should be started before any work is conducted, with only accredited laboratories doing analyses. Sampling programs should be peer reviewed by qualified people and the raw data with QA information stored in a central location, probably in Déline and Yellowknife.

### **2.3.6. Addressing Uncertainties**

It is important to question the possibility and feasibility of completely answering all of the questions asked by the community, and to assess the advantages and limitations of risk assessment as a decision making tool. In general, quantitative risk assessments give neither accurate nor precise estimates of risk. However, they can identify plausible upper bounds on the probability of different kinds of adverse effects.

In practice, there are areas of uncertainty in all aspects of the risk assessment process, and the utility of risk assessment as a decision making tool depends on how well the uncertainties are understood, how fairly they are represented to the risk manager, whether the true risk is likely over- or underestimated by the assessment, and how well the assessment (including approach, findings, uncertainties and conclusions) is presented to the community in a comprehensible manner, complete with a description of strengths and limitations.

As with any predictive assessment, an analysis of exposure pathways and doses due to a uranium mining tailings facility involves the use of environmental data, information on lifestyles and other data and mathematical simulation models. In addition to uncertainty arising from limited data, there is also a natural variation, such as wind speed or precipitation. Techniques for uncertainty analysis allow us to assess the effect of such uncertainty and natural variability and can help us identify areas where extra effort is needed. It is particularly important for the community to acknowledge that, no matter how many studies are undertaken, uncertainties will still exist.

### **3. ENVIRONMENTAL AND HUMAN HEALTH STUDIES**

Several studies were identified by the expert panel as being important to answer major community concerns. An overview of the principal areas of study and their integration was introduced in Section 2.3.5. An overview of the principal recommendations generated during the workshop discussions are represented in Figure 3.1. The details of the recommended work are described below such that each study or activity is presented under the following four headings:

- Rationale and Objectives;
- Project Description, Timeline and Budget;
- Supporting and Related Studies and Linkages; and
- Community Involvement

#### **3.1. Gather Archival Documents About Port Radium Mining Operations**

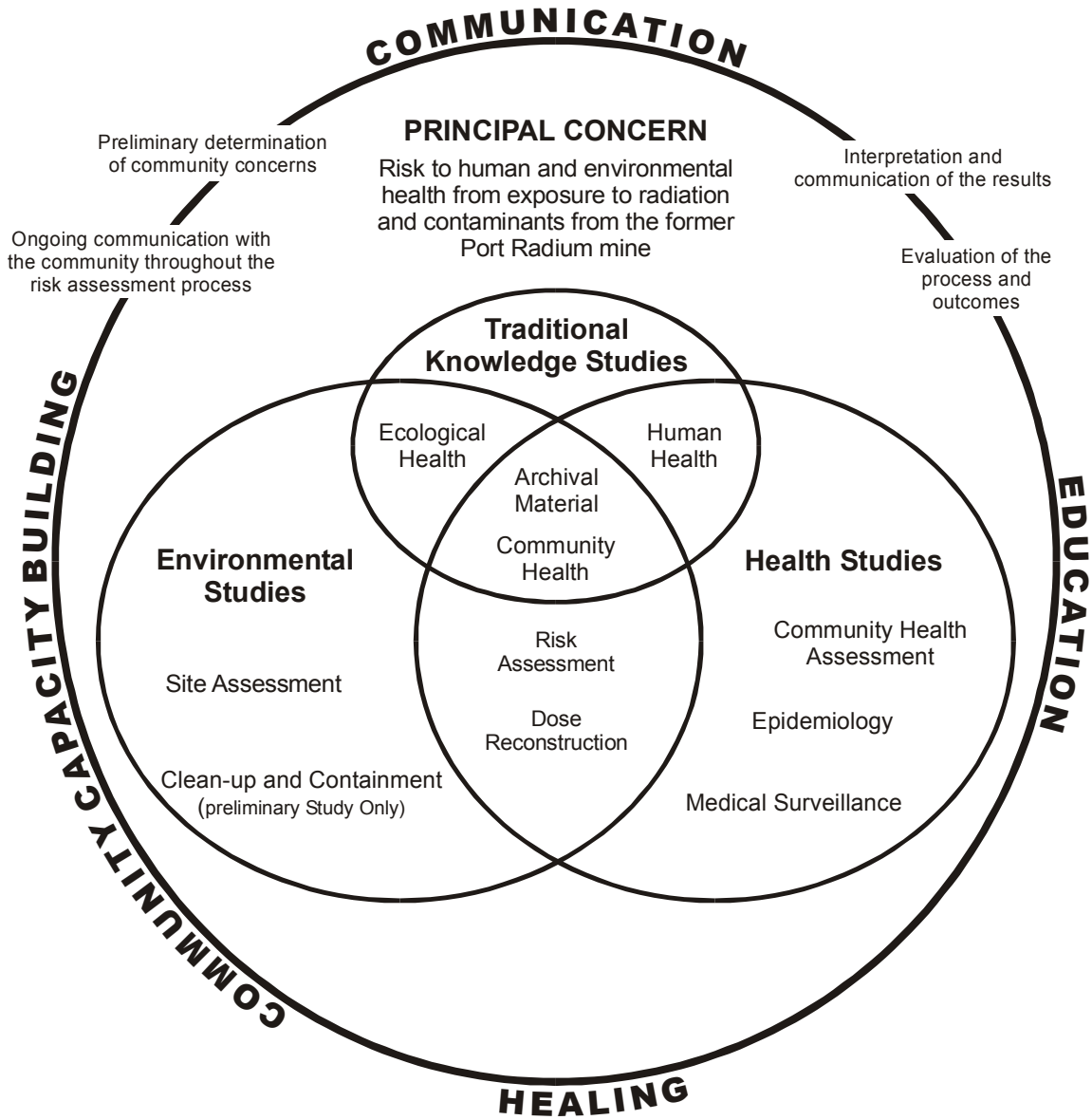
##### **Rationale and Objectives**

It is known that some historical site-related and industry-related information exists, relevant to both the Port Radium mine site and the ore carriers, which the CDUT has not yet collected, and which will assist in the historical and present-day environmental and health studies. The extent of this information is not currently known. The objective is to gather all relevant documents to ensure the CDUT's information needs are met and to allow the best use of resources and time in planning and implementing the proposed studies.

##### **Project Description, Timeline and Budget**

All relevant available documents about the Port Radium site and the ore carriers should be gathered. These documents may include:

- geological survey data
- details about the ore body characteristics
- documentation on Eldorado and Echo Bay operations and close-out plans
- general mining and ore handling practices
- employment/occupation and work force records
- applicable mining regulations from 1933-1982
- industrial health and safety practices and principles upon which these are based
- national and international radiation protection standards at the time of mine operation
- the state of the knowledge about radiation hazards and health effects due to various types of exposure
- locations of former waste disposal areas
- any other documents that may help in the risk assessment/risk management processes.



**Figure 3.1. Overview of the recommendations generated during the Experts and Community Workshop**

There may also be some existing related environmental data which the CDUT may need (e.g., more information on contaminant levels in caribou herds and other traditional foods). These documents and records may be available in the literature, existing company records, government files, or from the national archives. The identification of general data for each area of expertise could be done quickly; a few months to identify and obtain copies. Some work will have to be done to determine how best to organize the overall data from various disciplines and what data should be captured electronically and in what database and with what structure. A GIS system could be utilized to compile some of the spatial the data.

*Estimated timeline*

Six months

*Budget*

\$50,000

### **Supporting and Related Studies and Linkages**

Obtaining these historical documents may assist in site assessment (locating potential contamination onsite), developing the historical dose reconstruction, the risk assessment (to those exposed years ago) and may complement the historical information derived from interviews in Déline.

### **Community Involvement**

The Déline community's knowledge about waste disposal (mine equipment, household waste, etc.) at the Port Radium mine site will also be useful to identify waste characteristics as well as to locate contaminated sediment locations in Great Bear Lake. This is probably best accomplished during community interviews and linkages in the archival and interview projects should be carefully coordinated.

## **3.2. Traditional Knowledge**

This section describes the specific activities that were recommended at the Experts and Community Workshop and how they will be integrated into the environmental and health studies.

### **Rationale and Objectives**

TK studies are required to answer questions about human exposure including:

- work history at the site and along transportation route
- history of use of the territory for harvesting and other traditional purposes
- harvest and diet studies

Documentation of work history and activities of families who lived near or adjacent to Port Radium will eventually permit a retrospective assessment of historical exposure. The history of use of the territory for harvesting will help identify the segment of the Déline population that may have been subject to the most exposure by frequency and intensity of proximity to the site, and thus contribute to understanding the exposure history of lower risk groups.

Community views on potential linkages between community health status and environmental contaminants and possible contaminant pathways (e.g., currents, groundwater, movements of fish and aquatic organisms) may also be documented as they may provide useful information. Questions about the health of the environment can be answered by documenting local ecological knowledge of conditions affecting the transport and uptake of contaminants. Finally, TK studies will help answer questions about community health by documenting local perceptions of hazard and risk as well as local views on effects on the community's economic, social, and cultural well-being. All of these studies involve collecting data in two main ways: survey research and group workshops. Information and data gathered by TK studies will form the foundation of subsequent work.

### **Project Description, Timeline and Budget**

Before starting any studies it is important to **establish all protocols** for oral interviews. The development of a register of Déline persons, covering the period since mining began until today, will be the basis for determining who should be interviewed and how that sample relates to the larger population. The compilation and evaluation of existing information (oral history) and data (survey material) on the Déline community and the Port Radium mine site are essential before undertaking any other studies.

Before starting any oral history/documentary studies for retrospective impact assessment, and immediately following upon drawing up and approval of the research plan, the CDUT (with the assistance of appropriate experts) should develop: 1) draft protocols regarding community-based oral history and survey research for consideration and approval by the community; 2) draft protocols regarding the release, use, and control of relevant documentation in the possession of various governments, for consideration by those governments; and 3) options for data base management systems including GIS.

A priority requirement is to have a **detailed census** or a **population profile** of the Déline community. This register should be based on existing documentation such as church records, treaty annuity lists, band lists, etc. and fleshed out through consultation with elders who may be able to provide, on a preliminary basis, work history, basic biographies, circumstances of death if known, etc. This should take account of migration as much as possible. There are at least 200 Dene who are professionals in various fields and live away from Déline. It would seem sensible that a questionnaire survey be mailed to them also. This could give information that might be useful when compared to the people living in Déline.

Existing TK-related information has to be identified, gathered and evaluated. Existing information includes:

- Land use and occupancy documentation (Dene Nation)
- Harvest survey data (currently being conducted by the Sahtu Renewable Resources Board)
- Diet surveys (recently conducted by the Centre for Indigenous Peoples Nutrition and Environment, McGill University)
- All oral history material obtained to date

The surveys and studies will be evaluated for their completeness and reliability, and their applicability to the needs of this project. Information gaps will be clearly identified. The three recommended TK studies are as follows:

### Human Health

The human health studies of exposure will be done by survey research, either involving a prescribed interview schedule (e.g., work history, land use, harvest, diet), or semi-directed or open-ended oral history interviews (aspects of work history, land use).

- A) *Gather oral histories about ore carriers, miners and residents of Port Radium* - The project will consist of semi-directed interviews with Déline residents using an interview guide. It will interview, in order of priority: a) underground mine workers; b) surface mine workers, ore carriers, refinery, ore bag fillers, office workers and women, if any; c) residents of the Port Radium site, and d) close relatives of deceased workers and residents.
- B) *Survey on the use of territory for harvesting and other purposes* - This project is like a land use and occupancy survey but must be more precise about the actual history of use (years, seasons) and frequency of use. It is possible that the original Dene Land Use and Occupancy Study done in the 1970s may provide useful information. The project will consist of a survey of a large sample of (if not all) persons who harvested and traveled in the Port Radium area when mining and transportation occurred. This is an older cohort of persons (and therefore not a large one), and probably only one person per household (generally male head) need to be interviewed. The study could draw on earlier land use mapping but would differ from it in method by focusing on frequency and intensity of use. The project will also include a modest retrospective harvest and diet survey, keeping in mind the limits of recall accuracy. The specific requirements and design of this project will be based on the results of previous projects.



C) *Analysis of diet survey* - This project will make use of the current harvest survey conducted by the Sahtu Renewable Resources Board. This is a low-budget project as it involves only a focused analysis of data that are already being collected. The study does not require new interviews but only an analysis of existing data by a qualified person. Depending on the availability and format of the existing data base, the project will probably be completed in 10-15 days.

The project will identify the proportion of the current harvest that may be coming from the immediate area of the site, or that consists of species known to have elevated contaminants. It will include location and intensity of harvesting by species over time. This would indicate whether there is a need for more focused diet surveys for particular risk groups in the Déline population or for species (or tissue) of special concern. This project is less urgent because it is not obvious that there is a significant contamination problem in country food arising from the current status of the mine site. It should be budgeted for and completed during the second year.

#### Ecological Health Studies

The following studies are probably best conducted through workshops involving small groups of people selected for their particular knowledge and expertise discuss issues in a more open-ended fashion (types 1 and 3 TK; see Section 2.3.4 for definitions).

A) *Gather oral histories about ecological knowledge (TEK)* - Workshops involving elders, active harvesters and people who process the food will be used to record ecological knowledge of the community. One objective of these workshops will be to obtain local direction on organism (tissue) sampling priorities and strategies.

The project will probably draw on the knowledge of at least 10-20 persons, best identified by the community. It may be appropriate to conduct 2 or 3 separate workshops focusing on different topics. For example, one might address the status and health of the environment -what people are seeing, how they evaluate environmental health, and why. Another might focus on possible contaminant pathways, based on what people know about currents, winds, groundwater, fish movements, etc. Workshops should probably run for at least two days, and of course will be recorded and videotaped.

#### Community Health Studies

Local views and perspectives on economic, social, and cultural well-being, the effects of mine and transport operations could be documented through a workshop.

Local perceptions of hazard and risk could be discussed through a community workshop (see Section 5.5 Risk Communication).

**Table 3.1. Summary of Traditional Knowledge Studies/Activities**

<b>Traditional Knowledge Studies/Activities</b>	<b>Estimated Cost (\$K)</b>
TK Manager (2 years)	148.2
Office rental for TK Manager	24.0
Set protocols for oral interviews	20.8
Develop Register of Déline persons	8.6
Gather, organize and evaluate existing information	20.8
Gather oral history about ore carriers, miners and residents	39.3
Port Radium area traditional use study	30.3
Analysis of diet survey	8.6
Oral history about traditional ecological knowledge	29.8
Survey of local views on economic, social and cultural effects of the mine	8.2
Local perception of hazard and risk	8.2
Computer system with GIS capacity	20.0
Office/Administration/Supplies (10% of project costs)	36.7
<b>Total</b>	<b>403.5</b>

It is expected that the TK studies will be largely completed in the first year, with some activities associated with the land-use study or oral histories likely carrying over to the next year two.

### **Supporting and Related Studies and Linkages**

The acquisition of traditional knowledge is essential to undertake any studies. The register of Déline persons as well as the gathering of oral histories, survey material and existing documentary and oral records relating to exposure, mortality and morbidity are priorities because they provide an essential base for the *dose assessment* and *epidemiology*, and also help clarify and focus the future research. They should be done within the first three months of project startup. Input from other researchers in the design of many TK studies should be considered.

Beside the interviews done to assess exposure of mine workers and families, information on health, characteristics of the material to which the workers were exposed and exposure pathways of interest should be assembled. For efficiency, the TK studies should be coordinated with investigative work done to develop clean-up and containment options where appropriate. A detailed assessment of radiation doses to miners at Port Radium has been carried out (cited from Chambers 2000) but such detailed calculations

have not been done for transportation workers or for non-miners who lived or worked at the mine site. Radionuclides and other metals (including arsenic and cadmium) should be considered. Finally, existing information should be organized.

The analysis of the harvest survey conducted by the Sahtu Renewable Resources Board and the dietary survey done by the Centre for Indigenous Peoples Nutrition and Environment (CINE) will complement the inventory of species composing the diet of the Dene. Results of the two studies should be compared.

### **Community Involvement**

In addition to high community participation via the interviews, local interviewers, interpreters, and translators could be hired. The organization of TK workshops can significantly improve the understanding and healing process of the Déline people.

## **3.3. Environmental Studies**

### **3.3.1. Site Assessment**

#### **Rationale and Objectives**

It is evident that more information needs to be gathered about the site, in particular the location, characteristics and volumes of the tailings and waste rock. The objectives of the site assessment are to determine:

1. the contaminants of concern, sources, and pathways;
2. the extent of the area impacted by the mine site;
3. the potential risks posed to people while at this site;
4. clean-up and containment options for Port Radium.

#### **Project Description, Timeline and Budget**

The proposed site assessment work is summarized here, based upon the experts' recommendations, DIAND's experience, Canadian Council of Ministers of the Environment guidelines and Treasury Board policies on contaminated sites. The approximate sequence and timeline of studies and activities through to clean-up, if a detailed studies plan were to be implemented starting March 2001, are as follows:

1. the site data collection could be completed by March 2002
2. a risk assessment, development of clean-up and containment options and selection of one of these could be completed by March 2003
3. a project description for the chosen option would then be prepared and submitted to the Mackenzie Valley Environmental Impact Review Board and other responsible authorities for their review. This review could take a year (through to spring/summer 2004)

4. acquisition of permits for any works could possibly begin in the summer of 2005; permitting could also take up to a year, with site work possibly beginning in summer 2006

The workplan and budget presented here only brings us to the end of the risk assessment and selection of a clean-up option (steps 1 and 2 above). The work required for an environmental assessment, permitting and eventual clean-up cannot be budgeted until the data are collected, risk assessed and clean-up options are developed.

Table 3.2 lists some specific studies/activities and associated costs which were recommended by the expert panel.

**Table 3.2. Summary of Site Assessment Studies/Activities**

<b>Site Assessment Studies/Activities</b>	<b>Estimated Cost (\$K)</b>
Appropriate contour mapping for closure design	50
Waste inventory by area	100
Design details for existing structures (e.g., weirs, waste rock dykes)	20
Physical and chemical characteristics of tailings and waste rock (mineralogy, pore water quality, leaching character, material properties)	45
Contamination survey/clean-up plan	100
Geotechnical investigations for foundations, borrow materials sources and characteristics	100
Obtain information on stability of mine workings	50
Mapping of contaminated sediment in Great Bear Lake	75
Develop conceptual clean-up and containment options	75
Selection of preferred option and environmental assessment	75
Office/Administration/Supplies (10% of project costs)	69
<b>Total</b>	<b>759</b>

These cost estimates are based on the experts' experience in assessing and remediating uranium mines, and a moderately high degree of uncertainty with some of these estimates will persist until more is known about the site. All activities and information generated lead to the endpoint for this assessment; the ability to make an informed decision on clean-up and containment options. The costs associated with licensing, or other regulatory compliance activities, clean-up costs, and monitoring plan development and implementation are not included in this workplan and budget; a better estimate of these costs will results from completion of the site assessment.

## Supporting and Related Studies and Linkages

Existing reports, *traditional knowledge* and *archival documents* will assist in developing the site assessment work plan. The information from the site assessment will contribute to the *risk assessment* and *dose reconstruction* work, and will assist in providing safety information for those visiting the site.

## Community Involvement

There is only a minor role for the local community in the execution of the work to consider a clean-up and containment plan. Tasks where there could be input include: sample collection, borrow material investigation and review of data, draft reports and clean-up and containment plans. Implication of the community in the execution of a clean-up and containment plan should be defined. The community should be involved in the design and completion of the monitoring program such that their concerns are addressed and that they understand the relevance of the results.

### 3.3.2. Ecological Risk Assessment (ERA)

#### Rationale and Objectives

“Risk” is the probability that a specific adverse effect will occur in an individual or a population exposed to a hazard. “Risk assessment” is a largely scientific process for developing inferences about risk, and is comprised of the following main steps:

1. Problem Formulation
2. Exposure Assessment
3. Toxicity Assessment
4. Risk Characterization

Although risk assessment as a tool is often used to assess risk to humans (see Section 3.4.3), it also applies to environmental receptors; this type of study is termed an ecological risk assessment. (*Note: It is operationally inefficient to separate the human and the ecological risk assessment activities in this instance, but for clarity it will be presented here as distinct activities; ERA under Environmental Studies (Section 3.3) and the human health risk assessment under Human Health Studies (Section 3.4)*) Following the steps in a risk assessment, the objectives of the ERA are:

1. Identify the contaminants of concern and pathways for available ecological receptors.
2. Quantify levels of exposure to the receptors; if possible, differentiate natural levels from exposure due to the site.
3. Assess the potential effects of the exposure(s) on key receptor groups.
4. Characterize the risk, including the nature and degree of the risk under specific exposure conditions.

## Project Description, Timeline and Budget

The ecological risk assessment incorporates information from the site assessment and builds on past studies. There are some specific tasks, identified by the experts, which require new information about the site. The new studies are included here with the estimated costs, and for the risk assessment itself.

**Table 3.3. Summary of Ecological Risk Assessment Studies/Activities**

<b>ERA Studies/Activities</b>	<b>Estimated Cost (\$K)</b>
Terrestrial inventory of plant, animal and bird species	75
Assessment of contaminant levels in terrestrial species (excluding caribou)	60
Assessment and monitoring of contaminant levels in caribou	30
Assessment of contaminants (radionuclides, metals, organochlorines) in fish (4 sites in Great Bear Lake)	100
Assessment of sediment toxicity on invertebrates and sediment-dwelling fish	150
As-needed monitoring of additional environmental samples	75
Conduct full ecological risk assessment on the data	50
Office/Administration/Supplies (10% of project costs)	54
<b>Total</b>	<b>594</b>

The inventory of plants and animals from the Great Bear Lake area is a first step toward completing a detailed ecological risk assessment. The biological inventory and analyses are expected to take up to two full seasons. Previous chemical analyses indicate that the levels of chemical contaminants in sediments are high, but there is no indication about the toxicity towards fish or invertebrates living on and in the sediments. Detailed assessment of the chemistry of the sediments and the health of the benthic community is a priority. Data on the exposure will be compared to existing guidelines from Environment Canada, the Canadian Council of Ministers of the Environment and the Canadian Nuclear Safety Commission. This information will be used to plan further monitoring and testing of susceptible species.

Small projects such as a community-led caribou and fish monitoring can help the community re-establish its confidence in some of its principal sources of traditional food and can help demonstrate the impact of the Port Radium site on the surrounding environment (terrestrial and aquatic). In addition, a voluntary monitoring program could provide Déline residents with a means of testing the quality of harvested food and particular environmental samples on an "as-needed basis". Annual monitoring of contaminant levels in dietary items would indicate changes occurring through time and would also reassure local consumers that the quality of their food is not of concern.

## **Supporting and Related Studies and Linkages**

TK will play an important role in the inventory of aquatic and terrestrial species around the mine site. Furthermore, the human health risk assessment (see Section 3.4.4.) is linked to this study through the analyses of potential food species.

## **Community Involvement**

The knowledge of the elders, hunters and trappers in Déline will be crucial to making a list of the species present in the Great Bear Lake area at different times of the year. They will also help to identify the plants and animals. The people of Déline will also play a large part in the selection of sites and test species and in the collection of fish samples. Their involvement will be optimal for the voluntary monitoring of samples in their environment. A short-training should be provided to show the residents how to collect and preserve different types of samples (organisms, soil, water) as well as to do morphometric measurements when collecting animals. Collection, identification, preparation, storage, and shipping of samples should be entirely done by the community with supervision of the resident scientist. Interpretation of results could be done by the latter or an outside consultant.

## **3.4. Human Health Studies**

### **3.4.1. Gather Human Health Statistics**

#### **Rationale and Objectives**

Existing documentary records relating to exposure, mortality and morbidity since the formal opening of mining must be identified and critically evaluated for their completeness and reliability, and their applicability to the needs of this project. Information gaps will be clearly identified. The objective is to gather all relevant documents to ensure the CDUT's information needs are met and to allow the best use of resources and time in planning and implementing the proposed studies.

#### **Project Description, Timeline and Budget**

Negotiations with the relevant government authorities or the mining company should be undertaken to obtain all the names of the persons who were their employees. Population-based mortality and cancer incidence statistics will be obtained from the Population Health Division of the GNWT (by decade), for the most common causes of death, for the most frequent types of cancer, and for cancers that are most strongly associated with ionizing radiation. Names from the regions of Déline and Port Radium during the period of 1940-2000 will also be searched in cancer registries from: a) Alberta Cancer Board; b) British Columbia Cancer Control Agency; and, c) National Cancer Registry. The medical health records of the risk groups (some available from Déline and others from Inuvik) must also be obtained.

In addition to cancer-related information a broader community health profile should be developed, including all health determinants.

*Estimated timeline*

1 year

*Budget*

\$15,000

### **Supporting and Related Studies and Linkages**

Obtaining these historical documents will assist in further developing the necessary health surveys to be conducted. Furthermore, these data will likely be useful in the risk assessment (to those exposed years ago) and may complement the historical information derived from interviews in Déline.

### **Community Involvement**

The Déline community's knowledge about families who lived and worked at Port Radium will be invaluable in assisting with the collection of the older records and, in general, will aid with the formulation of an initial list of individuals. This will probably be best accomplished during community interviews.

## **3.4.2. Rapid Community Health Assessment**

### **Rationale and Objectives**

The Déline community has serious concerns about the health status of its people. The review of population-based statistics as described in Section 3.4.3 will allow identification of health problems that have occurred in excess, as well as, major types of serious illness in Déline residents. Surveillance programs describe disease patterns in a region of concern, and allow these to be compared to the expected frequency. If disease rates are higher than expected, then further investigation would be justified to find the reason. So far, rather limited information is available regarding how health in the Déline region compares with other regions. By identifying which specific illnesses have occurred in excess, it will be possible to plan targeted research or health care programs to respond to these problems. Therefore, the identification of the health status of Déline people is an urgent first step to be undertaken before any further research or service can be initiated to respond to specific health problems.

The community's views on the impacts of activities associated with the mining of uranium in the Déline area on the health of the individuals, the community and the environment can be assessed through a community health impact assessment. This multidisciplinary approach will allow individuals to understand the nature and consequences of the mining activity and promote the community defining its own health needs and potential solutions.



## Project Description, Timeline and Budget

The Rapid Community Health Assessment approach involves a multi-disciplinary team, including representatives from the community, that gathers information and views/perceptions from a wide range of sources on the needs and aspirations of the community. This approach has a number of direct benefits:

- The nature of the team reduces any one bias predominating
- It is multi-dimensional drawing knowledge from across the spectrum thereby creating a broad vision
- It combines individual, population, and community perspectives
- It produces as an end product an action plan for agreed prioritized issues
- The results are owned by the community making implementation easier
- It strengthens the local community and supports/legitimizes the traditional perspective, albeit within a wider social construct
- It enables the local community to be centrally involved in decision-making processes.

### *Estimated timeline*

This project should be conducted within 15 months.

**Table 3.4. Summary of Rapid Community Health Assessment Studies/Activities**

<b>Rapid Community Health Assessment Studies/Activities</b>	<b>Estimated Cost (\$K)</b>
<b>Phase 1</b> (approx. 12 days): Consultation with Déline community, setting framework	18
<b>Phase 2:</b> Review of the corporate information and database	See Section 3.4.3
<b>Phase 3: Detailed implementation plan</b> (approx. 35 days):	
Set up basis for community health impact assessment, questionnaire & key-relationship development	51
Training and development	9
<b>Phase 4: Community health impact surveys</b> (approx. 3 months):	
Carry out community health assessment using rapid appraisal techniques	98
Carry out interviews, analyze information, interpret and report traditional views, etc. (Two full-time community lay-workers and remuneration to interviewees)	80
<b>Phase 5: Evaluation, report &amp; feedback</b> (approx. 12 days)	16
Office/Administration/Supplies (10% of project costs)	27.2
<b>Total</b>	<b>299.2</b>

## **Supporting and Related Studies and Linkages**

Traditional knowledge studies will provide essential information and cultural understanding needed to realize the community health impact assessment.

## **Community Involvement**

A key component of the community health assessment will involve sharing understanding of the nature and consequences of the impact of radiation, occurring naturally, through human activity, or through lifestyle choices. A great deal of scientific and research material is available for this and the role of the facilitators will be to explain the effects of radiation and other causes of cancer on the individual and public health of the community. Active participation of individuals and the community at large will be at the heart of the evaluation; conducting interviews and assisting in the collection of samples.

### **3.4.3. Epidemiology**

#### **Rationale and Objectives**

The rapid community health assessment (see Section 3.4.2) will enable the identification of health problems, concerns and needs at the community level. This information is needed prior to considering any specific interventions (e.g., health care, prevention, education, etc.). The most common and serious illnesses, current health practices, and health service utilization will be described in the survey that will in turn help identify needs for development in health care, prevention and education. The principal objective of utilizing an epidemiologist is to provide the CDUT with the expertise to interpret the population based data in support of the community health assessment.

#### **Project Description, Timeline and Budget**

Following the collection of all relevant health statistics (see Section 3.4.1) the data will be combined, compiled and analyzed to help identify major problems. Age- and gender-adjusted incidence and mortality rates will be calculated, and standardized incidence/mortality ratios will be estimated to determine whether risk in Déline is different from expected (using the NWT and Canada as the standard for comparison). Given the size of the Déline population, the limitations of these data must be recognized, and the statistical analysis will need to be carefully conducted and presented.

#### *Estimated timeline*

This project should be conducted within three years.

**Table 3.5. Summary of Epidemiology Studies/Activities**

<b>Epidemiology Studies/Activities</b>	<b>Estimated Cost (\$K)</b>
Project Epidemiologist	120.0
Interviewers	See Section 3.4.2.
Travel/Accommodation (two trips per year)	36.0
Office/Administration/Supplies (10% of project costs)	15.6
<b>Total</b>	<b>171.6</b>

### **Supporting and Related Studies and Linkages**

The health survey study would benefit from the immediate completion of the historical review of health statistics, the results of which can guide the development of procedures for this survey. Information gathered by oral history studies is also essential to the epidemiological survey and would have to be collected according to the needs of the latter project.

### **Community Involvement**

Traditional knowledge will play a key role in this study. Thus, the involvement of the community is crucial to the understanding of current health problems, health history as well as risk factors.

#### **3.4.4. Human Health Risk Assessment (Past and Present)**

Human health risk assessment considers potential hazards and their effects on individuals or groups of people. In the case of the Port Radium site, there are exposure scenarios for past exposures, as well as those of present-day. As such the human health risk assessment proposed will address the two different time periods via retrospective (dose reconstruction) and present-day analyses.

### **Rationale and Objectives**

Miners, ore carriers and people living at the Port Radium mine site were exposed to various levels of radiation. Available data, documents and oral history will be used to estimate potential doses to Déline mine workers, ore carriers and people who were working or living at Port Radium. A human health exposure pathways analysis will also be used to evaluate how people's diet and activities contribute to their past and present-day contaminant exposure.

### **Project Description, Timeline and Budget**

Estimation of exposure doses will be performed using reasonably conservative assumptions, based on the best information on realistic exposure scenarios, and

employ information such as oral history descriptions, old photos, video documents and data on ore grades over time.

Data from mine site characterization as well as the levels of contaminants in food, biota and the environment will be used to carry out a comprehensive exposure pathways analysis. Contaminant levels in Déline peoples have to be evaluated and linkages between dietary intakes and/or activities and contaminant levels have to be assessed.

*Estimated timeline*

Following the archival review, and in conjunction with the TK interviews, it is estimated that the project will require about 6 months for gathering information about ore carriers and about 3 to 6 months for gathering information about other people living at the mine site. Pathways calculations could be done in 6 months once the data are available.

*Budget*

\$231,000

**Table 3.6. Summary of Human Health Risk Assessment Studies/Activities**

<b>Human Health Risk Assessment Studies/Activities</b>	<b>Estimated Cost (\$K)</b>
Dose Reconstruction	60
Risk Assessment (Past and Present)	150
Office/Administration/Supplies (10% of project costs)	21
<b>Total</b>	<b>231</b>

**Supporting and Related Studies and Linkages**

The successful outcome of these studies relies heavily upon information gathered from the search of archival materials, TK surveys, as well as the site assessment.

**Community Involvement**

Oral histories and TK will play important roles in successfully completing these studies.

**3.4.5. Medical Surveillance**

The surveillance program described in this section was developed directly from recommendations made by the oncologist in our expert panel at the Experts and Community Workshop.

## **Rationale and Objectives**

Monitoring the health and illness, service utilization and community's expectations and experiences is a fundamental step in any process of health need assessment of the community. A health surveillance program has to be established in order to follow the health status of particular risk groups (underground & surface miners, Port Radium residents, smokers etc.) as well as the Déline community.

## **Project Description, Timeline and Budget**

Health surveillance programs would be developed for the different risk groups that were identified from the Déline population:

1. Underground workers in the Uranium Eldorado Mine and the Echo Bay Mining Company
2. Smokers with five or more years of work underground
3. Mine surface workers with smoking history
4. Group 1 with no smoking history and less than five years of work
5. Population of Port Radium (smokers and non-smokers) from 1940 to town closure
6. Déline Community

Survivors of groups 1, 2, and 3 are at very high risk and require close surveillance every eight months. Groups 4 and 5 are at high risk and require surveillance once a year. Group 6 is at moderate risk and requires health surveillance every year. The following list indicates the recommended work that should be carried out to conduct proper assessments of individual health:

- Physical examination
- Chest x-ray
- Sputum for cytology and “induction” quantitative screening
- Routine blood chemistries – LDH, uric acid (including mercury)
- Complete blood count – differential and blood smear
- Urine for levels of arsenic

### *Estimated timeline*

Although the recommendation from the Experts and Community Workshop was for the establishment of a 5 year program, the current proposal is for 3 years.

**Table 3.7. Summary of Medical Surveillance Studies/Activities**

<b>Medical Surveillance Studies/Activities</b>	<b>Estimated Cost (\$K)</b>
Oncology nurse	225.0
Consultant in Public Health	15.0
Consultant in Health Physics	15.0
Consultant in Oncology	15.0
Consultation with Epidemiology/Biostatistics Centre	10.0
Data manager (from Déline – trained in data collection and computer entry)	75.0
Office/Administration/Supplies (10% of project costs)	35.5
<b>Total</b>	<b>390.5</b>

### **Supporting and Related Studies and Linkages**

Information gathered from the community health assessment, oral histories, TK surveys and archival searches will be vital to identify the risk groups.

### **Community Involvement**

The data manager will come from the Déline community and could be specifically trained at the Cross Cancer Institute.

Table 3.8. summarizes the specific human health related studies and activities and associated costs that were recommended by the expert panel.

**Table 3.8. Summary of Human Health Studies/Activities**

<b>Human Health Studies/Activities</b>	<b>Estimated Cost (\$K)</b>
Human Health Statistics	15.0
Rapid Community Health Assessment	299.0
Epidemiology	171.6
Human Health Risk Assessment (Past and Present)	231.0
Medical Surveillance	389.5
<b>Total</b>	<b>1106.1</b>

### **3.5. Overall Project Linkages**

For each section described above the supporting and related studies are indicated. Figure 3.1 illustrates the ways that all of the studies are linked, and illustrates the importance of compiling all existing information and of undertaking a traditional knowledge and oral history project. It shows how important the integration of environmental, health and traditional knowledge is, and indicates the challenge the CDUT will face in bringing together the multi-disciplinary sets of information to address the community's questions.

A good example of the inter-connected nature of the studies and the importance of obtaining the information in a stepwise approach is the relationship of TK to the other studies. The oral histories about ore carriers, miners and residents of Port Radium will support the dose reconstruction project; the survey on the use of the Port Radium area for harvesting and other purposes will be useful to assess exposure pathways; the analysis of the dietary survey will provide crucial information for the inventory of plants and animals consumed by Déline residents. This information will in turn be used to determine the type of samples needed for the risk assessment study on metals and radionuclides in dietary items. Oral histories will be useful to identify potentially contaminated areas around the mine site and to assess contaminant pathways to humans.

The communication of contributions of the individual studies and the linkages is seen as important to show people that no study is undertaken in isolation of the other relevant studies; the program of studies must be undertaken as a whole to arrive at the answers to the community's questions. Communication is essential to the success of the proposed projects and must be present in all steps of the process to keep the community well-informed and to evaluate if the stated needs are met.

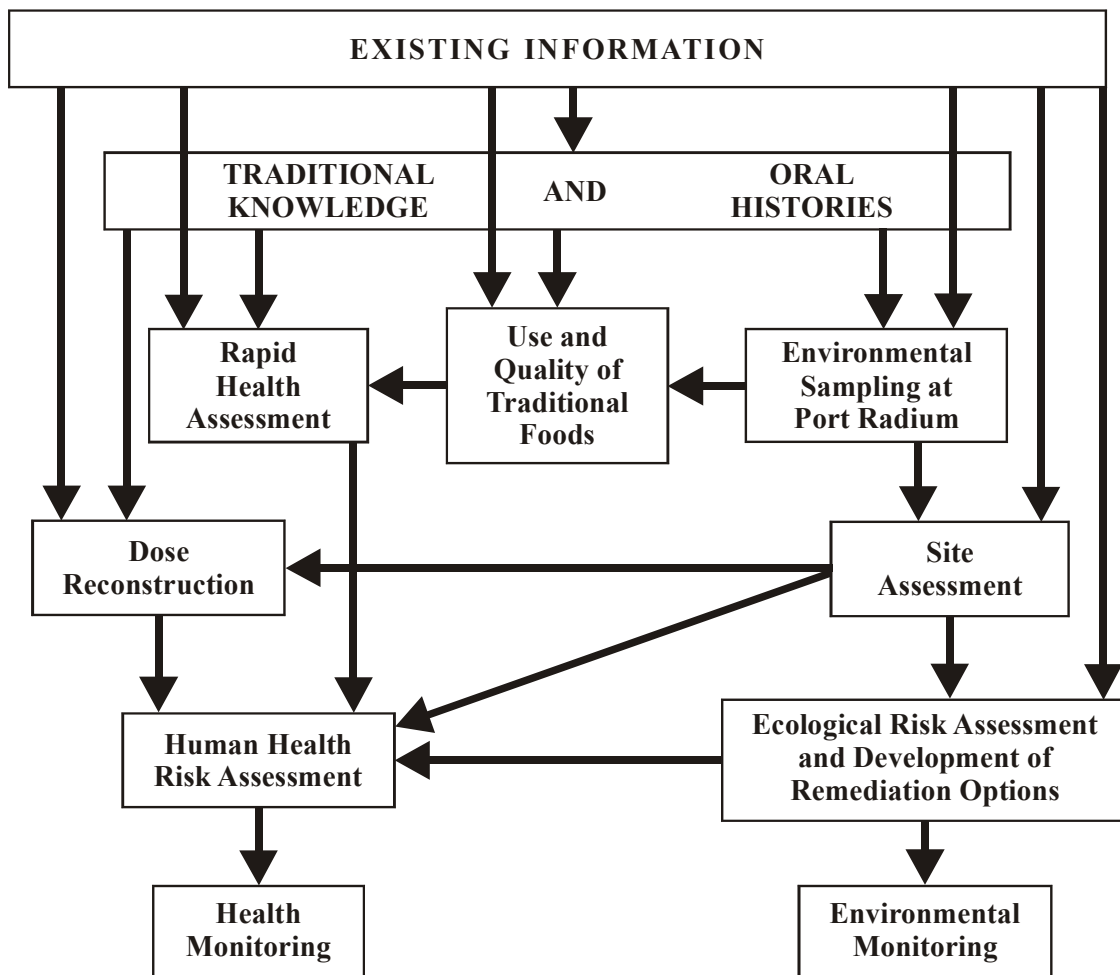


Figure 3.2. Schematic illustration of supporting and related studies and linkages

The communication of contributions of the individual studies and the linkages is seen as important to show people that no study is undertaken in isolation of the other relevant studies; the program of studies must be undertaken as a whole to arrive at the answers to the community's questions. Communication is essential to the success of the proposed projects and must be present in all steps of the process to keep the community well-informed and to evaluate if the stated needs are met. The roles of the Déline and Federal core staff in bringing together all of this information in a coordinated way and developing the appropriate communications strategy (see Sections 5.5 and 5.6) will be crucial to attain the goals of the Action Plan and answer the community's questions.



## 4. COMMUNITY HEALING

*“People need to heal, to heal in their mind, their heart and their soul. To make it work is to forgive each other. One of the most powerful tools that the native people believe is to forgive each other. What I have said, with one heart, it will be said with many many hearts tomorrow, everywhere across Canada. What Dene people really want is forgiveness, if that happens the fish will be healed, and the land of the country will be feeling this healing.”*

Charlie Neyelle, Traditional Healer for the Déline Uranium Team, October 26, 2000

Although community healing was not explicitly addressed in the organization of the Experts and Community Workshop, testimonials during the workshop by widows of ore-carriers, former ore-carriers, men who had lived and worked in and around Port Radium, and families of those affected highlighted the need for a healing program to be established in Déline. Some of the common points brought forward during the workshop have been outlined in Section 2.3.2 of this document. While the successful completion of the studies and activities described in this Action Plan and the direct involvement of the community through education and training will certainly promote, in a secondary manner, healing for the people of Déline, direct steps must also be taken to help the families affected by Port Radium heal.

A preliminary community-based health needs assessment recently conducted for the CDUT by two Public Healthcare consultants, Dr. Rafik Gardee and Mr. John Jackson, revealed a number of areas where healing and mental health issues should be addressed. Through a series of interviews with healthcare practitioners, community leaders and people directly affected by Port Radium, the consultants found that the psychological needs of individuals in the community are not being addressed in a systematic manner. Cancer, simply referred to as the “sickness”, is of such a high profile in Déline that it leads to obvious anxiety and distress within certain sections of the population. The individual and collective grief of the community appears to be manifesting itself in symptoms of depression, and the absence of cross cultural bereavement counselling and support for people carrying long-term losses represents a major deficit in the health services provided in Déline.

A program of bereavement and grief counselling, as well as professional psychological counselling, should be instituted in Déline to address the obvious psychological and emotional distress and suffering being endured by widows and other people affected by cancer deaths. Such a program should be run in conjunction with a series of workshops and retreats conducted by Déline’s Traditional Healer, Charlie Neyelle (with the possible assistance of outside organizations). It is important to adopt a holistic approach to healing and to promote psychological well-being throughout the community. Proposed funding requirements are outlined in Table 4.1.

**Table 4.1. Proposed Costs for Community Healing**

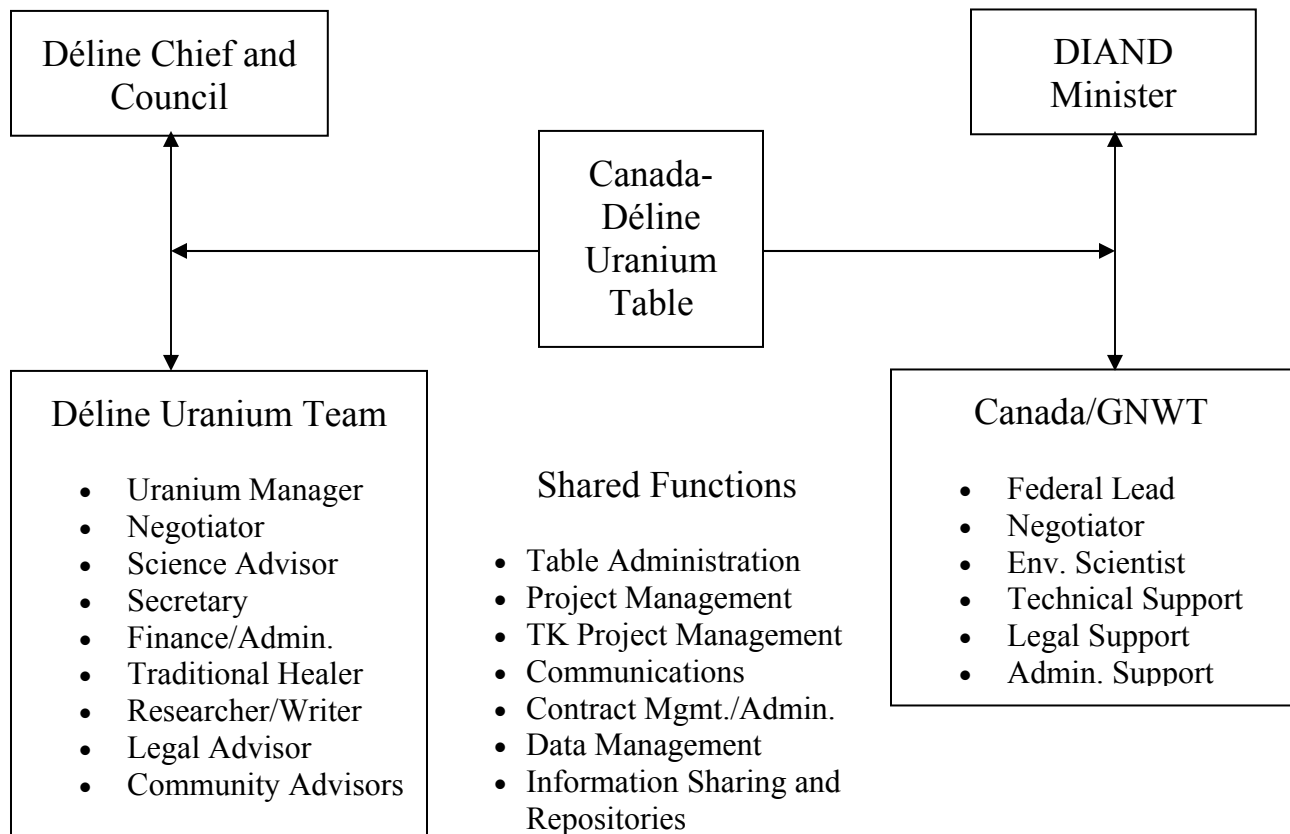
<b>Community Healing Needs</b>	<b>Estimated Cost (\$K)</b>
Community-based workshops (3x)	45
On the land retreats (3x)	60
Mission Building Renovation and Maintenance (for 3 years)	90
Professional counsellor (for 3 years)	240
<b>Total</b>	<b>435</b>

## 5. PROJECT MANAGEMENT, IMPLEMENTATION AND SUPPORT ELEMENTS

This chapter addresses the method by which decisions are made, the resources required for project management and support, and outlines a project management approach that may be adopted by the CDUT for some of the proposed work.

### 5.1. CDUT Management Structure

The model shown in Figure 5.1 has been in use generally since February, 2000, but has been refined to reflect the CDUT Terms of Reference, Canada's and Déline's operational requirements and the evolving requirements for overall project implementation, including community involvement.



**Figure 5.1. CDUT management structure**

## 5.2. Déline Uranium Team Core Capacity

The Minister of DIAND has committed to Déline that Canada would provide sufficient funds for the community to participate meaningfully at the Canada-Déline Uranium Table. This cost is seen in the fees, salaries and operational costs for the Déline Uranium Team shown in Figure 5.1. The proposed budget is shown in Table 5.1 below.

**Table 5.1. Annual Core Capacity Requirements for the Déline Uranium Team**

Budget item	Amount
<b>1. Staff</b>	
<b>a) Déline</b>	
Uranium Team Manager	\$60,000
Science Advisor	\$85,000
Secretary	\$35,000
Traditional Healer	\$40,000
Community Communications Coordinator	\$30,000
<i>employer contributions (14%)</i>	\$35,000
TK Project Manager	Sec. 3.2
Chief Negotiator (4 days/month)	\$24,000
Two Summer Students	\$11,000
<b>b) non-Déline</b>	
Legal Counsel (4 days/month)	\$64,800
Researcher/Advisor (5 days/month)	\$30,000
<b>2. O &amp; M</b>	
<b>a) Déline</b>	
Office Rent (2 offices)	\$24,000
Fax/Phone	\$12,000
LAN/Internet Service Fees	\$9,600
Supplies	\$12,000
Travel	\$40,000
Honoraria	\$40,000
Bank Charges	\$2,000
Translation	\$5,000
<b>b) non-Déline</b>	
Travel	\$20,000
Accommodation/Meals	\$20,000
Fax/Phone	\$6,000
<b>Total Budget = \$605,400</b>	

### 5.3. DIAND Core Capacity

DIAND has been the lead federal agency on the Port Radium issue for Canada. In March 2000, an Environmental Scientist assignment (year-to-year) position was funded to work out of the Yellowknife regional office. This position has been responsible for project management and technical support, and for representing the Department at the CDUT and interdepartmental meetings. This position is funded at the PC-03 level, and is purchased through O&M dollars as shown in Table 5.2.

**Table 5.2. Annual Core Capacity Requirements for DIAND**

Office	Total Salary (as O&M)	Total O&M	Annual Total
DIAND NT Env. Scientist – PC-03	\$90,879	\$70,000	\$160,879
DIAND HQ Travel and other costs	N/A	\$35,000	\$35,000
<b>ANNUAL TOTAL</b>	<b>\$90,879</b>	<b>\$105,000</b>	<b>\$195,879</b>

### 5.4. Project Management

#### 5.4.1. Introduction

A workshop was organized by the CDUT in May 2000 to identify the issues to be addressed arising out of the community's concerns regarding the effects of the activities at Port Radium and related sites. It was made clear by the participants, and agreed by the CDUT, that a specific objective would be to examine means for community involvement and active participation in future studies.

The following principals are important in relation to what has now become the Action Plan:

- involvement of the community is essential to improve community capacity development and should be part of all processes and studies;
- of prime importance is the role of Déline in planning, implementing and interpreting, i.e., managing the studies;
- science education programs related to the issues have to be developed and provided to the community.

It is therefore important that the community of Déline put in place mechanisms in order to obtain the maximum benefits, short, medium and long term, from the work and studies contemplated in this Action Plan. The participation of community members in the opportunities for employment, training, sub-contracting, purchase of goods and services, ownership and management arising from the work to be undertaken will contribute to the achievement of the objective of rebuilding the confidence of the Dene to carry out their traditional activities without real, or perceived threats from Port Radium.

In the past, consulting and environmental clean up contracts employing non Aboriginal workers have been awarded to outside companies. This approach is no longer acceptable to communities such as Déline. Increasingly, Aboriginal communities and their local businesses have positioned themselves in advance to manage and participate fully in the economic activity and capacity building generated by the work to be done in their area. A model for the new approach can be found in the recent past with involvement of the Inuvialuit community in the clean up of DEW Line sites.

#### **5.4.2. Identifying and Measuring the Opportunities**

The activities required to address the health, traditional knowledge and environmental studies, the design of environmental reclamation activities, the communications functions and the clean up itself provide a significant number of socio-economic opportunities. The activities, and thus the opportunities, are fully presented elsewhere in this Action Plan.

It is also important to evaluate or measure the potential benefit of these opportunities to the community. Once the potential benefit is known, specific opportunities can be targeted so as to provide the most benefits to the community.

Potential benefit consists of a number of components, such as:

1. Potential capacity for the community to participate;
2. Sustainability and transferability of the opportunity;
3. Time frame and certainty of the opportunity; and
4. Size or retained value of the opportunity.

#### **5.4.3. Recommendations**

The community of Déline has a significant opportunity to participate in a number of potential socio-economic benefits. We therefore recommend that within the first six months a workshop be organized to:

1. develop a business plan to identify the means by which a local community based company can manage contracts and joint ventures and set up and own subsidiary businesses;
2. develop and recommend a model Capacity Building Agreement (CBA) which will define the extent of the requirement for all contracts to employ, train, rent, purchase and contract locally;
3. explore the various ownership and management models for performing the work set out in the Action Plan. The workshop outcome will set the ground work and criteria to:
  - i. establish contractual relationships to obtain “first tier” immediate benefits such as employment, rent, training and the purchase of

- goods and services;
- ii. establish an ownership structure for performing the work in order to capture the “second tier” sustainable and transferable benefits including profit earned, management capacity developed, sustainable experience gained and residual assets acquired;
- iii. conduct annual evaluations to monitor progress and assess the success of the models being used

#### 5.4.4. Proposed Budget

**Table 5.3. Proposed budget to enable Déline to maximize the community capacity building opportunities**

<b>Budget Item</b>	<b>Proposed Cost (\$K)</b>
Workshop to develop business plan	45
Consultant to develop draft CBA’s and to assist with workshop materials	15
Setting up and operating Management Company (per year for 2.5 years):*	
Set-up and annual general costs	5
Project Manager	80
Office Rent	12
Financial/Administration Support	35
Annual evaluations	20
Phone/Fax/Office Supplies	8
Subtotal	160
<b>Total (over 3 years)</b>	<b>460</b>

**\*Note:** The funds budgeted for setting up and operating a Management Company will be held in abeyance pending the outcome and recommendations of the workshop to develop the business plan and options for such a company, as well as further deliberations between Canada and Déline regarding contract management services.

#### 5.5. Risk Communication

Community participation and effective risk communication are critical to all phases of the Action Plan. A stakeholder driven process to define the issues and concerns has already been initiated in Déline. A continued collaborative approach to articulating the research questions and conducting the studies will ensure that the scientists understand these concerns and that the community understands the science and has the opportunity to participate in the data collection.

Addressing the communication needs related to the issues and concerns identified by the CDUT and Déline will involve the initial determination of community

communication requirements and the development of a plan that will address the following:

1. Ongoing community communication
2. Interpretation and communication of final results
3. Evaluation of the process and outcomes

*Estimated timeline*

Ongoing throughout the duration of each of the other study components undertaken in the Action Plan.

*Budget*

\$145,600

Table 5.4 lists some specific studies/activities and associated costs that were recommended by the expert panel.

**Table 5.4. Summary of Risk Communication Activities**

<b>Risk Communication Activities</b>	<b>Estimated Cost (\$K)</b>
Initial determination of community communication requirements and development of communication plan	30.0
Ongoing community communication and evaluation	46.4
Interpretation and communication of final results	22.0
Evaluation of the process and outcomes	34.0
Office/Administration/Supplies	13.2
<b>Total</b>	<b>145.6</b>

Risk communication activities are integrally linked to all of the other components undertaken in the Action Plan. The implementation of the various stages of the risk communication activities will rely upon the progress and completion of the different health and environmental studies. Furthermore, the determination of information required, as well as, the preferred methods for communicating information will have to be rapidly determined by the community.

Community participation and involvement are critical to successful implementation of the communication and stakeholder participation activities. The activities proposed are based on community members conducting much of the work, with professional expertise being used to facilitate and coordinate activities. While this is absolutely necessary for this type of study, it adds further complexity and difficulty in estimating time and costs.



## 5.6. Education

### 5.6.1. Déline Uranium Video Series

As a means of initiating education about the concepts involved in the Port Radium issue the CDUT proposes a series of four videos that will encapsulate the main areas of concern regarding the Port Radium site and the citizens of Déline.

The goals of the videos are:

- involve the community
- provide a basic level of understanding
- initiate discussion.

#### Delivery

Each of these episodes would be available on videocassette. The language of the video would be English. If there is a demand the video could be versioned into North Slavey or a day workshop with unilingual speakers and a translator could be arranged.

These episodes will air on the community channel in Déline as part of the broader community educational plan. Each video could be played several times over the course of a week followed a public screening and question period.

#### Format

Each video will be composed footage collected over the past year (Experts Workshops, Risk Management Workshop, Traditional Knowledge Workshop, field trip to Port Radium, shots of Radium Gilbert), additional footage of a host narrator, stock footage, archival footage and original presentations by the experts where possible.

Each episode will be approximately 30 - 45 minutes and could cover the following:

1. **Human Health** – This topic would include an explanation of life expectancy, causes of death, what is cancer, what is radiation (from natural and man-made causes) and how radiation affects humans. The video would end with a short section on how to use statistics to measure human health and also the concept of exposure to harmful substances (how much for how long). Experts: Drs. John McLaughlin, Raul Urtasun & Rafik Gardee
2. **The Health of the Environment** – This video would illustrate the food chain (using northern examples) and introduce the concept of pathways of contamination. More specifically, for our audience we would then discuss what we all ready know about the “environment” at Port Radium and mention what we don’t know. Using our knowledge of the natural world will help us

understand the risks of exposure to the environment. Experts: Charlie Neyelle, and Drs. Peter Usher & Colin McDonald

3. **Risk Management** – In this episode risk management and what is the difference between danger and risk will be presented. How can risk management be used to begin to understand what happened at the Port Radium site and how can the issues at hand be addressed by the community of Déline? Experts: Dr. Ron Brecher & Cindy Jardine
4. **Mine Site Assessment** – This video will identify what is known about the Port Radium site; what possible dangers exist (to humans, the flora and the fauna); things to think about in planning a clean-up and containment program; how to maximize local labour and plan for it. Also this video should present what is unknown about the site and what questions need to be asked of the people who lived there. Experts: Drs. Doug Chambers & Victor Clulow, and Randy Knapp

**Table 5.5. Proposed Budget for the Déline Uranium Video Series**

Item	Estimated Cost (\$K)
Materials/Services	3.5
Fees/Wages	16.5
Travel/Accommodation	1.5
Equipment/Rentals	4.5
Administration	3.0
SUBTOTAL (cost for one 30-45 minute video)	29.0
<b>Total for Video Series</b>	<b>116.0</b>

## **6. ADDRESSING COMMUNITY CONCERNS AND MOVING FORWARD**

This chapter relates the objectives and deliverables of the proposed studies to the community's concerns as noted from the scoping exercise and the experts workshop. This roll-up pulls together the information from Chapters 3 through 5 and puts the proposed study results and activities in the context of the central issues as described in the Introduction:

1. Effects on ore carriers (past)
2. Effects on people who lived at or near the mine site (past)
3. Effects on Déline residents (present and future)
4. Safety of the environment (present and future)
5. Mine site clean-up and containment (future)

### **6.1. Addressing Community Concerns**

The Action Plan outcomes and objectives are shown below as they relate to the five central issues listed above. It is hoped that this is an easy reference to illustrate how the proposed Action Plan will address each of these broad issues.

#### **Steps to Address the Potential Effects on Ore Carriers**

- Identification of individuals who worked transporting the ore
- Physical examinations at health centre and follow-up
- Health survey of problems, concerns, needs
- Identification and analysis of health outcomes of these individuals
- Potential dose reconstruction, based on exposure pathway model and requiring information such as ore properties, handling practices and working conditions, living conditions, work history (jobs, time in each job), diet, other health determinants
- Exposure assessment (what do the dose estimates mean?)
- Healing exercises developed in community health assessment
- Effective communication of health information and other project information

#### **Steps to Address the Potential Effects on People Who Lived At or Near the Site**

- Identification of individuals and families who worked at the site or lived nearby
- Physical examinations at health centre and follow-up
- Health survey of problems, concerns, needs
- Identification and analysis of health outcomes of these individuals
- Potential dose reconstruction based on exposure pathway model and requiring information on living conditions, diet, other health determinants
- Potential exposure assessment (what do the dose estimates mean?)
- Healing exercises developed in community health assessment
- Effective communication of health information and other project information

### **Steps to Address Potential Present-Day Effects on Residents of Déline**

- Health survey of problems, concerns, needs
- Development of a present-day exposure pathway model, based on existing information and residents' input
- Estimate of present-day potential levels of radiation and metals exposure to residents, based on environmental sampling of dietary items, natural radiation measurements in the community, consideration of non-environmental sources
- Potential exposure assessment (what do the dose estimates mean?)
- Healing exercises developed in community health assessment
- Effective communication of health information and other project

### **Steps to Address the Safety of the Environment**

- Gather all known information about the mine and its operations
- Gather traditional knowledge and oral histories about the mine site and immediate area
- Identify contaminants of concern, pathways into the environment and key receptors
- Identify the extent of area impacted by the mine
- Assess the risks to people while at the site
- Quantify levels of exposure(s) to key receptors
- Assess potential effects of exposure to receptors
- Characterize the risk

### **Steps to Address Mine Site Clean-up and Containment**

- Further to the site assessment and ecological risk assessment, clean-up and containment and monitoring options can be developed
- Canadian Nuclear Safety Commission, under its new regulations, will also provide direction to the clean-up and containment efforts
- Applicable regulatory requirements (e.g., under the MVRMA) for site work will also impact any clean-up and containment work

These tables relate the study outcomes and objectives thematically. To help identify sections of the plan which address the individual questions posed by the community at the scoping exercise in May 2000, a matrix was developed (see Table 6.1). The matrix illustrates the study or studies that help to answer the questions captured during the scoping exercise.

**Table 6.1. Questions posed by the community about the Port Radium issue and the study or activity outlined in the Action Plan to help provide the answer.**

Community Question	Study or Activity Outlined in Action Plan to Help Answer the Question												
	Archives/reports	T.K.	Env.		Health					Risk communication	Healing	Education	Community capacity building
			Site assessment	ERA	RCHA	Epidemiology	Dose reconstruction	Exposure pathways	Human health RA				
What kinds of sicknesses can radiation cause?	X												
Can exposure to radiation cause deformities and/or reproductive problems?	X												
Is it more dangerous to have worked underground in the mines than on the surface?						X	X						
Is the mine causing cancer?					X		X						
Are the deaths of the ore carriers related to their exposure?	X	X				X							
What is the effect of the use of the canvas material from ore bags for housing and clothing?	X					X							
What are the safety issues at the site?	X		X										
Is it safe for researchers and others to be at the site?			X										
In what ways can people be exposed to contaminants from the site?		X	X	X				X					
In what ways are people being exposed to contaminants from the site?		X	X	X				X					
How can people protect themselves from being exposed?			X					X					
What do we know and not know about the causes of the cancers occurring in the community? Are they related to anything at the mine site?					X	X	X	X	X				
What are the hotspots?			X										
How long will these remain hot spots? What about other contamination?			X	X									
Is it airborne?			X	X									
Can the effects of Port Radium be reduced (health, environment)?			X	X					X				
What kinds of cancer occur in the community?					X				X				
What can you do to detect cancer, or slow/stop it if you have it?	X								X				
Are cigarettes causing cancer?	X				X				X				
What were the effects on the families living in and around Port Radium?	X	X				X							









## 6.2. Using the Outcomes of the Action Plan to Make Decisions

The health and environmental studies will produce a lot of information that is required for the CDUT to decide what further actions need to be taken to address the concerns. This is not to say that specific actions are not being taken throughout this action plan; some specific actions for individuals and the community within this action plan include:

- health needs of individuals are being addressed directly, with medical surveillance and follow-up;
- healing is recognized as important to individuals and the community, and steps are being taken to begin a healing process immediately;
- community involvement in the studies is recommended in each proposed action; this will help the community be informed, up-to-date and have a greater level of understanding of and support for the information produced;
- community capacity development is an important consideration, and to the extent possible, jobs, training and economic benefits are built into these studies;
- the communication strategy which will be developed and implemented will help the community with understanding the information produced, will assist with healing, and the materials produced will serve as a lasting reference for the future.

The decisions that need to be made, upon the collection of all existing materials and the information resulting from the health and environmental studies, include:

1. What should be done about the mine site with regard to clean-up and containment?
2. What should be done about licensing and ongoing monitoring of the mine site?
3. What steps need to be taken for ongoing health care for individuals?
4. How do we go forward with questions about historical exposure?

As previously presented in Section 2.3.1, the risk assessment and management process adopted by the CDUT is based upon meaningful community participation. Jardine (2000) summarized the value of a community-driven process:

*Community participation and effective risk communication are critical to all phases of the planned comprehensive plan. A community-driven process to define the issues and concerns has already been initiated in Déline. A continued collaborative approach to articulating the research questions and conducting the studies will ensure that the scientists understand these concerns and that the community understands the science and has the opportunity to participate in the data collection. This process will generate a body of knowledge that will be accepted by all groups as a valid basis for negotiations and agreement. Planned and carefully conducted communication at the beginning and throughout the process will ensure that community information needs are identified and met, and that everyone understands the results generated. Community involvement and communication are both necessary for the identification of appropriate risk management options and for successful risk decision-making.*

## 7. PROPOSED BUDGET AND TIMELINE

The total budget for the proposed three-year Action Plan is \$6.475 M. The results of studies and activities proposed in the plan will provide information for the CDUT to make educated decisions about the site clean-up and containment, monitoring and human health matters as they relate to the uranium mining and related activities. This budget does not include costs associated with:

- regulatory requirements for the work (e.g., licensing, environmental assessment);
- actual clean up costs - the clean-up options will be developed and one selected; and
- any on-going uranium-related health initiatives (e.g., cancer surveillance) beyond three years.

These cost estimates were developed from the Experts and Community Workshop and further refined through follow-up with the experts and comparable studies in the north. These cannot be perceived as project-level estimates, but provide a best guess for planning a three year program of health and environmental studies, community healing and capacity building. Table 7.1 shows the budget roll-up from all the studies, activities and project management and support elements.

**Table 7.1. Proposed budget requirements for a three year program**

Recommended Study/Activity	Proposed Budget (\$K)		
	Year 1	Year 2	Year 3
<b>GATHER PORT RADIUM ARCHIVAL MATERIAL</b>	<b>50.0</b>		
<b>TRADITIONAL KNOWLEDGE</b>			
TK Manager (\$65K salary + employer contributions)	74.1	74.1	
Office rental for TK Manager	12.0	12.0	
Set protocols for oral interviews	20.8		
Develop Register of Déline persons	8.6		
Gather, organize and evaluate existing information	20.8		
Gather oral histories about ore carriers, miners and residents	39.3		
Port Radium area traditional land-use survey		30.3	
Analysis of diet survey		8.6	
Oral histories about traditional ecological knowledge	29.8		
Survey of local views on economic, social and cultural effects of the mine		8.2	
Local perception of hazard and risk		8.2	
Computer system with GIS capacity	20.0		
Office/Administration/Supplies (10% of project costs)	22.5	14.2	
<b>SUBTOTAL</b>	<b>247.9</b>	<b>155.6</b>	
<b>ENVIRONMENTAL STUDIES</b>			
<b>Site Assessment</b>			
Appropriate contour mapping for closure design	50.0		

<b>Recommended Study/Activity</b>	<b>Proposed Budget (\$K)</b>		
	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>
Waste inventory by area	100.0		
Design details for existing structures (e.g., weirs, waste rock dykes)	20.0		
Physical and chemical characteristics of tailings and waste rock (mineralogy, pore water quality, leaching character, material properties)	45.0		
Contamination survey/clean-up plan	100.0		
Geotechnical investigations for foundations, borrow materials sources and characteristics	100.0		
Obtain information on stability of mine workings	50.0		
Mapping of contaminated sediment in Great Bear Lake	75.0		
Develop conceptual clean-up and containment options		75.0	
Selection of preferred option and environmental assessment			75.0
Office/Administration/Supplies (10% of project costs)	54.0	7.5	7.5
<b>SUBTOTAL</b>	<b>594.0</b>	<b>82.5</b>	<b>82.5</b>
<b>Ecological Risk Assessment</b>			
Terrestrial inventory of plant, animal and bird species	50.0	25.0	
Assessment of contaminant levels in terrestrial species (excluding caribou)	40.0	20.0	
Assessment and monitoring of contaminant levels in caribou	15.0	15.0	
Assessment of contaminants in fish (4 sites in Great Bear Lake)	70.0	30.0	
Assessment of sediment toxicity on invertebrates and sediment-dwelling fish	125	25.0	
As-needed monitoring of additional environmental samples	25.0	25.0	25.0
Conduct full ecological risk assessment on the data			50.0
Office/Administration/Supplies (10% of project costs)	32.5	14.0	7.5
<b>SUBTOTAL</b>	<b>357.5</b>	<b>154.0</b>	<b>82.5</b>
<b>HUMAN HEALTH STUDIES</b>			
<b>Gather Human Health Statistics</b>	<b>15.0</b>		
<b>Rapid Community Health Assessment</b>			
Consultation with Déline community, setting framework	18.0		
Set up basis for community health impact assessment, questionnaire & key-relationship development	51.0		
Training and development	9.0		
Carry out community health assessment using rapid appraisal techniques	98.0		
Carry out interviews, analyze information, interpret and report traditional views, etc. (Two full-time community lay-workers)	80.0		

<b>Recommended Study/Activity</b>	<b>Proposed Budget (\$K)</b>		
	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>
Final project review and evaluation		16.0	
Office/Administration/Supplies (10% of project costs)	25.6	1.6	
<b>SUBTOTAL</b>	<b>281.6</b>	<b>17.6</b>	
<b>Epidemiology</b>			
Project Epidemiologist	40.0	40.0	40.0
Travel	12.0	12.0	12.0
Office/Administration/Supplies (10% of project costs)	5.2	5.2	5.2
<b>SUBTOTAL</b>	<b>57.2</b>	<b>57.2</b>	<b>57.2</b>
<b>Human Health Risk Assessment (Past &amp; Present)</b>			
Dose Reconstruction		60.0	
Risk Assessment (Past and Present)		150.0	
Office/Administration/Supplies (10% of project costs)		21.0	
<b>SUBTOTAL</b>		<b>231.0</b>	
<b>Medical Surveillance</b>			
Oncology nurse	75.0	75.0	75.0
Consultant in Public Health	7.5	7.5	
Consultant in Health Physics	7.5	7.5	
Consultant in Oncology	7.5	7.5	
Consultation with Epidemiology/Biostatistics Centre	5.0	5.0	
Data manager (from Déline - trained in data collection and computer entry)	25.0	25.0	25.0
Office/Administration/Supplies (10% of project costs)	12.8	12.7	10.0
<b>SUBTOTAL</b>	<b>140.3</b>	<b>140.2</b>	<b>110.0</b>
<b>COMMUNITY HEALING</b>			
Workshops/Retreats	35.0	35.0	35.0
Mission Building renovation and maintenance	30.0	30.0	30.0
Professional counsellor	80.0	80.0	80.0
<b>SUBTOTAL</b>	<b>145.0</b>	<b>145.0</b>	<b>145.0</b>
<b>PROJECT MANAGEMENT, IMPLEMENTATION &amp; SUPPORT ELEMENTS</b>			
<b>Core Capacity Requirements</b>			
Déline Uranium Team (5 FT employees, 6 PT community advisors, 3 PT consultants, and O&M)	605.4	605.4	605.4
<b>DIAND</b>			
1 FTE scientist and O&M for regional office	160.9	160.9	160.9
Head Quarters O&M for travel and other costs	35.0	35.0	35.0
<b>SUBTOTAL</b>	<b>801.3</b>	<b>801.3</b>	<b>801.3</b>

Recommended Study / Activity	Proposed Budget (\$K)		
	Year 1	Year 2	Year 3
<b>Project Management</b>			
Workshop to develop business plan	45.0		
Development of Capacity Building Agreement	15.0		
Setting up and operating Management Company	80.0	160.0	160.0
<b>SUBTOTAL</b>	<b>140.0</b>	<b>160.0</b>	<b>160.0</b>
<b>Risk Communication</b>			
Initial determination of community communication requirements	30.0		
Ongoing community communication	15.5	15.5	15.5
Interpretation and communication of final results			22
Evaluation of the process and outcomes	11.3	11.3	11.3
Office/Administration/Supplies (10% of project costs)	5.7	2.7	4.8
<b>SUBTOTAL</b>	<b>62.5</b>	<b>29.5</b>	<b>53.6</b>
<b>Education</b>			
Déline Uranium Video Series	58.0	58.0	
<b>TOTAL</b>	<b>2952.3</b>	<b>2031.9</b>	<b>1490.1</b>

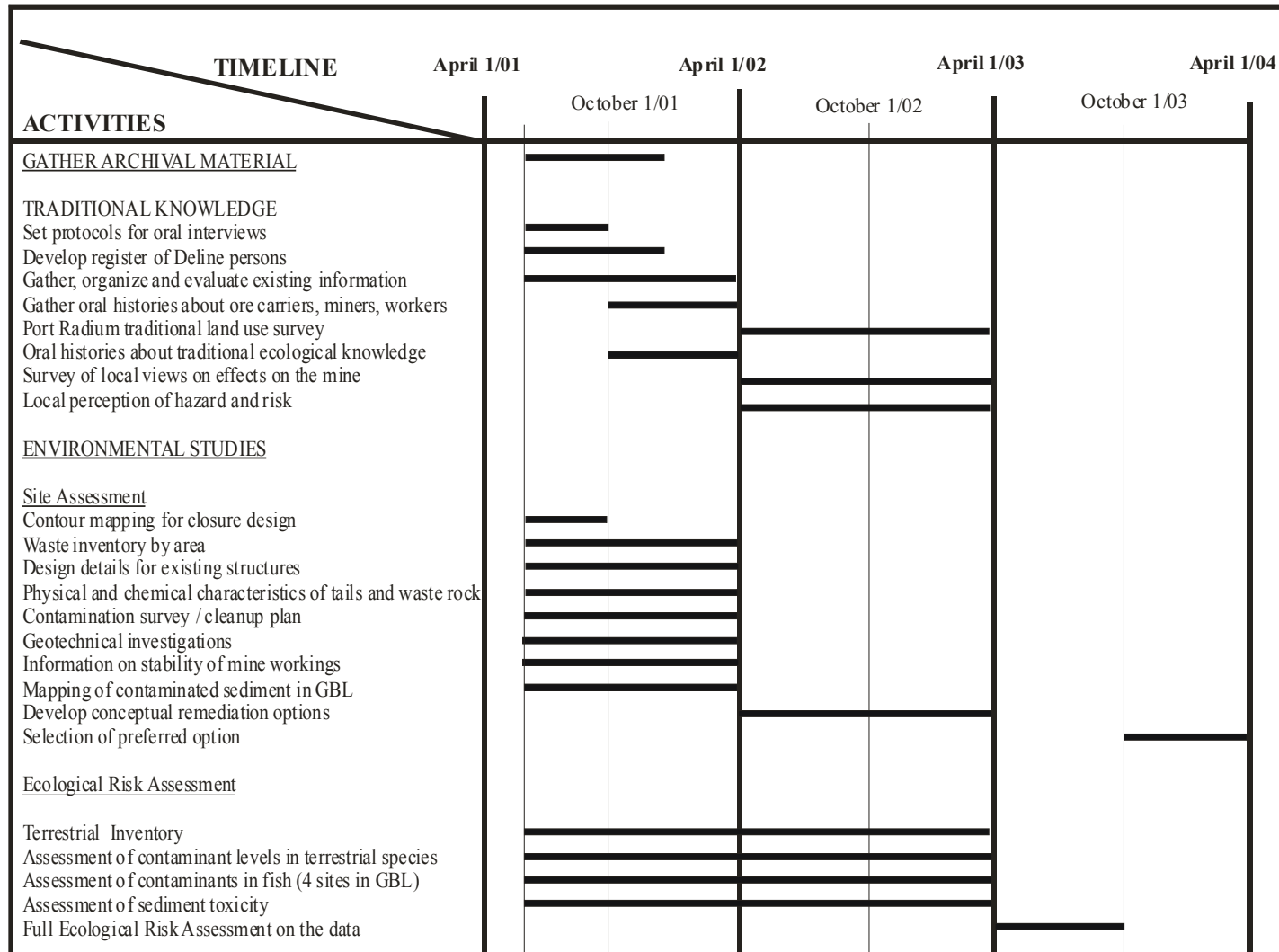
The overall costs, by major area, are shown in Table 7.2 below.

**Table 7.2. Summary of proposed budget requirements for the three year Action Plan**

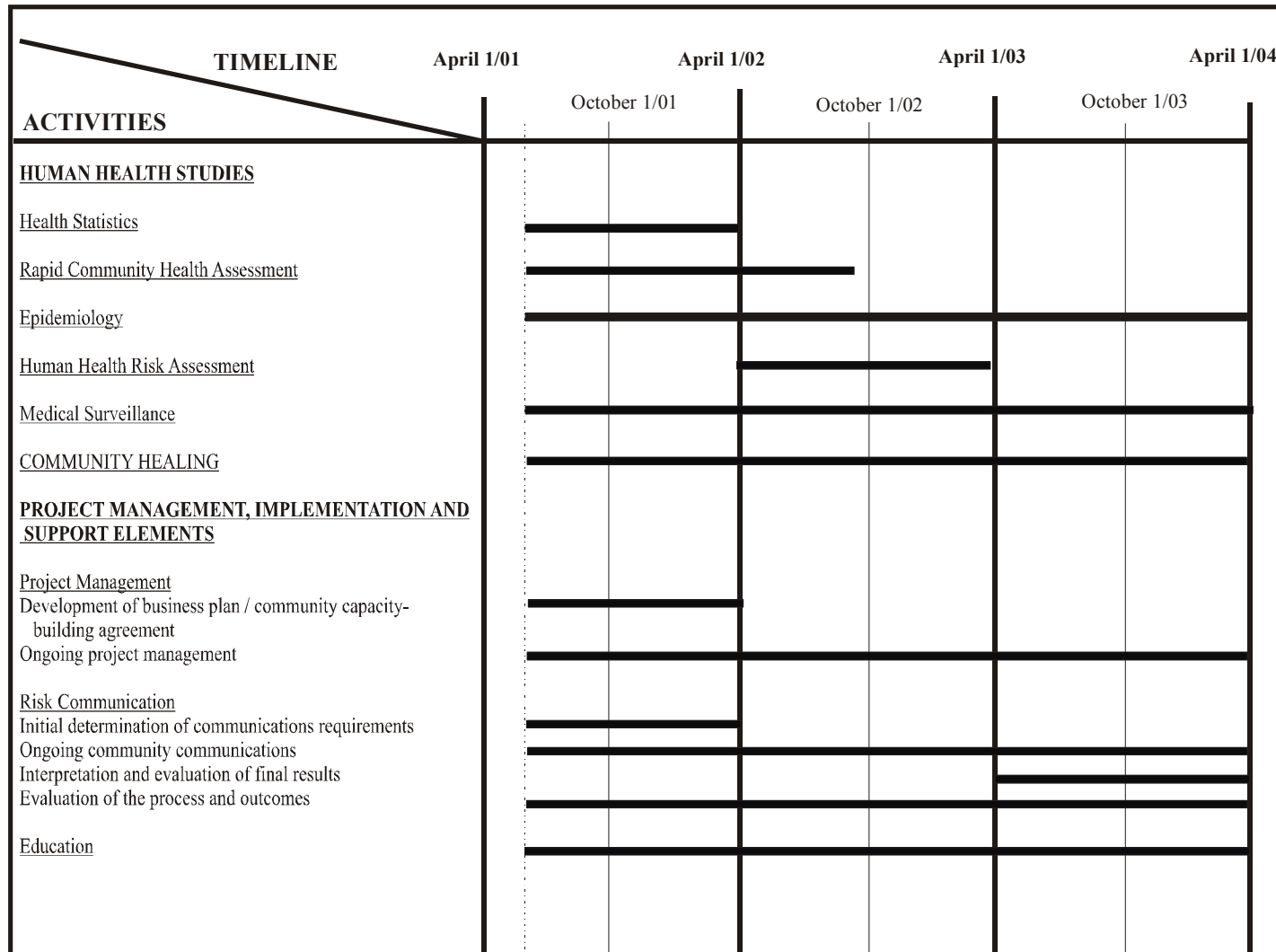
Recommended Study/Activity	Proposed Budget (\$K)			TOTALS
	Year 1	Year 2	Year 3	
Gather Port Radium Archival Material	50.0			<b>50.0</b>
Traditional Knowledge	247.9	155.6		<b>403.5</b>
Environmental Studies	951.5	236.5	165.0	<b>1353.0</b>
Human Health Studies	494.1	446.0	167.2	<b>1107.3</b>
Community Healing	145.0	145.0	145.0	<b>435.0</b>
Risk Communication and Education	122.5	87.5	51.6	<b>261.6</b>
Core Capacity Requirements (Déline and DIAND)	801.3	801.3	801.3	<b>2403.9</b>
Project Management	140.0	160.0	160.0	<b>460.0</b>
<b>TOTALS</b>	<b>2952.3</b>	<b>2031.9</b>	<b>1490.1</b>	<b>6474.3</b>

The project schedule, as developed by the CDUT, is shown in Figure 7.1 below. This Gant chart illustrates the timing and order of activities proposed in this Action Plan.

**Figure 7.1. Proposed project schedule for the three-year Action Plan**



Assumed Projects  
startup approx. June 1/01



Assumed Projects  
startup approx. June 1/01

## 8. REFERENCES

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## 9. APPENDIX

### DISCUSSION PAPER ON THE EXPERTS AND COMMUNITY WORKSHOP FOR THE CANADA-DÉLINE URANIUM TABLE

July 10, 2000

Prepared by the Experts Workshop Working Group  
(C. Clement, G. Grenville-Wood, G. Juniper, D. Kennedy, S. Montgomery, E. Myles, I. Proulx)

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At the May 12-14, 2000 meeting of the Canada-Déline Uranium Table (CDUT), the Experts Workshop Working Group (EWWG) was formed and assigned the task of presenting at the following CDUT meeting a draft discussion paper on the organization of the workshop.

The EWWG met for the first time May 14 with Cindy Jardine, a risk assessment specialist and the facilitator for the scoping exercise. The questions generated by the CDUT during the scoping exercise provide an indication of the types of expertise required for the Experts and Community Workshop. These questions have been organized thematically and a matrix developed to suggest the areas of expertise that might address each question (Appendix A).

This draft discussion paper outlines the EWWG's initial thoughts on the objectives of the workshop, the areas of expertise required, the expert selection protocol, and the format and timing of the workshop.

#### 1.0 Objectives

The overall objective of the Experts and Community Workshop is to provide technical input to contribute to the development of an **Action Plan** to direct the activities of the CDUT through its mandate. The Action Plan should be prescriptive enough to allow the CDUT to proceed with commissioning the work required to assess the health and environmental impacts of Port Radium.

Through discussions based on the questions of concern posed during the May 13-14 scoping exercise, the Action Plan will be developed by considering the following:

- the relevance of the questions;
- the feasibility of answering the questions;
- if there are other questions or considerations;
- the priority of the issues and/or activities (studies) and;
- how to answer these questions conceptually.

The input to the Action Plan should be developed as fully as possible at the workshop, perhaps utilizing sub-groups of experts to address specific areas (e.g., human health, environment, site clean-up and containment).

## **2.0 Areas of Expertise**

The matrix in Appendix A was prepared to show which areas of expertise could address the questions generated from the scoping exercise. The workshop will be composed of approximately 10 experts from the following areas:

1. Health Physics
2. General Human Health
3. Epidemiology
4. Oncology
5. Wildlife and Aquatic Health
6. Environmental Fate and Pathways Analysis of Radionuclides and Metals
7. Mine Site Remediation (Uranium/Heavy Metals)
8. Use of Traditional Knowledge in Environmental and Health Studies
9. Risk Assessment/Management
10. Risk Communication
11. Interdisciplinary Specialist

It may be that more than one area of expertise could be most effectively addressed with one person.

## **3.0 Overall Process for the Experts and Community Workshop**

The steps required to carry out the workshop are listed below in approximate chronological order.

- Select facilitator and experts (see Section 4: Protocol for Selection of Facilitator and Experts).
- Develop the format of the workshop. This is best accomplished with the assistance of the facilitator.
- Send an information package to each expert, including: (i) the objectives of the workshop; (ii) relevant questions and documents; and (iii) what specific issues we wish them to address. We will request that they provide their written responses to the EWWG about a month prior to the workshop.
- Distribute written submissions to all experts. The objective is to have all experts know, prior to the meeting, what other experts are going to say to prepare them for the dialogue and possibly allow some adjustments to their response. This step promotes a cross-disciplinary approach even before the workshop, and will help attain the most from the experts' time at the workshop.
- Hold the workshop in D line (see Section 5: Format of the Workshop)
- Prepare the Workshop Proceedings. The facilitator will have about 10 days to submit a record of the Workshop Proceedings to the EWWG.
- Prepare the technical input for the Action Plan. It is expected that the EWWG and key experts will develop the information obtained at the workshop into an Action Plan for the CDUT. It is expected that the work required to roll up the information from the workshop may take several weeks; this document should enable the CDUT to map its

activities from study design, sampling, completion, through to results interpretation and communication. It will also recommend other activities (such as information sessions) to address some of the questions and concerns arising out of the scoping session (Appendix A). This document may be the basis for future work plans and budgets.

#### **4.0 Protocol for Selection of Facilitator and Experts**

##### *4.1 Selection of workshop facilitator and experts*

- EWWG solicits participation of a workshop facilitator and experts through professional networks and broader means (e.g., internet bulletin boards) and develops a list of potential candidates. At least two (preferably more) candidate experts must be included for each area of expertise.
- EWWG requests resumes.
- EWWG reviews submitted resumes, and selects a “preferred” and (where possible) an “alternate” facilitator and experts for each area of expertise. This may involve telephone interviews with the candidates.
- EWWG submits the proposed list of participants to the CDUT members who may require changes to the list of preferred and alternate candidates. CDUT approves the final list for the facilitator, experts and alternates.
- Secure contracts with the facilitator and preferred experts (or alternates where required).

##### *4.2 Criteria for Selection of Experts*

- Recognized abilities in the applicable area of expertise (considerations will include publications, years of experience, formal education/training, certifications, etc.).
- Experience in various aspects of the area of expertise.
- Ability to present a range of views on their area of expertise.
- Excellent communications skills and experience communicating with community groups (preferably with northern and/or aboriginal communities).
- Some knowledge in another identified area of expertise and experience working in a multidisciplinary environment would be significant assets. Also to be considered is the value of using key experts more as the process goes on and studies are undertaken. This may mean that experts may be further involved in carrying out studies or in the interpretation or communication of the results. There may be some thought in the selection process toward this longer term involvement. To avoid the possibility that conflict of interest could occur, it should be made clear to experts that this is a planning exercise only and not a RFP for future work.

## 5.0 Workshop Format

The workshop will include the facilitator, experts, CDUT members and appointed members and invitees. It will likely be held over two or three days in Déline.

The description of the format of the workshop here is preliminary only. The facilitator, in consultation with the EWWG, will develop the specific format of the workshop to best achieve the objectives stated in Section 1. The workshop will likely be organized into several separate panels, each of which will focus on a set of related questions.

Within each panel discussion, panelists/experts will give brief presentations followed by a question period and discussion. Before the conclusion of each panel the facilitator will lead an open discussion on the topic. This open discussion, involving all participants, will focus on how each of the questions might be answered and in what order, and will take into account the perspectives of the experts, the community of Déline, and Canada.

Following the workshop the EWWG will consult with the facilitator (and maybe others) to conceptualize a follow-up meeting that may take the form of a public presentation/forum in Déline. The CDUT will decide on the format and timing.

## 6.0 Approximate timeline

- **July 15** CDUT approval of experts list
- **July 31** contracts secured with experts and information packages sent
- **August 15** workshop format finalized and sent to experts
- **August 31** responses received from experts and circulated among all
- **Sept. 18-21** Experts and Community Workshop in Déline
- **Sept. 30** workshop proceedings due from facilitator
- **October 31** input for the Action Plan finalized by EWWG, submitted to CDUT and principals for approval

## Appendix A:

### Area of Expertise:

- 1) Health Physics
- 2) General Human Health
- 3) Epidemiology
- 4) Oncology
- 5) Wildlife and Aquatic Health
- 6) Environmental Fate and Pathways Analysis of Radionuclides and Metals
- 7) Mine Site Remediation (Uranium/Heavy Metals)
- 8) Use of Traditional Knowledge in Health and Environmental Studies
- 9) Risk Assessment/Management
- 10) Risk Communication
- 11) Interdisciplinary Specialist\*

\*This area of expertise has not been considered in the following table since it will be included in the workshop for the purposes of integration rather than responding to specific questions.

### Other Source:

- 12) National Archives/Company reports

Question	Principal source of answer
1. What kinds of sicknesses can radiation cause?	1, 4
2. Can exposure to radiation cause deformities and/or reproductive problems?	1, 4
3. Is it more dangerous to have worked underground in the mines than on the surface?	1
4. Is the mine causing cancer?	1, 3
5. Are the deaths of the ore carriers related to their exposure?	1, 2, 3
6. What is the effect of the use of the canvas material from ore bags for housing and clothing?	1
7. What are the safety issues at the site?	1, 5, 6
8. Is it safe for researchers and others to be at the site?	1, 9
9. In what ways can people be exposed to contaminants from the site?	1, 5, 6
10. In what ways are people being exposed to contaminants from the site?	1, 5, 6
11. How can people protect themselves from being exposed?	1
12. What do we know and not know about the causes of the cancers occurring in the community? Are they related to anything at the mine site?	1, 3, 4
13. What are the hotspots?	1, 5, 6
14. How long will these remain hot spots? What about other contamination?	1, 5, 6
15. Is it airborne?	1, 6
16. Can the effects of Port Radium be reduced (health, environment)?	1, 5, 9
17. What kinds of cancer occur in the community?	2, 3, 4
18. What can you do to detect cancer, or slow/stop it if you have it?	2, 4
19. Are cigarettes causing cancer?	2, 3
20. What were the effects on the families living in and around Port Radium?	2, 3, 8

Question	Principal source of answer
21. What is the value of traditional food? Imputed cost (cost of replacing traditional foods with store-bought foods)? Social value? Health and nutritional benefit?	2, 8
22. What will happen to the widows? How do we help them through the grieving process?	2, 8
23. How does cancer incidence in Déline relate to other areas?	3
24. What are the social impacts of cancer related deaths?	3, 8, 10
25. How many different kinds of cancer are there? Which ones are related to us?	3, 4
26. Can we test the fish and animals every six months?	5, 6
27. Are there concerns about the site besides uranium and radiation (e.g., metals)?	5, 6
28. Can we put in monitoring facilities for the air and water?	6, 7
29. Can water currents spread the hazardous waste?	5, 6
30. Are other animals in the food chain affected?	5, 6
31. Is the mine affecting the environment?	5, 6, 8
32. How do we measure what's in the dry lakes?	6
33. How much sampling/monitoring needs to be done and how often?	5, 6, 7
34. How far has the contamination spread?	6
35. In a fire, will the wind carry contaminants?	6
36. What about long-term monitoring after clean-up and containment?	6, 7
37. What is the groundwater flow on the site (hydrology)?	6
38. What is the drainage basin?	6
39. Is the contaminated material moving?	6
40. Are the levels of radiation getting stronger at the mine site?	6
41. What are the changes in contaminant levels over time?	6
42. What are the naturally occurring (background) levels?	5, 6
43. What is the full inventory of hazardous waste at the site?	5, 6
44. Can caribou pick up the radiation on their feet by going through the site?	5
45. Is it affecting the fish?	5
46. Does the migration of caribou through the site affect their reproduction?	5, 8
47. Can contaminated animals affect humans by handling?	5
48. Can we protect/limit exposure to animals?	5, 7
49. Migratory patterns of animals, fish, birds? What animals are resident in the contaminated areas?	5, 8
50. What is the effect on vegetation at the site?	5, 8
51. What are the long-term effects on the wildlife (such as population size)?	5, 8
52. If we do clean-ups, can we use signs, fences around hotspots?	7
53. What is an acceptable level to clean up and contain to?	7, 9, 10
54. Can the mine be cleaned up?	7
55. What are the clean-up options? (removal, burial)	7
56. What are the containment options?	7
57. What about transportation routes?	7

Question	Principal source of answer
58. If there is a clean-up, where will the removed material go?	7
59. Can we completely contain the mine site in something like clay or concrete?	7
60. Who worked there, when, history of community with the mine?	8, 12
61. What are the different people's use of traditional foods?	8
62. How do we educate the community about the issues and concerns about Port Radium?	8, 9
63. What ways can we help people heal?	8
64. How is the mine site being used now? (human and ecological use)	8
65. How was it used before?	8
66. Can we know if those exposed at the mine site are still at risk?	9
67. How do we make it understandable? (process, questions, results)	10
68. Do we want to know the truth?	9, 10
69. How do we respond if people don't accept the results of the studies?	10
70. What do we do if the studies can't produce definitive answers?	10
71. How much were the ore carriers informed about the risks?	8, 12
72. What were the recovery rates of the processing and subsequent reprocessing?	12
73. What is the makeup of waste rock and tailings?	12
74. Can we get a blueprint of the whole mineshaft?	12
75. Is there a record of what was dumped in the mineshaft?	12
76. What was dumped in the water? (waste, machinery, oil, household items, etc.)	12
77. What happened to the equipment at the mine site (moved, disposed of, etc.)?	12

Process-related questions (to be answered by CDUT) and those that cannot really be addressed by a panel of experts:

1. What were the results of the lung capacity test done by U of A (Pat Hessel)?
2. Are there resources to carry this out?
3. What is the extent of our mandate with respect to the transportation route? (Port Radium to Bennet Field)
4. Is all the information going to be made available to the people of Déline?
5. Will there be an apology?
6. What types of expertise will be required to address these issues?
7. Will there be an increase in the yearly budget? (need more manpower for researchers such as communication officers)
8. Because we are expanding, will we get a Déline Uranium Building (like the Health Canada Building in Ottawa)?
9. How do we decide when enough is enough? When do we know enough to make a decision?
10. How do we link compensation to the scientific outcomes?
11. Is compensation strictly linked to scientific outcomes?
12. Is science truth?
13. How will compensation be determined?
14. How will traditional knowledge play a role in our work?

15. How will traditional knowledge play a role in the 4 aspects of the medicine wheel (mental, emotional, spiritual, physical)?
16. How can we involve the community in the research so that they understand the process and accept the results?
17. How do we know the government is going to help us?
18. If they don't how will we address these issues?
19. How can we work with other aboriginal communities who have similar problems? How can we share information, and support and encourage each other?
20. How do we know if the results are valid? How can we trust them?
21. How do we make sure that everyone's concerns are heard (such as the widows)?
22. Can we erect a monument to recognize the Dene workers at the mine and the Dene founder of the mine?
23. How can we maximize skills transfer and local economic benefits?
24. What can we learn from other similar uranium mining experiences?
25. How much money did the federal government make from the mine?