Environmental Assessment
Gap Analysis
Gunnar Mine Site Rehabilitation Project

Report Prepared for

Saskatchewan Research Council

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In Association with:

SENES Consultants Limited &

Canada North Environmental Services

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1 Introduction

1.1 Background

On December 16, 2008 the Saskatchewan Research Council (SRC) retained SRK Consulting, in association with SENES Consultants Ltd. and Canada North Environmental Services to conduct a gap analysis of existing data/information related to the Gunnar Mine Site Rehabilitation Project in order to conduct an environmental impact assessment and prepare an environmental impact statement that meets or exceeds the requirements of the requirements of both the federal and provincial environmental assessment agencies and relevant regulatory agencies and departments.

The objectives of the gap analysis, as defined in RFP# 2008-014 are:

- To review the *Draft Project-Specific Guidelines and Comprehensive Study Scoping Document, Environmental Impact Assessment of the Former Gunnar Mine Site Rehabilitation Project* (PSG) issued to the Saskatchewan Research Council by the Canadian Environmental Assessment Agency and the Saskatchewan Ministry of Environment;
- To review existing relevant data and literature (provided by the SRC);
- To identify, in consultations with the SRC, any potential gaps between the existing data/information and the draft Guidelines requirements;
- Provide a detailed list of data/information gaps identified for each of the gaps identified, provide an analysis of its relevance to completing the environmental impact assessment, a detailed overview of the additional data/information required and an estimate of the time required to obtain the required information; and;
- In consultation with the SRC and the appropriate regulatory agencies, clearly define the most appropriate methods to collect, compile, format and present the data/information in the required environmental impact statement.

As the Canadian Nuclear Safety Commission's *Record of Proceedings, including Reasons for Decision, Environmental Assessment Track Report Regarding SRC's Proposed Gunnar Site Rehabilitation Project* was also available and judged relevant, it was also reviewed and included in the Gap Analysis.

This report has been prepared and is being submitted to:

1. Identify potential gaps in existing data/information required by the draft Guidelines, provide an analysis of the character of each data/information gap in terms of its relevance to

completing the required environmental impact assessment and an estimate of the time required to obtain the required information; and,

2. Provide a detailed outline for the development of an Environmental Impact Statement that meets or exceeds the requirements of all relevant regulatory agencies (including, but not necessarily limited to the Canadian Environmental Assessment Agency, the Canadian Nuclear Safety Commission, Environment Canada, Fisheries and Oceans Canada, and the Saskatchewan Ministry of Environment), local stakeholders and the general public.

1.2 Environmental Assessment Regulatory Context

1.2.1 Introduction

The former Gunnar Mining Limited site is located on the southern tip of the Crackingstone Peninsula approximately 25 kilometres southwest of Uranium City. During operations, the site was only accessible by boat/barge in the summer and over the ice in the winter. The mine, mill and associated facilities was operated by the former Gunnar Mining Limited and commenced uranium production in 1955. Uranium ore was initially mined from an open-pit and then from an underground operation. The Gunnar operation officially closed in 1964 with little or no decommissioning of facilities. Shortly after closure, a trench was blasted between the open-pit and Lake Athabasca, allowing the open-pit and underground workings to flood. Approximately 1 year later the trench was blocked by waste rock. Between 1971 and 1980 a warehouse building located near the main Gunnar dock in Lake Athabasca was used as a commercial fish processing facility.

In 2007, the Governments of Saskatchewan and Canada signed a Memorandum of Agreement to address the current environmental conditions of the abandoned uranium mine sites in northern Saskatchewan, including the rehabilitation of the Gunnar site. Under the Agreement, Saskatchewan's Ministry of Energy and Resources [formerly Industry and Resources (SIR)] is responsible for the Gunnar Mine Site Rehabilitation Project. SIR retained the SRC under contract to act as project manager and designated agent to manage and perform the required environmental impact assessment and rehabilitation activities.

In April 2007, the SRC submitted the *Former Gunnar Mining Limited Site Rehabilitation Project Proposal* to the Assessment Branch, Saskatchewan Environment and in July 2007 was informed by the Canadian Environmental Assessment Agency that the project would require an environmental assessment as prescribed by the *Canadian Environmental Assessment Act* and by Saskatchewan Environment that it would require a Ministerial approval under the provincial *Environmental Assessment Act*. In March 2008, the Draft *Project-Specific Guidelines and Comprehensive Study Scoping Document, Environmental Impact Assessment of the Former Gunnar Mine Site Rehabilitation Project* where issued jointly by the Canadian Environmental Assessment Agency and Saskatchewan Environment (now the Saskatchewan Ministry of Environment).

1.2.2 Federal and Provincial Cooperation in the Environmental Assessment Process

Canada and Saskatchewan intend to cooperate throughout the assessment process in a manner that meets the legislated environmental assessment requirements of both parties. Under the *Cooperative Agreement*, federal and provincial environmental assessment processes, directed respectively by the federal *Canadian Environmental Assessment Act* (federal Act) and the provincial *Environmental Assessment Act* (provincial Act), are coordinated for projects with federal and provincial jurisdiction, when such projects are not limited by individual statutory or process requirements of the respective jurisdictions..

Under the *Cooperative Agreement*, the Province of Saskatchewan, Ministry of Environment, Environmental Assessment Branch, is the Lead Party and contact for the Gunnar Mine Site Rehabilitation Project, and has established a Project Administration Team for the cooperative environmental assessment. Membership on the Project Administration Team includes representatives from Saskatchewan's Ministry of Environment, Environmental Assessment Branch, the Canadian Nuclear Safety Commission (CNSC), Natural Resources Canada (NRCan), and the Canadian Environmental Assessment Agency (Agency).

As per the *Cooperative Agreement*, the Project Administration Team has worked together to consolidate the information requirements of both parties in the *Draft Project-Specific Guidelines and Comprehensive Study Scoping Document, Environmental Impact Assessment of the Former Gunnar Mine Site Rehabilitation Project* (PSG). Under the cooperative arrangement, a single environmental assessment and review process will be used to obtain the environmental assessment information needed for federal and provincial environmental processes. Both governments will use the information generated through the cooperative environmental assessment as the basis for their respective decisions about the project. However, each government will retain its ability to make project-related decisions on matters within its own legislative authority.

Pursuant to section 17(1) of the federal Act and section 9(1) of the provincial Act, the responsible authorities delegated the conduct of the environmental assessment to the Saskatchewan Research Council. The Proponent will prepare an EIS based on the *Draft Project-Specific Guidelines and Comprehensive Study Scoping Document, Environmental Impact Assessment of the Former Gunnar Mine Site Rehabilitation Project* (PSG). Once completed, the SRC will submit the EIS to the Project Administration Team for review.

1.3 Federal Assessment Process

The SRC has been informed that the proposed rehabilitation of the Gunnar site will be an undertaking in relation to a physical work, and thus is a '*project*' as defined in section 2 of the federal *Canadian Environmental Assessment Act* (the federal Act). The Canadian Nuclear Safety Commission (CNSC) and Natural resources Canada (NRCan) have indicated that they may take steps that enable various aspects of the project to be implemented. As a result, they have determined

that they are RAs under the federal Act. As such, they must ensure that an environmental assessment, as scoped by them and in accordance with the federal Act, is conducted prior to the issuance of federal licences, authorizations, permits, approvals, and/or funding as described below.

Canadian Nuclear Safety Commission (CNSC)

The CNSC has determined that authorization of SRC's proposal would require the issuance of a license to decommission. Licences are issued by the Commission under the authority set out in subsection 24(2) of the *Nuclear Safety and Control Act* (NSCA). Subsection 24(2) of the NSCA is listed as a "trigger" under the *Law List Regulations* of the federal Act in respect of the issuance of a licence. Pursuant to paragraph 5(1) (d) of the federal Act, an environmental assessment must be conducted before a licensing decision can be made. CNSC is therefore an RA under the federal Act.

Natural Resources Canada (NRCan)

NRCan is participating as an RA under the federal Act for the environmental assessment of the Gunnar Mine Site Rehabilitation Project because it is considering providing funding for the decommissioning project. NRCan is also participating in the EA as a federal department with expertise relevant to the Project. This review will be coordinated through the Environmental Assessment Group of NRCan's Science, Policy and Integration sector.

Expert Federal Authorities

Pursuant to the *Federal Coordination Regulations* under the federal Act, the following federal departments/agencies have an interest in the project related to their mandate and are participating in the review as expert Federal Authorities (FAs) in relation to the project:

- Fisheries and Oceans Canada (DFO)
- Transport Canada (TC)
- Environment Canada (EC) and
- Health Canada (HC).

1.3.1 Federal Environmental Assessment Coordinator (FEAC)

The Canadian Environmental Assessment Agency (Agency) is the FEAC for the proposed project and is responsible for coordinating the review activities of the RAs and expert FAs in accordance with section 12 of the federal Act and in conjunction with the provincial environmental assessment process. The FEAC will coordinate the federal participation on the joint federal-provincial Project Administration Team, which will include the RA and FA departments identified above as well as the provincial Environmental Assessment Branch.

1.3.2 Type of Federal Environmental Assessment

The CNSC and NRCan have determined that components of the proposed Gunnar Mine Site Rehabilitation Project are described in paragraph 19(a) of the *Comprehensive Study List Regulations* of the federal Act, as described below:

19. The proposed construction, decommissioning or abandonment, or an expansion that would result in an increase in production capacity of more than 35 per cent, of

(a) a uranium mine, a uranium mill or a waste management system any of which is on a site that is not within the boundaries of an existing licensed uranium mine or mill;

Although the project proposal is for 'site rehabilitation', the CNSC and NRCan consider the proposed activities to be activities related to decommissioning of a mine, mill and waste management systems. Subsection 19(a) of the *Comprehensive Study List Regulations* of the federal Act would therefore apply to this proposal.

1.3.3 Comprehensive Study Environmental Assessment Requirements

In accordance with subsection 21(1) of the federal Act, the RAs were required to consult with the public with respect to the proposed scope of the project for the purposes of the federal environmental assessment, the factors proposed to be considered, the proposed scope of those factors, and the ability of the comprehensive study to address issues relating to the project.

After taking into consideration comments from the public, the RAs were also required to recommend to the federal Minister whether the environmental assessment should be continued by means of a comprehensive study, or whether the project should be referred to a mediator or review panel. The recommendation document is referred to as the Track Report.

Once the Track Report was completed, the CNSC held a public hearing on September 17, 2008 to provide the public an opportunity to review, comment and present interventions before the Commission on the report prepared by the RAs. Following the public hearing, the Track Report was submitted to the federal Minister with a recommendation that the project be referred back to the RAs to continue the comprehensive study process. If the federal Minister decides that the project should continue as a comprehensive study, the project cannot be referred to a mediator or review panel at a later date.

If the federal Minister refers the project to a mediator or review panel, the project will no longer be subject to the comprehensive study process under the federal Act. The federal Minister, after consulting the RAs and other appropriate parties, will set the terms of reference for the review and appoint the mediator or review panel members. As per the Cooperative Agreement, the province will be immediately informed of this decision and will determine how the province would proceed. The public would have the opportunity to participate in the panel process.

If the environmental assessment continues as a comprehensive study, the RAs, following the review of the proponent's EIS and in consultation with SE, the Agency and the expert FAs, will conduct a comprehensive study and prepare a comprehensive study report (CSR). The CSR will be prepared based on the proponent's EIS and any additional information gathered throughout the assessment process. The RAs will ensure there are opportunities for public participation during the conduct of the comprehensive study. Once completed, the RAs will submit the CSR to the Agency.

Following submission of the CSR, the Agency will invite the public to comment on this report prior to the federal Minister taking a decision on the environmental assessment. Once the environmental assessment decision statement is issued, the federal Minister will refer the project back to the RAs for action.

A public registry for the project assessment has been established. This includes identification of the project assessment in the Canadian Environmental Assessment Registry (CEAR), which can be accessed on the Internet web site of the Agency (www.ceaa.gc.ca). The CEAR reference number for the project is 07-03-30100.

1.4 Provincial Environmental Impact Assessment Process

Following technical review of the April 2007 SRC proposal for the rehabilitation of the Gunnar site by provincial agencies and departments, the Gunnar Mine Site Rehabilitation Project was designated a "development" pursuant to section 2(d) of the provincial *Environmental Assessment Act* (provincial Act). As a consequence, SRC is required to conduct an EIA of the proposed Gunnar Mine Site Rehabilitation Project and prepare and submit an EIS to the provincial Minister of Environment (provincial Minister).

Once the EIS is submitted, the Environmental Assessment Branch will circulate the EIS to provincial departments and agencies for technical review. These departments and agencies include the Saskatchewan Departments of Environment, Watershed Authority, Health, First Nations and Métis Relations, Culture Youth and Recreation (Heritage Branch), Industry and Resources, Northern Affairs, and Government Relations.

Following the technical review of the EIS, the Environmental Assessment Branch will prepare Technical Review Comments that evaluate the EIS. The EIS and the Technical Review Comments, along with the federal Comprehensive Study Report (discussed below), will then be provided to the public for a minimum 30 day review. After the public review of the EIS, the submissions from the public, together with information generated during the technical review of the EIS, will be provided to the provincial Minister for his consideration prior to making his Ministerial Decision whether or not to approve the development.

2 Draft Project Specific Guidelines & Comprehensive Study Scoping Document

As stated previously, in April 2007, the SRC submitted *the Former Gunnar Mining Limited Site Rehabilitation Project Proposal* to the Assessment Branch, Saskatchewan Environment (now the Ministry of Environment) and in July 2007 was informed by the Canadian Environmental Assessment Agency that the project would require an environmental assessment as prescribed by the *Canadian Environmental Assessment Act* and by Saskatchewan Environment that it would require a

Ministerial approval under the *Environmental Assessment Act*. In March 2008, the *Draft Project-Specific Guidelines and Comprehensive Study Scoping Document, Environmental Impact Assessment of the Former Gunnar Mine Site Rehabilitation Project* (PSG) where issued jointly by the Canadian Environmental Assessment Agency and Saskatchewan Environment (now the Saskatchewan Ministry of Environment).

On September 17, 2008 the Canadian Nuclear Safety Commission (CNSC) held a one-day public hearing in Saskatoon, Saskatchewan to consider the *Project-Specific Guidelines and Comprehensive Study Scoping Document* – Former Gunnar Mine Site Rehabilitation Project (Scoping Document) and the *Environmental Assessment Track Report (Track Report)* regarding the Saskatchewan Research Council's proposal to develop and implement a plan to rehabilitate the former Gunnar mine site. Subsequent to that hearing, the CNSC issued *Record of Proceedings, including Reasons For Decision, Environmental Assessment Track Report Regarding SRC's Proposed Gunnar Site Rehabilitation Project* (CNSC Decision) issued on October 27, 2008. That document approved the Scoping Document and the Track Report, determined that "that the comprehensive study can adequately address issues related to the project, and recommended to the Minister of Environment that, pursuant to paragraph 21(2) (b) of the Canadian Environmental Assessment Act, the project should continue as a comprehensive study.

Appendix A provides a copy of the Draft *Project-Specific Guidelines and Comprehensive Study Scoping Document, Environmental Impact Assessment of the Former Gunnar Mine Site Rehabilitation Project* (April, 2007) and of the Canadian Nuclear Safety Commission *Record of Proceedings, including Reasons For Decision, Environmental Assessment Track Report Regarding SRC's Proposed Gunnar Site Rehabilitation Project* (October, 2008).

3 Gunnar Rehabilitation Project Environmental Impact Statement - Draft Table of Contents

In order to identify potential gaps in existing data/information in terms of its relevance to completing the required environmental impact assessment and to provide a detailed outline of an Environmental Impact Statement that will meet or exceed the requirements of all relevant regulatory agencies, local stakeholders and the general public, a detailed review of both the PSG and the CNSC Decision was completed and a draft Table of Contents developed for the anticipated *Former Gunnar Mine Site Rehabilitation Project Environmental Impact Statement* was prepared.

The draft Table of Contents was provided to the Saskatchewan Research Council on January 16, 2009. After conducting a review, the SRC in turn provided the draft to representatives of the "Environmental Assessment Team" of federal and provincial government departments and agencies involved for review and comments.

The draft Table of Contents was amended to reflect the comments received and used as the foundation for conducting the Gap Analysis. A copy of the proposed Table of Contents for the *Former Gunnar Mine Site Rehabilitation Project Environmental Impact Statement* is provided as Appendix B.

4 Summary of Existing Site or Related Information

A significant amount of data and information exists with related to the former Gunnar Mines Limited site and were reviewed to varying extent to complete this Gap Analysis. The list of documents includes, but may not necessarily be limited to:

- BBT Consultants, 1986, **Gunnar Field Study** - Prepared For Supply and Services Canada Under the National Uranium Tailings Program. NUTP No. - 155Q.2341-4-1674X (9 volumes). B.B.T. Geotechnical Consultants: IEC Beak Consultants Ltd; Sargent, Hauskins, Beckwith Concord Scientific Corp. March 1986.

- Beck, 1969**, Uranium Deposits of the Athabasca Region**, Saskatchewan, Saskatchewan Mineral Resources Report No. 126, L.S. Beck, 1969.

- Bothwell, 1984, **Eldorado, Canada's National Uranium Mining Company**, Robert Bothwell University of Toronto Press, Toronto, 1984

- Botsford, J.A. 1963. **The Gunnar Story**, J. A. Botsford, Canadian Mining Journal. Volume 84, Number 7, 1963, pg.47-114.

- Brown, L. Denis. 1993. **Health Physics at Gunnar and Lorado Mine Sites – An Interim Report**, Saskatchewan Radiation Safety Unit, June 1993.

- Brown, L. Denis. 1993. Proposed **Decommissioning of the Gunnar and Lorado Uranium Mine Sites**, BB Health Physics Services, 1993.

- Beak, 1989, **An Evaluation of Potential Environmental and Public Safety Impacts of Gunnar and Lorado Facilities in Northern Saskatchewan - Volume 1: Summary of Existing Baseline Data; Volume 2: Risk Assessment, Remedial Action Plans and Recommendations**, Beak Consultants Limited, 14 Abacus Road, Brampton, Ontario L6T 5B7. Sept. 1989.

- Beltman, D.J., W.H. Clements, J. Lipton, and D. Cacela. 1999. **Benthic macroinvertebrate metals exposure, accumulation, and community-level effects downstream from a hard-rock mine site**. Env. Toxicol. Chem. 18(2): 299-307

- Canada North Environmental Services (CanNorth). 2004. **2002 Limnological and Aquatic Investigations of the Abandoned Gunnar Pit near Lake Athabasca.** Prepared for COGEMA Resources Inc., Saskatoon, Saskatchewan. January 2004.

- Canada North Environmental Services (CanNorth). 2005. **Aquatic Investigations in Langley Bay and St. Mary's Channel of Lake Athabasca near the Abandoned Gunnar Mine Site.** Prepared for the Saskatchewan Research Council, Saskatoon, Saskatchewan. January 2005.

- Canada North Environmental Services (CanNorth). 2006. **Gunnar Site Characterization – 2004 and 2005 Aquatic Investigations.** Prepared for the Saskatchewan Research Council, Saskatoon, Saskatchewan. March 2006.

- Denison, 2006, **Demolition Strategy – Gunnar Uranium Mine, SK**, Denison Environmental Services, March 2006.

- Environment Canada, 1994, **Point Probable Maxim Precipitation in Northern Saskatchewan,** Report No. CSS-R94-01, Atmospheric Environment Service, Environment Canada, March 1994.

- KHS Environmental Management Group Limited (KHS). 2003. **Gunnar and Lorado 2002-2003 Update.** December 2003.

- Meteorological Services of Canada Web Site: 1961-1990 Normals for Uranium City A. http://www.msc.ec.gc.ca/climate/climate_normals_1990/show_normals_e.cfm?station_id=1490&prov=SK.

- Redmann, R.E. and F.T. Frankling. 1982. **Revegetation of abandoned uranium mill tailings near Uranium City, Saskatchewan. Plant species selection**. Sask. Dept. Environment and Univ. of Saskatchewan.

- Ruggles, R.G., D.J. Robinson, and A. Zaidi. 1978, **A Study of Water Pollution in the Vicinity of Two Abandoned Uranium Mills in Northern Saskatchewan**. Ruggles, R.G.; Robinson, D.J. and Zaidi, A. Western and Northern Region Environmental Protection Service, Environment Canada. Report EPS-MNR-5-81-2, 1978.

- Schreiner, B.T. 1984. **Quaternary Geology of the Precambrian Shield**, Saskatchewan. Saskatchewan Energy and Mines, Report 221.

- SENES, 2006, **Screening Level Human Health & Ecological Risk Assessment of the Gunnar Site**, SENES, March 2006

- Sheard, J.W., S.M. Swanson and B.C. Godwin. 1988. **Natural series radionuclides in the upland vegetation of northern Saskatchewan and the adjacent Northwest Territories**.

Department of Biology, University of Saskatchewan, Saskatoon, SK and the Saskatchewan Research Council, Saskatoon, SK. SRC Technical Report No. 217.

- SoilVision, 2007, **Groundwater Flow Modeling for the Former Gunnar Mine Site**, SoilVision Systems, Ltd., December 2007.

- SRC, 2007, **Annual Report – Cleanup of Abandoned Northern Sites Project – 2007/2008**. Saskatchewan Research Council, October 2007, SRC Publication No. 12194-5E07

- SRC, 2007, **Annual Report – Cleanup of Abandoned Northern Sites Project – 2006/2007. Saskatchewan Research Council, May 2007**, SRC Publication No. 12194-4E07

- SRC, 2007, **Former Gunnar Mining Limited Site Rehabilitation Project Proposal.** Saskatchewan Research Council, April 2007, SRC Publication No. 12194-3E07

- SRC, 2006, **Orphaned Uranium Mine Sites Project 2005 – 2006 Annual Report**. Saskatchewan Research Council, August 2006, SRC Publication No. 11882-11C06

- SRC, 2005, **Gunnar Site Characterization and Remedial Options Review** – Saskatchewan Research Council, January 2005, SRC Publication No. 11882-1C04

- Swanson, S and Z. Abouguendia. 1981. **The problem of abandoned uranium tailings in northern Saskatchewan: an overview**. Saskatchewan Research Council Publication No. C-805-48-C-81.

- Tones, 1982, **Limnological and Fisheries Investigation of the Flooded Open Pit at the Gunnar Uranium Mine**. P.I .Tones, Saskatchewan Research Council Publication No. C-805-10-E-82, February 1982.

- WaterMark, 2005, **Gunnar Mine Buildings and Structures Assessment of Options for Steel Handling Former Gunnar Mine Site**, Saskatchewan, Watermark Consulting Ltd., December 2005.

- Waite, D.T., S.R. Joshi, and H. Sommerstad. 1988. **The effect of uranium mine tailings on radionuclide concentrations in Langley Bay, Saskatchewan, Canada**. Arch. Environ. Contam. Toxicol. 17: 373-380.

- Waite, D.T., S.R. Joshi, and H. Sommerstad. 1989. **Movement of dissolved radionuclides from submerged uranium mine tailings into the surface water of Langley Bay, Saskatchewan, Canada.** Arch. Environ. Contam. Toxicol. 18: 881-887.

- Whiting, J., H. Maathuis, E. Christiansen, H. Heuser, P. Machibroda, and J.S. Kermeen. 1982. **Summary Report Surface Water and Groundwater Investigations of the Lorado Mill Area and Meteorological Data for the Gunnar Uranium Tailings**. Saskatchewan Research Council, Saskatoon, SK, SRC Publication No. E-820-4-E-82.

5 Environmental Assessment Gap Analysis

5.1 Introduction

The draft Table of Contents for the *Former Gunnar Mine Site Rehabilitation Project Environmental Impact Statement* (Appendix B) provided the framework for conducting the Gap Analysis.

Based on the draft Table of Contents, the *Former Gunnar Mine Site Rehabilitation Project Environmental Impact Statement* will have an Executive Summary and 18 separate sections. The following analysis is provided based on the identified sections and in the order in which they appear in the draft Table of Contents.

5.2 Gap Analysis (Based on Draft EIS Table of Contents)

EIS Executive Summary

The inclusion of an Executive Summary of the EIS is a requirement of the *Draft Project-Specific Guidelines and Comprehensive Study Scoping Document, Environmental Impact Assessment of the Former Gunnar Mine Site Rehabilitation Project* (PSG).

The Executive Summary must briefly summarize and cross-reference the EIS under the following topic areas:

- Description of the project;
- Purpose of, need for, and alternative means of carrying out, the project;
- Environmental effects of the project, including those from potential spills, malfunctions, or accidents;
- Any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out;
- The significance of the environmental impacts and technically and economically feasible mitigation measures;
- Renewable resources that are likely to be affected significantly by the project, including current use of lands and resources for traditional purposes by aboriginal persons; comments from the public and SRC's responses;
- Identification of uncertainties in regards to the project elements and/or environmental effects of the project, including those of a chemical, physical, and/or radiological nature; and

- The need for, and the requirements of, a follow-up program in respect of the project.

The executive summary, which can be under separate cover from the main EIS, should avoid the use of technical terms and jargon. To enhance involvement of northern Saskatchewan residents and First Nations in the public participation process, the executive summary should also be translated into each Aboriginal language, Cree and Dene, and made accessible in video or audio form.

The Executive Summary will be prepared by the SRC once the environmental assessment is completed and the Environmental Impact Statement prepared.

EIS Section 1 - Reason for Submission

The *Reason for Submission* section of the EIS must include a discussion of:

- ***Purpose of Submission –*** a brief summary of why the document is being submitted and to what agencies it is being submitted to. Sufficient information to complete this section is available in the existing legislation, regulations and correspondence from the various agencies including, but not necessarily limited to, the Saskatchewan Ministry of Environment, the Canadian Environmental Assessment Agency, the Canadian Nuclear Safety Commission, Fisheries and Oceans Canada and Environment Canada. The section should also make reference to an appendix which includes a copy of the Draft *Project-Specific Guidelines and Comprehensive Study Scoping Document, Environmental Impact Assessment of the Former Gunnar Mine Site Rehabilitation Project,* April, 2007 (PSG) and the CNSC *Record of Proceedings, including Reasons For Decision, Environmental Assessment Track Report Regarding SRC's Proposed Gunnar Site Rehabilitation Project,* October, 2008 (CNSC Decision). The appendix should also provide a table that summarizes the requirements specified in the PSG and the CSNC Decision and a reference of where (section number) within the environmental impact statement the requirement is addressed.

  The information required to complete this section will become available once the SRC has completed the environmental impact assessment (EA) and the environmental Impact Statement (EIS).

- ***The Proposed Project –*** a brief discussion of the proposed project. Information to complete this section will become available as the SRC completes the environmental impact assessment and prepares the environmental impact statement.

- ***Scope of Project –*** a brief description of the spatial and temporal extent of the rehabilitation project, including the environmental assessment review and approval, the actual rehabilitation activity, post-rehabilitation care, maintenance and monitoring and the eventual custodial transfer of the property to the Province. Information to complete this section will become available as the SRC completes the environmental impact assessment and prepares the environmental impact statement.

- ***Project Location –*** this section includes a clear and concise description of the project location using local and regional maps with identifiable features, UTM or comparable coordinates. Information to complete this section is available from numerous existing sources.

- ***Project Operator –*** a brief discussion of the SRC's name, business address and organizational structure. The section should also contain a concise statement of who, within the organization will be responsible for the project.

- ***Site Management –*** a brief discussion of who will be responsible for the oversight of on-site activities.

- ***Project Schedule –*** a schedule of activities anticipated to complete all phases of the project including the environmental assessment review and approval, the actual rehabilitation activity, post-rehabilitation care, maintenance and monitoring and the eventual custodial transfer of the property to the Province Saskatchewan. Information to complete this section will become available as the SRC completes the EA and prepares the EIS.

- ***Regulatory Context –*** a brief discussion of the regulatory context in which the project will operate during the environmental assessment review and approval process, the rehabilitation activity, post-rehabilitation care, maintenance and monitoring period and the eventual custodial transfer of the property to the institutional care of the Province.

- ***Land Tenure -*** During the conduct of the Gap Analysis, no documentation could be located or reviewed that clearly defines and/or assigns land tenure for the former Gunnar Mining Limited site. Historically in northern Saskatchewan, the Canadian Nuclear Safety Commission uses the property boundaries defined of the Surface Lease Agreement issued by the Province of Saskatchewan to a uranium mining and milling facility to define the boundaries included in the CNSC license issued pursuant to the *Nuclear Safety and Control Act*.

  The current lack of definition of land tenure for the former Gunnar site is considered a significant deficiency as the Saskatchewan Research Council currently does not appear to retain any regulatory instrument or authority that would allow it to restrict public access to the site now, during the proposed rehabilitation activities or in the post-rehabilitation transition monitoring period. In addition, the lack of land tenure may have implications with regard to the security of nuclear materials on the site as defined in the regulations issued pursuant to the *Nuclear Safety and Control Act.*

  The SRC must initiate discussions with the Province of Saskatchewan to clearly define land tenure and authority over the former Gunnar Mining Limited site.

- ***Saskatchewan Research Council*** **-** a brief statement on the SRC, its authorities, experience, ability and qualifications to carry out the project in a manner that makes adequate provision for the protection of the environment, the health and safety of employees and the public.

- ***Need for the Project*** **–** The section must establish the purpose of and need for the Gunnar Mine Site Rehabilitation Project and identify ownership and management responsibilities for the project. Under the federal *Canadian Environmental Assessment Act*, "purpose of" the project is defined as what is to be achieved by carrying out the project, where as "need for" is defined as the problem or opportunity the project is intending to solve or satisfy.

  Information to complete this section will become available as the SRC completes the environmental impact assessment (EA) and prepares the environmental Impact Statement (EIS).

EIS Section 2 - Summary of Historical Mining & Milling – Gunnar Mining Limited Site

Section 4.2.1 of the PSG requires that the EIS provide a concise history of the Gunnar uranium mine development in order to place the proposed Gunnar Mine Site Rehabilitation Project in context.

Sufficient information to complete this section of the EIS is located in:

- Beck, 1969, ***Uranium Deposits of the Athabasca Region, Saskatchewan***, Saskatchewan Mineral Resources Report No. 126, L.S. Beck, 1969.

- Botsford, J.A. 1963. ***The Gunnar Story***, J. A. Botsford, Canadian Mining Journal. Volume 84, Number 7, 1963, pg.47-114.

- KHS Environmental Management Group Limited (KHS). 2003. ***Gunnar and Lorado 2002-2003 Update*****.** Prepare for Saskatchewan Northern Affairs, December 2003

EIS Section 3 - Current Site Description

Section 4.2.2 of the PSG requires that the EIS contain a complete and detailed inventory of the abandoned physical structures (mill, mine infrastructure, maintenance and storage buildings, offices, residences); historical locations of structures no longer in place (including drum storage and tank farms, etc., that may have impacted soils); physical surface works (roads, pipelines, power lines, drainage works, etc.); effluent treatment systems; waste disposal sites, including those for tailings, waste rock, sludges, sewage, chemicals, garbage, etc.; and residual wastes and hazardous goods, as well as contaminated soils, that are present at the former Gunnar mine site.

The following provides a summary of each of the identified features or elements of the former Gunnar site and a discussion of available data or gaps in information/data in terms of completing this section of the EIS.

Mine Facilities

Significant information to complete a detailed inventory of the mine facilities is provided in ***The Gunnar Story***, (Botsford, 1963)

Open Pit Mine

Historical information to complete a detailed discussion of the open pit mine facility during operations is located in *The Gunnar Story*, (Botsford, 1963)

In 1964, a channel was blasted between the pit and Lake Athabasca to flood the pit. In 1966, the channel was filled with waste rock. Local anecdotal sources have indicated that a culvert was positioned in the channel before the waste rock was placed however this has never been confirmed.

Currently, there is a small surface depression marking the location of the channel. The difference in elevation between the pit water and the Lake Athabasca was 2.11 m in August 2004, indicating a flow gradient exists toward the lake however, this may change seasonally.

No evidence of a geophysical or geotechnical survey of the waste rock filled channel could be located in the documents provided for review.

The SRC should conduct a geophysical and geotechnical survey of the waste rock filled channel.

A geotechnical assessment on the stability of the flooded pit rim was conducted in 2004 by a qualified individual and is reported upon in the *Final Report, Gunnar Site Characterization and Remedial Options Review* (SRC, 2005).

During the options review process, the SRC will be required to assess the significance of the "failures" identified in that report. That assessment must include, at a minimum the risk posed to worker health and safety during rehabilitation activities and the potential environmental impact of possible failures including an assessment on how much material could possibly fail and the impacts of such a failure on the aquatic environment in the event that the pit remains flooded after rehabilitation activities have been completed.

The flooded pit has also been the subject of two separate aquatic investigations:

- *Limnological and Fisheries Investigation of the Flooded Open Pit at the Gunnar Uranium Mine.* (P.I .Tones, Saskatchewan Research Council Publication No. C-805-10-E-82, February 1982).; and,
- *Limnological and Aquatic Investigations of the Abandoned Gunnar Pit near Lake Athabasca. Final Report* **(**CanNorth, Prepared for COGEMA Resources Inc., Saskatoon, Saskatchewan, Project No. 1041. January 2004)

Surface water quality in the flooded pit has been monitored on an annual basis by the SRC since 2006.

It is important to note that, depending on the potential options identified for the flooded open pit, additional sampling of the deep pit water and pit sediments may be required particularly for the presence of sulphides in the sediments and in the water column immediately overlaying the substrate. Such an investigation, if judged necessary, would also focus on the analysis of all of the redox species that could potentially inhibit sulphide formation (i.e. ammonia, nitrite, nitrate, etc). The type of sampling required may pose certain challenges because of the depth of the flooded pit and due to the fact that constituents targeted for analysis are not stable if exposed to air.

Underground Mine

Historical information to complete a discussion of the underground mine during operations is located in *The Gunnar Story*, (Botsford, 1963)

The SRC should assemble and retain as much the underground mine geological information as possible with a particular focus on level plans and stope surveys. Such information (if enough historical documentation is available) will allow the creation of a 3D model of the workings to demonstrate to reviewers and the public where the mine was/is in relation to Lake Athabasca.

In addition, all exploration drill hole records should be obtained and retained by the SRC in order to facilitate a site survey to identify and characterize all exploration drill hole locations with a particular focus on identifying drill holes discharging water and to characterize the quality of the water being discharged.

The Saskatchewan Ministry of Energy and Resources generally retains such records and the SRC should contact that Ministry and secure a copy of all records on file related to the former Gunnar Mines Limited site.

Once the historical records have been obtained and reviewed, a detailed ground survey of the entire former Gunnar Mines Limited site must be conducted to locate and characterize each drill hole. The characterization should include the specific location of each, type and length of drill casing protruding above the ground surface and whether the drill hole is dry or discharging water. If the drill hole is discharging water, flows should be estimated and a sample of the water collected, appropriately preserved and submitted for chemical analysis.

No formal documentation on the closure methods employed to cap or seal the underground mine shaft or raise at the end of operations was found during the review of the documentation provided. As the stability and competency of the closure methods can not be defined, the SRC must ensure that the areas are well marked and all access to the area restrict in order to ensure worker safety during the actual rehabilitation activities and public safety in the interim.

It may be more cost effective to assume that the current caps will have to be replaced during rehabilitation activities rather than spending funds on non-destructive investigations of the current caps and attempting to aquire regulatory approval of the existing caps and their long-term competency.

Waste Rock Piles

The majority of the waste rock on site is immediately east of the flooded pit in two adjoining piles separated by a short valley. The waste rock piles are expected to include mine waste rock and overburden generated from surface stripping of the open pit mine and from both open pit and underground mining. The piles have steep side-slopes and plateau-like upper surfaces. The waste rock is located on the shore of Lake Athabasca with the toe of the waste rock piles protruding into the water of St. Mary's Channel and Zeemel Bay.

The sides of these piles are very steep and, although they have been in place for over 40 years, there is some evidence of slope failure suggesting instability in the long term. No evidence could be found that a geotechnical assessment of the waste rock pile slopes has ever been conducted.

The SRC must conduct a geotechnical assessment by a qualified individual of all current waste rock piles slopes.

Samples of the waste rock from the piles was previously recovered and analyzed as part of the 1985 NUTP investigation (BBT, 1986) and a summary of the results are presented in Appendix C of *Gunnar Site Characterization and Remedial Options Review* (SRC, 2005).

As part of the 2004 SRC investigation, the waste rock piles were again sampled to determine the potential for acid rock drainage (ARD) and metals leaching potential. Appendix E2 of *Gunnar Site Characterization and Remedial Options Review* provides a discussion of the preliminary examination of the Gunnar waste rock.

During the environmental assessment process, the SRC will be required to rule out the potential for future acidification and ARD. A review of the information provided in Appendix E2 of the *Gunnar Site Characterization and Remedial Options Review* does not provide sufficient information on the methodology employed in the waste rock sample collection/analysis and provides only "Preliminary Comments" in the report section. This lack of information does not provide sufficient information to assess rehabilitations options for the site and will be judged as a "significant deficiency" by the regulatory agencies during the review of the environmental impact statement.

In addition, the waste rock samples collected by the SRC in 2004 were limited to only waste rock from the surface of the piles (i.e. rock that has been on surface of approximately 40 years and therefore subject to significant weathering). As a result, the samples collected to date may not be representative of the rock that could potentially be exposed during rehabilitation activities (i.e. sloping and re-contouring of the waste rock piles) or if the waste rock is used as a cover or fill material during the remediation of other areas of the site.

The SRC must conduct a rigorous waste rock characterization program designed to characterize an adequate number of representative samples of both weathered (current surface rock) and un-weather (buried) waste rock that could potentially be used or exposed during rehabilitation activities.

The waste rock characterization program must, at a minimum, be designed and carried out by a qualified, experienced geochemist and include subjecting the waste rock samples to field testing of pH and conductivity, laboratory analysis of total metals, radionuclides in solids, Acid-Base-Accounting (ABA) using the most advanced methods, and shake flask tests to assess soluble contaminants under various conditions.

The collection of appropriate samples will likely require a backhoe on site to dig test pits 3-5 m in depth at various locations on the waste rock piles.

The waste rock characterization program should be conducted as soon as possible, as the information could potentially be a significant input parameter in the selection of the preferred option for a number of different elements of site rehabilitation.

Waste Rock Seep

During the 1981 investigation of the Gunnar flooded pit (Tones, 1982), Tones identified two small streams coming from the waste rock piles and estimated the flows at 3-5 L/sec and 1-2 L/sec. ^{210}Lead and uranium concentrations in the water seeping from the waste rock piles were found to be higher than the concentrations in the flooded pit surface waters.

The National Uranium Tailings Program (NUTP) Gunnar Field Study investigated the same seeps in 1985 and reported that the seepage flows in June and again in August 1985 were significantly less than previously reported by Tones.

The only consistent seep from the waste rock pile currently exists in the small valley between the two waste rock piles and flows into Zeemel Bay of Lake Athabasca. The water quality in the seep has been monitored annually by the SRC since 2005 and the *Gunnar Site Characterization – 2004 & 2005 Aquatic Investigations* (CanNorth, March 2006) concluded that "*The waste rock pile seep continues to be a source of contamination in Zeemel Bay and this will require consideration when assessing remediation strategies.*"

The *Screening Level Human Health & Ecological Risk Assessment of the Gunnar Site (*SENES, 2006) completed by SENES Consultants Ltd. concluded that, although the area is quite small and the rest of Zeemel Bay has low uranium concentrations, the uranium concentration in the waste rock seep may cause potential adverse effects on aquatic species in the wetland area into which the seep flows and terrestrial animals that may consume the aquatic vegetation (SENES, 2006).

Although the water quality of the seep is relatively well documented, the source of the seep has not been identified during any of the field investigations conducted to date.

The SRC must attempt to identify the source and volume of the waste rock seep in order to assess the potential of remediating the flow. One investigation that the SRC may wish to consider is an analysis of stable isotopes (e.g. ^{3}H, ^{18}O) which are preferentially enriched by evaporation. Sampling the water from the seep, the flooded pit and Zeemel Bay and subjecting the samples to a stable isotope analysis may provide results that would allow for a determination of whether the seep water is originating from the flooded underground mine or from surface sources.

An investigation to determine the source of the waste rock pile seep water is required as soon as possible in order to conduct an analysis of possible options to remediate the seep.

Mill/Acid Plant

Significant information to complete a detailed inventory of the mill and acid plant facilities is provided in *The Gunnar Story*, (Botsford, 1963). However, an inventory of any residual chemicals remaining in these buildings has not been conducted.

In order to fully characterize the site, develop rehabilitation options, conduct an environmental impact assessment and prepare an environmental impact statement, a detailed survey of residual chemicals remaining in all buildings on the site must be conducted. That survey must;

- Identify and record the location of all residual chemical on the site;
- Describe current storage or containment vessels;
- Collect, if safe to do so, representative samples of the identified residual chemicals present on the site and submit each sample for analysis in order to characterize the type and concentration of contaminants present; and;
- Prepare an estimate of the total volume of each type of residual chemical on or around the site.

This activity must be completed as soon as possible in order to include the volume and type of residual chemicals in the assessment and analysis of potential rehabilitation options for the site.

Occupational health and safety must be a paramount consideration in the planning and execution of this survey.

Mill Tailings

During operations, mill tailings and other aqueous wastes were initially discharged into a small lake located 500 m to the north of the mill. The lake is referred to as either Blair Lake or Mudford Lake in historical documentation; however the basin became known as the Gunnar Main tailings area (Gunnar Main). The Gunnar Main tailings basin eventually filled with tailings solids and a small rock outcrop was blasted to allow the tailings to flow from the Main area to a small depression referred to as Gunnar Central Tailings. Once this relatively small basin was filled, the tailings continued to flow downhill, eventually entering Langley Bay, Lake Athabasca. During operations, a sufficient volume of tailings was discharged and allowed to flow into Langley Bay so as to eventually cut Langley Bay into two separate portions: one which is still connected by a narrow

channel to Lake Athabasca proper and a smaller 'back bay' which has intermittent connection to Langley Bay itself.

Although a number of the documents reviewed provide maps of the three separate tailings areas (Gunnar Main, Gunnar Central and Langley Bay) none of the maps or documents reviewed provides a detailed description of the full extent of tailings in each area. For example, evidence exists of tailing being transport by wind into the tree line surrounding the Gunnar Main tailings area and evidence of tailings beaches is also suggested by gamma level measurement at various locations along the shores of Langley Bay at locations well away from the main tailings area. In addition information could be found regarding the beaches surrounding Back Bay.

The SRC must conduct a detailed survey of all three tailings areas to accurately map the extent of tailings in each area and the survey must include those tailings that have been transported beyond the tailings area boundaries by wind or water.

As part of the National Uranium Tailings Program (NUTP) (BBT 1986) investigation of the Gunnar Site, boreholes and wells were completed into tailings areas. Samples of the soils and tailings materials encountered during the drilling of these boreholes and wells were submitted for chemical analyses.

No additional information or data was located that provides an adequate characterization of the tailings in each of the tailings areas during a review of the documentation provided. This is considered a significant gap in the information/data.

The SRC must conduct a rigorous tailings characterization program on each of the three separate tailings areas (Gunnar Main, Gunnar Central and Langley Bay). That program must include representative samples of wind blown tailings and beached tailings throughout Langley Bay.

The tailings characterization program must be designed to characterize an adequate number of representative samples of both weathered (current surface tailings) and un-weather (*in situ* tailings at depth) tailings from each of the three separate tailings areas.

The tailings characterization program must, at a minimum, be designed and carried out by a qualified, experienced geochemist and include subjecting the tailings samples to field testing of pH and conductivity, laboratory analysis of total metals, radionuclides in solids, Acid-Base-Accounting (using the most advanced methods), and shake flask tests to assess soluble contaminants under various conditions.

The collection of appropriate representative samples will likely require a backhoe on site to collect samples for appropriate depths within the three separate tailings areas (although it could potentially be completed using a hand auger). If heavy equipment is used to complete this work, access to Gunnar Central and Gunnar Main tailings areas must be a consideration. In addition, the stability of the working surface for the equipment must be carefully considered during the execution of this work.

The tailings characterization program should be conducted as soon as possible as the information will be a significant input parameter in the selection of the preferred option for the rehabilitation of the tailings areas.

In addition to the tailings characterization program, a surface investigation of the three tailings areas should be conducted in the summer by a qualified individual to:

- Assess all three tailings surfaces for evidence of surface salt accumulation and the potential for migration of salts though a potential cover.
- Inspect all tailings areas for trafficability and test doubtful areas using hand-held vane shear apparatus.
- Investigate the existing tailings surface for evidence of boils, frost heave, frost cracking and/or cryoturbation and to assess the depth of frost - as all of these have the potential to damage a potential cover.

Gunnar Main Tailings

The Gunnar Main tailings basin eventually filled with tailings solids and a small rock outcrop was blasted to allow the tailings to flow from the Main area to what is now referred to as the Gunnar Central tailings area.

Since milling operations ceased at the site, water has ponded on the surface of the Gunnar Main tailings area. The water is currently retained on the tailings area by a series of beaver dams constructed downstream of the channel blasted through the outcrop. The beaver dams do not provide the level of permanent long-term stability that will be required of the site and will have to be replaced with an engineered containment structure during the rehabilitation activities.

The SRC must conduct a site inspection by a qualified individual to assess the potential and appropriate location for the potential construction of an engineered containment structure at the discharge of the Gunnar Main tailings area.

In addition, a detailed characterization of the surface flow channel between Gunnar Main and Gunnar Central must be completed by qualified individuals. That characterization should include a detailed description of the flow channel (depth, width, slope, character, etc.) an assessment of the amount of residual tailings present in the flow path and a characterization of the vegetation present in the areas.

Gunnar Central Tailings

The SRC must conduct a ground survey of the area between the main mine site and the Gunnar Central tailings area in order to assess the ability and requirements to accessed the Gunnar Central tailings area with heavy equipment.

A detailed characterization of the surface flow channel between Gunnar Central and Langley Bay must be completed by qualified individuals. That characterization should include a detailed description of the flow channel (depth, width, slope, character, etc.) an assessment of the amount of residual tailings present in the flow path and a characterization of the vegetation present in the areas.

Langley Bay Tailings

Local anecdotal sources indicate that a road existed during operations that accessed the Langley Bay tailings area from the main mine site area although none of the documents reviewed provide any details of such a road.

The SRC must conduct a ground survey of the area between the main mine site and the Langley Bay tailings area in order to assess the ability and requirements to access the Langley Bay tailings area with heavy equipment.

Tailings Pore Water

Pore water sampling within the tailings area was conducted as part of the NUPT program and is reported on in *Gunnar Field Study* **(**B.B.T., 1986) and a single sample was collected for analysis at four separate locations by the SRC in 2004 (*Gunnar Site Characterization and Remedial Options Review* SRC, 2005) .

The SRC must conduct additional pore water sampling within the tailings management areas to develop a more comprehensive data base and provide a sufficiently rigorous baseline to model the potential impacts of the preferred option for the rehabilitation of the tailings management areas.

On- site Residual Chemicals

No information/data on residual chemicals on the former Gunnar Mine site was located during a review of the documentation provided for this Gap Analysis.

In order to fully characterize the site, develop rehabilitation options, conduct an environmental impact assessment and prepare an environmental impact statement, the SRC must conduct a detailed survey of all residual chemicals remaining on the site. That survey must;

- Identify and record the location of all residual chemicals on the site;
- Describe current storage or containment vessels;
- Collect, if safe to do so, representative samples of the identified residual chemicals present on the site and submit each sample for analysis in order to characterize the type and concentration of contaminants present; and;
- Prepare an estimate of the total volume of each type of residual chemical on or around the site.

This activity must be completed as soon as possible in order to include the volume and type of residual chemicals in the assessment and analysis of potential rehabilitation options for the site.

Occupational health and safety considerations and requirement must be a significant component in the planning and executive of this survey.

Auxiliary Structures

Mine Operation Related

Sufficient information to complete a detailed inventory of the mine facilities is located in *The Gunnar Story*, (Botsford, 1963) and the *Gunnar and Lorado 2002-2003 Update* (KHS, 2003) with the exception of the former town site located west of the main mine site.

No information could be located concerning gamma levels, remaining infrastructure, residual wastes or any other features of the area of the former town site.

A detailed survey of the former town site must be conducted. The survey must include a general inspection of the area to identify, characterize and record all remaining infrastructure in the area, to identify, characterize and record all residual chemical/wastes and potentially contaminated soil present. A detailed gamma survey of the area and its access road is also required and the results documented.

Post-Mine Operation Structures

Very little detailed information is provided in any of the documentation reviewed regarding the 'post-mine operation' structures present at the Gunnar site. This includes the former fish processing facility located near the current dock, the compressor area associated with the fish plant, the abandoned barge in the channel between the flooded pit and Lake Athabasca and the series of cabins located east of the former fish processing facility and the barge.

A detailed survey of the former fish processing facility, surrounding area (including the compressor area), the current and historic dock areas, the abandoned barge in the channel between the flooded pit and Lake Athabasca and the series of cabins located east of the former fish processing facility and the barge. The survey must include a general inspection of the areas to identify, characterize and record all remaining infrastructure in the area, to identify, characterize and record all residual chemical/wastes and potentially contaminated soil present. A detailed gamma survey of the area is also required and the results documented.

Additional Infrastructure

Very little detailed information is provided in any of the documentation reviewed with regard to the current condition and extent (i.e. volume and character) of various additional infrastructure on the site including, but not necessarily limited to the utilidors used to pipe stream heat, fresh water and sewage throughout the site, the road ways (both within the mine site and those accessing the former town site and airstrip), freshwater intake facilities, sewage management facilities and the air strip itself.

A detailed survey of these areas is required. The survey must include a general inspection of all areas to identify, characterize and record all remaining infrastructure, to identify, characterize and record all residual chemical/wastes and potentially contaminated soils present. A detailed gamma survey of the area is also required and the results documented.

This activity must be completed as soon as possible in order to include the volume and type of material requiring disposal in the assessment and analysis of potential rehabilitation options.

Contaminated Soils

No information/data on potentially contaminated soils on and around the former Gunnar Mine site was located during a review of the documentation provided for this Gap Analysis.

In order to fully characterize the site, develop rehabilitation options, conduct an environmental impact assessment and prepare an environmental impact statement the SRC must conduct a detailed survey of the site;

- To identify and record the location of areas of all potentially contaminated soils;
- To collect representative samples of the identified contaminated soils in order to characterize the type and concentration of contaminants present; and,
- To provide an estimate of the total volume of each type of contaminated soils present on and around the site.

This activity must be completed as soon as possible in order to include the volume and type of contaminated soil requiring disposal in the assessment and analysis of potential rehabilitation options.

Other Wastes (Refuse/Debris)

Although a number of the documents reviewed provided a brief and passing reference to “other refuse and waste” and, in one instance, an estimate of the number of steel barrels on site, no detailed information/data on the other types of wastes such as steel, plastic, piping, etc. on and around the former Gunnar Mine site was located during a review of the documentation provided for this Gap Analysis.

In order to fully characterize the current site conditions, develop rehabilitation options, conduct an environmental impact assessment and prepare an environmental impact statement a detailed survey of the site must be conducted;

- To identify and record the location of all “other” types of waste material located on the site; and,
- To provide an estimate of the total volume of each type of contaminated soils present on and around the site.

This activity must be completed as soon as possible in order to include the volume and type waste material requiring removal or appropriate disposal in the assessment and analysis of potential rehabilitation options.

EIS Section 4 - Existing Environment

Historical Data Summary

There are a significant number of sources of historical data related to the former Gunnar site and the select portions of the surrounding environment. Generally data from the sources discussed in section 4, *Summary of Existing Site or Related Information*, is sufficient to prepare this section of the EIS however the documentation identified provides an extraordinary amount of data. As section 4.2.2 of the PSG states that "relevant details of prior studies or evaluations of the Gunnar site should be reviewed and incorporated where appropriate" in the EIS, all of the available data should be assembled as soon as possible, reviewed and relevant data formatted in a manner that will allow for its inclusion in the environmental assessment and eventually in the EIS.

Climate/Meteorology

Section 4.5.2 of the PSG states that "any current databases of climatic, meteorological and air quality information, including dust, radon and gamma radiation data, should be referenced in the EIS".

Climatological and meteorological parameters, including wind speed and direction, temperature, and precipitation, are important in establishing climatic conditions and determining dispersion patterns of air emissions that may affect local and regional air quality once the project commences. The Gunnar Project is located in close proximity to Uranium City therefore; the long-term climate and meteorology information collected at this city's airport can be applied.

In addition, regional data must also be reviewed. This information should provide an overview of the climatic conditions in the Local Study Area (LSA) but also regionally. Local and regional averages, trends, and maximum and minimum values must be discussed for temperature, precipitation, and surface winds. Local and regional information on evaporation, evapo-transpiration, atmospheric stability, and mixing height must also be analyzed and discussed. It is noted that all data should be reviewed for anomalies and obvious errors (e.g., data entry or unit conversion).

Contingent on air contaminant data availability, basic statistical data should be developed for the project area (e.g., number of samples exceeding limits, geometric and arithmetic means, minimums, maximums, and 10th and 90th percentiles). Figures showing temporal concentrations in air quality data must also be prepared where they are illustrative of a trend. Finally, the effects on global warming and how this could potentially impact the project must also be discussed.

Generally, data from the sources discussed, as well as from previous area investigations, is sufficient to prepare this section of the EIS however, available data should be assembled as soon as possible, reviewed and the preparation of this section of the EIS begun.

Air Quality

The EA must consider two aspects of air quality; radon and dust.

While a limited amount of historical radon data does exist within the *Gunnar Field* (B.B.T. 1986), sufficient information does exist with regard to current radon concentration on and around the Gunnar site as the SRC initially installed 13 radon detectors at various locations on the site in 2004 and has continually monitored radon (with a few disruption from lost cups) since that time. A 14th detector was installed in 2005 and it too has been monitoring radon on a continuous basis since that time. This radon monitoring must continue.

While historical data on dusting does not exists, generally the environmental assessment will have to consider dusting during actual rehabilitation activities and therefore will likely be a requirement in the monitoring program during rehabilitation activities.

Gamma Radiation Levels

Significant information on gamma radiation dose rates throughout the main Gunnar mine site is provided in:

- Brown, L. Denis. 1993. Proposed **Decommissioning of the Gunnar and Lorado Uranium Mine Sites**, BB Health Physics Services, 1993.
- KHS Environmental Management Group Limited (KHS). 2003. **Gunnar and Lorado 2002-2003 Update.** December 2003.
- SRC, 2007, **Former Gunnar Mining Limited Site Rehabilitation Project Proposal.** Saskatchewan Research Council, April 2007, SRC Publication No. 12194-3E07

All of the available data should be assembled as soon as possible, reviewed and relevant data formatted in a manner that will allow for its inclusion in this section of the EIS.

During the Gap Analysis, a review of the information/data provided by the Saskatchewan Research Council failed to locate data on gamma radiation dose rates:

- For any of the roads within the mine site proper;
- For the road that travels from the main site west to the former town site;
- From any areas within the former town site itself;
- For the road that travels from the mine site to the airstrip; or,
- For the airstrip itself.

As the majority of these areas show evidence of historical disturbance and the use of waste rock for construction purposes, a gamma survey, conducted at a height of one meter above ground surface,

should be undertaken in all disturbed areas that are potentially contaminated and the results recorded for inclusion in the EA and EIS. Areas illustrating average dose rates from gamma exposure in excess of 1 μSv/h above background (averaged over a 100 m x 100 m surface, or a 10,000 m^2 surface), or with a maximum spot dose in excess of 2.5 μSv/h above background, will likely require remediation during site rehabilitation.

Geology

Discussion of regional and local geology can be found in *Uranium Deposits of the Athabasca Region* (Beck, 1969) and *The Gunnar Story*, (Botsford, 1963) although in both instances, the discussion focuses primarily on the geology of and in the immediate vicinity of the ore body itself and very little information is provided on the geology in the vicinity of the tailings management areas.

The SRC should assemble all existing drill hole records (including logs) for all historical drilling conducted in the vicinity of the former Gunnar site and compile the results to provide a more comprehensive discussion of the local geology with a particular focus on the mine and tailings management areas.

Topography

Detailed topography for the entire Gunnar mine site does not exist beyond that provided on publically available maps.

A detailed topographic survey of the entire Gunnar mine site is required. It is recommended that the survey have a 10 cm resolution on three tailings management areas and 50 cm resolution on the remainder of the site. The survey should extend at least 200 m beyond on all sides of the site (including the wind blown tailings on Gunnar Main Tailings) and include the former town site, the airstrip and the roads connecting these areas to the main site.

The survey should be completed as soon as possible.

The SRC should investigate the potential of completing the requisite survey using air photos or satellite images (e.g. Quickbird). If this does not prove possible, an on-site survey will have to be undertaken once the spring melt is complete.

Hydrogeology

Preliminary groundwater modeling of the three tailings management areas at the Gunnar site was conducted in 2005 and 2006 and is reported upon in *Groundwater Flow Modeling for the Former Gunnar Mine Site, Final*, December 2007, Soilvision Systems Ltd.

Section 6 of that report provides recommendations and states:

The purpose of this numerical study was to perform numerical modeling that would provide estimates of flow rates and climatic influences. This study is by no means to be considered a comprehensive analysis and the following recommendations are noted:

- *The use of a model incorporating the flow of surface water is recommended to fully gauge the impacts on contaminants transport in the surface flows*
- *The effects of frozen areas of the tailings near the surface play a significant in understanding the relationship between surface flow and groundwater flow. It is recommended that coupled numerical modeling be run incorporating temperature effects and surface water flow.*
- *It is recommended that statistically based methodology be implemented in the estimation of the driest and wettest years for the purpose of modeling best case and worst case scenarios.*
- *It is recommended that one-dimensional simulations be run for longer periods until an approximate steady state condition is achieved.*
- *Further sensitivity studies need to be performed in order to determine improves estimates of actual and potential evaporation.*

Additional groundwater modeling is required, as the *Groundwater Flow Modeling for the Former Gunnar Mine Site, Final*, by it own admission, is not sufficient to satisfy the requirements of the rehabilitation project (options analysis, selection of the preferred option or the modelling of potential impacts resulting from implementing the preferred option).

The SRC must conduct a more detailed groundwater investigation with a particular focus on the tailings management areas and, to a lesser extent, the permeability between the flooded pit and Lake Athabasca.

Generally, this should include:

- A detailed review of historic information on the area and site including *The Gunnar Story* to document minewater inflow (total mine dewatering at the end of mining produced 75 gpm and the fact that the Gunnar Main tailings area was formerly a perched lake, regional permiabilities, etc.)
- A detailed review of the earlier work completed (particularly the information provided in the NUTP program and the *Groundwater Flow Modeling for the Former Gunnar Mine Site, Final*, December 2007, Soilvision Systems Ltd.)
- A review of the structural geology of the area to identify any possible through-going faults.
- A review of historical tailings pore water quality investigations.
- The development of appropriate calculations/modelling to demonstrate/show low permeability;
- Prepare and use the results to show low risks associated with groundwater pathway

The SRC must complete this work as soon as possible as the results of the groundwater modelling will play a significant role in the analysis of options for the rehabilitation of the three tailings areas (Gunnar Main, Gunnar Central and Langley Bay), in the choice of the preferred rehabilitation for each and in the contaminant transport modelling of post-rehabilitation of the tailings areas and the former open pit.

Aquatic Environment

A full suite of baseline aquatic investigations in the Gunnar Mine Site area were completed by Canada North Environmental Services (CanNorth) between 2002 and 2005. Details of the sampling programs are reported in CanNorth 2004, CanNorth 2005, and CanNorth 2006. A summary of the aquatic surveys are as follows:

Waterbody	Bathymetry	Limnology/Water Chemistry/Plankton	Sediment Chemistry	Benthic Invertebrates	Macrophyte Chemistry	Incidental Duck Chemistry	Fish Community	Aquatic Habitat	Fish Chemistry
Gunnar Pit	2002	2002	2002	2002	No	No	2002	2002	2004
Back Bay	2005	2005	2005	2005	2005	2005	2005	2005	2005
Langley Bay	No	2004, 2005	2004	2004	2005	No	2004, 2005	2004	2004, 2005
Zeemel Bay	No	2005	2005	2005	2005	No	2005	2005	2005
St. Mary's Channel	No	2004, 2005	2004	2004	No	No	2004	2004	2004
Dixon Bay	No	2005	2005	2005	No	No	2005	2005	2005
AWG[1] Program: Black Bay/Fredette Lake	No	2000-2008	2000-2008	No	2000-2008 Terrestrial Vegetation	No	No	No	2000-2008

Additional data from the AWG program could also be utilized as supporting information. The program was initiated in 2000 and reports the heavy metal concentrations and radionuclide activities for water, sediment, terrestrial vegetation, large mammals, and fish. Both far-field exposure and reference areas of the AWG program are in the vicinity of the Gunnar Mine Site (Black Bay, far-field exposure across from Langley Bay on Lake Athabasca; Fredette Lake, reference area north of

[1] The Athabasca Working Group program (AWG) is an environmental monitoring program funded by Cameco Corporation and AREVA Resources Canada Ltd, and is managed by Canada North Environmental Services.

Uranium City). Consultation with Cameco Corporation and AREVA Resources Canada Ltd. will be required for the use of the AWG data.

It is also recommended that the SRC obtain further details on the local aquatic environment, including the following:

- Additional aquatic investigations (bathymetry, water quality/plankton, sediment quality, benthic invertebrates, and fish community/habitat) for the two unnamed ponds (between Gunnar Pit and Back Bay), Mudford Lake, and Spring Lake. Fish community/habitat, water quality, sediment quality, benthic invertebrate, and stream flow data should also be collected for streams associated with the aforementioned ponds and lakes, contingent on stream size. These waterbodies are potentially fish-bearing and are within the possible impact area.

- Bathymetric mapping will be required for Zeemel Bay, Langley Bay, St. Mary's Channel, and Dixon Bay.

- Surface hydrology (stream characteristics and stream discharge) of the main creeks in the study area should be completed (small unnamed creeks, Thompson Creek, Hurd Creek, Spring Creek, and Zeemel Creek).

- Fish community/habitat, water quality, sediment quality, and benthic invertebrate data may also have to be collected, contingent on stream size, for the main creeks in the study area (i.e., Thompson Creek, Hurd Creek, Spring Creek, and Zeemel Creek).

- Water quality sampling by CanNorth (2002-2005) and SRC (2005-2008) has been completed during the summer/fall seasons. Winter water quality sampling should be included to interpret seasonal trends and rehabilitation effects.

- Data regarding mercury concentrations in the sediment has been obtained for Dixon Bay, Zeemel Bay, and Back Bay. Although mercury was found to be below detection (<0.05) at these sites, mercury concentrations in the sediment should also be determined for Langley Bay and St. Mary's Channel.

A "Fish habitat Compensation Program" will likely be required for certain aspects of the rehabilitation project as discussed in subsequent sections of this report. If this is the case, detailed quantitative fish habitat assessments of waterbodies requiring compensation will have to be completed to assess the quality and extent of habitat that will potentially be lost and a fish habitat compensation program will have to be developed.

Terrestrial Environment

Sufficient baseline data to complete an environmental assessment of the impacts of the rehabilitation project on the terrestrial environment in and around the former Gunnar Mine site could not be located in the documentation provided. For example, historical terrestrial vegetation samples have been collected on the site in 1983 and 1985 under the auspices of the NUTP program and a limited amount of vegetation mapping and vegetation sample collection was concluded in 2005, however in both instances the focus was almost exclusively on the three tailings areas (Gunnar Main, Gunnar Central and Langley Bay).

The Saskatchewan Research Council must complete a baseline investigation of the terrestrial environment in and around the former Gunnar mine site as soon as possible. The study should include, but not necessarily be limited to:

- Soils
- Understory vegetation
- Forest vegetation
- Vegetation mapping
- Concentration of Contaminants of Potential Concern (COPC) in typical browse vegetation (i.e. leaves, grasses, lichen & berries) consumed by local wildlife both on and off the site (i.e. beaver, muskrat, mink, hare, ptarmigan, moose & potentially other VECs identified during consultations).
- Rare and endangered plant species
- Identified VECs
- Birds
- Small mammals
- Large mammals
- Reptiles & amphibians
- Species at Risk

Heritage Resources

Section 4.5.12 of the PSG states that “in the EIS, the proponent should note that following their review of the proposal, the Heritage Resources Branch, Saskatchewan Department of Culture, Youth and Recreation advised that, since the proposed Gunnar Mine Site Rehabilitation Project would take place in the footprint of the former mine disturbance, the Heritage Resources has no further concerns with the project proceeding as planned. The proponent should confirm these conclusions with local First Nations during the conduct of the EIA”.

Based on this requirement, public consultations intended to identify the potential of the existence of heritage resources or sites of “special significance” to the aboriginal communities in the area of the former Gunnar Mine site must be conducted.

It is recommended that these consultations include the North Saskatchewan Environmental Quality Committee, Traditional Users of the area, the Project Review Committee and the local public, that they take place within the region of the project and that all activities and results of such consultations conducted in this respect are well documented for presentation in the EIS. This should include a detailed description of methods to secure participation of the various groups in the consultation session, the provision of materials in a manner suitable for the audience and suitable for soliciting public input, the provision of translation services if deemed necessary, and the documentation of the results.

Socio-economic Environment

Within the *Canadian Environmental Assessment Act*, "environmental effect" in respect to a project is defined as:

(a) any change that the project may cause in the environment, including any change it may cause to a listed wildlife species, its critical habitat or the residences of individuals of that species, as those terms are defined in subsection 2(1) of the Species at Risk Act,

(b) any effect of any change referred to in paragraph (a) on

(i) health and socio-economic conditions,

(ii) physical and cultural heritage,

(iii) the current use of lands and resources for traditional purposes by Aboriginal persons, or

(iv) any structure, site or thing that is of historical, archaeological, paleontological or architectural significance, or

(c) any change to the project that may be caused by the environment

In order to assess the potential changes to the socio-economic environment that could result from the Gunnar Rehabilitation Project, acquisition of an adequate level of appropriate social and economic baseline data is required. The *Northern Saskatchewan, Regional Training Needs Assessment Report 2008-2009* (April 2008) prepared by Northlands College, the Northern Labour Market Committee and the Saskatchewan Ministry of Advanced Education, Employment and Labour provides a significant amount of relevant socio-economic baseline data however additional data specific to the Uranium City area and the Athabasca Basin is required.

Based on these requirements, the SRC must complete a socio-economic baseline study that focuses on the Athabasca Basin in general and Uranium City area in particular. Consideration should be given to extending this study to include communities at the west end of Lake Athabasca as some of those communities have expressed an interest in rehabilitation activities at the site, are signatories to Treaty 8 and/or, in the case of Métis people, may consider the area of the former Gunnar mine site as within their traditional territories. The study should incorporate a review and inclusion of relevant

information contained within the *Northern Saskatchewan, Regional Training Needs Assessment Report 2008-2009* or a more recent iteration of that report.

In addition, section 4.4 of the PSG issued for the project states that "the EIS should provide a description of employment requirements, including skill levels and training, required to implement the Gunnar rehabilitation plan. Jobs and contractor opportunities targeted for Northerners and commitments to potential local, regional and Saskatchewan suppliers should be noted". Such information will depend on the activities undertaken to complete the rehabilitation of the Gunnar site and therefore can not be completed by the SRC until the project is fully described and the Schedule of Activities and the Project Requirements sections of the environmental impact assessment are complete.

2005 Screening Level Ecological and Human Health Risk Assessment

As stated in section 4.2.2 of the PSG, a key component of the development of the Gunnar rehabilitation plan will be the identification of the risks to the environment and the public from the abandoned Gunnar mine site. That section states "the potential environmental and public hazards associated with the abandoned features of the mine should be identified and an assessment of the current level of risk to the environment and the public from these hazards should be conducted. The EIS should provide an overview of the nature and source of any potentially significant risks, including radiological risks, from the project to the workers and the public".

In 2005, the Saskatchewan Research Council contracted the service of SENES Consultants Ltd. to complete a screening level human health and ecological risk assessment for the Gunnar Mine site, and that document addresses, in large part, the requirements specified in the PSG.

Section 6.4 of the SENES assessment identifies uncertainties involved in the screening level risk assessment conducted and one of the uncertainties included the dietary characteristics (food, water and soil or sediment consumption) of ecological receptors. In order to reduce this uncertainty with regard to humans that may reside near the former Gunnar Mine site, it is recommended that during the public consultations that will be required in the planning of the rehabilitation activities and to conduct the environmental impact assessment, that the consumption of local (to the site) foods stuff be the subject of consultation to characterize such consumption to the extent possible.

EIS Section 5 - Traditional Knowledge

Item 17 of the CNSC issued *Record of Proceedings, including Reasons For Decision, Environmental Assessment Track Report Regarding SRC's Proposed Gunnar Site Rehabilitation Project* (October 27, 2008) states "the Commission modifies the Guidelines-Scoping Document as follows: under section 3.2.2, add a subsection so that the Scope of the Factors to be Considered includes traditional knowledge. In this regard, the proponent's Environmental Impact Statement will include a specific section on the incorporation of traditional knowledge".

Section 4.3 of the PSG also states that "Elements of the public information/consultation plan should involve the contribution of traditional knowledge to the development of the rehabilitation plan and the identification of VECs and any current and traditional uses of the Gunnar site and environs". Section 4.4 of the same document states that "the EIS should describe terrestrial and aquatic recreational activities, cultural activities, culturally significant sites and the use of renewable and non renewable resources (e.g. trapping, hunting, fishing, and gathering)" in the area.

Based on these requirements, consultations with past and current Traditional Users of the area in and around the former Gunnar mine site must be conducted in a manner that contributes traditional knowledge to;

1. Identify Valued Ecosystem Components (VECs) relevant to the project;
2. Identify any current and traditional uses of the Gunnar site and area; and,
3. Solicit input on the rehabilitation plans for the site.

In order to accomplish items 1 and 2, the SRC may wish to consider the commissioning of a Traditional Land Use study during the conduct of the environmental impact assessment and report the results in the environmental impact statement.

A Traditional Land Use (TLU) study can identify where Aboriginal people hunt, fish, and trap on public land. Information contained in a TLU study can also inform resource management decision-making and flag where potential conflicts might exist. During consultation, a TLU study can help avoid infringements of Aboriginal and treaty rights, especially where the Aboriginal community shares the identity of significant sites with the province. TLU study information can help build positive relationships between the First Nation, government, and industry that serve as the foundation to future consultation activities.

Generally, the tasks to complete a TLU include the following:

- Informing the community or communities in question as to the need for the study and subsequently develop support in the community;
- Develop a set of questions that are appropriate to the type of TLU study being performed;
- Contact the appropriate First Nations/Métis communities to choose an appropriate interviewer/researcher;
- Train the interviewer/researcher to ask the questions developed;
- Train the interviewer/researcher to map the appropriate TLU areas on a topographic map (or establish key TLU areas identified in the study);
- Report on the information obtained in the TLU study; and,
- Complete maps specific to the information obtained in the TLU study.

In order to complete item 3, it is recommended that the Saskatchewan Research Council include the participation of an appropriate number of "traditional users" in the consultation on rehabilitation options discussed in EIS Section 8 below.

Consideration should also be given to extending the proposed consultations to include communities at the west end of Lake Athabasca as some of those communities have expressed an interest in rehabilitation activities at the site, are signatories to Treaty 8 and/or, in the case of Métis people, may consider the area of the former Gunnar mine site as within their traditional territories.

EIS Section 6 - Valued Ecosystem Components (VECs)

To date, consultation with regard to the identification of VECs in northern Saskatchewan has been limited to the Northern Saskatchewan Environmental Quality Committee.

Section 3.2.3 of the PSG states that "VECs of interest in this area will be chosen through consultation with northern residents through the Environmental Quality Committee (EQC) and incorporating traditional knowledge and land use. The most recent list of VECs includes the following:

Terrestrial Receptors

- *Birds* – Mallard, Eagle, Merganser, Ptarmigan/Grouse, Scaup
- *Terrestrial Mammals* – Bear, Woodland Caribou, Barren Ground Caribou, Snowshoe Hare, Moose, Wolf Lynx
- *Terrestrial Vegetation* – Blueberries, Labrador Tea, Lichen, Cranberries, Browse, Rosehips

Aquatic Receptors

- *Aquatic Vegetation* – Algae, Pond Lily, Pondweed
- *Consumers of Primary Producers* – Zooplankton, Chironomids
- *Fish* – Northern Pike, Lake Whitefish, Lake Trout, White Sucker
- *Aquatic Mammals* – Beaver, Muskrat, Otter, Mink"

However, section 56 of the *CNSC Decision* states "With respect to identifying the valued ecosystem components of interest, the Commission notes that the consultation referred to in section 3.2.3 of the Guidelines-Scoping Document, Valued Ecosystem Components, should not be limited to the EQC".

Based on the requirement specified in the *CNSC Decision*, public consultations intended to specifically identify VECs in relation to the former Gunnar Mine Site Rehabilitation Project must be conducted by the SRC early in the environmental assessment process and ideally should be conducted before any additional aquatic baselines or terrestrial baseline investigations are undertaken.

It is recommended that consultation on the identification of VECs be initiated as soon as possible, that the consultations include the North Saskatchewan Environmental Quality Committee, Traditional Users of the site area, the Project Review Committee, the public and appropriate regulator agencies. These consultation sessions should take place within the region of the project and any consultations conducted in this respect must be well documented for presentation in the EIS. This should include a detailed description of methods used to secure the participation of the various

groups in the consultation session, the provision of materials in a manner suitable for the audience and suitable for soliciting public input, the provision of translation services if deemed necessary, and the documentation of the results.

EIS Section 7 - Rehabilitation Objectives

No site specific "decommissioning" or "endpoint" objectives have been established for the *Former Gunnar Mine Site Rehabilitation Project* and the PSG state that such objectives must be the subject of consultation with both the public (i.e. likely the North Saskatchewan Environmental Quality Committee, the Project Review Committee, local public) and the appropriate regulatory agencies during the conduct of the environmental assessment. Therefore, consultation on such objectives should be a major focus of any Consultation Strategy developed by the SRC and should be undertaken as soon as possible.

A more detailed discussion of the establishment of "decommissioning" or "endpoint" objectives is provided a subsequent section of this report (7.1).

EIS Section 8 - Options Analysis

As prescribed in section 4.2 of the Draft *Project-Specific Guidelines and Comprehensive Study Scoping Document, Environmental Impact Assessment of the Former Gunnar Mine Site Rehabilitation Project* (PSG), the EIS must provide a detailed description all potentially realistic options for each element of the Gunnar site, documenting the pros and cons of each option based on the identification of the current and potential hazards and levels of risk to the environment at the site and the preferred option(s) must be identified and justified.

The EIS must also discuss, in detail, the criteria (environmental, engineering, economic) used by the SRC to evaluate alternative means and/or options for the rehabilitation plan, justify the environmental acceptability of the preferred option using these criteria and include a discussion of how radiological doses to workers and the public were considered in the assessment.

"Alternative means" are defined within the PSG as the various technically and economically feasible ways that the project can be implemented and the criteria used to evaluate them must reflect the potential concern for both the short-term (during implementation of the plan) and long-term (after abandonment of the rehabilitated Gunnar site) physio-chemical stability and environmental impacts of the project.

The PSG also identify that an important factor to consider when developing rehabilitation options and the scope of physical rehabilitation works is the impact of natural biological and geochemical processes on the site since abandonment. Since abandonment, natural processes may have mitigated site hazards and reduced the level of risk to the environment and the public and the PSG state that "if natural mitigation has been significant, the current level of risk to the environment and to the public may be acceptable without additional physical rehabilitation work" and state that the proposed

physical rehabilitation work should also be evaluated in terms of the current level of risk to the environment and of the potential for disturbance to effect such "natural mitigation processes".

In summary, the EIS must clearly document the options analysis methods employed in completing the rehabilitation planning and clearly identify, justify and document the preferred option proposed for the rehabilitation of each element of the site, including, but not necessarily limited to:

- The mine (both flooded open pit and underground);
- The waste rock piles;
- The waste rock seep;
- The mill/acid plant;
- Each of the three tailings areas separately (Gunnar Main Tailings, Gunnar Central Tailings, and Langley Bay Tailings);
- All auxiliary facilities (head frame, geology building, mine dry building, maintenance shop);
- All remaining buildings and remnants of building (recreation/community centre, the former recreation/community centre, foundations, etc.);
- All other infrastructure remaining on site (freshwater intake, utilidors, etc.);
- All residual chemicals on site;
- All contaminated soils on site; and,
- Any other waste material identified on the site.

It is also important to note that section 4.3 of the PSG states that "Efforts should be made to involve the public in the development of the rehabilitation plan, including the identification of issues and objectives, options for final land forms and end uses, alternative methods of rehabilitation, and the determination of the preferred alternative for rehabilitation."

The SRC has not yet conducted an analysis of the potential options to conduct the rehabilitation of the elements present at the former Gunnar Mine site.

In order to effectively complete the process, there is a need for some basic characterization of the site and its various elements, a need to form common definitions of objectives or "end-points", and a need to manage resources and schedules. Experience has shown that implementing the following general steps in sequence provides the most effective and inclusive process to conducting the options analysis for the rehabilitation of abandoned mine sites.

1. Consult with agencies and communities on "end-point" objectives.
2. Collect complete list of options from other projects and by asking communities for ideas.
3. Review technical feasibility of options.
4. Convene workshop with representatives of all stakeholders to compare technically feasible options to objectives and get some sense of preferences.
5. Develop initial recommendations to meet objectives.
6. Discuss initial recommendations with communities and make changes.

7. Develop complete descriptions, pre-feasibility level designs, performance predictions, and cost estimates.

In mine closure work, the ingredients necessary to initiate the process are a concise definition of the scope of the project and a compilation of all available information.

The options review process then goes through the following steps:

1. Identify closure methods that might be applicable for the site under study.

2. Establish and define the "evaluation criteria" that will be used to select the preferred option/alternatives. Examples of criteria groups used in previous projects are "cost", "risk", "opportunity" and "stakeholder acceptance". The grouping "risk", for example, usually includes human health risk, ecological risk, and technological risk.

3. A matrix is then created with the option/alternatives listed across the top row and the evaluation criteria listed in the first column. Every block on the matrix is reviewed to determine if enough information exists to evaluate each alternative according to each criterion. In simple cases, the available information may be adequate to allow immediate scoring or ranking. In more complex situations, the initial attempt to fill in the matrix helps to identify critical information gaps. At this stage the "available information" includes not only project specific information, which may be very limited, but also experience elsewhere.

4. The investigations needed to fill the critical information gaps are then defined and initiated. The investigations start by answering the questions in the simplest possible manner, for example, by a set of conservative assumptions. After each step in the investigation, the matrix is re-evaluated to determine if the critical information gaps are now adequately filled. The investigations stop when the information is adequate to answer the "top question". i.e. when the critical information gap is filled.

5. Once the critical information gaps have been filled, the matrix is completed and the individual evaluation criteria are assessed. At this point, it is necessary to choose a method for summing or weighting the individual criteria. There are many alternatives. Simple ranking and scoring methods are common. Converting all evaluations to equivalent units, such as cost-benefit dollars or risk or "utils", is also possible. For complex projects, it may be more desirable to use "multi-attribute analysis", which is a method developed for problems where it is not easy to convert all criteria to consistent units.

6. The resulting evaluations are then confirmed by sensitivity analyses that test the strength of the conclusions under different weightings and/or different assumptions about any remaining uncertainties.

In order to ensure that the final options for each element of the site meet, to the extent possible, the owner's and all other relevant stakeholders objectives, the SRC may wish to consider conducting

workshop(s) consisting of representatives of the appropriate regulatory agencies and other relevant stakeholders (i.e. representatives of local First Nations and Métis communities, the Athabasca Sub-Committee of the Northern Saskatchewan Environmental Quality Committee, the Project Review Committee) with the stated objective of providing :

1. A statement on post closure "land use" based on input from northern residents, regulatory agencies and technical experts;
2. A list of suggested "end-point criteria" for each element of the site which includes input from local northern residents, regulatory agencies and technical experts;
3. A summary of all options identified for the final closure of each element identified;
4. A series of final closure scenarios for the site;
5. An concise discussion of why a particular option or scenario was not carried forward for further consideration;
6. A list of preferred option or scenario for further consideration;
7. A list of uncertainties related to each identified preferred option; and,
8. Proposed activities to address, where possible, identified uncertainties.

In the case of the rehabilitation of the former Gunnar Mine site, the initiation of this process should be completed before June 2009. In that way, should the initial workshop identify any critical information gap, the required information could be collected during the open water season of 2009.

EIS Section 9 - Project Description

Project Description

This section of the EIS must provide a detailed description of the proposed activities to be undertaken during the rehabilitation project. It must provide a detailed discussion of each element of the rehabilitation program including a description of the proposed activity, the fate of materials generated during the activity and the anticipated impacts of the activity from both an environmental and work health and safety perspective. Anticipated elements of the project include, but are not necessarily limited to:

- The mine (both flooded open pit and underground);
- The waste rock piles;
- The waste rock seep;
- The mill/acid plant;
- All three tailings areas separately (Gunnar Main Tailings, Gunnar Central Tailings, and Langley Bay Tailings);
- All auxiliary facilities (head frame, geology building, mine dry building, maintenance shop);
- All remaining buildings and remnants of building (recreation/community centre, the former recreation/community centre, foundations, etc.);
- All other infrastructure remaining on site (freshwater intake, utilidors, etc.);

- All residual chemicals on site;
- All contaminated soils;
- Any other waste material identified on the site; and,
- Reclamation and re-vegetation as required.

Information to complete this section of the EIS will become available once the SRC has completed the Options Analysis and decided on the preferred rehabilitation options for each of the listed elements of the project.

Project Requirements

This section of the EIS must provide a detailed description of all of materials, equipment, personnel, etc. required to complete the project as described in the previous section. Section 4.2.3 of the PSG states that the EIS should provide a detailed description of the logistics and implementation of the rehabilitation plan and that this should:

- Anticipated commencement and schedule;
- Estimated manpower and skill requirements;
- Manpower housing and support facilities;
- Materials, transportation, and power requirements;
- Transportation of decommissioning equipment to the Gunnar site;
- Transportation of any materials from the site;
- Construction and decommissioning of any roads built to facilitate rehabilitation activities;
- Any proposed use of the Uranium City airport and anticipated level of service;
- Sourcing of materials;
- Equipment requirements and maintenance;
- Worker health and safety considerations, including conventional and radiological concerns;
- Fire prevention and suppression programs, including wildfire; and
- Emergency measures, contingency plans or procedures.

The majority of the information required to complete this section of the EIS will become available as the SRC completes the options analysis, decides on the preferred option and develops a detailed description of project activities and schedule.

Borrow Material

No assessment of available “borrow material” has been conducted on or near the former Gunnar mine site. Although, at this stage of the project no preferred options have identified for any of the elements of the site, it is anticipated that relatively fine grained material may be required for such things as a cover for a potential landfill and/or as construction material for a potential cover of all or

a portion of the tailings areas. In addition, coarse grained material may be required for such things as channel armouring, etc.

The SRC must conduct a phased survey of locally available borrow material on and near the former Gunnar mine site. This survey should include, an initial calculation of potential cover volumes required in order to get an 'order of magnitude' estimate of how much material may be required, followed by an air photo interpretation to locate possible sites within approximately 20 km of the site, initial site survey with hand sampling of all likely sites with grain size analyses of the samples. Based on the results of this initial survey, the SRC may conduct a follow up study including the digging of test pits and appropriate analysis of suitable sites. The digging of test pits will require the mobilization of suitably sized equipment (i.e. backhoe). The survey of potential borrow material should include an assessment of the existence of clean coarse material that could potentially be available in the waste rock piles.

Occupational Health & Safety during Activities

The environmental impact statement should include a discussion of occupational health and safety considerations related to all activities associated with the preferred rehabilitation activities. The discussion should include separate sections on conventional and radiological occupation health and safety including an estimation and assessment of the potential dose to workers during each identified rehabilitation activity.

Information to complete this section of the EIS will become available once the SRC has completed the Options Analysis and decided on the preferred rehabilitation options for each of the listed elements of the project.

Hazardous Substances & Waste Dangerous Goods

The environmental impact statement must also include a detailed discussion of the storage and handling of all hazardous substances and waste dangerous goods (as defined by their use and management on the site).

Spill Response & Management

The environmental impact statement must also include a discussion of spill response and management planning rehabilitation activities.

Regulatory Compliance during Activities

Acts & Regulations

Section 4.2.1 of the PSG states that the EIS should include a comprehensive list of the applicable federal and provincial legislation, regulations and guidelines that will apply to the planning and implementation of the proposed project and that the proponent briefly describe (in tabular form) the activity(s) requiring approval, the project stage the approval or the permit will be required at, the

regulatory agency in charge for the approval or permit, name of the approval or permit, and associated legislation/regulation.

Agencies

The primary regulatory agencies during the actual rehabilitation activities will be the Canadian Nuclear Safety Commission, Environment Canada, the Saskatchewan Ministry of Environment and the Ministry of Advanced Education, Employment and Labour and potentially Fisheries and Oceans Canada and Environment Canada.

The environmental impact statement must also include a discussion of the following programs which will likely be a requirement of the various agencies during the actual rehabilitation activities:

- Quality Assurance Program
- Radiation Protection Program
- Code of Practice
- Occupational Health & Safety Program
- Asbestos Management Program
- Environmental Protection Program
- Inspections & Monitoring during Activities
- Training
- Site Security
- Financial Guarantees

Information to complete this section of the EIS will become available once the SRC has completed the Options Analysis, decided on the preferred rehabilitation options for each of the listed elements of the project, and prepared the “project description’ section of the EIS.

Fish Habitat Compensation Program

The potential does exist for rehabilitation activities at the former Gunnar mine to result in the harmful alteration, disruption or destruction (HADD) of fish habitat. The HADD of fish habitat is prohibited unless authorized by DFO and Authorizations are not issued unless the HADD is acceptable to DFO and suitable measures to compensate for the negative effects on fish habitat that result from the project are implemented by the proponent in the form of a fish habitat compensation plan or program. This requirement is further discussed in subsequent a subsequent section.

EIS Section 10 - Malfunctions & Accidents

The PSG require that the environmental impact statement document mitigation and contingency plans which would be implemented in the event of potential containment failures, spills, malfunctions, accidents, inadvertent waste releases if contaminant migration predictions are not met, or if site-specific remediation objectives or risk management objectives are not met during the rehabilitation activities.

Information to complete this section will become available as the SRC completes the environmental impact assessment (EA) and prepares the environmental Impact Statement (EIS).

The SRC will also be required to prepare for review and approval by the appropriate regulatory agency (s) a detailed Environmental Contingency Plan to cover all site activities. This Plan should consist of a number of Environmental Protection Plans (EPP) focusing on specific activities and/or situations. The EPPs must document proactive as well as reactive procedures to be implemented to prevent and/or mitigate accidental releases or spills of potentially harmful substances. Examples of required EPPs include but may not necessarily be limited to:

- A general contingency plan including, but not necessarily limited to;
  - actions to be taken in the event of a material spill,
  - actions to be taken in the event of a spillage of contaminated waters outside of contained areas,
  - actions to be taken in the event that effluent approaches or exceeds specified quality limits specified
  - a general action plan to deal with spills of unspecified hazardous materials.
- A Petroleum Spill Contingency Plan; and
- A Hazardous Substances and Waste Dangerous Goods Contingency Plan.

Although the actual plans do not necessarily have to be completed for inclusion in the environmental impact statement, consideration should be given to including a draft version in the document to demonstrate competence and to facilitate regulatory review. At a minimum, the environmental impact statement must include a commitment to submitting the plans for review and approval before initiating any rehabilitation activities on the site.

EIS Section 11 - Schedule of Activities

The environmental impact statement must include a detailed “schedule of activities” for the proposed project including anticipated commencement and overall schedule.

Information to complete this section of the EIS will become available once the SRC has completed the Options Analysis and decided on the preferred rehabilitation options for each of the listed elements of the project. The SRC should review the Canadian Nuclear Safety Commission Regulatory Guide G-219 *Decommissioning Planning for Licensed Activities.* The appendix of that document provides a list of recommended “Work Packages” for decommissioning a uranium mine and mill which can be used to broadly outline the schedule of activities.

EIS Section 12 - Scope of Assessment

Section 3.2.4 of the PSG states that impacts with respect to spatial and temporal boundaries may vary depending on the factor being considered, and the assessment of these impacts should consider:

- Timing/scheduling of project activities;
- Natural variations of an environmental component;
- The time necessary for an effect to become evident, taking into account the frequency of the effect as well;
- The time required for recovery from an impact, including the estimated degree of recovery;
- Cumulative effects;
- Comments from the public; and
- Traditional knowledge and land use.

The SRC will be required to clearly define (in text and maps) the rationale for the spatial boundaries that are used in the environmental assessment. The spatial boundaries should be determined specific to each factor being considered to effectively assess the potential environmental effects of the project. The study area, i.e., the geographic scope of the investigations, should include those local areas directly impacted by the undertakings associated with the project and also the zones within which there may be environmental effects that are cumulative, regional or global in nature.

The temporal scale of the assessment must encompass the entire lifespan of the rehabilitation project, and will include approvals and licensing, mobilization, actual rehabilitation activities (including maintenance and/or modifications), reclamation and abandonment of project components, as well as completion of a fish habitat compensation plan, if one is required.

Information to complete this section of the EIS will become available as the SRC completes the environmental impact assessment (EA) and prepares the environmental Impact Statement (EIS).

Assessment Process

Similarly, the processes undertaken to assess potential impacts must be clearly documented in the EIS as well as in summary matrices and tables. The assessment process should consider scientific analysis of ecosystem effects, along with traditional ecological knowledge (TEK), local knowledge and available experience in determining the significance of potential effects.

Information to complete this section of the EIS will become available as the SRC completes the environmental impact assessment (EA) and prepares the environmental Impact Statement (EIS).

EIS Section 13 - Assessment of Effects and Mitigation

Assessment of Effects of Project

The assessment methodology must be described in the EIS, and should follow the general methodology listed below:

- Identify the potential interactions between all project activities and the existing environment during all phases of the project.

- Describe the resulting changes (positive and negative, direct and/or indirect) that would likely occur to the components of the environment and VECs as a result of the identified interactions with the project. Quantitative ecological risk assessment modeling and qualitative methods will be used to identify and describe the likely adverse environmental effect. As indicated in subsection 4.2.2, the proponent is advised to refer to CCME guidance on risk assessment.

- Identify and describe technically and economically feasible mitigation measures that may be applied to each likely adverse environmental effect (or sequence of effects). Mitigation strategies should reflect avoidance, precautionary and preventive principles.

- Describe how each mitigation measure proposed will affect the effect based on the assessment criteria used above, e.g., implementation of mitigation measure "X" will result in a "Y" change to the potential adverse environmental effect.

- Describe the significance of the residual environmental effects that will likely occur as a result of the project, having taken into account the implementation of the proposed mitigation measures (i.e. residual environmental effects). For each identified effect, the predicted magnitude, timing, duration, frequency of occurrence, degree of reversibility, geographic extent, temporal boundaries (short or long term), probability of occurrence, and ecological context (sensitivity of the valued ecosystem components (VEC) to environmental disturbance) should be considered in determining if it is a likely significant adverse effect. The EIS must clearly explain the method used to determine effects level for each of the above listed determinants and how these levels were combined to produce an overall conclusion. The methods employed should be transparent and reproducible.

The analysis must be documented in a manner that readily enables the reader to draw conclusions on the significance of the environmental effects.

Mitigation to manage or avoid adverse effects must also be described for each component and for each undertaking in relation to the project. This includes:

- Assessment of Dose to Workers & Public during Activities
- Assessment of Project GHG Emissions during Activities
- Assessment of Effects of the Project on the Environment including;
    - On Air Quality
    - On Surface Hydrology
    - On Groundwater Quality
    - On Surface Water Quality
    - On Sediment Quality
    - On Benthos
    - On Plankton

- On Aquatic Vegetation
- On Soils
- On Fish & Fish Habitat
- On Terrestrial Components
- On Human Health
- On Land Use
- On the Sustainable Use of Renewable Resources
- On Traditional Pursuits
- On Navigation
- Socio-Economic Effects of the Project

Information to complete this section of the EIS will only become available once the SRC has completed the options analysis for each element of the site, chosen the preferred option for each site and completed any required impact modelling related to the element.

Assessment of Effects of Malfunction/Accident

The environmental impact statement must also provide an assessment of the effects of potential malfunctions and/or accidents during the rehabilitation activities. Information to complete this section of the EIS will become available as the SRC completes the environmental impact assessment (EA) and prepares the environmental Impact Statement (EIS).

Ecological and Human Health Risk Assessment

The environmental impact assessment must included a detailed ecological and human health risk assessment conducted by a Qualified Person in Risk Assessment (i.e. QP_{RA} under Ontario regulation 153/04 or equivalent).

Effects of the Environment on the Project

The environmental assessment must take into account how the environment could adversely affect the project, e.g. effects from severe weather events, forest fires, draught, or earthquakes. The assessment must consider any potential effects of climate change on the project, including an assessment of whether the project is sensitive to changes in climatic conditions during its lifespan e.g., impact on multi-year water balance calculations and/or impacts on permafrost.

Possible important interactions between the natural hazards and the project should be identified, followed by an assessment of the effects of those interactions, the available mitigation measures, and the significance of any remaining likely adverse effects on the project.

Information to complete this section will become available as the SRC completes the environmental impact assessment (EA) and prepares the environmental Impact Statement (EIS).

Cumulative Environmental Effects

The EIS must discuss whether existing environmental conditions, including effects from other proposed mining/industrial activity and the rehabilitation of former uranium mines in the area (Beaverlodge and other abandoned sites), will influence the project. The discussion should address whether the project-specific effects of the proposed Gunnar Mine Site Rehabilitation Project, combined with the impacts from other existing and planned activities in the region would result in, or contribute to any cumulative environmental effects.

Information to complete this section will become available as the SRC completes the environmental impact assessment (EA) and prepares the environmental Impact Statement (EIS).

In order to complete this section of the environmental impact statement, the SRC should refer to the *Operational Policy Statement OPS-EPO/3-1999 Addressing Cumulative Environmental Effects under the Canadian Environmental Assessment Act* and the *Cumulative Effects Assessment Practitioners Guide* available from the Canadian Environmental Assessment Agency.

Fish Habitat Compensation

Meeting the requirements of the federal *Fisheries Act* during the rehabilitation project is mandatory, irrespective of any other regulatory or permitting system. Section 36(3) of the *Fisheries Act* specifies that unless authorized by federal regulation, no person shall deposit or permit the deposit of deleterious substances of any type in water frequented by fish, or in any place under any conditions where the deleterious substance, or any other deleterious substance that results from the deposit of the deleterious substance, may enter any such water. The legal definition of deleterious substance provided in subsection 34(1) of the *Fisheries Act*, in conjunction with court rulings, provides a very broad interpretation of 'deleterious' and includes any substance with a potentially harmful chemical, physical or biological effect on fish or fish habitat.

The potential does exist for rehabilitation activities at the former Gunnar mine to result in the harmful alteration, disruption or destruction (HADD) of fish habitat. The HADD of fish habitat is prohibited unless authorized by Fisheries and Oceans Canada (DFO) and Authorizations are not issued unless the HADD is acceptable to DFO and suitable measures to compensate for the negative effects on fish habitat that result from the project are implemented by the proponent in the form of a fish habitat compensation plan.

The *Canadian Environmental Assessment Act (CEAA)* Law List Regulations include both the *Fisheries Act* subsection 35(2) and amendments to Schedule 2 of the MMER as "triggers" for federal environmental assessment. This means that DFO is required to conduct an environmental assessment of the project as described by CEAA, before making a decision on issuing an Authorization for the HADD of fish habitat. In the event that a Fish Habitat Compensation Plan to offset HADD resulting from the rehabilitation activities at former Gunnar Mine site, DFO approval of the plan and associated follow-up programs will be required before that department will consider the environmental assessment complete.

Assessment of Residual Impacts

The EIS must describe the nature and extent of any residual environmental effects of the project including any residual contamination that is not addressed by the remediation project. As well, the EIS must include a characterization as to whether residual environmental effects are significant or not significant, and the rationale for such characterization. The EIS must provide a detailed plan for responding to any known or predicted residual effects, and provide a procedure for identifying and responding to effects that were not predicted or foreseen. The SRC should consider consulting guidance materials from the Canadian Environmental Assessment Agency on determining the significance of adverse environmental effects.

Information to complete this section will become available as the SRC completes the environmental impact assessment (EA) and prepares the environmental Impact Statement (EIS).

EIS Section 14 - Follow-up Programs

Monitoring During Activities

Section 4.7 of the PSG requires that the EIS identify the need for, and requirements of, any monitoring programs, beyond the identified in the CEAA required follow-up program, and to be conducted during the actual rehabilitation activities.

Although the detailed monitoring programs will be designed in consultation with regulatory agencies during licensing, the EIS should provide a description of proposed technically and economically feasible monitoring procedures, including parameters, locations, sampling frequency and methodology. Taking into consideration improvements in monitoring techniques, the programs should be consistent with baseline data sampling methodology and be compatible with the existing regional environmental database.

The EIS should address:

- monitoring programs for any potential environmental impacts, including potential contaminant loadings to plant and animal species that are significant in the food web and that are considered relevant Valued Ecosystem Components (VECs); and

- monitoring programs for ground water and surface water quality in the vicinity of the rehabilitated Gunnar site.

Monitoring should not only ensure compliance with any regulatory requirements but also should allow the systematic audit of the implementation of the rehabilitation plan and the predicted success of the rehabilitation procedures. The monitoring programs, in verifying the success of the rehabilitation procedures, should confirm the design criteria for rehabilitation plan.

Information to complete this section will become available as the SRC completes the environmental impact assessment (EA) and prepares the environmental Impact Statement (EIS).

Transition Phase Inspections & Monitoring

The EIS should also discuss the need for, and requirements of, any monitoring programs to be conducted on the post-rehabilitated Gunnar site.

CEAA defined Follow-up Programs

The need for, and requirements of a federal 'follow-up program' in respect of the project is a requirement under the federal assessment *Act*. The purpose of the follow-up program is to assist in determining if the environmental and cumulative effects of the project are as predicted and to confirm whether the mitigation measures are effective. Information gathered during the follow-up will be posted on the Canadian Environmental Assessment Registry (CEAR), allowing the public to review the results. Therefore, the EIS must describe a specific monitoring or follow-up program under the *Canadian Environmental Assessment Act* that includes the detailed scope of the program together with schedule and reporting milestones. The federal follow-up may be a component of the larger monitoring program, but should be specifically defined and presented in the EIS.

Effects, predictions, assumptions and mitigation actions that are to be tested in the follow-up monitoring program will need to be converted into field-testable monitoring objectives. The monitoring plan design should include a statistical evaluation of the adequacy of existing baseline data to provide a benchmark against which to test for project effects, and the need for any additional monitoring to establish a firmer project environmental baseline.

The follow-up program plan must be described in the EIS in sufficient detail to allow independent judgment as to the likelihood that it will deliver the type, quantity and quality of information required to reliably verify predicted effects (or absence of them), confirm EIS assumptions and confirm effectiveness of mitigation. The follow-up program should include an assessment of radiation exposures to members of the public using environmental monitoring results collected after implementation of the project.

Fish Habitat Compensation Program & Monitoring

In the event that a Fish Habitat Compensation Agreement is required, such an agreement will require the prior approval of a detailed monitoring program to demonstrate that the activities undertaken are successful in achieving the stated objective of the compensation works.

Institutional Control

The EIS must include proposed criteria for custodial transfer of the rehabilitated Gunnar site to the institutional control of the Province of Saskatchewan. The discussion should address, but not necessarily be limited to:

- The provision of records that fully describes the site conditions, all rehabilitation activities and completed works, assessments, and final configurations;
- The results of post-rehabilitation site care, maintenance and monitoring;

- The need for active or passive site management;
- Required land controls; and
- A summary of any remaining long term financial liabilities for monitoring, care, maintenance, or contingency remediation.

EIS Section 15 - Public & Stakeholder Consultations

Public consultation is an integral component of the environmental assessment process, requiring stakeholders to be fully informed about the proposed project. The PSG require the SRC to involve the public in the development of the rehabilitation plan, including the identification of issues and objectives, the selection of the preferred options for specific activities and final land forms/end uses for the site. The PSG specify that these issues should be discussed with regional residents, Aboriginal peoples, organizations and other stakeholders.

The EIS must describe the program for consultation with northern residents and Aboriginal peoples. The consultation program also should provide a basis for discussion of enhancement of regional business and employment opportunities with these groups. Public consultations and involvement is recommended at all stages of the project and any concerns raised during those consultations must be documented in the EIS and their significance evaluated within the environmental impact statement.

According to the PSG, the consultation program should promote a broader understanding of the project, the identified environmental and public hazards at the Gunnar site, and the current levels of environmental and public risk associated with these hazards. Elements of the public information/consultation plan should involve the contribution of traditional knowledge to the development of the rehabilitation plan and the identification of VECs and any current and traditional uses of the Gunnar site and environs.

Generally, the topic headings in this section of the EIS include:

- History of Previous Consultations
- Project Planning Consultations
- Environmental Assessment Consultations
- Summary of Concerns Raised & Response to Concerns
- Commitment to Continuing Consultations

It is recommended that the SRC develop a detailed Consultation Strategy (that includes both the regulatory agencies and the public) for the rehabilitation project and schedule regular reviews and updates of the plan. It is also important to note that section 4.3 of the PSG states that efforts should be made to involve the public in the development of the rehabilitation plan, including the identification of issues and objectives (see Rehabilitation Objectives section), options for final land forms and end uses, alternative methods of rehabilitation, and the determination of the preferred alternative for rehabilitation (see Options Analysis section).

The consultation strategy should focus on the North Saskatchewan Environmental Quality Committee, Traditional Users of the area, the Project Review Committee and the local public. Consultations should take place, to the extent possible within the region of the project

It is critically important that all consultation activities and results of any consultations conducted in this respect are well documented for presentation in the EIS. This should include a detailed description of methods to secure participation of the various groups in the consultation session, the provision of materials in a manner suitable for the audience and suitable for soliciting public input, the provision of translation services if deemed necessary, and the documentation of the results.

EIS Section 16 - Conclusions

The EIS must provide a concise, complete statement of the anticipated net environmental costs and benefits of the proposed rehabilitation of the former Gunnar mine site in both the short and long-terms. The discussion should include, if possible, any intangible costs and benefits that cannot be expressed in economic terms.

To satisfy requirements specified in the *Canadian Environmental Assessment Act,* the conclusions section must include a statement that specifically addresses whether the project is likely to cause significant adverse effects on the environment.

Information to complete this section of the EIS will become available as the SRC completes the environmental impact assessment (EA) and prepares the environmental Impact Statement (EIS).

EIS Section 17 - References

All documents referenced in the EIS must be appropriately cited in this section.

EIS Section 18 - SRC EIS Distribution Record

The SRC should maintain a document log and readily available copy of any and all documents issued or received related to the rehabilitation project. The log does not have to be included in the EIS however; the maintenance of such a log should be a significant component of the project management responsibilities.

6 Regulatory Framework Analysis

6.1 Federal Requirements

A number of the rehabilitation activities at the former Gunnar mine site will require review by various federal authorities such as Environment Canada, Fisheries and Oceans Canada (DFO) (regarding HADD) and/or by the Navigable Waters Protection Program (NWPP) administered by

Transport Canada. If a formal approval is required for these activities, the federal authority will have to undertake an Environmental Assessment of the proposal pursuant to Section 5.1(d) of the *Canadian Environmental Assessment Act* (CEAA). It is important that these requirements are fully considered in the preparation of the environmental impact assessment in order to ensure that the final *Former Gunnar Mine Site Rehabilitation Project Environmental Impact Statement* meets the needs of these agencies.

It is also not yet clear whether the rehabilitation of the former Gunnar mine site will be subject to the *Metal Mining Effluent Regulations (SOR/2002-222)* (MMER) and whether or not the SRC will be required to apply to Environment Canada for recognition of the site under the closed mine status referenced in section 32 of the MMER. Currently the regulations specify that after a period of three years over which a mine has maintained a rate of production of less than 10% of the designed rate of capacity the mine it will be granted status as a closed mine. The SRC should immediately initiate discussions with Environment Canada regarding the potential application of the *Metal Mining Effluent Regulations (SOR/2002-222)* to the former Gunnar Mining Limited site rehabilitation program.

It should be noted that notwithstanding the site attaining the status of a closed mine that the project will still subject to section 36(3) of the *Fisheries Act* for the occurrence of any deposit of a deleterious substance.

The rehabilitation of the former Gunnar mines site will require review, approval and licensing by the Canadian Nuclear Safety Commission (CNSC). Appendix C provides a summary of the license application requirements specified in regulations issued pursuant to the *Nuclear Safety and Control Act.* Generally, a detailed plan must be filed with the CNSC for appropriate licensing action under the federal *Nuclear Safety and Control Act* prior to beginning any rehabilitation activities. It is recommended that the SRC conduct a detailed review of the CNSC Regulatory Guide G-219 *Decommissioning Planning for Licensed Activities* for a broader understanding of the requirements of that agency.

6.2 Potential MMER “Schedule 2” Listing

During the review of the draft Environmental Impact Statement Table of Contents, Environment Canada provided the following comment.

> “A fish compensation plan may be presented. Environment Canada appears to now be reviewing these with regard to our Department's Mandate as part of assessment "package" for scheduling lakes. We may be required to do so here as well.” [Environment Canada comments on the draft Table of Contents 1/21/2009]

The comment refers to “scheduling” lakes which is of some concern as it implies that Environment Canada may be considering the listing of the tailings management areas (particularly Langley Bay tailings area) at the former Gunnar Mining Limited site under Schedule 2 of the *Metal Mining Effluent Regulations (SOR/2002-222).*

The *Metal Mining Effluent Regulations,* promulgated under the federal *Fisheries Act,* came into force in 2002. They impose effluent discharge limits for cyanide as well as for arsenic, copper, lead, zinc, nickel and radium-226. They also prohibit the discharge of effluent that is acutely lethal to fish (rainbow trout). The regulations also require environmental effects monitoring programs to determine whether mine effluent affects fish, fish habitat or the use of fisheries resources. EEM studies include effluent characterization, receiving water quality monitoring, sub-lethal effluent toxicity tests, site characterization, fish population surveys, fish tissue analysis and benthic invertebrate community surveys.

In 2006 the *Metal Mining Effluent Regulations* were amended and section 5 addresses the authority to discharge tailings into fish bearing waters and section 27.1 specifies the requirements associated with the release of deleterious substances into a tailings impoundment area that is subject to Schedule 2 designation.

If it is determined that a tailings impoundment area (TIA) will impact a natural waterbody frequented by fish, authority to use the waterbody requires the addition of the site to Schedule 2 of the *Metal Mining Effluent Regulations* (MMER), a regulation made under Section 36 of the *Fisheries Act.* The addition of the site to Schedule 2 requires an amendment to the MMER and Governor in Council (Federal Cabinet) approval of the amendment.

The SRC should confirm with Environment Canada and Fisheries and Oceans Canada that those agencies do **not** intend to add the Langley Bay tailings area (or any other areas of the site) to Schedule 2 of the *Metal Mining Effluent Regulations (SOR/2002-222),* a regulation made under Section 36 of the *Fisheries Act.*

6.3 Provincial Legislations & Regulations

As the rehabilitation of the former Gunnar mine site is a unique project when considered against certain provisions provided in regulations. It is recommended that the SRC immediately initiate discussions with representatives of the Ministry of Environment regarding the application of the *Environmental Protection Act* and associated regulations in order to clearly understand how the requirements of the Act and associated regulations will be applied to the project.

The following provides a general overview of the most pertinent of these acts and regulations.

Environmental Management and Protection Act, (2002)

The Environmental Management and Protection Act, 2002 (EMPA, 2002) is the primary provincial legislation that applies to mining operations. A number of regulations under EMPA 2002 may be applied in the implementation of the SRC's rehabilitation plan for the former Gunnar mine site. The SRC should initiate discussion with the Saskatchewan Ministry of Environment to clearly define what type of regulatory instrument the Gunnar rehabilitation project will require.

Mineral Industry Environmental Protection Regulations, 1996

It is recommended that the SRC immediately initiate discussions with representatives of the Ministry of Environment regarding the application of the *Mineral Industry Environmental Projection regulations, 1996* in order to clearly understand how the requirements of the will be applied to the project. As currently written, the *Mineral Industry Environmental Protection Regulations, 1996* (MIEPR 1996) require proponents to apply for approval to construct and operate a pollutant control facility at the mining site and before receiving an approval to operate a pollutant control facility a proponent must have an approved decommissioning and reclamation plan in place along with an assurance fund that covers the cost of completing the required work.

The information that is required in an application for approval of a decommissioning and reclamation plan and the various forms for establishing an assurance fund are described respectively in sections 14 and 15 of the MIEPR (1996). The application must include the following information:

- A time frame for decommissioning and reclaiming the mine site;
- A description of the proposed methods and procedures of, and time frames for, monitoring the mining site for physical and chemical stability and for detecting spills or the release of pollutants during and after decommissioning and reclamation;
- An estimate of the cost required to carry out the decommissioning and reclamation plan and the cost of monitoring the mining site after the decommissioning and reclamation;
- A proposal for an assurance fund that complies with section 15, to ensure completion of the decommissioning and reclamation plan;
- A proposal for the management and administration of the assurance fund; and
- A proposal respecting the release of all or portions of the assurance fund during the decommissioning and reclamation of the mining site.

Section 18 of the same regulations state that the proponent is required to give sixty days notice in writing prior to the initiation of an approved plan to permanently close a pollutant control facility, mine or mill.

As the Gunnar site is not currently subject to an Approval to Operate, it is unclear how the Ministry of Environment will apply the requirements specified in the regulations. It is recommended that the SRC immediately initiate discussions with representatives of the Ministry of Environment regarding the application of the *Environmental Protection Act* and associated regulations in order to clearly understand how the requirements of the Act and associated regulations will be applied to the project.

Once the rehabilitation activity is completed and a sufficient period of transition phase monitoring demonstrates that the site has achieved an appropriate level of environmental and physical stability in accordance with the rehabilitation, the SRC may make a written application for a Release from Decommissioning and Reclamation. Section 22 of the regulations outlines the application

procedures for a proponent to follow for obtaining their release from any further obligations that are set out in the decommissioning and reclamation plan.

The application for Release from Decommissioning and Reclamation must contain, at a minimum:

1. A summary of the decommissioning and reclamation activities that have been completed by the operator;

2. A description of the performance of the site during the transition (decommissioning and post decommissioning) monitoring phase;

3. Predictions that are based on the documented performance of the site during the post decommissioning phase monitoring, of any potential ongoing expenditures the Province may be expected to accrue in order to adequately maintain and monitor the site if it assumes custodial responsibility for the property;

4. A list and assessment of remaining environmental liabilities; and,

5. Provide an estimate of the potential costs to the Province to address such liabilities should it assume custodial responsibility.

Upon receiving the application, the Province will initiate a detailed review of the application. That review will include opportunities for public input on any conditions that may be applied before the Release from Decommissioning and Reclamation is issued and the type of institutional controls that will be applied to the site.

Only after these steps are completed to the satisfaction of the Minister, will a Release from Decommissioning and Reclamation be issued to the operator and the custodial responsibility for the property can be transferred from the operator to the provincial institutional control management framework.

A proponent that intends to return a site into provincial custody after having completed the decommissioning and reclamation and has met the closure objectives and requirements to receive a Release must apply for the transfer of custody into the province's institutional control program. The program is legislated by the *Reclaimed Industrial Sites Act* and *The Reclaimed Industrial Sites Regulations*.

The Hazardous Substances and Waste Dangerous Goods Regulations

Section 17 of *The Hazardous Substances and Waste Dangerous Goods Regulations* (HSWDG) require that anyone person proposing to operate or remove, abandon, dispose or permanently close any storage facility for hazardous substances and waste dangerous goods must apply to the minister for approval to decommission and reclaim any storage facilities used for the storage of hazardous

substances or waste dangerous goods. The request for approval should be submitted at least 30 days prior to the work being undertaken.

During the rehabilitation activities, some activities may require approvals from other branches of Ministry of Environment.

- An Aquatic Habitat Protection Permit may be required to conduct any work in or near water (i.e. removal of stream crossings).
- A Timber Permit may be required to remove or cut trees during rehabilitation activities.
- A Sand & Gravel permit may be required to access and use sand or gravel resources during the rehabilitation activity.

These permits will outline the conditions under which the work may be undertaken.

***The Occupational Health and Safety Act 1993*, (The Mines Regulations 2003)**

Similarly, as the rehabilitation of the former Mine site is a unique project when considered against certain provisions provided in regulations issued pursuant to *The Occupational Health and Safety Act 1993*, it is recommended that the SRC immediately initiate discussions with representatives of the Ministry of Advanced Education, Employment and Labour regarding the application of the At and associated regulations.

For example, the *Mines Regulations, 2003* (Mine Regs, 2003) issued pursuant to *The Occupational Health and Safety Act 1993*, include a number of sections that relate to the closing of mines. Section 406 of the Mines Regs, 2003 states that before a mine or any part of a mine is closed, abandoned or otherwise rendered inaccessible, the employer, contractor or owner must ensure that all plans required pursuant to subsection 7(2) are updated. These copies of the plans are to be certified as correct by the employer, contractor or owner and forwarded to the chief mines inspector. Subsection 7(2), describes the information that the owner or operator of the mine must provide the Chief Mines Inspector of Saskatchewan Labour prior to initiating final closure activities. The information to be provided includes the following:

- A surface plan showing the boundaries of the property and all lakes, streams, roads, railways, electric transmission lines, main pipelines, buildings, shafts, adits, surface workings, diamond drill holes, boreholes, dumps and tailings management areas;
- A plan of each underground level, showing all workings, shafts, drifts, crosscuts, diamond drill holes, dams and bulkheads;

- A plan respecting vertical mine sections at suitable intervals showing all shafts (raises and winzes), drifts, crosscuts, stopes and workings in relation to the surface, including the location of the top of bedrock, the surface of overburden, the position of any unconsolidated deposit and the position of any known watercourse or body of water, with each section shown on a separate drawing; and,

- A ventilation plan showing the direction and quantity of the main air currents, locations of permanent fans, ventilation doors, stoppings and connections with adjacent mines.

This information is also required within the *Application for Release from Decommissioning and Reclamation* discussed above.

The conditions for the closure of underground mines and open pits are also described in sections 407 and 408 of the regulations and section 409 outlines a number of requirements pertaining to the final closure of any plants that are associated with mines that are being closed.

7 Unique Issues

7.1 Defining "End-Point" Criteria (Decommissioning Objectives)

No site specific "decommissioning" or "endpoint" objectives have been established for the *Former Gunnar Mine Site Rehabilitation Project* and the PSG state that such objectives must be the subject of consultation with both the public (i.e. likely the North Saskatchewan Environmental Quality Committee, the Project Review Committee, local public) and the appropriate regulatory agencies during the conduct of the environmental assessment. As a result, the development of such objectives must be a major focus of the SRC's Consultation Strategy (with both regulatory agencies and the public) developed for the environmental assessment process.

The general objective of the rehabilitation activities at the former Gunnar Mine site are, to the extent possible, remove, minimize, or control potential hazards, risks and contaminant sources, thereby minimizing the adverse environmental effects that may be associated with the property. The project must therefore be planned to achieve an end-state that will be safe for non-human biota and human use, stable, allow utilization for traditional purposes, and on which, to the extent possible, minimizes potential constraints on future land use planning decisions. In addition, the rehabilitation project must be designed to minimize the need for future care and maintenance activities and long-term institutional control taking into consideration socio-economic factors.

Notwithstanding these general objectives, within the environmental impact assessment and the environmental impacts statement, the SRC will be required to establish "decommissioning" or "endpoint" objectives. The early establishment of objectives that are acceptable to the regulatory agencies and, to the extent possible, the public will provide significant guidance as to what

rehabilitation activities are required, will be the basis on which the success of the rehabilitation activities will be determined and will establish the benchmark that, once achieved, will indicate the fulfillment of the SRC's obligations and allow for the transfer of custodial responsibility for the property back to the Province.

The required objectives should be founded on an agreed to "Post-Closure Land Use" and be flexible enough to adapt to changing circumstances without compromising the agreed to end point.

As any agreed to post closure land use may take several years to achieve, a set of specific performance indicators (end-point or decommissioning objectives) will have to be developed during the conduct of the environmental impact assessment and presented by the SRC in the EIS. The "end-point" or "decommissioning objectives" will likely include:

- Water Quality Objective (WQO) values and a set of site specific locations at which those values are to be achieved;
- Sediment Quality Objective (SQO) values and a set of site specific locations at which those values are to be achieved;
- Radiological Objective (RO) values and specific locations at which those values are to be achieved;
- Soils Quality Objective (SQO) values and site specific locations at which those objectives are to be achieved;

Caution is required in the establishment of such "end-point" or "decommissioning objectives" values.

For example, the basis for the current sediment quality guidelines established by the Canadian Council of Minister's of Environment is not well founded and applying these guidelines to areas of the Former Gunnar site such as Langley Bay would lead to a requirement for extensive remediation activities with significant associated costs. Accurate biological surveys of these areas combined with an assessment the ecological risk posed by the areas as they currently exist should be used as the foundation to establish site specific objectives that are reasonable (from a cost perspective) and achievable.

In addition, the environmental impact statement should propose a process for the periodic review and modification of the end-point or decommissioning objectives in light of improved knowledge or changed circumstances.

In order to begin the process of establishing site specific "decommissioning" or "endpoint" objectives" for the former Gunnar site rehabilitation project, it is recommended that the SRC complete a detailed review of the Section 7 "Decommissioning Objectives" of the Canadian Nuclear Safety Commission *Comprehensive Study Report for the Cluff Lake Decommissioning Report* as it is

the most recent application of such objectives by the regulatory agencies to the decommissioning of a uranium mine in northern Saskatchewan.

In that document it is stated that:

> *"Water quality objectives generally represent contaminant concentrations below which significant adverse effects on aquatic organisms are unlikely. Therefore, water quality that meets or exceeds such objectives will ensure that waterbodies on the Cluff Lake site can support a healthy aquatic community.*
>
> *The SSWQO for "General" and "Protection of Aquatic Life and Wildlife" were adopted as decommissioning water quality objectives, with the exception of iron. There is no Saskatchewan or national water quality guidelines for uranium, molybdenum or cobalt.*
>
> *For iron, uranium, molybdenum, and cobalt, site-specific decommissioning water quality objectives were developed based on site-specific conditions, the consideration of past, interim, and current guidelines from other jurisdictions, and experimental toxicity data published in the literature."*

A preliminary review of the recent water quality data for the former Gunnar mine site indicates that the SSWQO are already met at a number of locations on and around the site, therefore careful consideration and discussions with the appropriate regulatory agencies (particularly the Saskatchewan Ministry of Environment and the Canadian Nuclear Safety Commission) should be initiated as soon as possible to define what is "reasonably" achievable on the site (in terms of decommissioning objectives) and what the regulatory agencies will consider acceptable.

It is further recommended that the SRC **not** initiate public consultations on "decommissioning" or "endpoint" objectives" without carefully considering what is "reasonably" achievable at the site and what objectives the regulatory agencies will judge acceptable.

7.2 CNSC License Type

Section 2.3.1.1 of the PSG states that the "CNSC authorization of SRC's proposal would require the issuance of a license to decommission". Licences are issued by the Commission under the authority set out in subsection 24(2) of the *Nuclear Safety and Control Act* (NSCA) however, neither the PSG nor the *CNSC Decision* specify the type of license and under what regulation such a license will be required.

A definition of "decommission" is **not** provided in the *Nuclear Safety and Control Act*, the *Uranium Mines and Mills Regulations* or the *General Regulations* (issued pursuant to that Act), the *Canadian Environmental Assessment Act*, the *Comprehensive Study List Regulations*, the Saskatchewan *Environmental Management and Protections Act, 2002*, or the Saskatchewan *Environmental Assessment Act*.

Section 2, subsection (c) of the Saskatchewan *Mineral Industry Environmental Protection Regulations, 1996* states: "decommission" means to remove or retire permanently from service or take any action to remove or retire all or part of a mine site. The Merriam-Webster Online Dictionary defines "decommission" - to remove *(as a ship or nuclear power plant)* from service.

In the case of the Gunnar site, the mine was "removed from service" in 1965 when both the pit and underground workings were flooded and the mill was "removed from service" when the crushers, the Marc ball mills, the majority of the pumps and at least one leach tank were removed from the facility in the late 1960s and early 1970s.

Because "decommission" is not defined in either the *Nuclear Safety and Control Act*, the *Uranium Mines and Mills Regulations*, or the *General Regulations* (issued pursuant to that Act), or any other legislation likely to apply to the proposed activities at the site, the SRC, in preparing the project proposal did not want to pre-suppose the Canadian Nuclear Safety Commission's decision on the type of license and therefore referred to the project as "the rehabilitation of the former Gunnar Mine site. Although it is not a critical issue in the conduct of the environmental impact assessment or the preparation of the environmental impact statement the SRC should attempt to confirm with the CNSC what type of license the CNSC intends to issue for the project and the justification for the determination of the licence type. Strictly speaking the information is not required at this time, however, it will allow the final EIS to address, to the extent possible, the information requirements for an eventual license application to the CNSC and allow for the inclusion of as much of this information as possible in the document.

The requirements for an application under the regulations issued pursuant to the *Nuclear Safety and Control Act* are provided in Appendix C.

7.3 Definition & Application of "Nuclear Energy Worker"

The *Nuclear Safety and Control Act* defines a "nuclear energy worker" as a person who is required, in the course of the person's business or occupation in connection with a nuclear substance or nuclear facility, to perform duties in such circumstances that there is a reasonable probability that the person may receive and dose of radiation that is greater that the prescribed limit for the general public.

The limit for an annual effective dose to a member of the public specified in the *Radiation Protection Regulations* issued pursuant to the *Nuclear Safety and Control Act* is 1mSv while the limit for a nuclear energy worker (NEW) is 50 mSv in any year and 100 mSv in any five year period (an average of 20 mSv per year).

Careful consideration of these limits should be maintained by the SRC during the entire rehabilitation project as it may be possible to schedule activities over the course of the project to limit the exposure of individual workers and therefore limit the number of NEW required to complete the rehabilitation activities.

7.4 Asbestos Management & Disposal

As has been indicated in various documents describing the former Gunnar Mining Limited site, asbestos siding and asbestos insulation were used extensively in the construction and insulation of a significant number of the facilities still in existence on the site. This has been confirmed in earlier investigations conducted and in follow up laboratory verification of the composition of certain 'insulating' construction materials encountered on the site.

The majority of the buildings on the site were sheeted in a "slate like" asbestos siding. Hot water pipes were wrapped with asbestos and in a number of the structures; "spray on" asbestos was used as the primary insulation. The insulation is, in all cases, in very poor condition and large quantities litter the floor of the various buildings.

The removal and appropriate disposal of the large volumes of asbestos must be a consideration in any rehabilitation activity at the site.

The SRC must consider both the federal and provincial health and safety Acts and Regulations applicable to asbestos handling and management during all relevant activities undertaken on the former Gunnar Mining Limited.

As the decommissioning/rehabilitation of the site will also require the disposal of asbestos covered material as well as asbestos sheeting etc. the SRC should immediately engage in discussions with the appropriate regulatory agency (Saskatchewan Ministry of Environment and Ministry of Advanced Education, Employment and Labour) on the allowable disposal scenarios for asbestos of the type that will be encountered during the decommissioning/rehabilitation activities.

8 Required Data/Information Acquisition

Table 1 is provided as a summary the recommended data/information acquisition requirements to undertake the options analysis for each element of the site, identify the preferred option for each, complete an assessment of the impacts of implementing the preferred options and prepare the required environmental impact statement as prescribed in the *Draft Project-Specific Guidelines and Comprehensive Study Scoping Document, Environmental Impact Assessment of the Former Gunnar Mine Site Rehabilitation Project* (issued by the Saskatchewan Ministry of Environment and the Canadian Environmental Assessment Agency) and the Canadian Nuclear Safety Commission *Record of Proceedings* (CNSC Decision).

Table 1: Recommended Data/Information Acquisition

(Critical - Must be addressed to conduct EA **- Moderate -** Would enhance EA but not "critical" **- Low –** Relevant but not required)

Required Data/Information Acquisition	Rank	Completion
The SRC must initiate discussions with the Province of Saskatchewan to clearly define land tenure and authority over the former Gunnar Mining Limited site.	Critical	ASAP
The SRC should conduct a geophysical and geotechnical survey of the waste rock filled channel between the flooded Gunnar pit and Lake Athabasca.	Moderate	July 1, 2009
The SRC should assemble and retain as much the underground mine geological information as possible with a particular focus on level plans and stope surveys.	Moderate – based on what exists	ASAP
The SRC should assemble all existing drill hole records (including logs) for all drilling conducted in the vicinity of the former Gunnar site to enhance the discussion of local geology and in order to facilitate a site survey to identify and characterize all drill hole locations.	Moderate – based on what exists	April 2009
A detailed ground survey of the entire former Gunnar Mines Limited site must be conducted to locate and characterize each exploration drill hole.	Critical	July 1, 2009
The SRC must conduct a geotechnical assessment of all waste rock pile slopes by a qualified individual.	Critical	July 1, 2009
The SRC must conduct a rigorous waste rock characterization program designed to characterize a sufficient number of representative samples of both weathered (surface) and un-weather (buried) waste rock that could potentially be used or exposed during rehabilitation activities.	Critical	ASAP
The SRC must attempt to identify the source and volume of the waste rock seep in order to assess the potential of remediating the flow.	Critical	July 1, 2009
A detailed survey of residual chemicals remaining in all buildings on the site must be conducted. (Occupational health and safety must be a paramount consideration in the planning and execution of this survey.)	Critical	ASAP
The SRC must conduct a detailed survey of all three tailings areas to accurately map the extent of tailings in each area. That survey must include those tailings that have been transported (i.e. by wind blown, water, etc.) beyond the main tailings area boundaries.	Critical	July 1, 2009

Required Data/Information Acquisition	Rank	Completion
The SRC must conduct a rigorous tailings characterization program on each of the three separate tailings areas (Gunnar Main, Gunnar Central and Langley Bay). That program must be designed to characterize a sufficient number of representative samples of both weathered (surface) and un-weather (buried) tailings from each of the three separate tailings areas.	Critical	ASAP
The SRC must conduct additional pore water sampling within the tailings management areas to develop a more comprehensive data base and provide a sufficiently rigorous baseline.	Critical	ASAP
An investigation of the tailings areas must be conducted in the summer by a qualified individual to: • assess all three tailings surface for evidence of surface salt accumulation and the potential of migration of salts though a potential cover; • inspect all tailings areas for trafficability and test doubtful areas using hand-held vane shear apparatus; and • investigate the existing tailings surface for evidence of boils, frost heave, frost cracking and/or cryoturbation and to assess the depth of frost - as all of these have the potential to damage a potential covers.	Critical	July 1, 2009
The SRC must conduct a site inspection by a qualified individual to assess the potential and appropriate location for the construction of an engineered containment structure at the discharge of the Gunnar Main tailings area.	Critical	July 1, 2009
A detailed characterization of the surface flow channel between Gunnar Main and Gunnar Central must be completed by a qualified individual.	Critical	July 1, 2009
The SRC must conduct a ground survey of the area between the main mine site and the Gunnar Central and the main mine site and the Langley Bay tailings areas in order to assess the ability and requirements to access the tailings areas with heavy equipment.	Critical	July 1, 2009
A detailed characterization of the surface flow channel between Gunnar Central and Langley Bay must be completed by a qualified individual.	Critical	July 1, 2009
The SRC must conduct a ground survey of the area between the main mine site and the Langley Bay tailings area in order to assess the ability and requirements to access the Langley Bay tailings area with heavy equipment.	Critical	July 1, 2009
The SRC must conduct a detailed survey of all residual chemicals remaining on the site.	Critical	July 1, 2009
A detailed survey of the former town site must be conducted. The survey must include a general inspection of the area to identify, characterize and record all remaining infrastructure in the area, to identify, characterize and record all residual chemical/wastes and potentially contaminated soil present.	Critical	July 1, 2009
A detailed survey of the former fish processing facility, surrounding area (including the compressor area), the current and historic dock areas, the abandoned barge in the channel between the flooded pit and Lake Athabasca and the series of cabins located east of the former fish processing facility and the barge must be conducted.	Critical	July 1, 2009
A detailed survey of additional infrastructure on the site including, but not necessarily limited to the utilidors used to pipe stream heat, fresh water and sewage throughout the site, the road ways (both within the mine site and those accessing the former town site and airstrip), freshwater intake facilities, sewage management facilities and the air strip itself is required.	Critical	July 1, 2009

Required Data/Information Acquisition	Rank	Completion
The SRC must conduct a detailed survey of the entire site to; identify and record the location of areas of all potentially contaminated soils; collect representative samples of the identified contaminated soils in order to characterize the type and concentration of contaminants present; and, provide an estimate of the total volume of each type of contaminated soils present on and around the site.	Critical	July 1, 2009
A detailed survey of the entire site must be conducted to; identify and record the location of all "other" types of waste material located on the site; and, provide an estimate of the total volume of each type of contaminated soils present on and around the site.	Critical	July 1, 2009
The SRC must conduct more detailed groundwater investigation with a particular focus on the tailings management areas and, to a lesser extent, the permeability between the flooded pit and Lake Athabasca.	Critical	ASAP
A detailed topographic survey of the entire Gunnar mine site is required.	Critical	ASAP
A detailed gamma survey is required of all roads within the mine site proper; Of the road that travels from the main site west to the former town site; Of all areas within the former town site itself; Of the road that travels from the mine site to the airstrip; and of the airstrip itself.	Critical	July 1, 2009
The SRC must complete additional aquatic investigations. These include: • Bathymetry, water quality/plankton, sediment quality, benthic invertebrates, and fish community/habitat at two unnamed ponds (between Gunnar Pit and Back Bay), Mudford Lake, and Spring Lake. Fish community/habitat, water quality, sediment quality, benthic invertebrate, and stream flow data may also have to be collected for streams associated with the aforementioned ponds and lakes, contingent on stream size. • Bathymetric mapping of Zeemel Bay, Langley Bay, St. Mary's Channel, and Dixon Bay. • Surface hydrology (stream characteristics and stream discharge) of the main creeks in the study area (small unnamed creeks, Thompson Creek, Hurd Creek, Spring Creek, and Zeemel Creek). • Fish community/habitat, water quality, sediment quality, and benthic invertebrate data may also have to be collected, contingent on stream size, for the main creeks in the study area (i.e., Thompson Creek, Hurd Creek, Spring Creek, and Zeemel Creek). • Winter water quality sampling should be included to decipher between seasonal trends and rehabilitation effects. • Mercury concentrations in the sediment should be determined for Langley Bay and St. Mary's Channel. • Fish habitat compensation may be required for this project. If this is the case, detailed quantitative fish habitat assessments of waterbodies requiring compensation will have to be completed to assess loss and a fish habitat compensation program will have to be developed.	Critical	ASAP
Saskatchewan Research Council must complete a baseline study of the terrestrial environment in and around the former Gunnar mine site.	Critical	ASAP
Depending on the potential realistic options for the flooded open pit, additional sampling of the deep pit water and pit sediments may be required particularly for the presence of sulphides in the sediments and in the water column immediately overlaying the substrate.	?	?
The SRC must conduct a survey of locally available borrow material on and near the former Gunnar mine site.	Critical	July 1, 2009
The SRC must complete a socio-economic baseline study that focuses on the Athabasca Basin in general and Uranium City area in particular.	Critical	Summer 2009

Required Data/Information Acquisition	Rank	Completion
Careful consideration and discussions with the appropriate regulatory agencies (particularly the Saskatchewan Ministry of Environment and the Canadian Nuclear Safety Commission) should be initiated as soon as possible to define what is achievable on the site (in terms of decommissioning objectives) and what the regulatory agencies will consider acceptable. It is recommended that the SRC initiate such discussions as soon as possible.	Critical	ASAP
The SRC should not initiate public consultation on "decommissioning" or "endpoint" objectives" without carefully considering what is achievable at the site and what objectives the regulatory agencies will judge acceptable.	NA	NA
The SRC must conduct a detailed options analysis, identification and justification of the preferred rehabilitations options. "Efforts should be made to involve the public in the development of the rehabilitation plan, including the identification of issues and objectives, options for final land forms and end use, alternative methods of rehabilitation, and the determination of the preferred alternative for rehabilitation." (PSG).	Critical	ASAP
Public consultation on the establishment of site specific "decommissioning" or "endpoint" objectives for the *Former Gunnar Mine Site Rehabilitation Project* must be conducted.	Critical	ASAP
Public consultations intended to specifically identify VECs in relation to the former Gunnar Mine Site Rehabilitation Project must be conducted by the SRC.	Critical	ASAP -- Before terrestrial baseline and any additional aquatic baseline
Consultations with past and current Traditional Users of the area in and around the former Gunnar mine site must be conducted in a manner that contributes traditional knowledge to; the identification of Valued Ecosystem Components (VECs) relevant to the project; identify any current and traditional uses of the Gunnar site and area; and, solicit input on the rehabilitation plans for the site.	Critical	ASAP
Public consultations intended to identify the potential of the existence of heritage resources or sites of "special significance" to the aboriginal communities in the area of the former Gunnar Mine site must be conducted.	Critical	ASAP
Public consultations on the consumption of local (to the site) foods stuffs should be conducted.	Critical	Summer 2009
The SRC should immediately initiate discussions with Environment Canada regarding the potential application of the *Metal Mining Effluent Regulations (SOR/2002-222)* to the former Gunnar Mining Limited site rehabilitation program.	Moderate	ASAP
The SRC should attempt to confirm with the CNSC what type of license the CNSC intends to issue for the project and the justification for the determination of the licence type.	Moderate	ASAP
The SRC should immediately engage in discussions with the appropriate regulatory agency (Saskatchewan Ministry of Environment and Ministry of Advanced Education, Employment and Labour) on the allowable disposal scenarios for asbestos of the type that will be encountered during the decommissioning/rehabilitation activities.	Critical	ASAP
The SRC should confirm with Environment Canada and Fisheries and Oceans Canada that those agencies do not intend to add the Langley Bay tailings area (or any other areas of the site) to Schedule 2 of the *Metal Mining Effluent Regulations (SOR/2002-222),* a regulation made under Section 36 of the *Fisheries Act*.	Critical	ASAP

During the analysis of the information/data required to complete the environmental assessment and prepare the *Former Gunnar Mine Site Rehabilitation Project Environmental Impact Statement* a number of areas are indentified where information to complete certain sections of the environmental impact statement will only become available once the SRC has completed the options analysis for each element of the site, chosen the preferred option for each and completed the required impact modelling. Appendix D provides a summary of all of the anticipated requirements to complete the environmental assessment and prepare an environmental impact statement. It also identifies, in summary form, what information will only become available as the SRC completes each stage of the environmental assessment process.

Appendix E provides as illustration of anticipated information/data required to complete the environmental assessment and prepare the *Former Gunnar Mine Site Rehabilitation Project Environmental Impact Statement.*