Gunnar Uranium Mine Remediation

January 21, 2010
Saskatoon, SK
Saskatchewan Research Council and AECOM Canada Ltd.

Agriculture, Biotechnology & Food

Mining & Minerals

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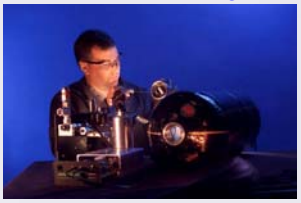
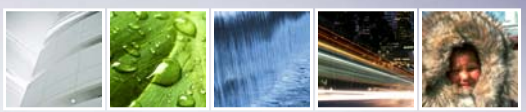


Energy

AECOM

- AECOM is a full-service global engineering and environmental consulting company



- AECOM responsibilities on this project include:
  - defining the existing environment
  - developing clean up/rehabilitation options and facilitating selection of a preferred option
  - preparing an Environmental Impact Statement (EIS)

Presentation Outline

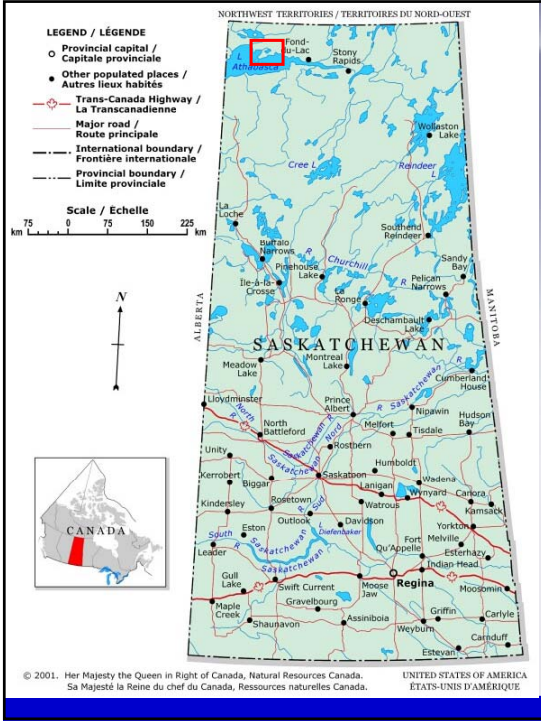
1. Goal of the Clean-up
2. Site Overview and History
3. Site Characterization
4. Challenges and Issues

Goal of Clean-up

- The former Gunnar Mine is an abandoned mine requiring cleanup.
- It poses risks to the public health and safety and poses environmental risks resulting from contaminated sources
- The goal of the project is to reduce those risks

Current Situation

- EIS Guidelines are specific and developed by both levels of government – good cooperation
- Good understanding of:
  - existing environment and areas of contamination
  - technical options for rehabilitation
- Engagement program initiated
- EIS to be submitted in December 2010

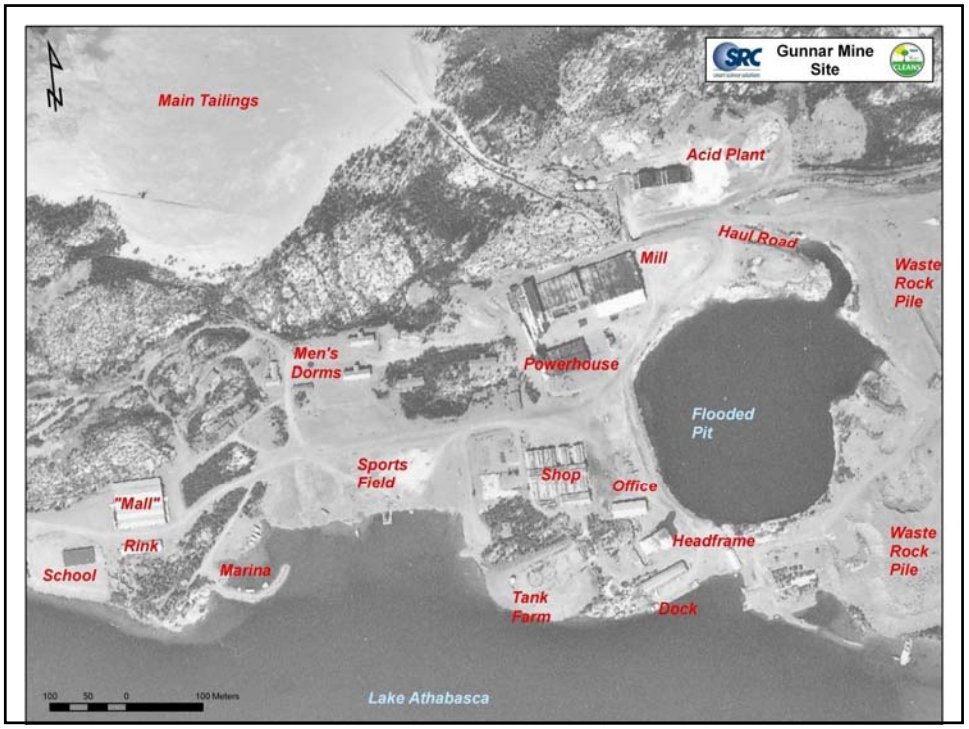


Gunnar Site

- Northwestern Saskatchewan on the Crackingstone peninsula

Gunnar History

- Mine operated from 1953 to 1964
- Open pit and underground mining
- A total of 8.3 million tons of rock mined
- Pit was flooded, shaft covered with concrete cap, and mine site abandoned



Gunnar 1955 (open pit no head frame)

Gunnar 2009 (45 years after closure)

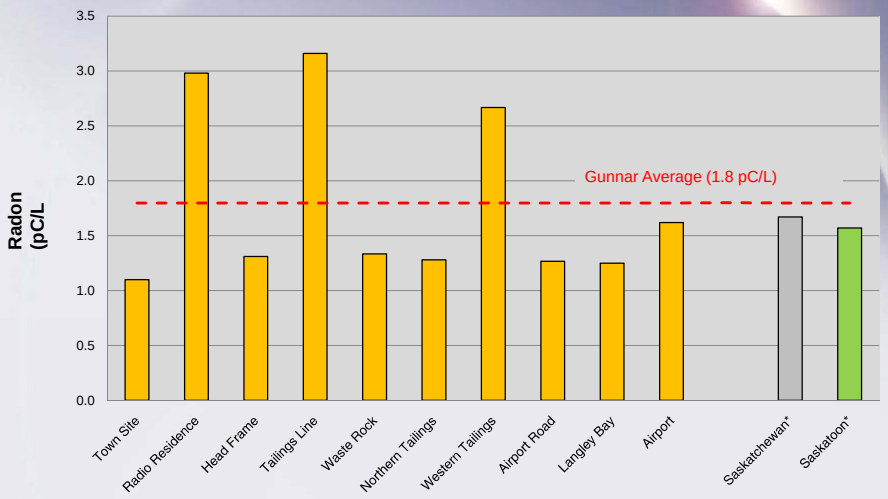
Hazards/Site Characterization

- Radon
- Gamma Radiation
- Buildings and Structures
- Tailings Areas
- Waste Rock Piles
- Gunnar Pit

Radon Gas Monitoring

10 radon gas stations are located on the Gunnar site Detectors are collected and analyzed twice a year

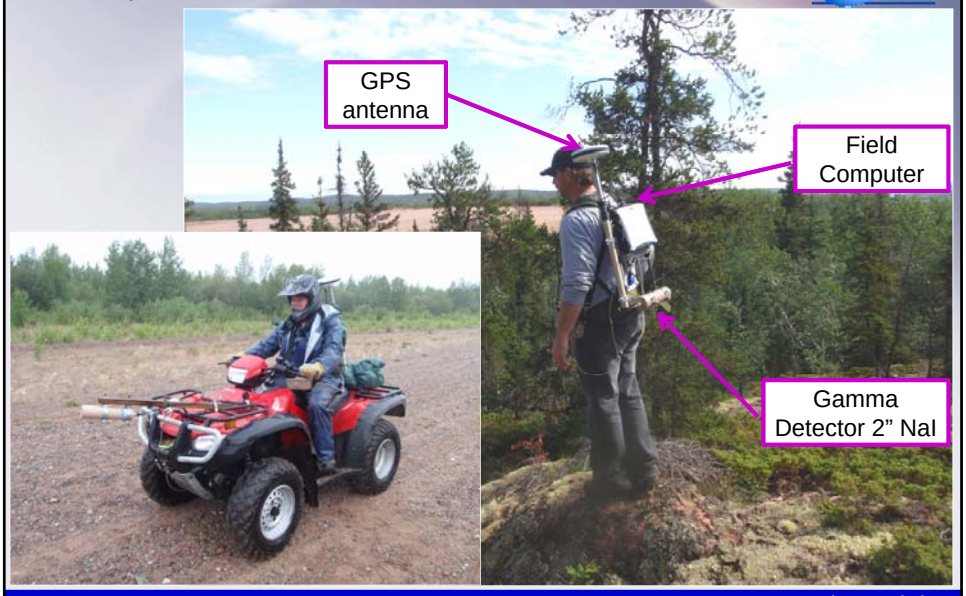
Average Radon Levels Gunnar site 2004-2009



*Saskatchewan & Saskatoon levels from Health Physics, 1994

Gamma Radiation Survey

(reading taken every 2 seconds, over 40,000 gamma measurements collected)



Buildings and Structures

Married Persons Quarters

Single Workers Residence

Buildings structurally unsound

Many of the residence buildings are in very poor condition

Buildings and Structures

Head Frame

Crusher, Mill, Acid Plant

Mill Building

Ore Storage Bins

Product Packaging Area

Acid Plant corroded and structurally unsound

Asbestos

Friable -spray on asbestos insulation & pipe insulation

Non-friable asbestos siding

Asbestos requires specialized handling and disposal techniques

Gunnar Tailings Areas

A total of 4.4 million tonnes of tailings were discharged from the mill and are now located in three areas

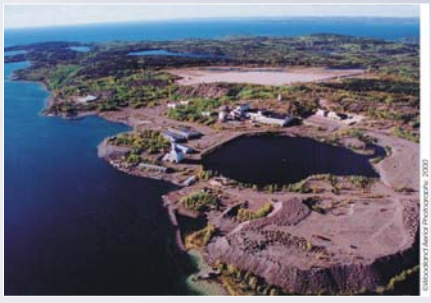
Gunnar Main Tailings Area

Gunnar Main looking south towards Lake Athabasca

Water ponded on Gunnar Main (note wind blown dust)

Waste Rock

2.7 million m^3 of waste rock located adjacent to the shore of Zeemel Creek and Lake Athabasca



Gunnar Pit

Gunnar Pit - 1964

116m deep, and approx. 300m dia.

50 m from shore of Lake Athabasca

Gunnar Pit today

Flooded and supporting a population of northern pike

Challenges and Issues

Many Options to Consider

- **Do nothing**
- **Move material** to a naturally contained site:
  - Lake Athabasca
  - Other lakes or water bodies
  - Fill the open pit with tailings, waste rock, construction materials
  - On-site disposal of construction materials and waste rock
- **Leave in place** and manage insitu
- **Subset of options**
  - different cover materials
  - different methods to reduce gamma emissions
  - manage waterborne and airborne contaminants.

End-Point Criteria

- What will the site look like after rehabilitation and what are the expectations for contaminant source clean-up?
- Consideration from:
  - public and aboriginal community
  - provincial and federal depa
  - project proponent
  - technical specialists

Selecting Preferred Option

- All options will be assessed – how will they be evaluated?
- Selection of the preferred option involves input from many affected or interested parties:
  - public and aboriginal community
  - provincial and federal departments
  - project proponent
  - technical specialists

Examples of Technical Challenges

- **Tailings**
  - If move tailings, need to consider whether existing issues may be exasperated (increased contamination)
  - Engineering issues related to moving or keeping in place
  - Adequate tailings cover material not readily available – could require quarry development in the area

Examples of Technical Challenges

- **Tailings / Waste Rock**
  - Using waste rock to cover the tailings will not help the gamma radiation issue
  - Unsure of what is in waste rock piles below surface
- **Open Pit**
  - How best to utilize while meeting goal of clean-up
  - To be able to use the pit will require dewatering and possibly treatment over several years


Approach to Challenges

- Establish end-point criteria and selection process for options early in the process and through engagement
- Input and feedback from Athabasca communities, regulators, and other interested parties on the options through a series of facilitated workshops and meetings
- Solid understanding of existing and potential future risks to humans and environment at final rehabilitation
- Integration of traditional knowledge (TK)




Thank You…

Concept by a student from the school in Fond du Lac

www.saskcleans.ca