



# Giant Mine Remediation Project

**Giant Mine Remediation Joint Project Office**

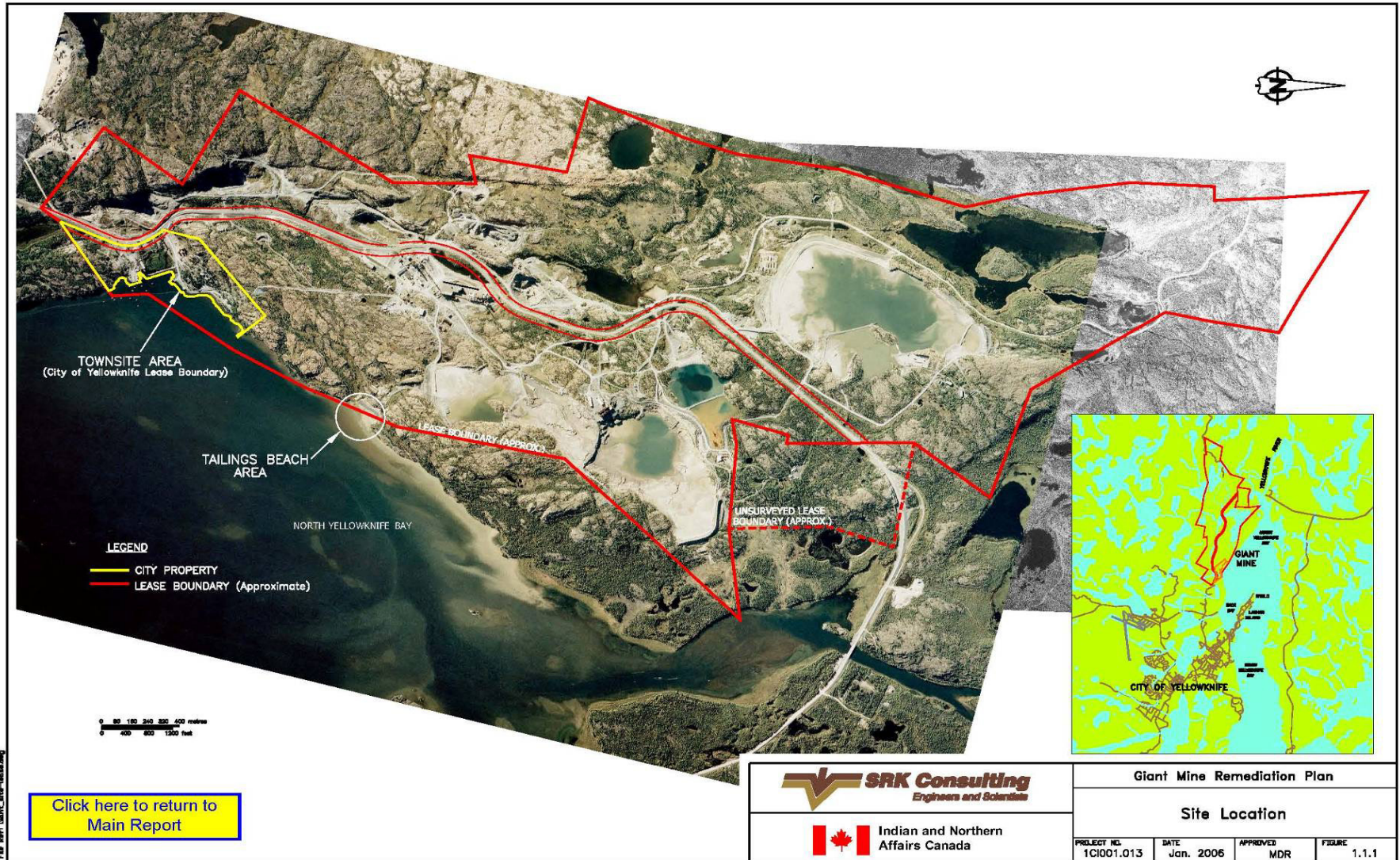


# Giant Mine: Site History

- Operated from 1948 through 2004
- In 1999 Royal Oak was assigned into Receivership
  - The property was subsequently transferred to Miramar Giant Mine Limited, through INAC.
- In 2005 Miramar Giant Mine Limited was assigned into bankruptcy.
- Royal Oak Lease area is now under the care of INAC and PWGSC .
- Site Characteristics:
  - The site covers approximately 850 hectares;
  - Mineral rights have been withdrawn;
  - Surface lands administered by GNWT (Municipal and Community Affairs);
  - Mining extracted over 7.6 million ounces of gold; and
  - Processing of gold ore by roasting resulted in the production of arsenic trioxide dust:
    - 237,000 tonnes of this material is now stored underground; and
    - Various building and surface areas around the property are also contaminated with this material and asbestos.



# Giant Mine: Site Location



- On NWT Commissioner's Land
- Within Yellowknife City Limits
- Includes Town Site City Lease

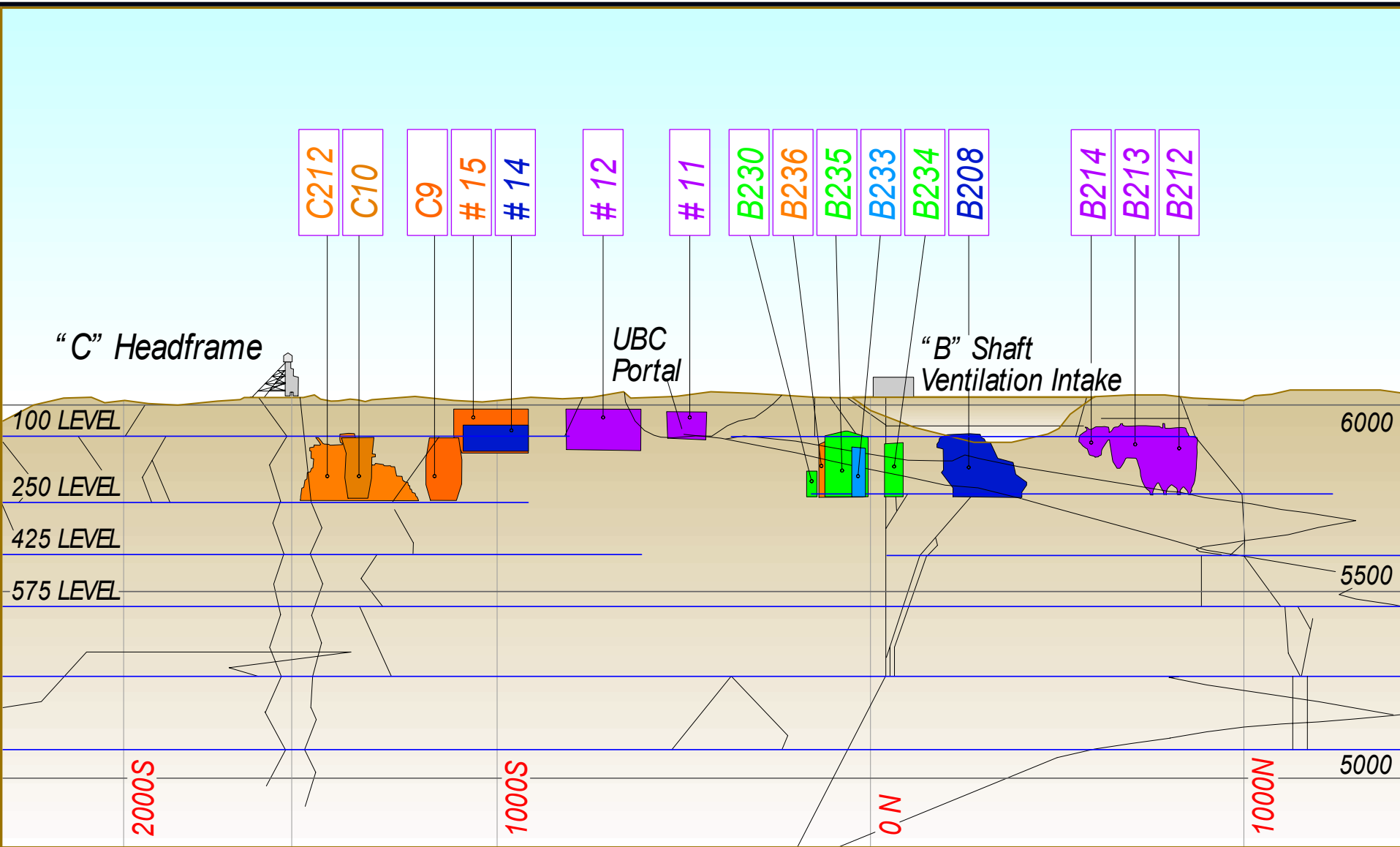
- Within traditional Akaitcho lands
- TliCho Monfwi economic measures

# Giant Mine: Site Issues



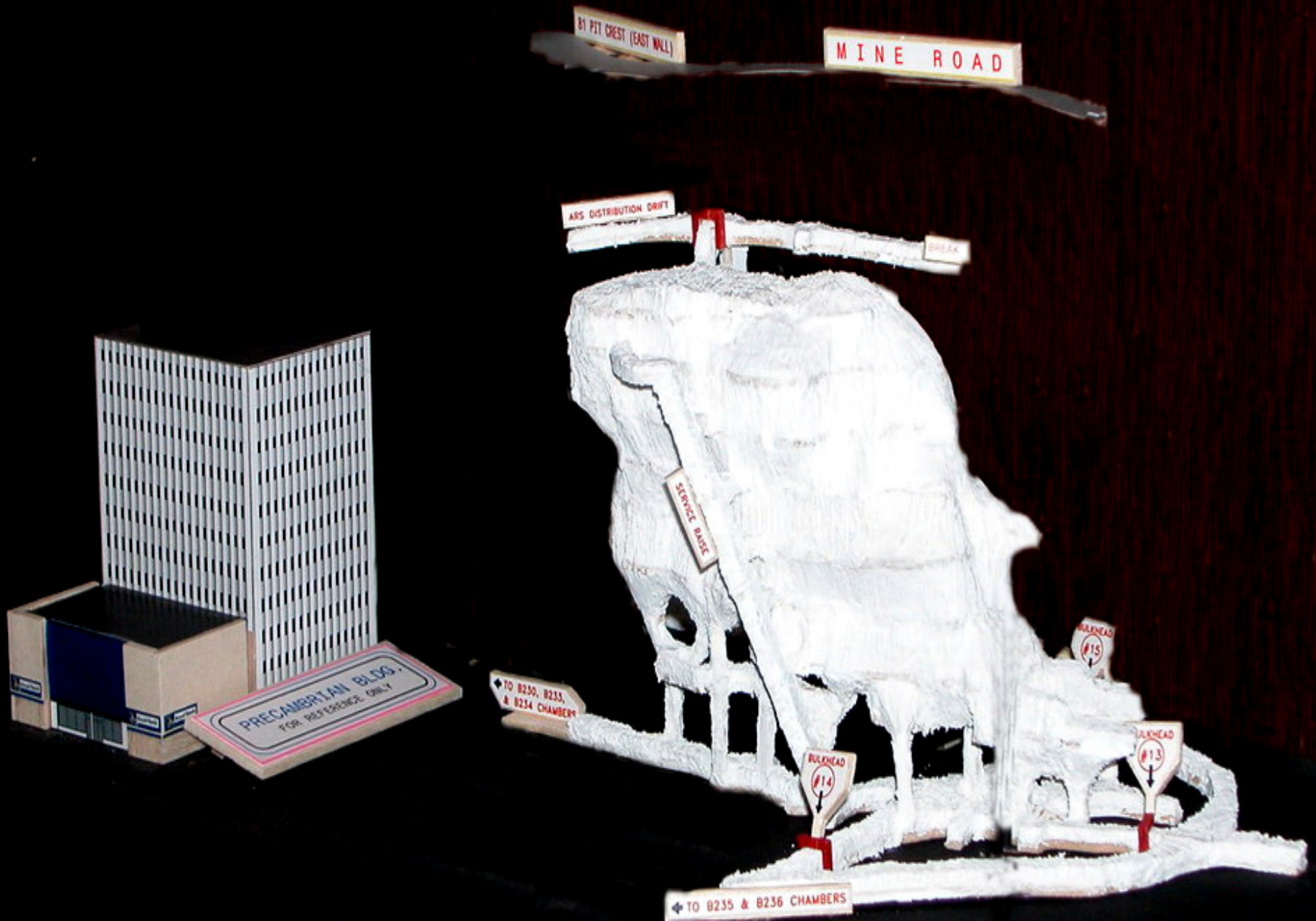
Photo Credit:  
Paul Vecsei

# Giant Mine: Site Issues



• Arsenic trioxide dust, currently stored underground in 10 chambers and 5 stopes, are enclosed in rock with access drifts sealed by cement bulkheads.

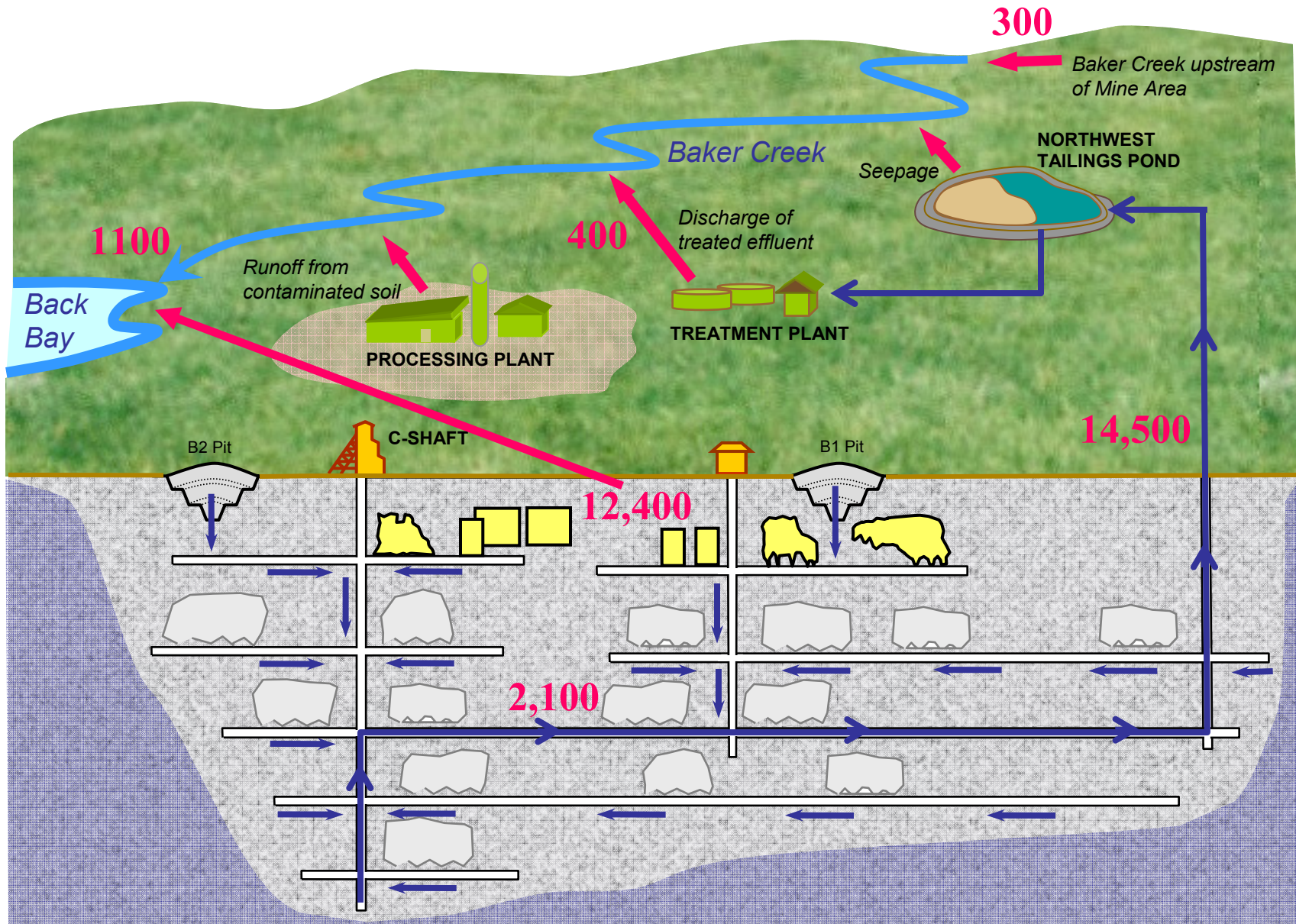
# Giant Mine: Site Issues



# Giant Mine: Site Issues



# Giant Mine: Site Issues



# Giant Mine - Remediation Plan

The elements of the Remediation Plan include:

- Sub-surface
  - 237,000 tonnes of arsenic trioxide.
- Surface:
  - Pits and underground mine openings;
  - Tailings impoundments and sludge pond;
  - Surface material contaminated with arsenic and hydrocarbons;
  - Remediation and realignment of Baker Creek; and
  - Demolition of mine infrastructure, which contains asbestos.
- Long Term Water Treatment
  - New water treatment plant.
- Monitoring



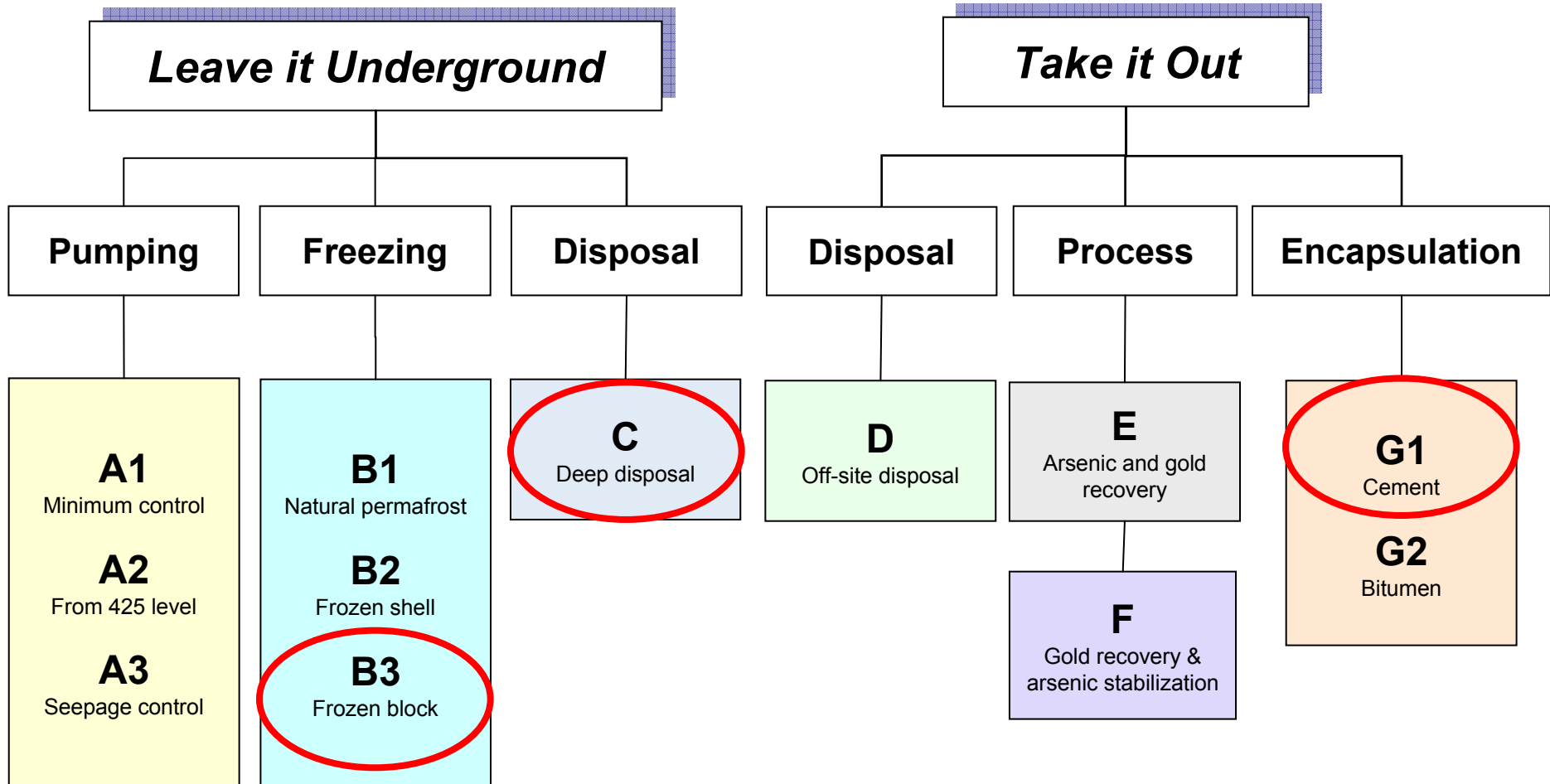
# Giant Mine: Sub-Surface

- Work completed from January 2000 through June 2003 included:
  - The development of a historical account of arsenic trioxide production & storage at the site;
  - The detailed investigation of dust and storage areas;
  - The development of a Human Health and Ecological Risk Assessment (HHERA) for current and possible future releases;
  - The assessment of over 56 methods for managing the arsenic trioxide dust;
  - An initial report with 17 supporting documents (May, 2001) and a detailed assessment of 12 alternatives;
  - A final comprehensive report with 19 supporting documents (Dec, 2002) with two recommended options for public consideration (held Jan, 2003)
- Conclusions of this work included:
  - There is no walk-away solution;
  - It is not possible to remediate the site to a pre-mining condition;
  - The existing condition of the site must be managed to protect human safety and the environment.



# Giant Mine: Sub-Surface

- Arsenic Management Options



Note: Alternatives B1, E and G2 deemed not feasible early in evaluation.

# Giant Mine: Sub-Surface

- Assessment of Risks

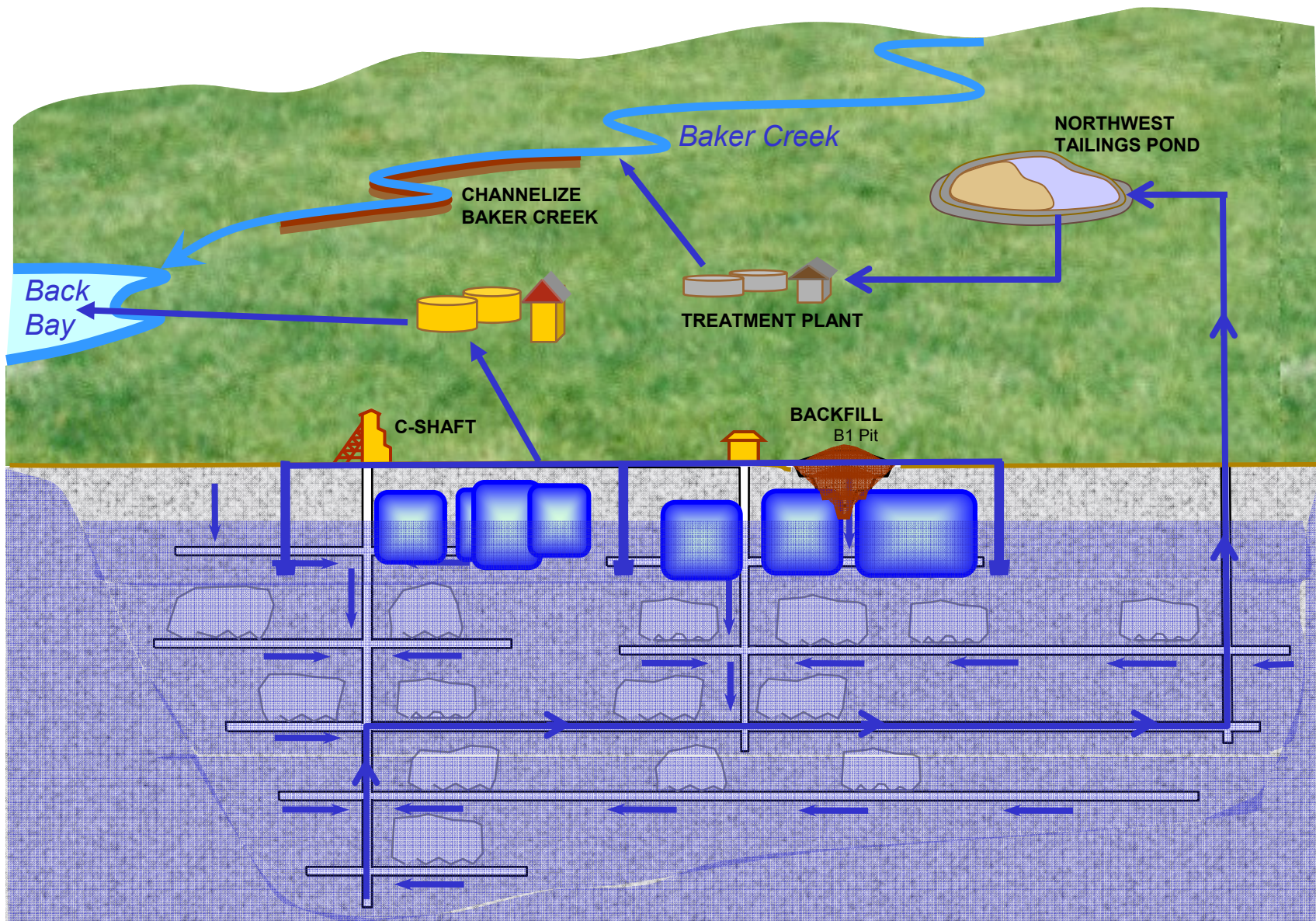
Arsenic Trioxide Management Alternatives	Probability of Significant Arsenic Release		Worker Health & Safety Risk	Net Cost Range (\$M)
	Short Term	Long Term		
A1. Water Treatment with Minimum Control	Low	High	Low	30-70
A2. Water Treatment with Drawdown	Low	Moderate	Low	80-110
A3. Water Treatment with Seepage Control	Low	Moderate	Low	80-120
B2. Frozen Shell	Very Low	Low	Low	90-110
B3. Frozen Block	Very Low	Low	Low	90-120
C. Deep Disposal	Low	Very Low	Moderate	190-230
D. Removal & Surface Disposal	High	Very Low	Moderate	600-1000
F. Removal, Gold Recovery and Arsenic Stabilization	Moderate	Very Low	Moderate	400-500
G1. Removal & Cement Encapsulation	Moderate	Low	Moderate	230-280

# Giant – Sub-Surface

- INAC held over 20 public sessions between January and May 2003
- A public workshop was held in May 2003:
  - In the May 2003 workshop four Yellowknife MLA's read a statement pledging support for the "in situ" freeze option;
  - Many of the attendees agreed and indicated that it was time to act; and
  - Some attendees remained unconvinced that the "in situ" method is the best option.
- Based on recommendations of the Technical Advisor, Independent Peer Review Panel as well as input from the public and incorporating the principal of value for money, INAC selected the in situ "frozen block" method as the most appropriate long term management alternative (February 2004)

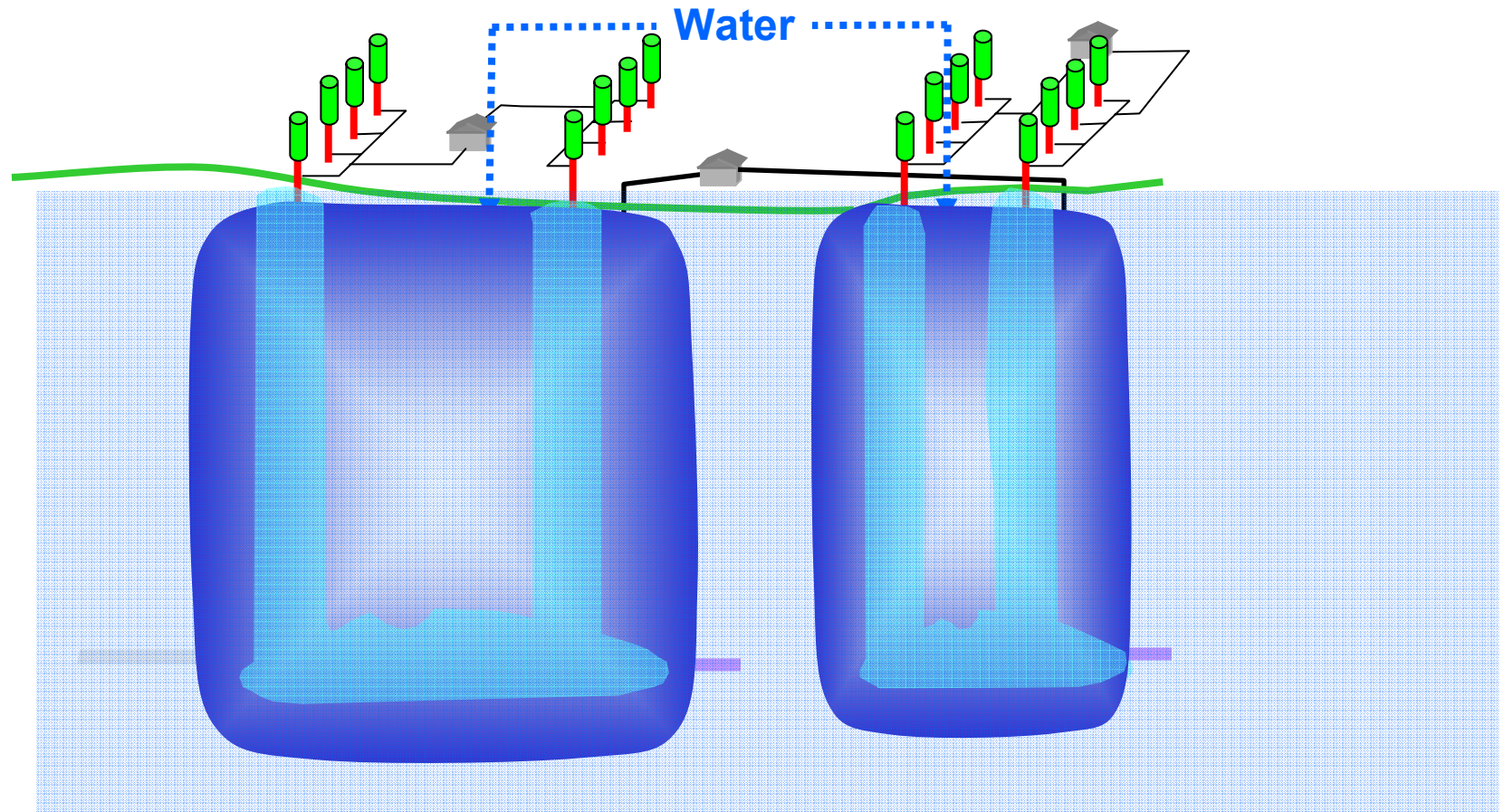


# Giant Mine: Sub-Surface

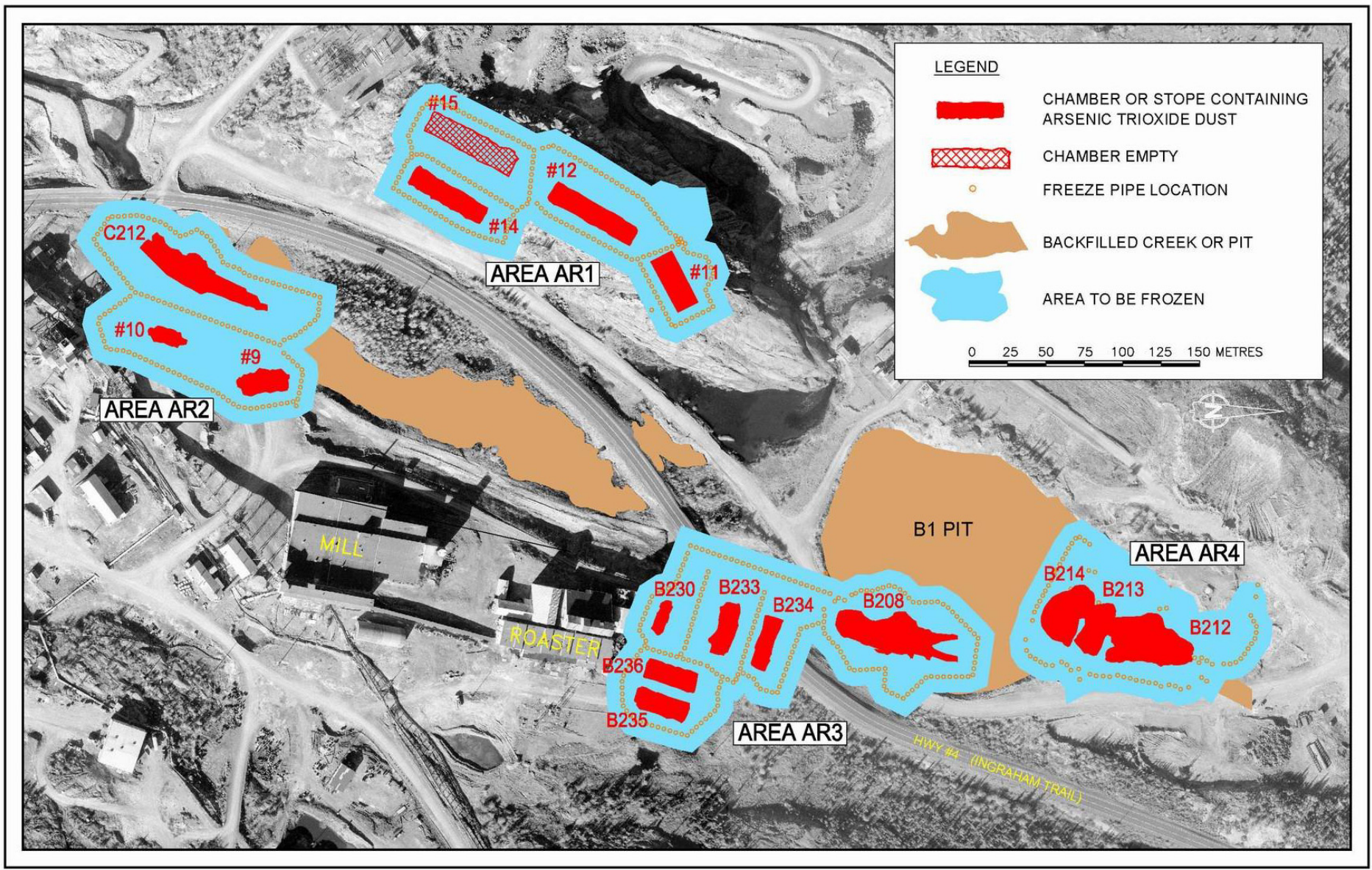


# Giant Mine: Sub-Surface

- Freezing and water management process



# Giant Mine: Sub-Surface



- Four separate Arsenic Trioxide storage areas to be frozen.

# Giant Mine: Surface

- 2002 air photo



# Giant Mine: Surface



- Tailings Containment Areas (95 hectares)

# Giant Mine: Surface

## Tailings Cover Design

- Bottom layer of broken rock has 4 functions:
  - Physical Barrier to prevent contact with the tailings by humans or animals;
  - Prevents erosion (ATV's, Dirt Bikes);
  - Prevent upward wicking of arsenic salts through to cover; and
  - Helps prevent roots from penetrating tailings.
- Upper layer of locally available silt and silty clay will:
  - Act as clean surface to shed runoff;
  - Allow vegetation to establish;
  - Reduce water infiltration;
  - Allow for future recreational and/or traditional use;
  - Eliminate airborne tailings fines on windy days

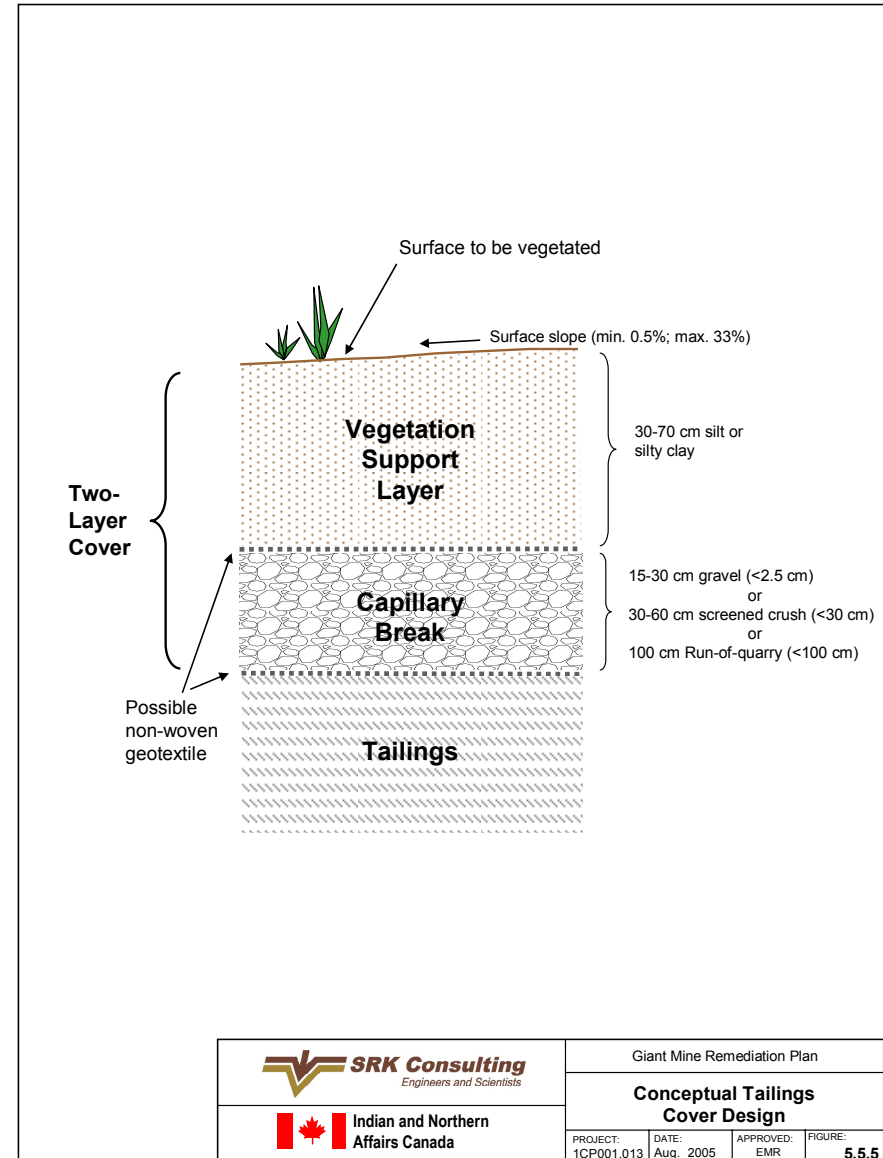
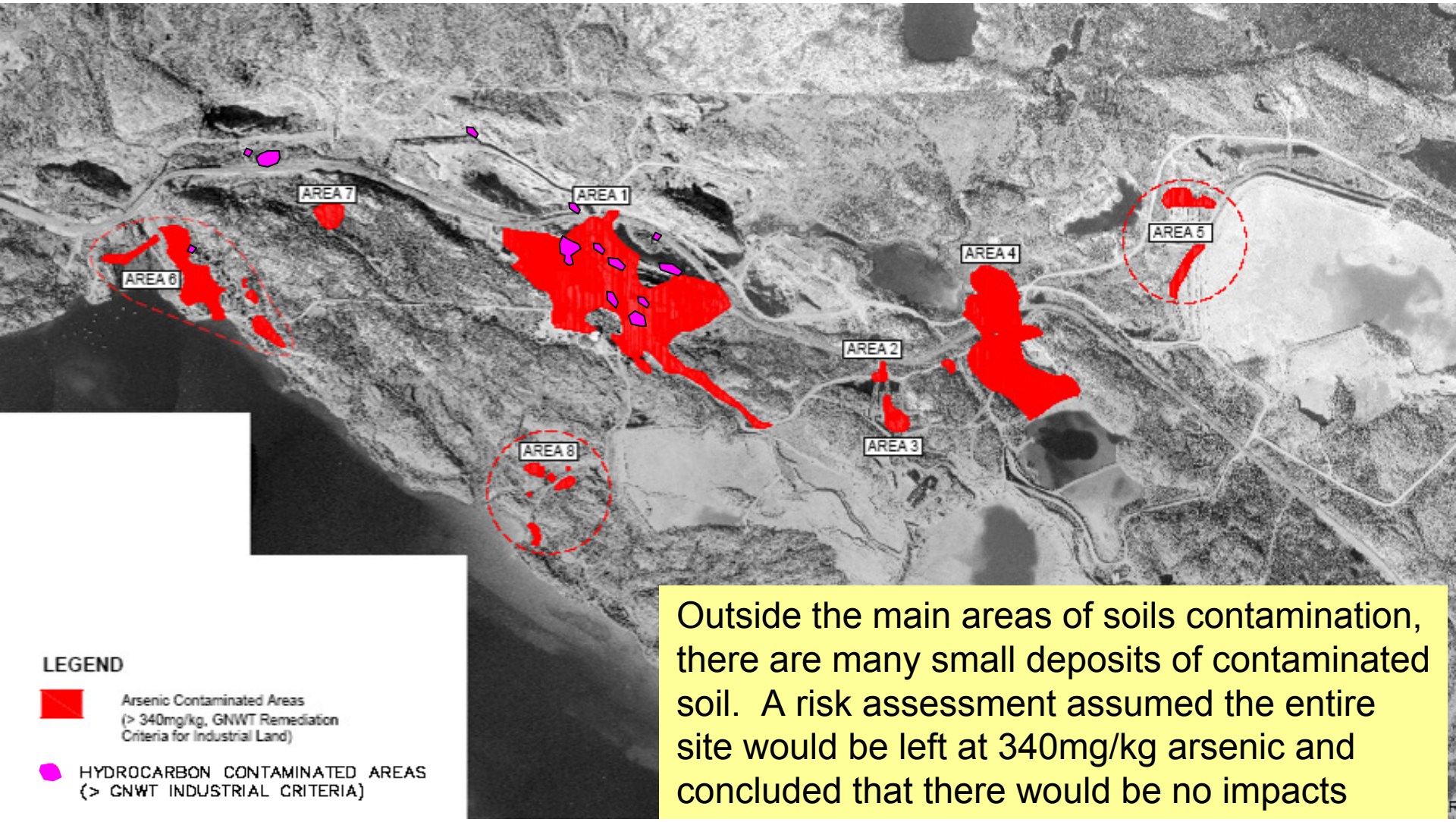


Fig 5.5.5\_5.5.6-Conceptual Tailings Cover Design.ppt

Note: Typical tailings cap cross-section

# Giant Mine: Surface

- Contaminated surface materials
  - Site will be remediated to GNWT industrial standard - 340 mg/kg



- All existing infrastructure, with no future use, will be demolished (following asbestos removal).



# Giant Mine: Water Treatment

## Minewater

- Expected to require treatment for an extended period of time after remediation measures have been implemented.
- Current water treatment system:
  - The age of the current plant and seasonal treatment is a concern; and
  - One bank of reactor tanks has been decommissioned because of leakage.



# Giant Mine – Water Treatment

## Site Water Management

- Construct a new Best Available Technology (BAT) water treatment plant:
  - Located near the C-Shaft.
- Change operating procedure from a seasonal discharge to a year round discharge.
- Design includes holding pond and long term monitoring.
- Change discharge point from Baker Creek to Yellowknife Bay.
- All surface runoff from the tailings pond will be directed underground until it has reached acceptable quality for direct discharge to the environment.



# Giant Mine – Remediation Plan

- Must integrate sub-surface and surface aspects of remediation.
- Cooperation Agreement:
  - March 15, 2005
- Draft Remediation Plan reviewed by:
  - Independent Peer Review Panel in January 2005;
  - Government of Northwest Territories in 2005; and
  - Federal Contaminated Sites Action Plan (FCSAP) expert support departments 2005, including:
    - Health Canada
    - Environment Canada
    - Department of Fisheries and Oceans
- Final review of revised plan by:
  - Independent Peer Review Panel in December 2005;
  - Government of Northwest Territories in March 2006; and
  - Federal Contaminated Sites Action Plan (FCSAP) expert support departments in May 2006.



# Giant Mine – Current Status

## Regulatory and Environmental Assessment:

- Remediation Plan finalized in 2007
- Water license application submitted in October 19, 2007
  - Mackenzie Valley Land and Water Board (MVLWB) determined that the application was complete and recommended that the project proceed to regulatory/licensing.
- Environmental Assessment
  - City of Yellowknife Council requested an Environmental Assessment;
  - Project assigned to Environmental Assessment on March 31, 2008;
  - Environmental Scoping workshop completed on June 17, 2008;
  - Scoping hearing completed on July 22 and 23, 2008;
  - Scoping decision completed on December 19, 2008;
  - Terms of Reference for Developer's Assessment Report (DAR) issued March 16, 2009; and
  - DAR Currently being developed



# Giant Mine – Current Status

- Water management:
  - Pumping mine water;
  - Surface contaminated water collection systems;
  - Maintenance of pumps/piping and underground access; and
  - Seasonal operation of Effluent Treatment Plant
- Maintenance of infrastructure:
  - Heating systems;
  - Mine Ventilation Systems;
  - Electrical distribution systems;
  - Mine equipment maintenance;
  - General site housekeeping; and
  - Miscellaneous repair.
- Seasonal application of dust suppressant
- Inspections:
  - Bulkheads
  - Annual geotechnical dam inspections

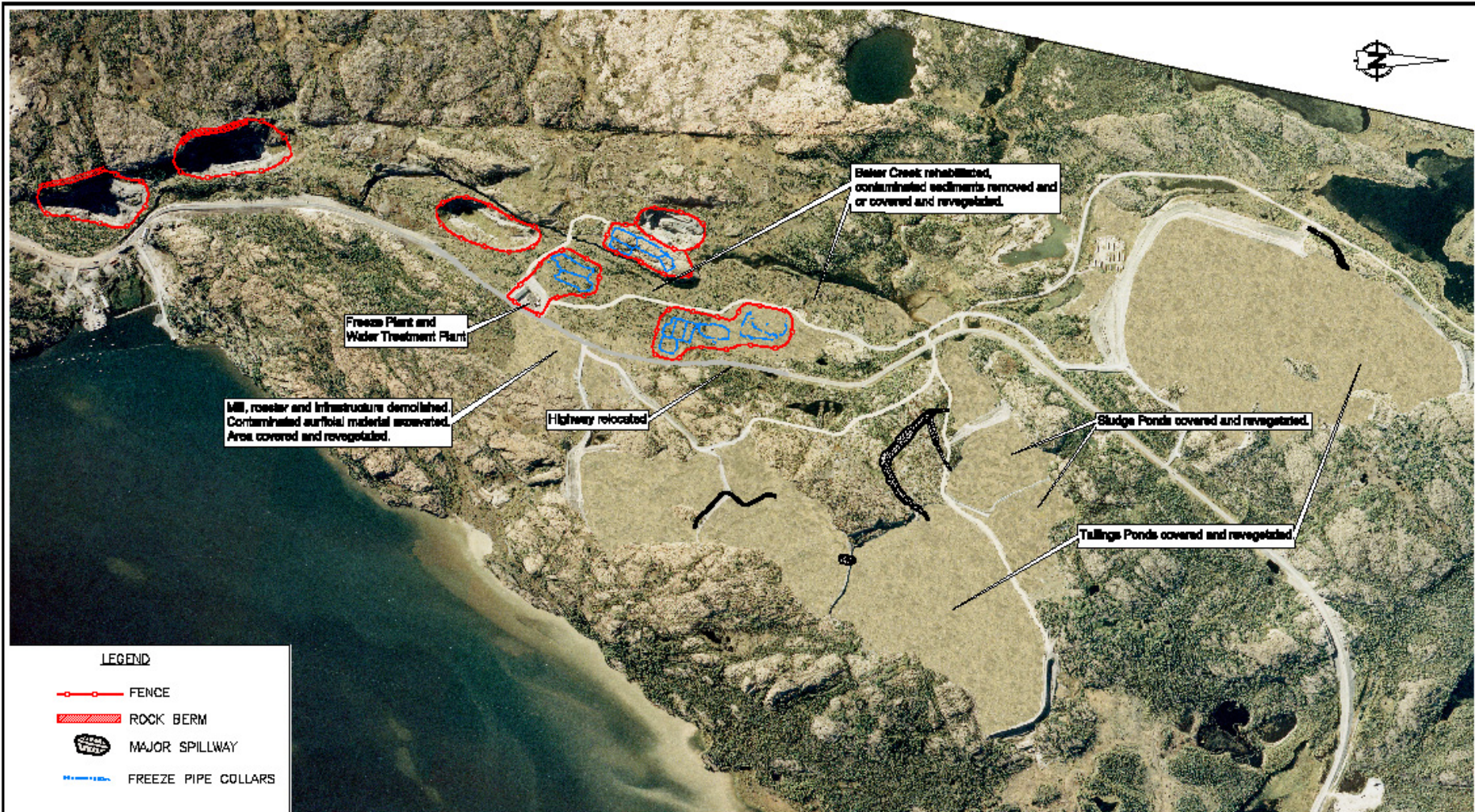


# Giant Mine – Current Status

- Maintain site security
- NWT Mine Health and Safety Act inspections/work
- Sampling and reporting in compliance with Metal Mining Effluent Regulations of Fisheries Act
- Continued Risk Mitigation work
- INAC considers it necessary to complete a freeze optimization study during the Environmental Assessment:
  - Freeze modeling has been completed;
  - Confirmation of modeling required from field test to elaborate and further inform the Environmental Assessment process;
  - The study will provide additional information required for detailed engineering design and detailed cost estimates; and
  - The study will provide valuable project management information for use in final remediation.
- Minister retains the authority to intervene should the risks at the site increase.



# Giant Mine: Post-Remediation Site Overview



0 00 100 200 300 400 metres



Giant Mine Remediation Plan

Post Remediation Site Conditions

PROJECT NO.	DATE	APPROVED	FIGURE
1C1001.013	Jan. 2006	MDR	6.1.1

Thank You Very Much

