Containment of Arsenic Trioxide Using Freeze Techniques at Giant Mine

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SMART Remediation
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Giant Mine
Remediation Project

Giant Mine Containment of Arsenic Trioxide Using Freeze Techniques

2018 SMART Remediation Ottawa – February 15, 2018

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Overview

- Site Background
- Freeze
  - Background
  - Studies
  - Design
- Next Steps

Canada

Site Background

- 900 hectare site located 5 km north of the City of Yellowknife, Northwest Territories
- Lies within city limits and overlapping Aboriginal land claims
- Gold mine operated from 1944 until 1999
- Roasting of ore produced Arsenic Trioxide dust, a toxic contaminant

Giant Mine was one of Canada's longest operating gold mines, producing its 10,000th brick in 1984, and generating 7 million ounces of gold during its operation.

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Site Background

Canada

Site Background

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Freeze Background
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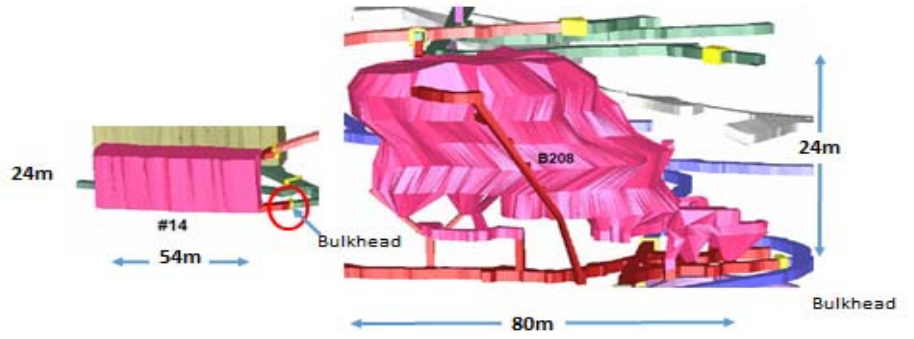
Arsenic trioxide dust chambers and stopes
Canada

Arsenic trioxide dust chambers and stopes



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Freeze Studies

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Arsenic Trioxide Removal Options Analysis

Technical Advisor Studies
- 2000-2002
- 56 management options investigated

Public Workshop
- 12 Management Options furthered review
- 7 in-situ 5 ex-situ

3rd Public Workshop
- One in-situ and one ex-situ methods reviewed
- Frozen Block Method selected

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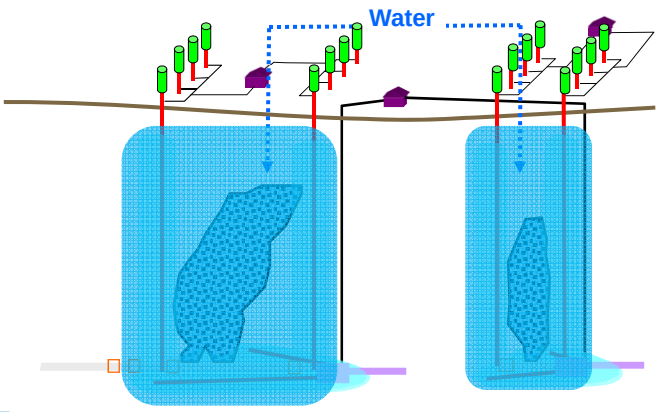
Wet Frozen Block Method



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Trade off Studies

- Evaluations of significant design choices
  - Wet vs. dry frozen blocks
  - Freezing from surface & underground vs. surface only
  - Freezing rate
  - Methods of active to passive conversion
  - Surface amendments/treatments
  - Active vs. hybrid vs. passive

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Trade off Studies Conclusions

Preferred Option:

- Dry frozen blocks
- Freezing from the surface only
- Preference for passive thermosyphons, with active freezing used where required to agree with the overall project schedule

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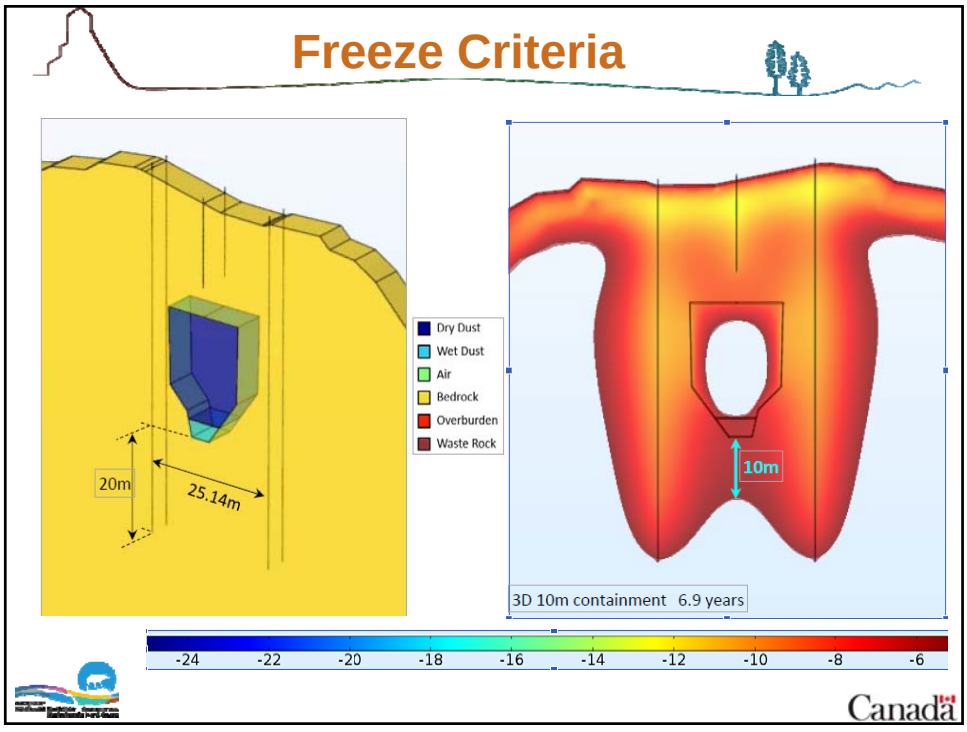
Freeze Criteria
20m
25.14m
Dry Dust
Wet Dust
Air
Bedrock
Overburden
Waste Rock
10m
3D 10m containment 6.9 years
-24
-22
-20
-18
-16
-14
-12
-10
-8
-6
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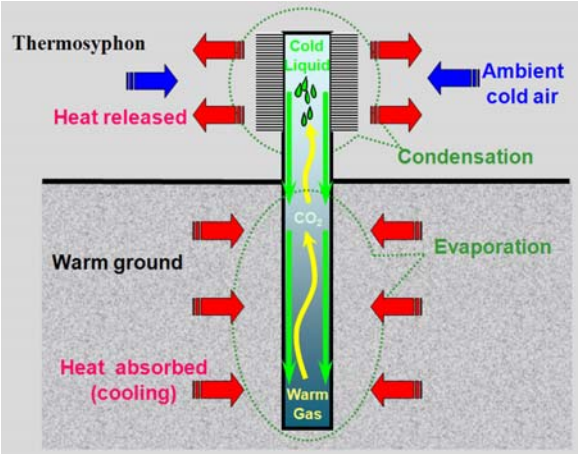
Passive Thermosyphon



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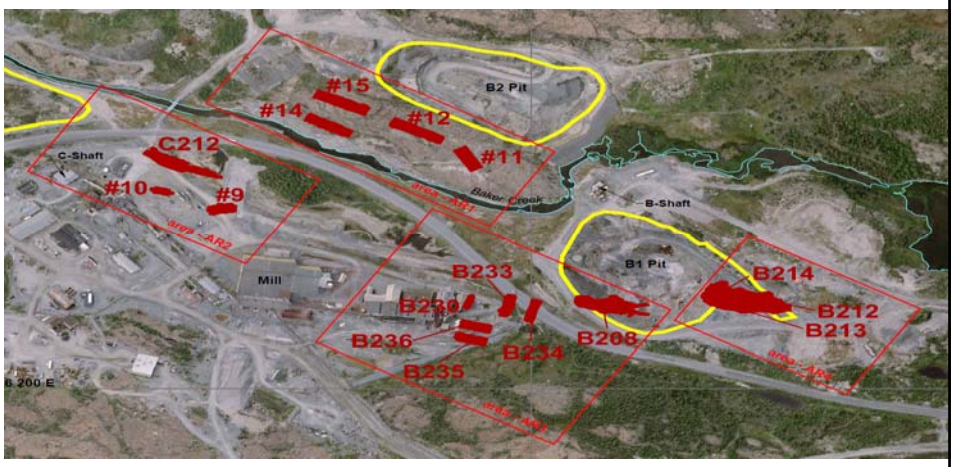
Freeze Areas



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Freeze Area 1

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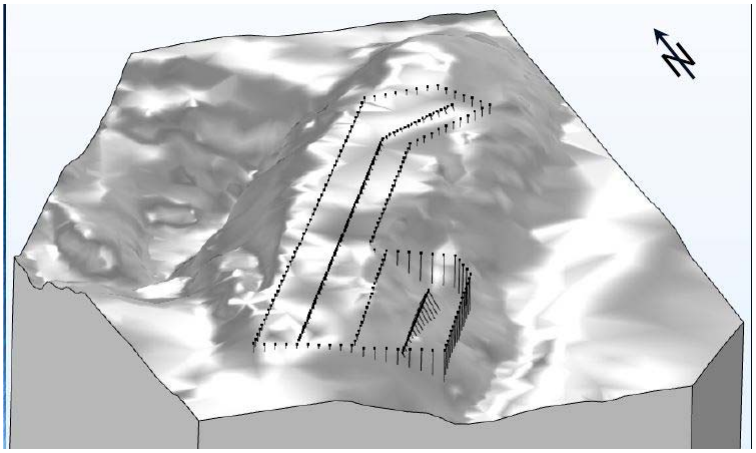
Freeze Area 1



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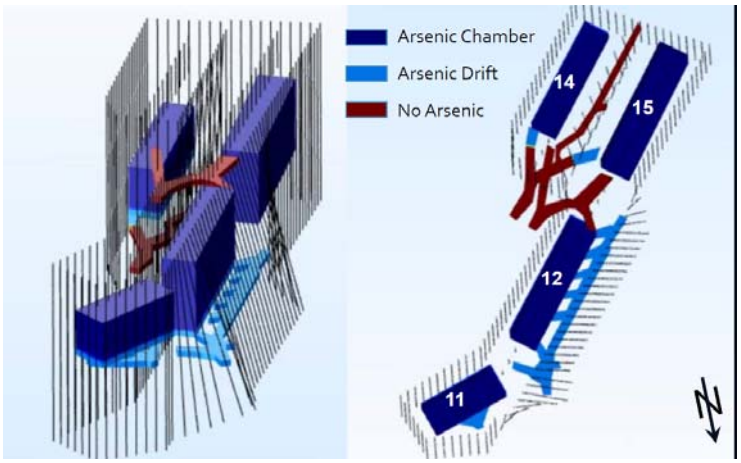
Thermosyphon Orientation



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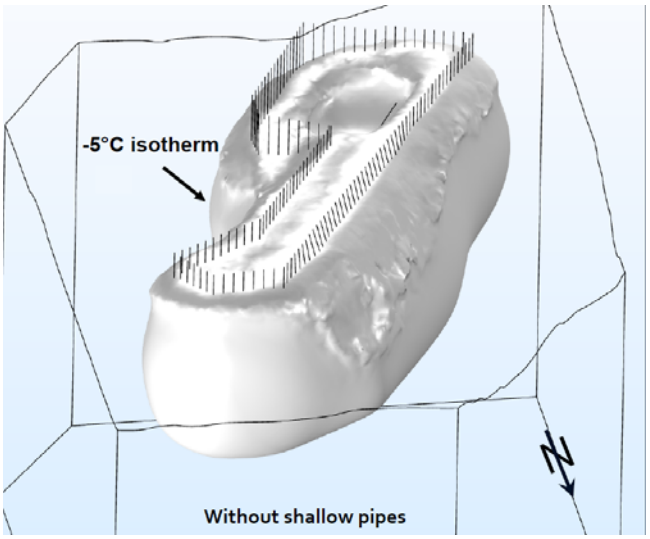
Long Term Results



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Next Steps

- Complete Detailed Design of Areas 1 & 2 ~ Feb 2019
- Complete Detailed Design of Areas 3 & 4 ~ Jan 2020
- Begin Construction ~ Apr 2021

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Questions?

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