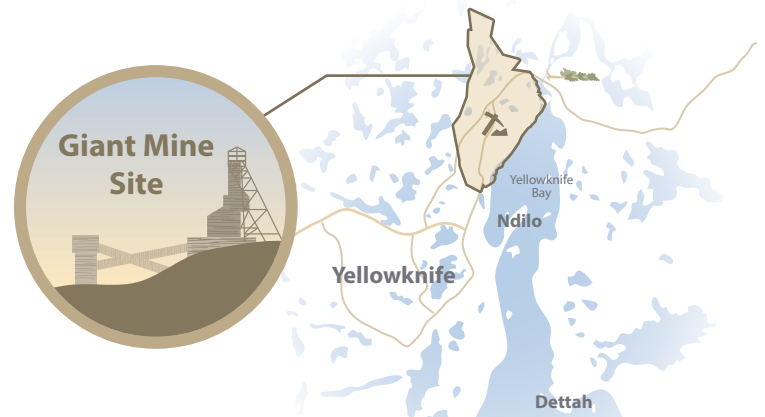


OUR RESEARCH PROGRAM

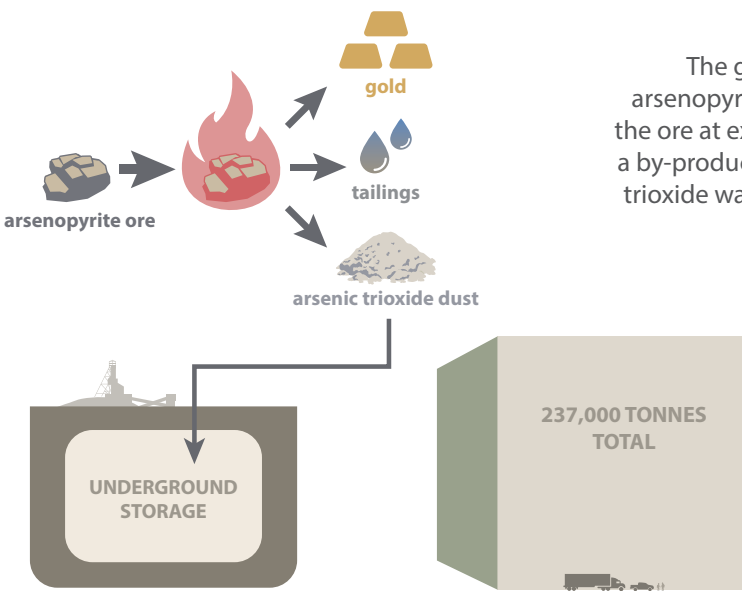
the Giant Mine Oversight Board (GMOB) research program

Giant Mine operated as a gold mine from 1948-1999 close to the communities of Yellowknife, Ndilo and Dettah, in the Northwest Territories of Canada. The site lies on the north shore of Yellowknife Bay, a small arm of Great Slave Lake, and is close to numerous creeks, rivers, ponds and small lakes. The now abandoned mine contains hundreds of thousands of tonnes of toxic waste, which is a source of significant concern for everyone. The main responsibility for cleaning up the site now lies with the Government of Canada, supported by the Government of the Northwest Territories. **The challenge of permanently cleaning up the toxic waste will require creativity, patience, and collaboration to solve.**



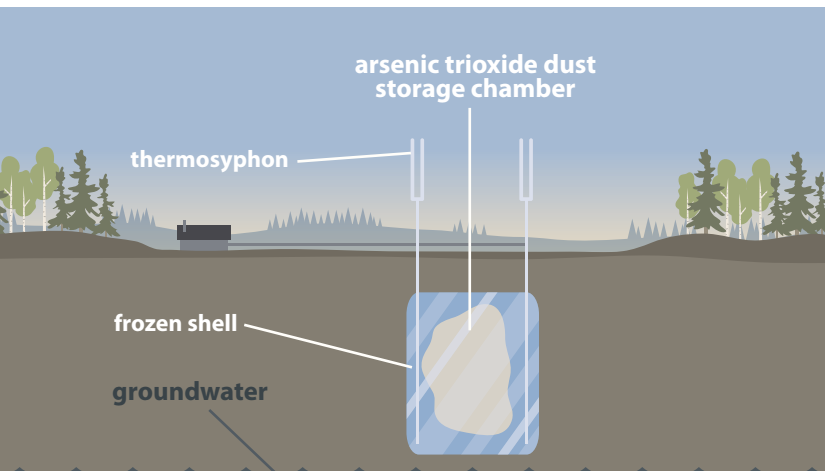
A challenge with a long history

The gold at Giant Mine occurred within an arsenic rich mineral called arsenopyrite. Separating the gold from the arsenopyrite required roasting the ore at extremely high temperatures, which produced arsenic trioxide as a by-product. In the first few years of the mine's operation, all of the arsenic trioxide was released directly into the environment from a tall smokestack. This contaminated the lands and waters around Giant Mine.



Because of growing environmental and health concerns, the operators of the mine gradually adapted their processes to capture the arsenic trioxide from the smoke stack and store it underground. **Over the lifetime of Giant Mine, 237,000 tonnes of this dust were stored in fourteen underground chambers at the mine site where it remains today.**

Arsenic trioxide is a highly toxic compound, and even a tiny amount can be harmful to people and the environment. The legacy of past arsenic trioxide contamination at Giant Mine is still felt today: the soils and many lakes surrounding the mine site have elevated levels of arsenic. To reduce risks from arsenic exposure, swimming, fishing, and harvesting of edible plants are discouraged in many of these areas.

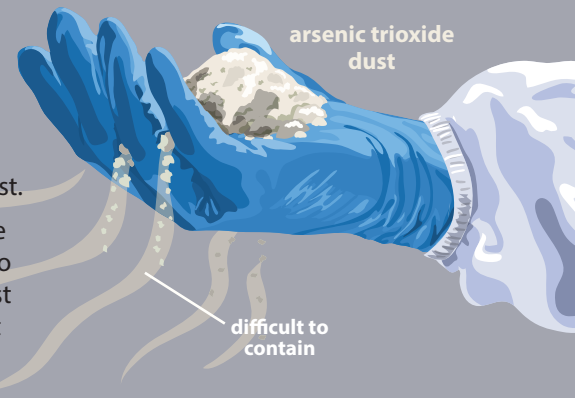


This stored arsenic trioxide dust is a significant source of concern for local residents. Because moving the dust could create additional contamination, **the government agencies decided to freeze it in place until a more permanent solution could be found.** Keeping the dust frozen is intended to prevent it from dissolving into the groundwater and spreading into the surrounding area.

The quest for a permanent solution

The Giant Mine Oversight Board is an independent non-profit organization whose mandate includes finding a permanent solution for the stored arsenic trioxide dust at Giant Mine. It oversees a research program to find a safe method of dealing with the dust.

Safely dealing with the arsenic trioxide dust is not an easy challenge. Arsenic in the dust is dangerous to workers and the environment. It can spread by air and dissolve into water. This means any potential solution must not only stabilize the arsenic trioxide dust but prevent the accidental release of arsenic trioxide when treating and/or extracting it from the underground chambers.



Why is a more permanent solution needed?

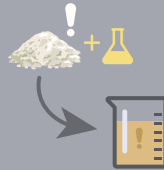
- The freezing method will require perpetual maintenance of the freezing infrastructure to prevent the release of arsenic trioxide into the groundwater.
- A future failure of underground structures (bulkheads or crown pillars), or flooding of the mine by Baker Creek, could lead to its escape.
- Residents of the communities of Yellowknife, Ndilo, and Dettah are concerned for their current health and that of the environment.
- Residents are concerned for future generations and the long-term effectiveness of freezing the underground chambers. This is particularly important given the long-term effects of climate change.

Exploring a range of potential solutions

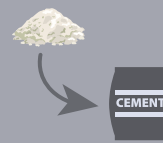
In 2018, GMOB partnered with researchers from across the country to begin the process of finding a permanent solution for the arsenic trioxide. The current research projects focus on ways to remove the threat posed by the stored arsenic trioxide dust. They include:



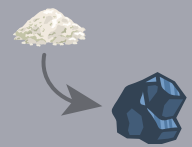
Learning more about the chemical properties of the arsenic trioxide dust at Giant Mine



Chemically changing the arsenic trioxide into a chemical that is less toxic and which doesn't dissolve as easily



Mixing the arsenic trioxide into a cement



Transforming the arsenic trioxide into a type of glass

These research projects are meant to run for up to five years. **It is unlikely that a permanent solution will have been identified at the end of the five years, but a lot of important information will have been gained to help focus research in subsequent stages.** Once a promising solution is found, the next step will be to test it in a small *pilot project* to find out if it can be conducted safely. If the pilot project is successful, then full implementation of the solution at Giant Mine can be considered.

The road ahead

The Giant Mine Oversight Board is working with others towards a future where community members can feel confident about the safety of the Giant Mine site. **Progressive steps currently being pursued to protect the health and safety of the surrounding community and environment include:**

Giant Mine Oversight Board:

Identifying a permanent solution to remove the threat posed by the stored arsenic trioxide dust.

Governments of Canada and the Northwest Territories:

Remediation of the already contaminated Giant Mine site.

Research Partners:

Research on impacts to the land and waters surrounding the site.

Giant Mine Oversight Board:

Receipt and review of new ideas and proposals from independent researchers and companies, for consideration for future funding.



If you have a research idea that could be part of a permanent solution for the management of arsenic trioxide, or have any questions about GMOB and its research program, please reach out to us.

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