

2020 ANNUAL REPORT







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The Giant Mine Oversight Board at a Glance

Purpose

The 2015 Giant Mine Remediation Project Environmental Agreement established the Giant Mine Oversight Board (GMOB). GMOB has two purposes:

1. Independently monitor, promote, advise, and advocate for the responsible management of the remediation of the Giant Mine site, and
2. Manage a research program to seek a permanent solution to the arsenic trioxide stored underground at the Giant Mine.

Mandate

To achieve its purposes, GMOB's mandate is to:

- Monitor and report on the Giant Mine Remediation Project.
- Review, comment, and make recommendations on programs, research, and reports about the Project.
- Research a permanent solution for the arsenic trioxide stored underground at the Giant Mine site.
- Communicate to the public and Parties to the Environmental Agreement about GMOB's activities.

Vision

GMOB envisions that the remediation of the Giant Mine site, including the sub-surface, will be carried out in an environmentally sound, socially responsible, and culturally appropriate manner.

Governance

GMOB is governed by a six-member Board of Directors. Each of the six Parties to the Giant Mine Remediation Project Environmental Agreement appoints one member to the Board. Each Director acts independently from the Party making the appointment. The Parties are:

1. Government of Canada, Crown-Indigenous Relations and Northern Affairs Canada
2. Government of the Northwest Territories, Environment and Natural Resources
3. Yellowknives Dene First Nation
4. North Slave Métis Alliance
5. Alternatives North
6. City of Yellowknife

The Government of Canada, Crown-Indigenous Relations and Northern Affairs Canada and the Government of the Northwest Territories are co-proponents of the Giant Mine Remediation Project. They work together as the Giant Mine Remediation Project Team. The co-proponents are referred to as the 'Project Team' throughout this report.

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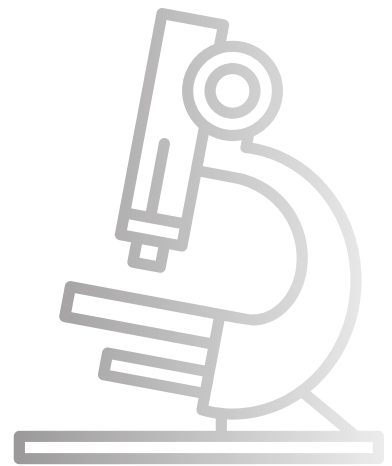
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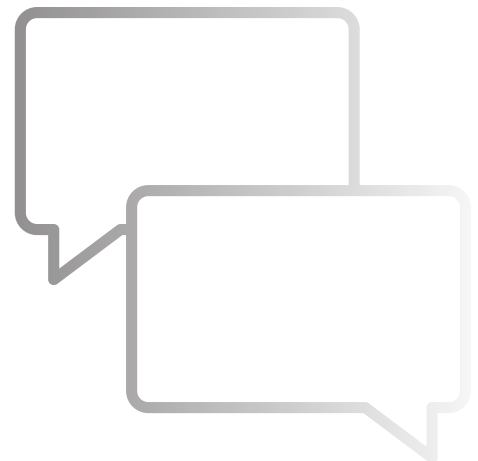
Project Oversight



Research Program



Promote Public
Awareness and
Engagement



Message from the Giant Mine Oversight Board

The Giant Mine Oversight Board (GMOB) has two primary objectives: 1) to independently monitor, promote, advise, and advocate for the responsible management of the remediation of the Giant Mine site; and 2) to manage a research program to seek a permanent solution to the arsenic trioxide stored underground at the Giant Mine.

In the fifth annual report, GMOB describes project oversight and research activities, outcomes, and next steps in some detail. Public awareness and engagement activities are reported as part of oversight and research responsibilities as it is GMOB's practice to integrate these activities in everything it does. GMOB also makes recommendations and offers commitments for the next steps.

GMOB is encouraged by the work completed in 2020 despite the challenges of the COVID-19 pandemic. All evidence reviewed by GMOB in the last year indicates that the Giant Mine Remediation Project Team has effectively mitigated all potentially significant environmental impacts associated with site contamination. GMOB is pleased that the issuance of environmental regulatory authorizations are nearing completion. This means that the Project Team can now initiate full remediation, which will make the site even safer over the long-term. GMOB is also encouraged by continued improvements in the Project Team's public engagement activities, including those that have contributed to critical studies and management and monitoring plans. GMOB looks forward to discussions about post-remediation activities and the potential of a new remediation industry growing from the Giant Mine Remediation Project.

GMOB supports the work underway to reconcile the legacy of Giant Mine. Notable achievements in this regard include dialogue between Canada and the Yellowknives Dene First Nation to address requests for a formal apology and compensation. GMOB hopes to see significant progress on these matters in 2021.

On behalf of the GMOB Board of Directors and our Executive Director, I wish to thank the Project Team, the Parties to the Giant Mine Remediation Project Environmental Agreement, and the public for their continued involvement and support. This will ensure that the remediation of the Giant Mine site, including the sub-surface, is carried out in an environmentally sound, socially responsible, and culturally appropriate manner.

David Livingstone
Chair, GMOB

Giant Mine Oversight Board Work in 2020

The following sections describe the Giant Mine Oversight Board's work in 2020 to fulfil project oversight and research responsibilities. GMOB's work on public awareness and engagement is described as part of its other responsibilities.

PROJECT OVERSIGHT

Project oversight involves monitoring, reviewing, and commenting on documents and presentations; attending meetings; seeking expert advice; and making recommendations. It also involves promoting public awareness and engagement related to remediation of the Giant Mine. GMOB's project oversight activities in 2020 are summarized under seven topics:

1. ENVIRONMENT
2. SOCIO-ECONOMIC
3. ENGAGEMENT
4. RECONCILIATION
5. PROJECT MANAGEMENT AND PLANNING
6. COMMUNITY HEALTH AND WELLNESS
7. LONG TERM PLANNING

Each topic is briefly discussed in terms of:

- Expectations** → What did GMOB expect?
- Actions** → What actions were taken?
- Outcomes** → What were the outcomes of the actions?
- Next Steps** → What are the next steps?

Recommendations and commitments to action are included in the next steps. The status of previous recommendations is described in Appendix A.

ENVIRONMENT

What Did GMOB Expect?

GMOB expects effective management and monitoring plans to be implemented throughout the three phases of the Giant Mine Remediation Project – current care and maintenance, active remediation, and long-term care. These plans should ensure that site activities are carried out in ways that minimize negative effects to the environment, now and in future. This is the goal of site remediation. GMOB expects that site activities will be modified or curtailed as necessary, based on monitoring results and adaptive management.

What Actions Were Taken?

Throughout 2020, the Project Team continued its inspections, monitoring, and reporting on air, water, effluent, and dust control management systems. An Aquatic Advisory Committee was established to guide decisions on mitigations and monitoring for Baker Creek and Back Bay.

Several management and monitoring plans were prepared and shared with the Parties to the Environmental Agreement prior to submission to the Mackenzie Valley Land and Water Board. Plans respond to the environmental mitigations, monitoring, and reporting requirements set out in the Type A Water License issued by the Mackenzie Valley Land and Water Board in 2020. Two plans, the Engagement Plan and Spill Contingency Plan received interim approval in 2020. The range of plans and documents related to permitting processes currently under development are listed in the adjacent text box.

Dams at the Giant Mine site are used for mine and surface water management and tailings solids retention. In 2019-20, the Project Team conducted the annual geotechnical dam inspection to assess water level restrictions and geotechnical integrity. At the same time, the Project Team completed 10-year dam safety reviews. The inspection and safety reviews found that stability work would be required on Dam #1 to slow thawing of the frozen core, stabilize the dam, and mitigate risk to human health and safety. Stabilization work was completed in mid-December 2020 with the installation of thermosyphons. Additional monitoring recommended by inspectors was also addressed. The full safety review report is anticipated in early 2021.

In response to GMOB's 2019 recommendation, the Project Team committed to:

1. Auditing and reporting annually on energy use and greenhouse gas emissions.
2. Reducing greenhouse gas emissions as the scope of remediation activities allow.

Management and Monitoring Plans

Arsenic Trioxide Frozen Shell
Tailings
Engagement
Spill Contingency
Waste
Water
Dust
Erosion and Sediment
Borrow and Explosives
Wildlife and Habitat
Aquatic Effects Monitoring
Program Design
Traffic Management
Public Access
Water Monitoring

Design Plans

Freeze
Underground
Non Hazardous
Waste Landfill
Site Infrastructure

Construction Plans

Freeze System for Area AR1
Underground Mine Working
Landfill

Quarry Permit

Area AR1

Fisheries Authorizations

Winter Drilling
Area AR1 Blasting
Baker Creek
Yellowknife Bay

Development Permit (City of YK)

Site-wide
Development Permit
Building Permit

Archeological Permit

Area AR1

What Were the Outcomes of the Actions?

GMOB notes that ongoing monitoring and inspections in 2020 identified no significant environmental issues.

The Project Team's timely and comprehensive response to the water licensing process is a positive sign for upcoming remediation activities. Similarly, the range of management and monitoring plans approved and under-development also indicates the Project Team's efforts to avoid negative environmental impacts and make the site safer both in the short and longer terms.

Concerns raised about the stability of Dam #1 and approaches to mitigation indicate that engagement, inspection, and monitoring systems are working effectively. The Project Team worked collaboratively with consultants and contractors to rapidly design and construct a freeze system to reduce the potential for environmental impacts.

Despite the Project Team's auditing and reporting commitments, GMOB did not see any substantive action on its 2019 recommendation to take every opportunity to reduce greenhouse gas emissions. Beyond reporting commitments, the Project Team largely ignored the recommendation.

What Are the Next Steps?

GMOB makes one recommendation and one commitment for the next steps.

GMOB recommends that the Project Team develop a short and long-term strategy that sets targets and commits to action to proactively reduce greenhouse gas emissions (2020-1)¹. To this end, the Project Team is encouraged to aspire to be a climate leader, role model, and advocate for federal climate action policies as set out by the Centre for Greening Government in the Treasury Board of Canada Secretariat.

GMOB will continue to offer suggestions to the Project Team for ways to reduce greenhouse gas emissions. For example, GMOB suggests investigating the potential of 'green' diesel in remediation activities.

Federal policies assert that the Government of Canada will ensure that Canada is a global leader in government operations that are net-zero, resilient and green.
www.canada.ca/en/treasury-board-secretariat/services/innovation/greening-government/strategy.html

¹ To facilitate monitoring, GMOB recommendations are numbered sequentially throughout this annual report (e.g., 2020-1, 2020-2).

SOCIO-ECONOMIC

What Did GMOB Expect?

GMOB expects northerners, including local Indigenous people, to benefit from the Giant Mine Remediation Project. Benefits are expected from business opportunities, employment, education, social impact mitigations, and involvement in decision-making. These benefits are expected:

1. in the short term during active remediation of the site, and
2. in the long term, through the care and maintenance of the remediated site.

The Giant Mine Remediation Project Team's *Socio-Economic Strategy, 2016-2021*, aims to ensure northern and Indigenous peoples benefit from the Project as much as possible within applicable federal policies. GMOB expects the strategy and supporting Socio-Economic Action Plan for 2018-2021 to guide activities to maximize benefits. In 2020, the Action Plan identified several initiatives, including:

- Forming a training coordination group and linking training providers, contractors, and the Project Team to strengthen and maximize local remediation capacity.
- Monitoring labour demand and barriers, and taking action to respond to risks and opportunities, including those impacting the participation of women.
- Engaging and preparing northern and Indigenous governments and businesses to respond to upcoming contracts.
- Exploring the need to form an Indigenous Benefits Plan Monitoring and Advisory Committee.

In 2019, GMOB recommended that the Government of Canada appoint an envoy. The envoy would be a champion for and lead initiatives that position northerners to reap long-term socio-economic benefits from the Project. GMOB expected a response to this recommendation in 2020.

What Actions Were Taken?

The Giant Mine Remediation Project Team's *Socio-Economic Strategy, 2016-2021*, sets out key performance indicators of anticipated impacts of employment, training, procurement, and other supporting actions. Targets for key performance indicators were initially finalized and approved in June 2020, then updated and released in August 2020. As the main construction manager, Parsons has operational responsibility for achieving the goals and targets set out in the Strategy and Action Plan.

The Socio-Economic Advisory Body is made up of senior management representatives from public and Indigenous governments and partners. The Advisory Body provides strategic advice to the Socio-Economic Working Group. It also champions the implementation of the *Socio-Economic Strategy, 2016-2021*. GMOB is an observer of the Advisory Body. The Socio-Economic Advisory Body met three times in 2020.

The Socio-Economic Working Group coordinates socio-economic activities. In 2020, the Working Group conducted an internal survey to assess the effectiveness of its work.

The Working Group met ten times in 2020 and held two workshops.

To better inform its oversight responsibilities, GMOB contracted an independent review of the Project Team's *Socio-Economic Strategy, 2016-2021*, *Socio-Economic Action Plan for 2018-2021*, and the socio-economic data collected to date. The review will:

- Identify needed adjustments to key performance indicators that will improve use, monitoring, and reporting;
- Offer recommendations related to specific socio-economic issues apparent from data released to date; and
- Provide advice and recommendations for renewing the socio-economic strategy.

GMOB will report on the independent review when it is completed.

The Project Team held a virtual social impact management workshop at the end of October 2020. The seventeen attendees were from local organizations with mandates for health and wellness. Members of the Socio-Economic Working Group also attended. The workshop provided information about the Project, the *Socio-Economic Strategy, 2016-2021* and *Socio-Economic Action Plan for 2018-2021*. Potential social impacts and possible monitoring and mitigation measures were also discussed.

In 2020, the Giant Mine Remediation Project contributed funds to the Yellowknives Dene First Nation's education and training agency, Dechita Nàowo. Funds were used to deliver Building Environmental Aboriginal Human Resources environmental training programs through Eco-Canada. The Yellowknives Dene First Nation also conducted a socio-economic survey with assistance from Queen's University. The survey was not directly related to the Giant Mine Remediation Project or funded by it.

No action was taken on GMOB's 2019 recommendation for an envoy to champion initiatives that position northerners to reap long-term socio-economic benefits from the Project.

What Were the Outcomes of the Actions?

The Project Team's *Socio-Economic Strategy, 2016-2021* and *Socio-Economic Action Plan for 2018-2021* provide a way forward to maximize socio-economic benefits and minimize negative social impacts to northerners. The Project Team's work on these plans and its support of the Socio-Economic Working Group are positive steps. GMOB commends the Socio-Economic Working Group for undertaking an internal survey to gauge its effectiveness.

GMOB finds that conclusive statements about the outcomes of the Project Team's socio-economic plans are not possible at this time. The reasons for this are inadequate data analyses and reporting in a manner that shows:

1. How and whether targets are being met, exceeded, or maximized, and
2. The nature of mitigations considered and/or implemented to maximize business and employment opportunities.

Building Environmental Aboriginal Human Resources is a collection of customizable environmental training programs for Indigenous Communities that braid Traditional Ecological Knowledge with Western Science.
www.eco.ca/beahr/

In addition to these limitations, it is unclear who is accountable for meeting targets and leading needed mitigations. The timeframe and methods for reporting on targets and mitigations are also unclear.

GMOB is concerned about the lack of vision and plans to leverage the potential of the Project to contribute to longer-term economic activity in the NWT. Specifically, GMOB questions:

1. How northerners can/will benefit from the care and maintenance of the site once remediation is completed, and
2. How expertise developed through remediation of the Giant Mine can be used as a springboard for evolving a northern remediation industry.

In both cases, forward-looking plans are the responsibility of the Government of the NWT and the Government of Canada.

GMOB appreciates the input of the organizations participating in the virtual social impact management workshop. The workshop detailed social impacts in health, housing and infrastructure, crime and violence, culture, money management and other infrastructure and services. Addressing these potential impacts will inform mitigations.

GMOB supports training initiatives that are run locally and informed by community and Indigenous perspectives. Dechita Nàowo's training efforts are an example. GMOB believes that local knowledge and perspectives incorporated into training initiatives enhance their effectiveness.

What Are the Next Steps?

GMOB makes two commitments and three recommendations to guide the next steps.

GMOB commits to:

1. Sharing its independent review of the Project Team's *Socio-Economic Strategy, 2016-2021*, *Socio-Economic Action Plan for 2018-2021*, and the socio-economic data collected to date. The review can help inform monitoring and reporting functions as well as future strategies and action plans.
2. Exploring strategies and socio-economic targets for leveraging opportunities associated with the Project over the long term. GMOB will bring the results of this investigation forward as a priority in its engagement with the Project Team, the Parties to the Environmental Agreement and the general public.

GMOB recommends that:

1. The Project Team uses the findings of GMOB's independent review to improve outcomes and reporting on its *Socio-Economic Strategy, 2016-2021*, as well as strategy renewals and updates (2020-2).
2. The Socio-Economic Working Group brings forth socio-economic considerations identified in the Perpetual Care Plan framework into the goals of the Perpetual Care Plan (2020-3). This will require the Working Group to initiate and encourage the full participation of all the Parties to the Environmental Agreement in discussions about the Plan.
3. One of the goals of the Perpetual Care Plan be to ensure that northerners have central roles in the care, maintenance, and management of the Giant Mine site into the future (2020-4).

GMOB looks forward to the Socio-Economic Working Group's next steps to follow-up on areas for improvement identified in its survey. These include:

- More focused communication about the Working Group's input.
- Meeting agendas with specific decision points.
- An accountability framework to track work items, task assignments, and commitments.
- A brief description of each member and their responsibilities.
- More focused consideration of who should participate in the Working Group.

GMOB also looks forward to the outcomes from the Yellowknives Dene First Nation's socio-economic research focused on Giant Mine, planned for 2021.

ENGAGEMENT

What Did GMOB Expect?

GMOB expects that at any time, local communities and other northerners can learn about and express their thoughts on the remediation and care of the Giant Mine site. To this end, GMOB expects the Parties to the Environmental Agreement and the Project Team to meaningfully and regularly communicate and engage with each other. GMOB has the same expectations for communications and engagement with directly affected local communities, the general public, and special interests such as community, commercial, and academic organizations.

What Actions Were Taken?

There were many engagement initiatives in 2020. Examples include:

- Establishing the Aquatic Advisory Committee to discuss reclamation and monitoring of Baker Creek and Back Bay.
- Reviewing draft technical and plain language versions of the *Quantitative Risk Assessment Report* with the Parties of the Environmental Agreement to respond to questions and concerns.
- Holding a working session with stakeholders to discuss the framework for the Perpetual Care Plan.
- Regular meetings of the Yellowknife Health Effects Monitoring Program Technical Committee. The Committee released various study results and began the development of an interactive communications plan to engage local communities.

In August 2020, a survey was tested as part of the *Hoèla Weteèts'eèdeè: Overcoming Hardships from Giant Mine* study. The study team finalized applications for ethics approvals, a step required for studies involving human participants. Once ethic approvals are granted the study will be launched in 2021. This study will rely heavily on community engagement.

A Giant Mine webpage was added to the City of Yellowknife's website. The webpage describes who from the City is involved with remediation activities and which working groups the City sits on as an active partner. The webpage also provides information on GMOB, a brief description of regulatory processes related to remediation, City actions following regulatory approvals, and a socio-economic tab marking City participation.

What Were the Outcomes of the Actions?

GMOB supports the Project Team's work to find ways to maintain quality engagement processes despite the limitations posed by the COVID-19 pandemic.

GMOB finds that the Project Team's retention of a dedicated engagement manager has improved the quality, meaningfulness, and accessibility of public engagement and communication activities. It is noteworthy that the Project Team has shown responsiveness to concerns raised in engagement sessions. Further, the Project Team now routinely addresses issues related to effective participation in engagement processes. These issues

The Yellowknife Health Effects Monitoring Program Technical Committee is led by Dr. Laurie Chan from the University of Ottawa and supported by the Project. The overall objective of the Health Effects Monitoring Program is to design and implement a broad health effects biomonitoring program for the population of Yellowknife, Ndilq, and Dettah. The Monitoring Program focuses on arsenic and other contaminants of potential concern such as antimony, cadmium, lead, manganese, and vanadium, which might result from the Project. The Monitoring Program determines current or baseline levels of arsenic exposure along with other metals before remediation. During remediation, new monitoring data will be collected and compared to the baseline to ensure that arsenic levels are not increasing due to work being done at Giant Mine.

Hoèla Weteèts'eèdeè:

Overcoming Hardships from Giant Mine is led by Wilfrid Laurier University's Dr. Ketan Shankardass with the Yellowknives Dene First Nation and a technical advisory committee. The study measures how Giant Mine affects the stress and resiliency of people who live in the Yellowknife area.

include the need for pre-meetings, plain language materials, and consideration of the capacity and funding needs of the Parties to the Environmental Agreement. An example of improvements in engagement activities is the Project Team's pre-engagement of the Parties in reviewing management and monitoring plans prior to submission to the Mackenzie Valley Land and Water Board.

While GMOB finds that public engagement and communications have improved, the Project Team has not provided any indicators to assess the effectiveness of these activities. This impacts GMOB's ability to oversee or report on the effectiveness of engagement activities, including:

- The extent of public awareness of the Project or opportunities to voice thoughts and concerns;
- Knowledge of the current reclamation plans and future site management plans; and
- Enabling residents to express their interests regarding options for future land uses near the Giant Mine site.

What Are the Next Steps?

GMOB makes one commitment and two recommendations to guide the next steps.

To inform public engagement and communication activities and oversight, GMOB is committed to conducting a public survey in 2021. The survey will collect information on public satisfaction with, and effectiveness of engagement and communication activities of the Project Team, GMOB, and the Parties to the Environmental Agreement. The survey will also ask the public about their knowledge of the Giant Mine Remediation Project, various activities, and opportunities to be involved.

To improve oversight of public engagement and communications, **GMOB recommends** that the Project Team identify indicators to enable the effectiveness of these activities to be measured **(2020-5)**.

GMOB welcomes the City of Yellowknife's Giant Mine webpage. Ongoing updates and improvements will be needed to keep pace with upcoming remediation activities. **GMOB recommends** that the City make the webpage interactive to enable Yellowknife residents to provide their input on the Project **(2020-6)**. This will enhance the information that the City brings forth to Project-related processes.

"Three principles have guided our (City of Yellowknife) involvement: A reclamation that will result in a healthy and safe environment that is valuable to our city. Ensuring a clear and transparent plan to guide the reclamation. Opportunity for northerners to participate in the remediation, ensuring that it benefits our citizens."
www.yellowknife.ca/en/city-government/giant-mine-socio-economic-action-plan.asp?_mid_=33043

RECONCILIATION

What Did GMOB Expect?

GMOB expects the remediation and care of Giant Mine to be an opportunity for reconciliation with local Indigenous people, particularly the Yellowknives Dene First Nation and the North Slave Métis Alliance. To this end, GMOB expects to see reconciliation considered in Project Team decisions.

GMOB also expects the Government of Canada to respond to repeated requests and previous recommendations for an apology and compensation to the Yellowknives Dene First Nation. The absence of an apology and compensation continues to influence every conversation and decision about the Project.

GMOB understands 'reconciliation' as to repair the legacy of Giant Mine and advance the interests of those harmed by past Giant Mine activities.

What Actions Were Taken?

In day-to-day activities, GMOB deliberately tried to identify opportunities for reconciliation, as well as challenges and ways to overcome them. At its annual meeting, GMOB encouraged discussion of efforts toward reconciliation with the Parties to the Environmental Agreement.

In 2020, Crown-Indigenous Relations and Northern Affairs Canada funded the Yellowknives Dene First Nation to conduct research to support its participation in discussions about an apology and compensation. The research report was released in December 2020. Meetings between these parties are planned for 2021. In addition, the Yellowknives Dene First Nation launched a petition and organized a public protest to seek support for an apology and compensation.

What Were the Outcomes of the Actions?

GMOB finds that understanding of reconciliation as it applies to the Project is improving. In fact, the existence of GMOB itself is now seen as an act of reconciliation in both its functioning and its application of a 'reconciliation lens' to its work. GMOB notes that the principle of reconciliation is beginning to appear in Project Team activities and those of the various Project Team committees.

GMOB supports Crown-Indigenous Relations and Northern Affairs Canada and the Yellowknives Dene First Nation in their continuing work toward a formal apology and compensation. Positive results from this work will improve Project outcomes in both the short and long term.

What Are the Next Steps?

GMOB offers no recommendations for the next steps for reconciliation. However, GMOB will continue to:

1. Focus on reconciliation in its day-to-day activities in 2021 and beyond.
2. Monitor responses to previous and current recommendations with respect to honouring the principle of reconciliation.

Over the past five years, GMOB has overseen the Project Team's care and maintenance of the Giant Mine site in preparation for active remediation. Now GMOB looks forward to overseeing remediation work.

PROJECT MANAGEMENT AND PLANNING

What Did GMOB Expect?

GMOB's oversight of project management and planning activities takes an 'exceptions based' approach. This means that GMOB responds to noticeable deviations or changes in scope, schedule, or budget and seeks answers to three questions:

Scope → Did the Project Team implement what it planned?

Schedule → Were any substantive changes, including slippage, made to the schedule?

Budget → Were budget targets met?

What Actions Were Taken?

Two main types of project management and planning actions occurred in 2020:

1. Care and maintenance: The Project Team continued to implement these activities at the Giant Mine site.
2. Regulatory activities: The Project Team successfully obtained both the Type A Water License and Land Use Permit through the Mackenzie Valley Land and Water Board.

A quantitative risk assessment is a requirement of the Mackenzie Valley Environmental Impact Review Board's 2013 *Report of Environmental Assessment for the Giant Mine Remediation Project*. The assessment is intended to inform the Closure and Reclamation Plan and Perpetual Care Plan. In 2020, the Project Team shared draft technical and plain language versions of the *Quantitative Risk Assessment Report* with the Parties to the Environmental Agreement. A series of web-based meetings followed the release of the draft reports. These meetings allowed the Parties to ask questions of the Project Team and the authors of the Report. The *Quantitative Risk Assessment Report* will be finalized in 2021.

What Were the Outcomes of the Actions?

GMOB saw no exceptions in the scope, schedule, and budget of project management and planning activities in 2020.

GMOB commends the Mackenzie Valley Land and Water Board, the Project Team, and all intervenors on their work to ensure that the water licence process was completed on schedule and the land use permit secured. With these authorizations in hand, the Project Team can now move from Project care and maintenance to active remediation. This is a major milestone.

The Type A Water License sets out the schedule for submission of key design, management, monitoring, and engagement plans. These plans will guide remediation activities. The scheduled plans and the final *Quantitative Risk Assessment Report* will inform GMOB's future expectations for remediation and post-remediation activities.

What Are the Next Steps?

GMOB offers no recommendations for the next steps for project management and planning.

In 2021, GMOB will shift its oversight focus from preparations for remediation to monitoring the progress of remediation.

Once the *Quantitative Risk Assessment Report* is finalized, GMOB will monitor its integration into project design plans and in the development of management and monitoring plans.

COMMUNITY HEALTH AND WELLNESS

What Did GMOB Expect?

GMOB expects that local residents should have a reasonable understanding of the:

- Closure and Reclamation Plan and its implications for future land use.
- Current and future risks to public health related to dust, runoff, construction, and contaminated soils associated with the area.
- Activities that are safe to pursue in the area during and after remediation for example, hiking, fishing, and use of the Giant Mine boat launch.

GMOB also expects that local residents should experience minimal negative effects from the Project on their way of life.

What Actions Were Taken?

In 2020, the Health Effects Monitoring Program study continued on schedule. Results are being analyzed and will be published in plain language materials.

As discussed previously (see Engagement), the stress study, now called *Hoèla Weteèts'eèdeè: Overcoming Hardships* from Giant Mine will be launched in 2021. This study was required by the Giant Mine Project Environmental Agreement but has been delayed for several reasons, including the COVID-19 pandemic.

A risk assessment on occupational exposure for highway workers was completed. The offsite Human Health Effects and Risk Assessment project is underway.

The Project Team continues to inform the public of risks associated with use of the area through increased signage and public advisories. An agreement was reached whereby the Project Team will ensure that residents have safe access to a functional boat launch at the Giant Mine site throughout remediation.

What Were the Outcomes of the Actions?

GMOB finds that the various studies, agreements, engagement, and communications activities are creating more awareness and local involvement in the Project. Still, GMOB remains concerned about the extent of public understanding of the Project. GMOB is also concerned about the success of the Project Team's efforts to balance public opinion and technical information in its decision-making processes. Two examples of these concerns are:

1. Local residents continue to fear exposure to arsenic in tailings dust from the Project site. This fear seems to exist even though arsenic in the tailings is from arsenopyrite and calcine minerals, not arsenic trioxide. Concerns about tailings dust were evident in October 2020 when strong winds caused dust from the site to move across Back Bay toward the mouth of the Yellowknife River.
2. The Project Team does not intend to remediate the vast majority of contaminated undisturbed soils, meaning that high arsenic levels will remain in the soil both on and offsite. Local residents do not seem to fully understand that the Project Team intends to use fencing combined with public information campaigns to control access and manage associated risks of contaminated soils.

What Are the Next Steps?

GMOB offers one recommendation for the next steps for community health and wellness.

GMOB recommends that the Project Team continue to improve engagement and communications activities to ensure that local people:

- a. Are not experiencing unnecessary stress or fear due to dust coming off the Giant Mine site, and
- b. Understand the three main types of site remediation standards - residential, industrial, untouched – and how they apply to the site [\(2020-7\)](#).

As discussed previously (see Engagement), GMOB plans to survey local people in 2021 to gain a better understanding of public awareness of the Project Team's remediation plan and post-remediation risks. Survey data will inform GMOB's work with the Parties to the Environmental Agreement to improve awareness of the risks and assumptions associated with managing highly contaminated soils as outlined in the approved Closure and Reclamation Plan. Awareness activities could include print and social media campaigns, surveys, and workshops.

The Development of Options for Consideration for Long Term Funding for Giant Mine (July 2019) concluded that if government appropriations can be committed for the long-term, for instance through an expanded and updated Northern Abandoned Mine Reclamation Program with a longer time horizon, it could provide a stable source of funding for the Giant Mine Remediation Project (Deloitte LLP, p.50).

LONG TERM PLANNING

What Did GMOB Expect?

The Closure and Reclamation Plan requires active maintenance of the Giant Mine site in perpetuity. For this reason, the Environmental Agreement requires the development of a Perpetual Care Plan to be implemented upon completion of remediation. GMOB anticipates meaningful public engagement and discussion of the Plan. GMOB expects long term planning to serve as a springboard for the development of a northern remediation industry.

GMOB expects a guarantee of funds from the Government of Canada and the Government of the Northwest Territories to ensure that the costs of perpetual care and maintenance of the site are available in perpetuity.

GMOB expects that a site-specific land use plan will be developed and implemented.

What Actions Were Taken?

A task group of members from each of the Parties to the Environmental Agreement continues to work on the Perpetual Care Plan. A framework for the Plan was completed in 2020 and was reviewed by GMOB. The framework will inform a request for proposals to develop the Perpetual Care Plan.

In accordance with the measure set out by the Mackenzie Valley Environmental Impact Review Board, Crown-Indigenous Relations and Northern Affairs Canada released a report on long-term funding options in July 2019. No specific actions were taken in 2020 with respect to securing guaranteed funding for the perpetual care and maintenance of the site. Similarly, no specific actions were taken toward developing a site-specific land use plan.

What Were the Outcomes of the Actions?

The framework and the steps toward contracting expertise to develop the Perpetual Care Plan marks important progress toward a final plan for post-remediation care and maintenance. The Plan itself is expected to be completed in 2021.

Lack of action on funding and land use planning issues means:

- There is no guarantee of funding for care and maintenance of the site after remediation.
- There is no consensus on future land uses at and around the site, and no party has stepped up to lead a land-use planning process.

What Are the Next Steps?

GMOB provides no recommendations but makes three commitments for the next steps for long-term planning.

1. GMOB will continue to advocate with the responsible governments for guaranteed funding to implement the Perpetual Care Plan.
2. GMOB will seek input through its public survey (see Engagement) about future uses of the Giant Mine site. This input will inform GMOB's discussions with all the agencies and organizations with interest in future use of the site.
3. GMOB will continue to encourage consideration of northern skills and capacities developed through the Project as foundational elements of a new northern remediation industry.

Why is a more permanent solution needed?

Freezing the arsenic trioxide dust is not a permanent solution. The approach involves a technology (thermosyphons) that require perpetual care to ensure the arsenic trioxide remains frozen.

While the method will be effective for the foreseeable future, systems requiring perpetual care eventually fail. When this occurs, the arsenic trioxide will eventually thaw and impact 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 impacts of climate change.

GMOB RESEARCH PROGRAM

GMOB's research program has three parts – state of knowledge, directly funded research, and consideration of proposals from independent researchers. The research program is briefly discussed here in terms of:

Expectations → What did GMOB expect?

Actions → What actions were taken?

Outcomes → What were the outcomes of the actions?

Next Steps → What are the next steps?

What Did GMOB Expect?

237,000 tonnes of arsenic trioxide dust are currently stored in fourteen underground chambers at the Giant Mine site. After evaluating a range of technical solutions to manage potential environmental impacts associated with the dust, the Project Team determined that its preferred method was to permanently freeze the dust and the rock around each underground chamber.

The Environmental Assessment of the Giant Mine Remediation Project concluded that the 'frozen block' method was the most appropriate technical solution currently available. However, it was also determined that freezing should not be viewed as the permanent solution and that emerging technologies should continue to be investigated. As a result, Article 7 of the Giant Mine Remediation Environmental Agreement tasks GMOB with supporting research into technical approaches that could serve as a permanent solution.

What Actions Were Taken?

Actions undertaken by GMOB in 2020 on each part of its research strategy include:

1. State of knowledge reviews:

In October 2020, GMOB contracted the Wolfson Centre for Bulk Solids Handling Technology, the University of Greenwich, for a high-level state of the knowledge report on current extraction technologies for underground arsenic trioxide. This was a preliminary review that will be used to inform future decisions regarding research into arsenic trioxide extraction methods.

2. Directly funded research:

Throughout 2020, GMOB continued to fund multiple arsenic trioxide stabilization research projects through the Toward Environmentally Responsible Resource Extraction Network (TERRE-NET). The research projects include:

- i. Assessing the chemical and physical properties of the arsenic dust;
- ii. Chemically changing the arsenic dust into a less toxic and more stable sulphide mineral;
- iii. Mixing the arsenic dust into a cement paste backfill; and
- iv. Turning the arsenic dust into a type of glass.

A summary of the four TERRE-NET research projects and progress to date are described in Appendix B.

GMOB entered into an agreement with Dundee Sustainable Technologies for the provision of glass samples for research project #4. Dundee Sustainable Technologies reported that vitrification of the glass samples for TERRE-NET assessment would be completed in early 2021.

GMOB also held meetings with Crown-Indigenous Relations and Northern Affairs Canada, and TERRE-NET to develop a plan to extract additional arsenic trioxide samples for use in future research.

3. Consideration of proposals from independent researchers.

In late 2020, GMOB assembled an independent expert panel to assist with the review of unsolicited proposals potentially relevant to GMOB's research mandate. The first meeting of the expert panel in December 2020 focused on orientation and developing a proposal assessment methodology.

What Were the Outcomes of the Actions?

Throughout 2020, arsenic trioxide samples and tailings were shipped to TERRE-NET researchers as follows:

- Dundee Sustainable Technologies.
- University of Waterloo.
- Université du Québec en Abitibi-Témiscamingue.
- University of Alberta.

Progress on the four TERRE-NET research projects has been slower than expected due to challenges associated with the COVID-19 pandemic, including the temporary closure of TERRE-NET laboratories. Nevertheless, findings in 2020 are encouraging and will inform GMOB's research program in the future.

The establishment of the independent expert panel and the development of methods to assess unsolicited proposals will enable GMOB to more actively encourage the submission of relevant research proposals.

What Are the Next Steps?

In 2021, GMOB will explore the state of knowledge on extraction technologies in more depth. This investigation will build on the Giant Mine State of Knowledge Review: Arsenic Dust Management Strategies Report (August 2017). It will complement the research being done by TERRE-NET on arsenic trioxide stabilization methods.

In 2021, GMOB and TERRE-NET members will continue to seek additional research funding through the Natural Sciences and Engineering Research Council of Canada and other sources.

GMOB will continue to invite independent research proposals and possible linkages with other expert groups. As proposals are submitted to GMOB, the independent expert panel will convene periodically to evaluate whether proposals warrant consideration by GMOB.

APPENDICES

APPENDIX A

The Status of Previous Recommendations

The status of previous recommendations is assessed as follows:

- **Addressed:** Actions were taken to implement the recommendation. It may be complete, or our evaluation of progress shows that work is on track to complete the recommendation in future. This doesn't mean it is the end of the story on that topic or that we won't continue to keep an eye on it (e.g., how effective is the implementation?)
- **In Progress:** Actions were taken to implement the recommendation, but there is not enough progress to know if it will be completed in future.
- **Not Addressed:** The party to whom the recommendation was directed either did not agree or did not act on the recommendation.
- **Not Addressed and No Longer Relevant:** GMOB concludes the recommendation is no longer relevant.

YEAR and RECOMMENDATION #	TOPIC	STATUS
Environment		
2016-7A/B 2017-10 2018-9	Improve integration, monitoring, and reporting on environmental activities.	In Progress: Management and monitoring plans have been or are being prepared.
2019-9	Reduce greenhouse gas emissions where feasible, consider offsets and report annually.	In Progress: Commitments have been made to annual reporting and reductions where feasible, but these fall short of federal government policies.

Socio-Economic		
2016-11	Apply a structured framework from a community health and well-being perspective to evaluating social, economic, and cultural aspects of the Project.	Not Addressed: Improvements in public engagement and communications, especially for various studies and plans, indicate that this framework isn't needed.
2017-1 2018-1	Develop and implement a socio-economic strategy to ensure northerners, particularly local Indigenous people are positively impacted by the Project.	Addressed: The strategy developed has an implementation plan to guide monitoring.
2019-1	Appoint a special envoy to work with the various interests to develop and implement an integrated economic strategy.	Not Addressed: The responsibility for appointing an envoy and the need for this position requires further discussion.

YEAR and RECOMMENDATION #	TOPIC	STATUS
Engagement		
2016-3A 2017-2 2018-3	Give priority to engagement and communications with the public and Parties to the Environmental Agreement.	In Progress: Public engagement and communications continue to improve.
2016-9 2017-3 2018-2 2019-2	Ensure all Parties to the Giant Mine Remediation Project Environmental Agreement have adequate resources to fully participate in all aspects of the Project.	Addressed: Proposal-based funding is addressing the resource needs of the various Parties.
2018-4 2019-3	More information and engagement from the City of Yellowknife that ensures citizens know about social and economic benefits.	In Progress: A City of Yellowknife webpage has been launched, but more interactive work is needed.

Reconciliation		
2016-3B 2017-4 2018-5 2019-4	Respond to the requests from the Yellowknives Dene First Nation for an apology and compensation.	In Progress: Preparatory work will inform discussions in 2021 about an apology and compensation.

Project Management and Planning		
2016-2	Develop performance measures to enable monitoring of the Project.	In Progress: The Project Team continues to update and refine performance measures.
2016-4	Develop a Tradition Knowledge Strategy.	Not Addressed: The Governmentt of the NWT funded the Yellowknives Dene First Nation Traditional Knowledge Study in 2017-18, but no strategy has been released.
2016-5A	Identify foreseeable additional advanced remedial work required prior to full remediation.	Addressed: Achieved through ongoing monitoring and responsiveness to change.
2016-5B	Develop, monitor, and report on a risk profile of the site.	Addressed: Ongoing monitoring and communication of trends in the risk profile.
2016-6	Identify and mitigate delays in remediation planning.	Addressed: Regulatory approvals mean active remediation is beginning in 2021.
2016-10	Consider options to a government-driven and controlled approach to the Project.	Not Addressed: No longer relevant.
2017-5 2018-6 2019-5	Provide a five-year project plan and critical path to link and integrate aspects of the Project.	Not Addressed: No longer relevant.
2017-6 2018-7	Describe the Main Construction Manager's responsibilities.	Addressed: Responsibilities are articulated.

YEAR and RECOMMENDATION #	TOPIC	STATUS
Project Management and Planning CONTINUED		
2017-7	Provide results of Independent Peer Review Panel on remediation and stabilization of arsenic dust.	Addressed: The Panel has provided results on one occasion.
2017-8 2018-8	Complete measures five and six in the Mackenzie Valley's Environmental Impact Review Board's Report of Environmental Assessment.	In Progress: Integration of Quantitative Risk Assessment work is underway.
2017-9	Mackenzie Valley Land and Water Board to consider interim water license.	Not Addressed: No longer relevant

Health and Wellness		
2016-8 2017-12 2018-11 2019-7	Deal with offsite contamination issues, including land use, safety, public health and environmental concerns.	In Progress: Risk assessment work and improved public engagement and communications contribute to addressing these legacy issues.
2016-12 2017-11 2018-10	Communicate effectively on studies that address arsenic contamination and risk and health studies.	In Progress: Improved public engagement and communications are beginning to address these issues.
2018-4 2019-3	The City of Yellowknife continues to improve the engagement of local residents in all aspects of the Project.	In Progress: A City of Yellowknife webpage has been launched, but more interactive engagement is needed.

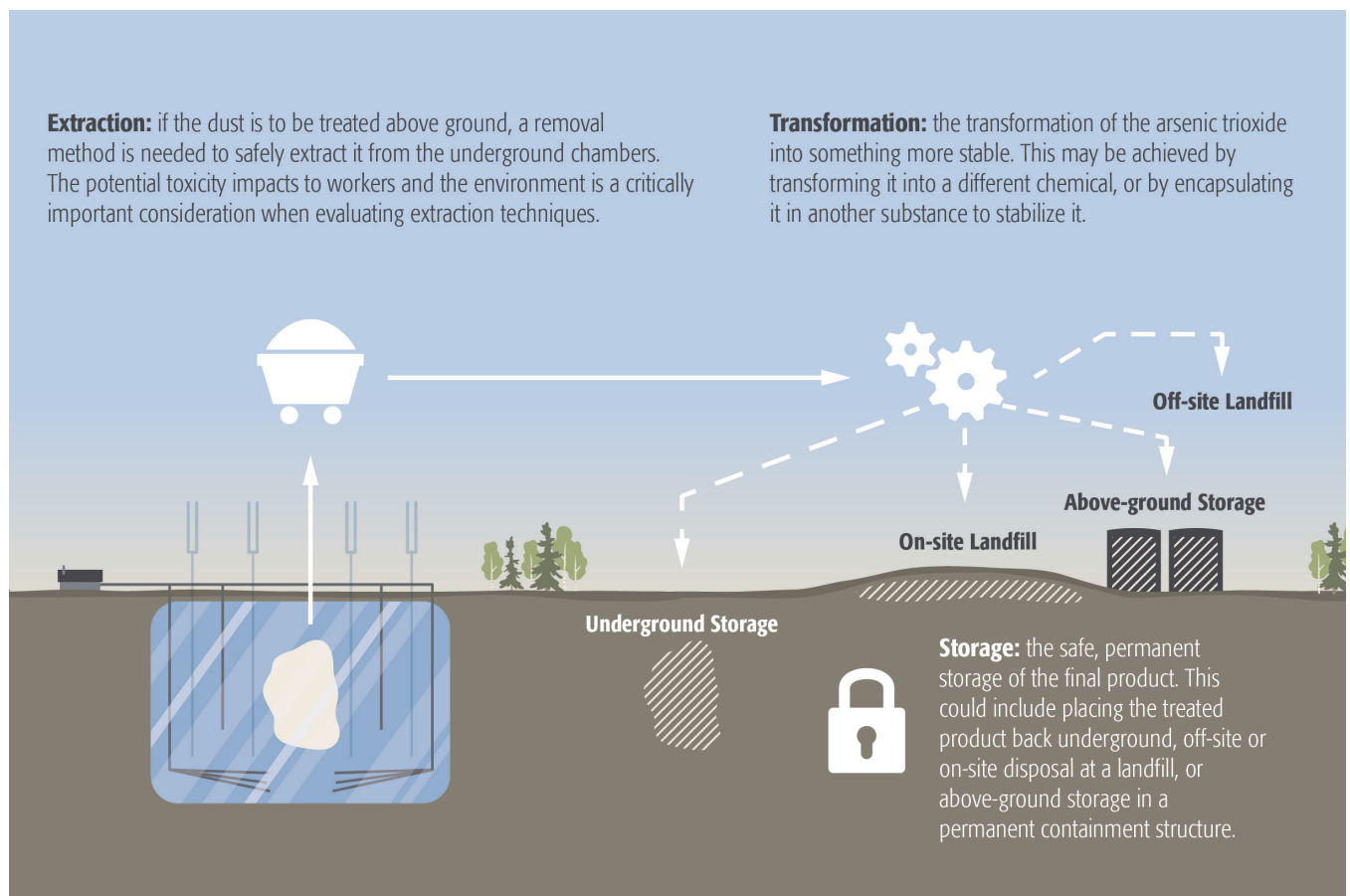
Long-Term Planning		
2017-8	Complete measure six in the Mackenzie Valley's Environmental Impact Review Board's Report of Environmental Assessment.	Addressed: However, outcomes are unsatisfactory.
2019-6	Use legislation to guarantee long-term funding.	Not Addressed: No progress has been made on long-term funding.
2019-8	Develop a land-use plan for the site.	Not Addressed: No progress has been made to develop a land-use plan.

APPENDIX B

Overview of GMOB Funded Research

Article 7 of the Giant Mine Remediation Environmental Agreement tasks GMOB with undertaking research into technical approaches that do not require constant and forever care and maintenance. As shown in the figure below, a permanent solution must address three key challenges: extraction of the dust, transformation to a much less toxic material, and safe storage of the final product.

Key Challenges to Address for a Permanent Solution to Arsenic Trioxide Dust Stored Underground at Giant Mine



In 2018, GMOB partnered with a consortium of experts referred to as TERRE-NET. TERRE-NET is an integrated network of leading academics from universities across Canada who work toward managing mine tailings and mitigating contamination. One of their goals is to find sustainable ways to deal with environmental challenges associated with the resource sector, including the management of hazardous mine wastes. These experts work in various scientific and social science fields. TERRE-NET is headquartered at the University of Waterloo. At this time, GMOB has asked TERRE-NET to focus on technology that will transform the arsenic trioxide into a stable, much less toxic material. This approach is the most efficient use of GMOB's resources as there is little other stabilization research taking place elsewhere in the world that focuses specifically on arsenic trioxide.

A summary of the four TERRE-NET research projects and progress to date follows.



PROJECT 1

Understanding the important chemical properties of the arsenic trioxide dust from Giant Mine

Why this is important? There is evidence of important differences in the composition of arsenic trioxide dust that was created over the many years that Giant Mine operated. The differences are due to differences in the rock that was mined and the exact conditions used for roasting the ore. When a way to treat and stabilize the arsenic trioxide dust is found, it is necessary to ensure that it will work for all the dust stored across the site, regardless of these differences.

Research Team: University of Saskatchewan and Queen's University

Progress to date: The research confirms that toxic dust contains many substances other than arsenic trioxide. The additional substances continue to be identified by chemical composition and properties, including structure or solubility. Identification of the various substances will inform other research projects focused on ways to stabilize arsenic trioxide.

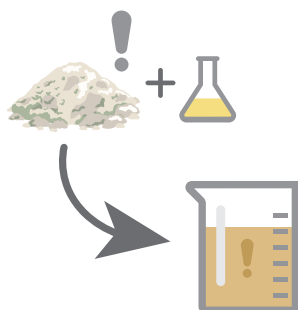
PROJECT 2

Chemically changing the arsenic trioxide into a less toxic material that doesn't dissolve as easily in water

Why this is important? While freezing the arsenic trioxide dust stops it from entering local ground or surface water sources, it does not permanently change it into a non-toxic material. The goal of this project is to alter the form of arsenic from arsenic trioxide to arsenic trisulphide. Arsenic trisulphide is much more stable in the environment than arsenic trioxide because it doesn't dissolve as easily in water.

Research Team: University of Ottawa

Progress to date: Researchers initially hoped that it would be possible to transform arsenic from the trioxide form to the trisulphide form without having to dissolve the dust in water first. Unfortunately, researchers have confirmed that it will be necessary to dissolve all the arsenic trioxide dust in water before chemically treating it with hydrogen sulphide gas and forming the less toxic arsenic trisulphide. Work is underway to understand the optimal conditions for the chemical reaction and for possible ways to produce hydrogen sulphide gas onsite if this method becomes feasible.



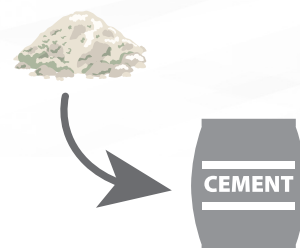
PROJECT 3

Stabilizing arsenic trioxide dust by mixing it with cement

Why this is important? More than 20 years ago, some research was completed to look at the feasibility of stabilizing the arsenic trioxide dust by mixing it with cement. Results from that time were variable, and further research was discontinued due to the acceptance of the frozen block method of storage. This research project revisits this idea with a focus on ways to make a cement-based paste backfill with arsenic trioxide dust. If stable, the paste could be deposited into the underground of the mine.

Research Team: University of Alberta and the Université du Québec en Abitibi-Témiscamingue.

Progress to date: Research to date has focused on making samples of paste backfill with different ratios of arsenic trioxide dust and cement. The research team has also tried different conditions for curing the cement mix to maximize stability. In the coming year, researchers will test the stability and leaching characteristics of the different cement mixtures.



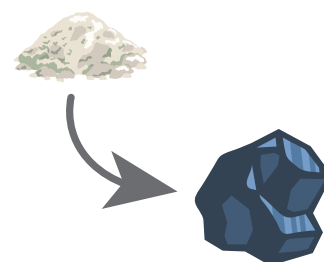
PROJECT 4

Transforming arsenic trioxide dust into a type of glass

Why this is important? The 2017 State of Knowledge Report that GMOB commissioned identified a promising method of stabilizing arsenic trioxide by transforming it into a type of glass through a process called vitrification. This method is being used in other countries to stabilize arsenic trioxide dust produced from mining. With the understanding that the exact composition of arsenic trioxide dust varies from mine site to mine site, GMOB thought it would be useful to have samples of the Giant Mine arsenic trioxide vitrified and then have researchers at TERRE-NET test the long-term stability of the product. The vitrification of the dust is being performed by a Canadian company called Dundee Sustainable Technologies.

Research Team: University of Waterloo.

Progress to date: During 2020, Dundee Sustainable Technologies initiated lab tests to vitrify arsenic trioxide samples. The vitrification work will be completed early in 2021. Subsequently, TERRE-NET's researchers will begin to analyze the vitrified product. This work will include tests that will help us understand if the material is stable over time or if it releases arsenic.



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