Innovative Process for Stabilizing the Subsurface at the Giant Mine Site

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Outline of Presentation

• Brief history of the site and the Giant Mine Remediation Project (GMRP)
• Advanced Site Stabilization Plan (SSP)
• Innovative approach to stabilizing a subsurface stope (B1-18 Complex)
• Challenges and Lessons Learned
• Questions / Comments
Giant Mine Remediation Project

• Created in 1999 – Agreement between the Federal Government and GNWT

• Main objectives include:
  – Minimize public and worker health and safety risks
  – Minimize the release of contaminants from the site to environment
  – Remediate the site in a manner that instills public confidence
  – Implement an approach that is cost-effective and robust

• One of the main elements of the Remediation Plan includes:

  “Stabilizing stopes and voids”
Advanced Site Stabilization Plan (SSP)

- The plan was developed to address urgent on-site risks in order to protect human health and safety as well as the environment
- Water Licence and Land Use Permit were approved by the MVLWB in March of 2013

Underground Stabilization

- Crown pillar and some bulkhead weakening and beginning to fail
- Subsidence (sinkholes) around pits and public highway
  - B1-18 Non-arsenic stope complex
How do we then stabilize the subsurface?

• Logical solution is to backfill these spaces with rock or aggregate

  BUT........we had many constraints to factor into the decision including:

1. Not enough rock material to use and access to the UG is limited
2. Hydraulic fill is uncontrollable
3. Baker Creek flows in and around the major areas that require this stabilization
4. Tailings are far from the area requiring fill
5. Surface space for setup was limited
6. Multiple pour locations with varying volume requirements
7. Work needed to be done immediately due to the time of year and funding

MOBILE PASTE BACKFILL PLANT
Stabilizing the Subsurface - General Backfill Plan

- Backfill type and approach
- Preparatory Work
- Backfill Design and Field Testing
- Backfill Production and Design for B1-18 Non-Arsenic Stope
Stabilizing the Subsurface - Backfill Type and Approach

- Tailings, which is finely crushed rock and is the main byproduct of milling gold ore, was proposed as the primary backfilling material.
- It is abundant on surface in the existing tailings ponds and is also present in large quantities in the underground as it was used during historical mining to stabilize voids.
- *Paste* tailings backfill was chosen to backfill the stope voids.
Definition of Paste

- **Paste** backfill, like hydraulic fill, contains sand to silt sized particles of aggregate, water and usually binder, if strength is required.
- Sources of aggregate can be naturally occurring such as glacial till, or man-made such as tailings.
- The solids content or pulp density is generally between 70-85% but can be higher or lower.
- A true paste backfill will not segregate, is pumpable over considerable distances in a pipeline, and produces very little bleed water.
Stabilizing the Subsurface - Preparatory Work
Lab and fieldwork to develop paste mix designs.
Minimum Unconfined Compressive Strength of 100 kPa for bulk stope fill to prevent liquefaction and associated underground hazards to mine personnel.
Stabilizing the Subsurface - Paste Production and Distribution

Example work flow
Example surface equipment distribution
A congested work site
Monitoring of paste distribution in the underground
Paste being delivered and a filled void
Backfill strength profiles
Daily Volumes and Average Flowrates

Flowrate (m³/hr)

Volume (m³)

TRK 1 (m³)

TRK 2 (m³)

Average Flowrate (m³/hr)

57.6m³/hr Final Avg. Flowrate

Target Production Flowrate
Temperature is almost equivalent to timeline October - December

- Learning curve, getting faster
- Fighting cold temperature
Challenges and Lessons Learned - Unique Operating Environment

- Backfilling targeted voids in an abandoned mine is challenging
- Limited knowledge of certain areas of the UG workings
- Fluctuating daily backfill sequencing - “If then else” strategies
- Site congestion
- Paste production in cold winter conditions
Questions / Comments