Minto Mine – Operational Experiences Managing Waste to Reduce Potential for Acid Rock Drainage

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Capstone – Our Global Operations

**Producing Mines**

- **Minto** (Yukon, Canada)
- **Pinto Valley** (Arizona, USA)
- **Cozamin** (Zacatecas, Mexico)

**Development Pipeline**

- **Kutcho** (British Columbia, Canada)
- **Santo Domingo** (Region III, Chile)

[Map showing the locations of the mining operations with Vancouver Head Office marked.]
Capstone - Portfolio

**PRODUCTION**

Three operating mines
Production assets located in stable geographies in the Americas producing ~230 M lbs of copper annually.

- **Pinto Valley**
  Arizona, US
  130 - 150 M lbs copper\(^1\)

- **Cozamin**
  Zacatecas State, Mexico
  44 M lbs copper\(^2\)

- **Minto**
  Yukon, Canada
  41 M lbs copper\(^2\)

**DEVELOPMENT**

Growth project
Disciplined approach to construction, offering significant growth in planned copper production over next five years.

- **Santo Domingo**
  Region III, Chile
  CS 70%; KORES 30%

**EXPLORATION**

Portfolio
Early-stage base metals exploration properties.

- **Chile**
- **Canada**
- **Mexico**

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2. ±5%; see news release dated December 19, 2012.
Minto Mine

- High-grade copper mine NW of Whitehorse (~40 km south of Pelly Crossing)
- Stream sediment sampling program drew Asarco Inc. to stake claims in 1970
- Sherwood Copper Corp. purchased Minto Explorations Ltd. in 2005
- Commercial production achieved in October 2007
- Began its mine life with one pit, six to seven year mine life
- Exploration success has extended the project life
Minto Mine

- The mine is located on Selkirk First Nation “Category A” lands

- Co operation agreement was originally signed in 1997
  - Renewed in 2009

- As land owners, Selkirk engaged in most aspects of site management and development
Minto Mine

Open pit and Underground mine in Yukon, Canada

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<table>
<thead>
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<tbody>
<tr>
<td>Daily production rate (tpd)</td>
<td>~ 4000</td>
</tr>
<tr>
<td>Mine life remaining (years)</td>
<td>+9</td>
</tr>
<tr>
<td>Production - 2013 guidance (M lbs Cu)</td>
<td>41</td>
</tr>
<tr>
<td>By-products</td>
<td>Au, Ag</td>
</tr>
</tbody>
</table>

Shipment of Copper

- Concentrate is trucked to Skagway and from there delivered to customers by boat
Overview of our presentation

- ABA program at Minto
  - Objectives

- Defining PAG at Minto Mine
  - Water licence criteria

- Initial Indicators of changed ABA results: Timeline

- Adapting Strategies

- Operational Challenges

Maintaining a long term focus on reducing potential for ML ARD, adapting accordingly
Objectives:
- determine the NP/AP ratio of waste rock and overburden
- Generally guide site knowledge of ABA characteristics of waste rock
- Feeds into ML ARD monitoring used for EA

Field geologist: key player
- collects samples
- Records rock types or lithological units not previously identified
- changes in mineralogy such as identifying pyrite, other sulphate and carbonate minerals

A composite sample of drill cuttings from each blast in waste
Test Work and Evaluation
- ABA analysis using the BC Research Method
  - As required in water licence

- Paste pH, inorganic carbonate content and Fizz test

- Every 10th sample:
  - Filtering the residual liquid phase used to determine NP and run ICP MS scan includes calcium, magnesium, aluminum and iron
# Minto Mine – Waste Segregation

- **Initial Waste Segregation and Dispatch procedure**
  - All waste rock from Area 2 Pit was dispatched and disposed of based on Cu% grade

<table>
<thead>
<tr>
<th>Waste Grade Bins</th>
<th>Copper Grade Range</th>
<th>Description of Disposal</th>
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<tbody>
<tr>
<td>Zero-grade Waste</td>
<td>&lt; 0.01%</td>
<td>Can be utilized for construction projects and dumps located in sensitive areas.</td>
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<tr>
<td>Low-grade Waste</td>
<td>0.01% - 0.10%</td>
<td>Not of significant concern at closure, generally used for construction.</td>
</tr>
<tr>
<td>Mid-grade Waste</td>
<td>0.10% - 0.36%</td>
<td>Copper Leach is a concern at closure, material must be handled separately, but has poor prospects for future milling.</td>
</tr>
<tr>
<td>High-grade Waste</td>
<td>&gt; 0.36% - Cutoff Grade</td>
<td>The same disposal requirements apply as do for mid-grade waste, but there is a chance that if mill throughput or metal prices increase substantially, this material will prove economic.</td>
</tr>
</tbody>
</table>
Defining PAG at Minto: Main Pit ABA data
Defining PAG at Minto: Area 2 ABA data
Initial Indicators - Timeline

2007 - 2011
- Very little PAG observed

April 2011
- Area 2 Pit – Mining Started

January 2012
- Area 2 Pit – Initial Indication
- Elevated (>0.3%) sulphide sulphur

February 2012
- Area 2 Pit – NP/AP < 3 Observed
- 7 Samples elevated sulphide sulphur
- 2 Samples < 3 NP/AP (2.58, 2.40)

February 2012
- Area 2 Pit – No concerns at this time
- 2 samples elevated sulphide sulphur
- 1 sample < 3 NP/AP (2.9)
Initial Indicators - Timeline

**April 2012**
- Area 2 Pit – Change in Trend
  - Significant change in NP/AP
  - 6 samples with elevated sulphide
  - 6 samples with NP/AP <3:1 (1.8, 1.4, 1.8, 2.3, 2.7)

**May 2012**
- Construction Season
  - Unsure about construction rock characteristics

**May 2012**
- Preliminary Discussion – Waste Segregation Strategy
  - Consideration given to adapting waste rock management strategy.

**June 2012**
- Area 2 Pit – Trend Established
  - More data confirming presence of PAG.

**July 2012**
- Adapting Waste Rock Strategies
  - Options explored for adapting waste rock management strategy.
Operational Challenges

- **Adapted Waste Segregation and Dispatching**
  - All waste rock to be dispatched based on NP/AP and sulphide sulphur content

- **Waste Dispatch Solution Criteria**
  - Does not disrupt production or involve significant rehandling
  - Feasible from a cost perspective
  - Quickly implemented
  - Reliable/Consistent

- **Waste Disposal Solution Criteria**
  - Addresses environmental risk
  - Feasible from a cost perspective
  - Does not disrupt production or involve significant rehandling
Solution for Classification of Waste Rock

- Carbon - Sulphur Induction Furnace
  - Met all the criteria:
    - Turn-around on results the same or quicker than Cu assay
    - Cost was feasible at ~ $40,000
    - Unit purchased and setup in 1 month
    - Procedures for sampling, testing, data management and field staking were developed while waiting for unit
    - Measurements are repeatable and a calculated NP and AP could be determined

- Final Choice - Eltra CS 800 induction furnace
Solution Waste Rock Disposal

- Disposal in the Main Pit below the closure saturation elevation.
  - Addresses environmental risk - PAG material will be saturated upon closure
  - Will not have to rehandle material upon closure
  - Relatively short haul, access available
Implementation

- **On-site Assay lab**
  - *Every* blast hole sample split
  - Using Eltra induction furnace determine C(T) and S(T)

- **Geology**
  - Integrate onsite data into blast hole database
    - NP and AP for every blast hole
  - Create new waste rock type (PAG) for rock with NP/AP <3

- **Mine Operations**
  - Determining mineable blocks
    - Used ore mining strategy for segregating PAG in blasted muck piles
  - Develop design for PAG dump in the Main Pit
    - Determine volume of PAG impacting storage capacity for closure planning
  - Develop and Implement a Waste Rock Verification Program
Conclusion and Lessons Learned

- Minto orebodies are complex, requiring conservative practices related to management of ARD
  - Not a porphyry deposit
  - Irregular ore zones made more complex by structural features

- Use this information to inform future Environment Assessment studies and refine exploration core logging practices
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