AGENDA

- Lundin Mining, Candelaria District
- TSF Candelaria description and capacity
- TSF distribution System - Water recovery – Monitoring
- Natural events
- TSF Los Diques – construction/transition
- TSF Summary/Inspections and review
- Conclusions/Learnings
1. Lundin Mining holds an indirect 24% equity stake in the Freeport Cobalt Oy business which includes a cobalt refinery located in Kokkola, Finland.

2. Lundin Mining holds an 80% interest in Candelaria.
Candelaria District

The district is formed by Candelaria Open Pit, Candelaria Norte, Santos and Alcaparrosa ore deposits.

The ore extracted from these deposits is processed in the Candelaria and Pedro Aguirre Cerda (PAC) concentrator Plants.

The copper concentrate produced is shipped at the Punta Padrones Mechanized Clean Port in Caldera.

The Desalination Plant provides 100% of water process demand. Is located in the same industrial complex as the Port.
Candelaria 2030: Operacional continuity

**STATUS:** EIA approved (July 2015)

**Main FEATURES**

**MINE**
Expansion of the pit to exploit new mineral reserves

**WASTE FACILITIES**
Increase in the storage volume of waste

**TSF Los Diques**
Construction of a new tailing facility

**MINE LIFE**
Extension of the mine life operation from 2018 to 2030
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TSF Candelaria and TSF Los Diques

- NORTH DAM
- SOUTH DAM
- MAIN DUM
- DR Los Diques
TSF Candelaria – main information

- Actual deposit in operation from 1994
- Volume authorized: 318.4 Mm³
- Volume accumulated: 309.0 Mm³
- Total tonnage accumulated: 541 Mt
- Actual deposit level: 795.9 masl
- Crest Elevation: 800.0 masl
- Authorized level: 798.5 masl
- Freeboard: 1.5 m
Volume of accumulated tailings

Accumulated tonnage Tailings
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TSF distribution System - Water recovery – Monitoring

- Daily and weekly meetings with maintenance staff, coordination and work planning
- Inspection of lines and slopes, vortices, maintenance of roads
- Deposit control program
  - Bathymetric
  - Infiltrations
  - Stability of the walls
  - Water phreatic level
- Internal and External Audits
- Owner policies, regulatory requirements, and commitments
- Safe work procedures
- Tailings management system

Evaluate and periodically execute new projects, in conjunction with Engineering and Management
Tailing Distribution system

THICKENERS
2; 400 ft diameter

PUMPS
3 pumping group
5 pumps each
3 Discharge line

PUMPS STATION
Gravimetric tailing
3 pumping groups
3 pumps each

TAILINGS DUMP
Main DAM
South DAM
North DAM
Water recovery system

- Make up: 0.34 m³/ton
- Water recovery: 85%
Monitoring - PI System
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Natural events - Without impacts in tailing facilities

### Earthquakes

<table>
<thead>
<tr>
<th>Year</th>
<th>Magnitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>5.8⁰</td>
</tr>
<tr>
<td>2006</td>
<td>6.3⁰</td>
</tr>
<tr>
<td>2013</td>
<td>6.8⁰</td>
</tr>
</tbody>
</table>

### Rainfall Events

<table>
<thead>
<tr>
<th>Year</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>157.5 mm</td>
</tr>
<tr>
<td>2015</td>
<td>65.3 mm</td>
</tr>
<tr>
<td>2017</td>
<td>45.5 mm</td>
</tr>
</tbody>
</table>
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Para esto sugiero mencionar con un slide por tema:
- Down stream construction
- Espesor de capas
- Granulometrías y tamaños máximos
- Estudio de deformaciones coef sísmico
- Análisis químico

TSF Los Diques
TSF Los Diques – Relevants aspects of the design

• Retaining wall constructed by high strength casting, composed of fresh rock.
• Growth method type downstream.
• Construction of the wall using compacted layers of controlled thickness.
• Developments for the control of infiltrations: curtain wall and curtain of injections.
• Geotechnical instrumentation to monitor the behavior of the retaining wall.
• Strong basal drainage system.
• Quality control and monitoring for the generation of acid drainage.
Main wall section
TSF Los Diques – Main dam

Muro Sur

Muro Principal Fase 0&1

Muro Principal Fase 2&3

Filters

Elev 764

Elev 773

Elev 747

Elev 796

Noviembre 2017
TSF Los Diques: Geotechnical Instrumentation

Allows for timely evaluation of the variables which control the behavior of the wall.

- **Fiber optic and Casagrande-type piezometers**: monitor the phreatic level within the wall.

- **Accelerometers**: determine the response of the wall against seismic events.

- **Inclinometers and topographic monoliths**: allow the monitoring of displacement patterns of the wall.

- **Aforador**: allows for the evaluation of quantity and characteristics of drainage flow.
<table>
<thead>
<tr>
<th>January</th>
<th>February</th>
<th>April</th>
<th>June</th>
<th>October</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tailing system Hydraulic test</td>
<td>Tailing delivery by Cajón Poniente (50% of tailing)</td>
<td>Barges water recovery</td>
<td>100% tailing delivery to TSF Los Diques</td>
<td>Return to TSF Candelaria. Business decision</td>
</tr>
</tbody>
</table>

TSF Los Diques – Operational chronology 2018
TSF Los Diques – accumulated tailing and water recovery 2018

Accumulated Tonnage Tailings

<table>
<thead>
<tr>
<th>Month</th>
<th>Tonnage (Millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>0.62</td>
</tr>
<tr>
<td>Feb</td>
<td>1.26</td>
</tr>
<tr>
<td>Mar</td>
<td>2.59</td>
</tr>
<tr>
<td>Apr</td>
<td>4.19</td>
</tr>
<tr>
<td>May</td>
<td>6.11</td>
</tr>
<tr>
<td>Jun</td>
<td>8.19</td>
</tr>
<tr>
<td>Jul</td>
<td>10.49</td>
</tr>
<tr>
<td>Ago</td>
<td>12.73</td>
</tr>
<tr>
<td>Sep</td>
<td>14.52</td>
</tr>
<tr>
<td>Oct</td>
<td></td>
</tr>
</tbody>
</table>

Legend:
- **TSF Los Diques**
- **Depósito Estéril Norte**
- **Depósito de Relaves**
- **Rajo Minera**
- **Depósito Estéril Nantoco**

ludin mining
Water recovery – Sequence

Volume water system Parshall

<table>
<thead>
<tr>
<th>Month</th>
<th>Water Recovery (Millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>0.02</td>
</tr>
<tr>
<td>Feb</td>
<td>0.04</td>
</tr>
<tr>
<td>Mar</td>
<td>0.12</td>
</tr>
<tr>
<td>Apr</td>
<td>0.20</td>
</tr>
<tr>
<td>May</td>
<td>0.27</td>
</tr>
<tr>
<td>Jun</td>
<td>0.28</td>
</tr>
<tr>
<td>Jul</td>
<td></td>
</tr>
<tr>
<td>Aug</td>
<td></td>
</tr>
<tr>
<td>Sep</td>
<td></td>
</tr>
<tr>
<td>Oct</td>
<td></td>
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Candelaria Tailings Facilities Summary

Active Facilities

Los Diques TSF
• Thickened technical disposal (55% solids) from Candelaria Plant
• Tailing stored 15 Mm$^3$
• One main dam and another perimeter dam
• Dam design = downstream construction
• Nearby population = highway C-397 and Candelaria operations
• Emergency plan review annually
• Quality control and monitoring for the generation of acid drainage

Candelaria TSF
• Slurry tailings (35% solids) from PAC Plant and thickened tailing (55% solids) from Candelaria Plant
• Tailing storage 305 Mm$^3$
• One main dam and three perimeter dams
• Max main dam height = 170 m
• Dam design = downstream construction
• Emergency plan review annually
• Quality control and monitoring for the generation of acid drainage
## Candelaria Tailings Dam Inspections and Reviews

<table>
<thead>
<tr>
<th>Description</th>
<th>Responsible</th>
<th>Independent</th>
<th>Frequency</th>
<th>Last</th>
<th>Next</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff Inspection (Visual)</td>
<td>Site Personnel</td>
<td>No</td>
<td>Several times daily</td>
<td>Daily</td>
<td>Daily</td>
</tr>
<tr>
<td>Formal Staff Inspection</td>
<td>Site Personnel</td>
<td>No</td>
<td>Quarterly</td>
<td>Q4 2018</td>
<td>Q1 2019</td>
</tr>
<tr>
<td>Dam Safety Inspection (DSI)</td>
<td>External Consultant (Engineer of Record)</td>
<td>No</td>
<td>Annual</td>
<td>2018</td>
<td>July 2019</td>
</tr>
<tr>
<td>Corporate Tailings Stewardship Review</td>
<td>External Consultant (Third-party)</td>
<td>Yes</td>
<td>Annual</td>
<td>November 2018</td>
<td>November 2019</td>
</tr>
<tr>
<td>Government Agency Inspection</td>
<td>SERNAGEOMIN (Servicio Nacional de Geología y Minería)</td>
<td>Yes</td>
<td>Typically twice per year</td>
<td>2018</td>
<td>2019</td>
</tr>
<tr>
<td>Government Agency Inspection</td>
<td>DGA (Dirección General de Aguas)</td>
<td>Yes</td>
<td>-</td>
<td>2018</td>
<td>-</td>
</tr>
</tbody>
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Conclusions/Learnings

- Planning (Tailing deposit plan)
- Strong water balance
- Operational manual/Procedures
- Availability of water production (Desal Plant)
- Training
- External support
- Expedite water recovery
- Early involved of Candelaria team in design and construction stages