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Agenda

1. Boliden – the company
2. Boliden Exploration
3. Exploration in Finland – Boliden FinnEx
4. Focus areas
   ✓ Kylylahti NME
   ✓ Outokumpu Field
   ✓ Kevitsa/Northern Finland
5. Exploration challenges
6. Concluding remarks
Boliden – the company

- Boliden is a leading metals company with a commitment to sustainable development

- The company’s core competence is within the fields of exploration, mining, smelting and metals recycling

- Six mining areas and five smelters in Sweden, Norway, Finland and Ireland

- Balanced metal mix
  - Zinc, copper, lead, nickel, precious metals

- Revenues ca. EUR 4 B

- Approx. 5 500 employees
Boliden Exploration

Active areas

Sweden
2 165 km² with 108 exploration licences
61 km² with 92 mining concessions
- Aitik and Norrbotten (Cu, Au, Mo)
- Boliden area (Zn, Cu, Pb, Au, Ag)
- Garpenberg and Bergslagen (Zn, Cu, Pb)

Ireland
1 781 km² with 53 exploration licences
- Meath/Tara area (Zn, Pb)

Finland
465 km² with 39 exploration licences and reservations
23 km² with 13 mining concessions
- Kylylahti/Outokumpu Field (Cu, Ni, Au, Ag, Zn)
- Kevitsa/Northern Finland (Ni, Cu, PGE)
Boliden Exploration
100 years of experience in exploration

- Boliden prioritises exploration in close connection to mines, but does also field exploration
- Target: a minimum of 10 years’ production lifespan in each mining area
- Good track record of finding deposits
  - Ca. 45 different deposits discovered
- Latest major discoveries – Rävliden in Boliden Area, Nautanen close to Aitik and Tara Deep close to Tara
- Long tradition in developing geophysical instruments
Boliden Exploration
Key factors in successful exploration

- Good safety culture
- Strong leadership and corporate commitment
- Integrated and multidisciplinary teams with a **continuity**
- Strong **willingness to test** ideas and be innovative
- Geoscientific expertise
- Use science rather than do science
- Social licence to operate
- Best practice methods and tools
- **Long term planning**
Boliden Exploration
Key factors in successful exploration
Exploration in Finland – Boliden FinnEx

- Boliden FinnEx is the company responsible for all exploration work conducted in Finland by Boliden.
- It has existed in its current form since the beginning of 2017.
- The exploration is focused on three areas forming individual sections:
  - Kevitsa/Northern Finland
  - Kylylahti NME (Near Mine Exploration)
  - Outokumpu Field
- At present the company employs 21 people (geologists, geophysicists and technicians) in the Sodankylä and Polvijärvi exploration offices.
- Even if Boliden is a relative newcomer in Finland (Kylylahti 2014, Kevitsa 2016), it has tapped into a longer history of exploration:
  - FinnEx’s presence in Sodankylä traces back to 2008 with Canadian First Quantum Minerals.
  - For Eastern Finland, Boliden owes a lot to Vulcan Resources and Altona Mining, which were active in the region in 2000’s.
Focus areas

Kylylahti mine
- **Cu-Au-Zn** production commenced in January 2012
- Budgeted production rate of 750 000 tpa for 2018
- Ca. 1.9 Mt ore reserve with 1.2 % Cu, 1.1 g/t Au and 0.5 % Zn

Luikonlahti mill
- Produces Cu-Au and Zn concentrates out of Kylylahti ore
- Production rate of 12 000 t Au, 5000 kg Zn and 500 kg Au in concentrates achieved in 2016

Outokumpu Field
- Existing **Cu-Zn-Ni-Co-Au** resources and exploration potential within 50 km of Luikonlahti mill
- Kotalahti area Ni-Cu
Focus areas
Kylylahti NME & Outokumpu Field
Near Mine Exploration, i.e. work taking place inside the Kylylahti mine lease, has been active since the Boliden acquisition in October 2014.

The work is currently carried out by 6 people:
- Head of Section
- 2 Project Geologists
- 2 Field Technicians
- 1 Geophysicist

In 2014-2015 all focus was on the deep extensions of known ore bodies.

Two new exploration drifts have been completed.

A lot of geophysical surveys carried out in the area.

34 km drilled since 2014 (NME)

21 km of exploration drilling for 2017.
Focus areas – Kylylahti NME

4. Geology
Focus areas – Outokumpu Field

Known deposits

- Keretti 1914 - 1989
- Luikonlahti 1968 - 1983
- Vuonos 1972 - 1986
- Kylylahti 2012 -

Historic production + Kylylahti:
1.2 Mt copper metal

Keretti 77 %
Luikonlahti 6 %
Vuongos 9 %
Kylylahti 8 %
Focus areas – Outokumpu Field
Outokumpu (Keretti, Hautalampi) – Vuonis – Perttilahti

<table>
<thead>
<tr>
<th></th>
<th>Outokumpu (Keretti)</th>
<th>Hautalampi</th>
<th>Vuonis</th>
<th>Perttilahti</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>28.3 Mt</td>
<td>3.2 Mt</td>
<td>5.5 Mt</td>
<td>1.32 Mt</td>
</tr>
<tr>
<td>Cu</td>
<td>3.36%</td>
<td>0.36%</td>
<td>2.13%</td>
<td>2.15%</td>
</tr>
<tr>
<td>Co</td>
<td>0.22%</td>
<td>0.11%</td>
<td>0.14%</td>
<td>0.16%</td>
</tr>
<tr>
<td>Zn</td>
<td>0.87%</td>
<td>0.07%</td>
<td>1.32%</td>
<td>1.89%</td>
</tr>
<tr>
<td>Ni</td>
<td>(0.10%)</td>
<td>0.43%</td>
<td>0.12%</td>
<td>0.15%</td>
</tr>
<tr>
<td>Ag</td>
<td>9 g/t</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Au</td>
<td>0.65 g/t</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>(25.3%)</td>
<td>2.79%</td>
<td>14.76%</td>
<td>18.9%</td>
</tr>
</tbody>
</table>
Focus areas – Outokumpu Field
Keretti – Vuonos – Karnukka belt

- Over 20 km long mineralised belt from Keretti Cu mine to Karnukka Cu prospect
- Perttilahti 1.32 Mt @ 2.15 % Cu, 1.89 % Zn, 0.15 % Ni, drill traverses at 800 m spacing
- Plans to deep drill the area between Vuonos and Perttilahti to have better understanding of the geological complexity
Kevitsa mine

- Ni-Cu-PGE production commenced in 2012
- Being permitted to treat 10 Mt of ore per year
- Ca. 150 Mt ore reserve with 0.34 % Cu and 0.22 % Ni

Sodankylä/Northern Finland

- Exploration focused on targets within trucking distance to Kevitsa mill, in essence the Sodankylä municipality
- The region (CLGB) is provably well-endowed with metals

Joint venture projects

- Ni-Cu-PGE focused JVs in Sodankylä and Pelkosenniemi
Focus areas
Kevitsa/Northern Finland
Focus areas – Kevitsa/Northern Finland

- Ni-Cu-PGE exploration focused on Kevitsa and its immediate surroundings, but also several targets further afield

- A considerable portion of tenements located inside Natura 2000, but so far the company has been able to conduct exploration also on protected ground

- In general, the target areas tend to be wet and swampy, so the exploration season is heavily winter-oriented

- Pre-diamond drilling stage exploration relies much on geophysics, particularly magnetic and EM methods, as well as base of till sampling, which has proved out to be useful in Sodankylä
Focus areas – Kevitsa/Northern Finland

Geology

- The Kevitsa Ni-Cu-PGE deposit sits in a differentiated, 2.05 Ga old mafic-ultramafic bowl-shaped intrusion surrounded by a suite of pelitic sediments and mafic to ultramafic volcanic rocks.
- The ore is predominantly disseminated, but also veins and slightly more massive parts have been encountered, although the latter tend to be pyrrhotite dominated.
- Voluminous mafic-ultramafic magmatism in CLGB has resulted in abundant prospective rock bodies to explore.
Exploration challenges
Exploration challenges

The heat is up
Exploration challenges
Exploration in Natura 2000 areas

- Requires an environmental impact assessment (Conservation Act 65§).
  - Purpose of the assessment is to establish if the proposed activities will significantly harm the habitats or species listed in its protection criterion.

- Prior to exploration:
  - Detailed exploration plan. *Coordinates of the DDHs, sampling locations, routes for the machinery, approximate duration and timing of activities.*
  - Establish baseline from known habitat and species occurrences.
  - Precautionary principle *already* to exploration planning stage.
  - Vegetation square/box for monitoring purposes.

- During exploration:
  - Exploration only during winter months, restrictions from bird nesting (Golden Eagle and White-tailed Eagle).
  - Track-mounted drill rigs with sludge collection and closed water circulation systems.
  - Other bells and whistles incl. oil spill kits, tarpaulin under the rig, catchment trays, biodegradable fuels etc.
  - Utilising same core routes and tracks.
  - Avoid cutting and/or damaging trees.

- Afterwards:
  - Monitoring impacts, adjusting to results, rehabilitation.
Exploration challenges
Is it possible to mine in Natura?

On EU level:
- ”Natura 2000 is not a system of strict nature reserves from which all human activities would be excluded”
- Plans and investments with no significant negative impact on will be accepted
- Even if negative impacts exist it is not impossible to develop a project if
  - Overriding public interest (interest cannot be achieved by other means)
    → Compensation measures (replace lost habitats with new ones)

On national level:
- No examples of extractive industries accepted at Natura 2000 areas
- Finnish authorities taking more strict approach in interpreting the conservation laws than EU (consequence of a past ”green” government/ministry)
- Anglo American’s Sakatti project likely the first one to test this
### The Natura permitting process

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Area selection.</td>
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<tr>
<td>2.</td>
<td>Ore prospecting permit application.</td>
</tr>
<tr>
<td>3.</td>
<td>'Light' reconnaissance exploration activities with landowner consent. 1 winter/summer season vetted against known environmental restrictions.</td>
</tr>
<tr>
<td>4.</td>
<td>Detailed exploration plan vetted.</td>
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<tr>
<td>5.</td>
<td>Biological field assessment based on exploration plan (routes included). Establishing baseline. 1 to 2 months in July/August. 1 - 3 months.</td>
</tr>
<tr>
<td>7.</td>
<td>Opinions in accordance with Conservation Act 65§ from environmental authorities. At mire protection areas separate permit needed from Ministry of Environment. ~6 - 12 months?</td>
</tr>
<tr>
<td>8.</td>
<td>Valid ore prospecting permit application at TUKES. 2 - 3 months.</td>
</tr>
<tr>
<td>9.</td>
<td>Exploration during winter months.</td>
</tr>
<tr>
<td>11.</td>
<td>Active processing of ore prospecting permit application at TUKES.</td>
</tr>
<tr>
<td>12.</td>
<td>No complaints 1 month.</td>
</tr>
<tr>
<td>13.</td>
<td>Exploration during winter months.</td>
</tr>
<tr>
<td>15.</td>
<td>Administrative court.</td>
</tr>
<tr>
<td>16.</td>
<td>Valid ore prospecting permit.</td>
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**Notes:**
- The Natura permitting process typically takes place from July to September to ensure that the environmental impact is assessed in a period with minimal environmental stress. 
- Active processing of the ore prospecting permit application at TUKES usually takes 2 to 3 months. 
- Exploration during winter months is permitted to ensure that the environmental impact is accurately assessed in terms of seasonal changes. 
- Environmental impact monitoring is conducted to ensure compliance with environmental regulations.
Concluding remarks

- Boliden has come to stay – a clear strategic decision and a long-term commitment to explore in Finland

- Scandinavian work mentality, good predictability and continuity make the company attractive for employees

  ➢ We have only scratched the surface in Northern Finland, so work remains to be done

  ➢ Outokumpu area is more mature in terms of exploration, but potential for deep-seated high-grade ore bodies is evident
Thank you