Copper and Uranium IOCG Mineral Systems of the Gawler Craton, South Australia

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This presentation
1. Snapshot of our Diverse Industry Sectors & Growing Minerals Industry
2. IOCG Copper-Gold-Uranium Mineral Systems of the Gawler Craton
3. Geoscience Research and Programs Targeting IOCG systems under cover
4. Further Information on South Australia’s Mineral Resources - SA Mining App
THE STATE OF SOUTH AUSTRALIA

KEY LOCATION FOR SUSTAINABLE BUSINESS

- A robust, resilient, knowledge based economy – with capacity to grow.
- World leading minerals and energy assets – ranked as Australia’s top destination for resources investment.¹
- Leading agricultural region producing premium quality food and wine for global export markets.
- A strong manufacturing base, including automotive, submarines and warships and high-value advanced manufacturing.
- Home to Australia’s wind and solar power industries.
- A world-class education system; leader in research and development; flexible and skilled workforce; and the fifth most liveable city in the world.²

DIVERSE INDUSTRY BASE

- Minerals & Energy
- Agriculture
- Renewable Energy
- Advanced Manufacturing
- Defence
- Education
- Health

1. Source: CSIRO
2. Source: The Economist Intelligence Unit

State population 1.6 million
Adelaide population 1.2 million

AUSTRALIA MINERALS
South Australia
Small Population, Challenging Terrain - Big Thinking

South Australia has only 7% of Australia’s population, but:

- 70% of Australia’s copper resources
- 80% of Australia’s uranium reserves
- 60% of Australia’s wine exports
- 50% of Australia’s wind power capacity
- 30% of Australia’s gold resources
- 30% of Australia’s defence industry
- 25% of Australia’s onshore gas resources
- 20% of Australia’s grain production
Geological setting

3 Ancient crustal regions:

1. Gawler Craton
2. Curnamona Province
3. Musgrave Province
SOUTH AUSTRALIA - Copper & Gold

- South Australia hosts 70% of Australia’s economic demonstrated resources of copper and 28% of Australia’s economic demonstrated gold resources.

- BHPB’s Olympic Dam is the fourth largest copper resource in the world and fifth largest known deposit of gold.

- Most of South Australia’s known copper resources (95% +) are Iron oxide-copper-gold (IOCG) from which gold and uranium are obtained as by-products.

- Total identified ore resources are 9.8 billion tonnes with contained copper of 88 million tonnes.
SOUTH AUSTRALIA - Uranium

- South Australia hosts **80%** of **Australia’s** resources and **27%** of the **world’s uranium** resources.

- There are three active uranium mines
  - Olympic Dam
  - Beverley/Beverley North
  - Honeymoon

- New Uranium Mine Approved and in Construction
  - Four Mile Uranium Mine near Beverley Uranium Mine

- A further 17 uranium prospects within the State with total identified resources of over 3 million tonnes.
South Australian mineral exploration expenditure by commodity 2012-13

- Copper: $106.3 million (46%)
- Iron ore: $47.9 million (21%)
- Other: $44 million (19%)
- Base metals: $19.3 million (8%)
- Uranium: $10.3 million (5%)
- Gold: $2.6 million (1%)

Total expenditure: $230.4 million

Source: ABS Cat. 8412.0
IOCG Mineralisation in SA

- IOCG mineralisation is a key resource and exploration target in SA:
  - copper
  - gold
  - iron ore
  - uranium
  - REEs

- IOCG mineral systems have also been linked with reworking and re-accumulation in other mineral systems as well.
  - e.g. source for sedimentary uranium
  - e.g. Central Gawler Au
  - e.g. porphyry, vein and sediment-hosted copper?
  - e.g. epithermal silver and base metals
Olympic Dam Mine (BHP Billiton Ltd)

- World’s largest uranium deposit (9576 Mt at 0.26 kg/t U3O8 resource)
- Eastern Gawler Craton IOCG hosted
Australian Cu Resources

Economic Demonstrated Resources at operating Australian copper mine  (Source: Geoscience Australia)
South Australia, unlike other locations, has a huge gap between the largest and second-largest known copper deposit, which suggests there is a good opportunity to find more giant deposits there.

Source: MinEx Consulting March 2012
Generating New Concepts In Copper Exploration In SA

**Total Remaining Cu**
Statistical under-representation of large 1-3Mt Cu occurrences and no giant 3-80 Mt Cu... so far

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Olympic Dam
### South Australia – Copper / IOCG

**Source:** MinEx Consulting Feb 2010

<table>
<thead>
<tr>
<th>Deposit / Craton</th>
<th>Style</th>
<th>Discovery</th>
<th>Size (Mt)</th>
<th>Cu (%)</th>
<th>Au (g/t)</th>
<th>U (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olympic Dam / Gawler</td>
<td>IOCG, Breccia</td>
<td>1976</td>
<td>9576</td>
<td>0.82</td>
<td>0.31</td>
<td>260</td>
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<tr>
<td>Prominent Hill / Gawler</td>
<td>IOCG, Breccia</td>
<td>2001</td>
<td>186</td>
<td>1.10</td>
<td>0.70</td>
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<tr>
<td>Carrapateena / Gawler</td>
<td>IOCG, Breccia</td>
<td>2006</td>
<td>800</td>
<td>0.80</td>
<td>0.30</td>
<td>155</td>
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<tr>
<td>Hillside / Gawler</td>
<td>IOCG, Skarn</td>
<td>2009</td>
<td>337</td>
<td>0.60</td>
<td>0.30</td>
<td></td>
</tr>
</tbody>
</table>

CAUTION: Not all discoveries turn into mines, and not all resources get recovered.

**Deposit / Craton Style Discovery Size (Mt) Cu (%) Au (g/t) U (ppm)**

**Olympic Dam (1976)**

**Prominent Hill (2001)**

**Carrapateena (2006)**

**Hillside (2009)**
Gawler Craton - South Australia - Geochronology

Hand et al., 2009

• ~1590 Ma magmatism & metamorphism & major hydrothermal event

Hand et al., 2007

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Fe oxide-Cu-Au hematite sericite breccia alteration

**Olympic Dam**
Total Resource 9 576 Mt at 0.82% Cu, 0.26 kg/t U3O8, 0.31 g/t Au and 1.39 g/t Ag. Total Ore Reserve 629 Mt at 1.76% Cu, 0.57 kg/t U3O8, 0.73 g/t Au and 3.36 g/t Ag

**Prominent Hill**
Total Resource (including Ankata and Malu) – 186 Mt at 1.1% Cu, 0.7 g/t Au. Production 2012, 101 737 t Cu, 140 746 oz Au, 721 998 oz Ag

**Carrapateena**
Total Resource 800 Mt at 0.8% Cu, 0.3 g/t Au, 3.3 g/t Ag and 155 ppm U3O8
Carrapateena: Resource update & Khamsin prospect

- Carrapateena Resource update announced in January.
- 292Mt @ 1.29% Cu (CoG 0.7% Cu)– a 43% increase.
- Second drill hole at Khamsin discovery 442m @ 0.49% Cu.
- Seismic and gravity surveys between Carrapateena and Fremantle Doctor Prospect to better define drill targets.
- Drilling in progress on selected regional targets.

(From OzMinerals 2013)
Carrapateena: Updated Inferred & Indicated resources

- The 2012 Indicated and Inferred Resources of 292Mt represent a 43% increase over the 2011 resource at a 0.7% Cu cut-off.

- Much of the 2011 Exploration Target area has been converted to Mineral Resources in 2012.

- Infill exploration drilling program has better defined the higher grade bornite zones - now one bornite zone.

- Deeper infill exploration drilling has led to an extension of the Resource laterally and at depth.

- 2013 Indicated and Inferred Resources further increased to 315Mt @ 1.2% Cu, 0.5g/t Au

*These wireframes show the interpreted limits of the Chalcopyrite envelope and Bornite zones respectively. These domains contain almost the entire resource. Intervals calculated using a 0.3% Cu cut-off grade.

Resource classification is shown in ‘stylised’ view at Section 737800mE with +/-50m window.

(From OzMinerals 2013)
HILLSIDE Resource –
based on over 750 drill holes and 230,000m drilled
Sodic-Calcic, Kspar-Bt, & Magnetite Veins & Skarns

Hillside: Total Resource 337 Mt at 0.6% Cu, 0.14 g/t Au and 15.70% Fe
Hillside Discovery

(see figure 2)

White Cliffs target area

Parara target area

Port of Ardrossan

New target area

Port Julia target area

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South Australia’s discovery costs are comparable to the World Average

Note: Adding in (73+14=) 87 Mt Cu-eq for missing data, reduces the average world discovery cost by 21% to 2.1 and 1.7 c/lb Cu without/with by-product credits
The Exploration Challenge ...
Gawler Craton IOCG Targeting under Deep Cover
Government incentives to support investment and bring forward discoveries

- Pathways to Discovery
- Pathways to Prospectivity
- Discovery to Development
- Next Generation Policy
- Innovation through Integration
- Water for Mining
- PACE Partnerships
- Communities
- PACE exploration
- PACE mining
- PACE energy
- PACE global
- CO2CRC
- Data Pathways
- Building Awareness
- Unconventional Gas Resources
- South Australian Resources Analysis

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Pathways to Discovery
- New statewide and regional datasets
- New geophysics and spectral data
- Multi-element reanalysis of historic calcite samples

Pathways to Prospectivity
- Multidisciplinary mineral systems analysis
- Multidisciplinary approach with mineral systems focus

Innovation through Integration
- Unique and innovative products and data delivered through SARIG 2020
- 3D modelling of mineral systems and prospective terranes

PACE exploration

PACE Partnerships
- PACE Targeting – geophysical surveying
- PACE Discovery Drilling – exploration drilling
- PACE Geochronology – mineral systems dating

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Using Potential Field Geophysics for IOCG exploration

- “See” through cover
- Continuous data
- Cost effective
- Iron in IOCG system expressed in potential field data (gravity and/or magnetic)

Moonplain image source http://www.worldisround.com/

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Geophysical Characterisation of IOCG Deposits

- Gravity “anomalies”
- Magnetic “anomalies”
- Coincident gravity and magnetic anomalies
Technologies will enable ‘Prospecting Drilling’
More to Explore - South Australia’s Mining App

- a free smart phone app designed for investors
- highlights real-time investment opportunities within resources sector
- information on geospatial map interface, mines and projects, geology