Mallee Bull Cu-basemetal discovery

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31/5/2012
Emerging precious-base metal resources company

- Mallee Bull Copper-polymetallic Discovery (Gilgunnia, NSW)
- Ruby Silver project (Armidale, NSW)
- Apollo Hill Gold project (Goldfields WA)
- Attunga Tungsten project (Tamworth, NSW)
- Rise & Shine Gold project (Central Otago, NZ)
REGIONAL GEOLOGY

• Modified from David (2010)
Gilgunnia (incl. Mallee Bull Discovery) Project
Peel’s interest in the Cobar Superbasin
Exploration strategy

Focus on under-explored regions of significant mineralisation potential

• Explore for deeper targets in an area previously covered by surface exploration methods (mapping, geochemistry, limited geophysics)
• Historic gold workings exist as shafts (4 Mile goldfield)
• Structurally favourable location near Nymagee-Wagga lineament
• Understanding key features of well known Cobar-style deposits in exploration methodology
• Use geophysics (VTEM) and IP to find suitable anomalies at depth
• Understanding the surface geology to interpret drillcore intercepts
• Scattered clusters and lines of up to 30 deep shafts (Au only)
Mallee Bull Discovery

Follow-up drilling confirms Mallee Bull as a “Cobar-style” discovery

- Initial work comprised heliborne VTEM, shallow RAB drilling and follow up fixed loop EM surveys which identified a strong conductor
- Initial RC drilling intersected weak mineralisation (Pb, Zn, Ag±Cu), and with down-hole EM, refined the location and size of the conductor
- One diamond tail was drilled based on geophysical modeling; intersected high grade base metal mineralisation
- Subsequent diamond and RC drilling confirmed significant base metal mineralisation coincident with the EM/IP anomaly
Cobar-style deposits

- Variable metallogeny copper-gold, but also silver, lead and zinc
- Massive to disseminated sulphides, complex metallogeny
- Pyrrhotite abundant – magnetic and/or non-magnetic
- Mineralisation steeply plunging, pipe-like
- Structurally hosted within the Cobar Supergroup near regional structures
- Orebodies can be very large e.g. CSA estimated to hold >1.6Mt copper metal and is open as ore grade averaging 5.5% Cu below 1800m
- Include CSA, New Cobar, Peak, Great Cobar, New Occidental, Chesney, Nymagee, Hera, Mallee Bull
Mineral deposits in the Cobar Superbasin

1. Intrusion related deposits
2. VMS deposits
3. Cobar – style massive sulphide deposits
4. Epithermal Au deposits
5. Massive sulphide base
   - metals deposits - Irish type
6. Carbonate hosted base
   - metal deposits - MVT type
7. Quartz vein hosted
   - gold deposits

Modified from David (2010)
Cobar Superbasin is worldclass mineral province

- Cobar Superbasin pre-mining metal inventory:
  - >2.2 Mt Cu = US$18b
  - >7 Moz Au = US$12b
  - >4.7 Mt Zn = US$9.5b
  - >2.8 Mt Pb = US$5.5b
  - >145 Moz Ag = US$4.5b
  - Total = US$50b
Stratigraphy of the southern Cobar Superbasin

• Gilligan et al 1994, Cobar 1:250k metallogenic map
Host sequence

- Local stratigraphy correlates to the Shume Formation and overlying Upper Amphitheatre Group.
- The sequence at Mallee Bull has been folded and faulted.
- A broad anticlinorium is interpreted. The western margin comprises thinly bedded turbidites (mudstone to sandstone) with minor volcaniclastic units.
- On the eastern margin shallow marine sandstones are glauconitic and contain dismembered trilobites.
- On surface, significant historic gold workings are scattered with shafts.
### Host sequence

- **Mallee Bull fm (inf.)** comprises well bedded turbidites dominantly of mudstones and siltstones.
- **Lower portions** have distinct volcanic detritus and scattered olistoliths.
- The basal unit is a volcaniclastic/epiclastic sequence of felsic volcanics (SRV).
- Highly variable in texture, fabric and width.

<table>
<thead>
<tr>
<th>Upper Amphitheatre Group</th>
<th>Mallee Bull fm formation undiff.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silver Ray volcanics</td>
<td></td>
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<tr>
<td>Keep It Dark sandstone</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Lower Amphitheatre Group</th>
<th>Shume Formation</th>
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<tbody>
<tr>
<td>4 Mile facies</td>
<td></td>
</tr>
<tr>
<td>Shume Formation (undiff.)</td>
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</tbody>
</table>

- **Volcanic olistolith/detritus**
- **Limestone olistolith**
- **Massive sulphide lenses**
- **Quartz vein**
- **Sulphide stringers**

20 m
**Host sequence**

- The top of the Shume Fm is a marker unit (Keep It Dark sandstone). Forms raised rounded massive outcrops
- Supermature massive quartz sandstone
- Beneath this interval is the 4 Mile facies (inf.) hosting mineralisation
- This unit passes into coarser facies turbidites of the Shume Fm.
• The lower stratigraphy is correlated to the Shume Fm
• Comprises poorly to well bedded mudstone/siltstone and sandstone-dominated turbidites
• The Shume Fm is divided informally on the basis of facies
• The uppermost portions of the Shume Fm hosts mineralisation (the 4 Mile facies)
Deep water turbiditic sediments
• Silver Ray volcanic member of the Mallee Bull Fm (Upper Amphitheatre Group)
• Dominantly epiclastic, with clasts of coherent felsic volcanics and aphanitic lithic material
• On the western limb the stratigraphy dips steeply to the west
• Mineralisation occurs below the Keep It Dark sandstone in the Shume Fm
• The Keep It Dark sandstone is a persistent marker bed at the top of the Shume Fm
• Volcaniclastic rocks occur in the Mallee Bull Fm as olistoliths and the basal Silver Ray volcanics.
• Rare volcanic detritus also present in the 4 Mile facies underneath the Keep It Dark sandstone
## Previous exploration

**No prior drilling, surface exploration only**

<table>
<thead>
<tr>
<th>EXPLORER</th>
<th>YEARS</th>
<th>METHODS</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mount Hope Minerals</td>
<td>1970-1973</td>
<td>Mapping, airborne magnetic-radiometric-EM survey</td>
<td>Modern style exploration but focus on outcropping or shallow targets</td>
</tr>
<tr>
<td>Union Corporation</td>
<td>1976-1978</td>
<td>Airborne and ground magnetics, mapping, auger geochem</td>
<td>Modern style exploration but focus on outcropping or shallow targets</td>
</tr>
<tr>
<td>Newmont</td>
<td>1984-1986</td>
<td>Geochemistry</td>
<td>Focus on shallow or outcropping targets</td>
</tr>
<tr>
<td>Shell Minerals</td>
<td>1981-82</td>
<td>RAB/chip sampling</td>
<td>Focus on shallow or outcropping targets</td>
</tr>
<tr>
<td>Pasminco/Triako</td>
<td>2000-2009</td>
<td>Identification and modelling of magnetic anomalies</td>
<td>Modern exploration for Cobar-style deposits. No follow up on anomaly G5 – Mallee Bull</td>
</tr>
</tbody>
</table>
• Focus on historic 4 Mile gold field due to presence of G5 magnetic anomaly
Exploration by Peel

- VTEM survey with follow-up fixed loop EM and downhole IP
- Detailed geological mapping and previous exploration compilation
- 60 Rab, 27 RC and 9 diamond holes
• A coincident magnetic/EM anomaly was identified in the 4 Mile area. Follow-up fixed loop EM and downhole IP further defined this
Exploration by Peel Mining

- Thorough logging of core and chips, field Niton and ALS assaying of chips and core
- Integration of all data to produce drill sections
- 3D modelling of geophysics and drill sections (in progress)
- Comprehensive deep drilling program and down hole
- Geophysics planned
## Mallee Bull Discovery

- Results to date

  - *Mallee Bull Cobar-style discovery better results to date include:*

<table>
<thead>
<tr>
<th>Interval</th>
<th>Cu (%)</th>
<th>Ag (g/t)</th>
<th>Au (g/t)</th>
</tr>
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<tbody>
<tr>
<td>10m @ 9.01% Pb, 11.00% Zn, 41 g/t Ag, 0.77 g/t Au</td>
<td>6.65m @ 3.10% Cu, 34 g/t Ag, 0.93 g/t Au</td>
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</tr>
<tr>
<td>9.3m @ 1.20% Cu, 19 g/t Ag, 0.14 g/t Au</td>
<td>10m @ 1.70% Cu, 46 g/t Ag, 0.27 g/t Au</td>
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</tr>
<tr>
<td>5m @ 2.40% Cu, 28 g/t Ag, 0.60 g/t Au</td>
<td>7m @ 2.32% Cu, 14 g/t Ag, 0.15 g/t Au</td>
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</tr>
<tr>
<td>7m @ 1.31% Cu, 19 g/t Ag, 0.56 g/t Au</td>
<td>6m @ 2.01% Cu, 64 g/t Ag, 0.43 g/t Au</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11m @ 2.71% Cu, 36 g/t Ag, 0.26 g/t Au</td>
<td>10m @ 2.66% Cu, 41 g/t Ag, 0.51 g/t Au</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5m @ 2.14% Cu, 41 g/t Ag, 1.29 g/t Au</td>
<td>10m @ 2.22% Cu, 33 g/t Ag, 0.44 g/t Au</td>
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- *Strike of mineralisation = >120m*
- *Steeply dipping to the west and stratabound*
- *Shallowest intercept to date = 150m below surface*
- *Deepest intercept to date = 310m below surface*
- *Mineralisation open in multiple directions, including down-dip*
• **Mineralisation/geology characteristics**
  
  – Broad alteration/mineralisation containing multiple intervals of massive sulphide and stringer mineralisation, including chalcopyrite, sphalerite, galena, pyrrhotite, arsenopyrite, pyrite
  
  – Geology comprises package of structurally deformed turbidite sequence sediments (including volcaniclastics)
  
  – Shoot-like structure dipping west and plunging to south?
  
  – Favourable geological and structural position, sited on the “nose” of an anticline – a suitable high-stress environment
  
  – Multiple additional coincident geochem/magnetic anomalies
  
  – Large proximal magnetic anomaly to north (Butcher’s Dog) still unexplained
  
  – Mineralisation hosted within the Lower Amphitheatre Group
  
  – Similarities to other Cobar-style deposits such as CSA, Shuttleton and Nymagee-Hera
### “Cobar –style’” deposits vs Mallee Bull Discovery

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Mallee Bull</th>
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<tbody>
<tr>
<td>Polymetallic (Cu-Ag-Au-Pb-Zn)</td>
<td>✓</td>
</tr>
<tr>
<td>Proximity to major structures (growth/transfer faults)</td>
<td>✓</td>
</tr>
<tr>
<td>Shear-hosted</td>
<td>✓</td>
</tr>
<tr>
<td>Strong geophysical response</td>
<td>✓</td>
</tr>
<tr>
<td>Chlorite and silica alteration</td>
<td>✓</td>
</tr>
<tr>
<td>Facies and rock competency contrasts</td>
<td>✓</td>
</tr>
<tr>
<td>Moderate to high strain zone</td>
<td>✓</td>
</tr>
<tr>
<td>Short strike length (&lt;200m)</td>
<td>✓</td>
</tr>
<tr>
<td>Narrow widths (5-20m)</td>
<td>✓</td>
</tr>
<tr>
<td>Vertical continuity (&gt;400m)</td>
<td>?</td>
</tr>
<tr>
<td>Generally occur as clustered/stacked lenses</td>
<td>?</td>
</tr>
</tbody>
</table>
Mallee Bull Discovery

- Deposit Drillcore comparison – Mallee Bull (left) vs Nymagee (right)
Mallee Bull mineralisation
Metal inventory and ore textures at Mallee Bull

- Cu, Zn, Pb, Ag, As, Sb, Bi, Au and Co
- Ore mineralogy comprises chalcopyrite, pyrite, pyrrhotite, sphalerite, galena, arsenopyrite, tetrahedrite, boulangerite \((5\text{PbS}.2\text{Sb}_2\text{S}_3)\) and Pb, Sb, Bi sulphosalts, very minor electrum
- Complex timing relationships with early (diagenetic) pyrite, later arsenopyrite, pyrrhotite and pyrite, then later base metal sulphides and sulphosalts
- There are multiple generations of pyrite and pyrrhotite
- Sphalerite and chalcopyrite show evidence of remobilisation
- Early formed arsenopyrite, brittlely deformed, overprinted and partially replaced by galena, chalcopyrite and pyrrhotite
Ore textures

- Replacement textures, evidence of deformation of some sulphides
- Structural control along fractures and within veins

- Sulphides occupy matrix between more competent clasts
- Note distinct green chlorite alteration
- Sphalerite and galena precipitating in favourable sites including in and around the margins of clasts
- Section from the top of the 4 Mile facies, note volcanic clasts
- Silicification and black chlorite development
• Early pyrite (diagenetic) with later anastomosing bands of sphalerite, pyrrhotite, lesser pyrite, galena and rare arsenopyrite

• Dark chlorite altered mudstone host. Fragments are ripped up into the massive sulphide horizon
• “elvan” type alteration (cf CSA)
• Strongly siliceous clasts of mudstone.
• Matrix replacement by chalcopyrite, black chlorite, lesser pyrrhotite and sphalerite.
• Some clasts contain fine trails of sulphides or disseminated grains
• Early sulphide minerals are deformed or show evidence of textural modification
• Arsenopyrite grains are fractured and later infilled by sphalerite, pyrrhotite, galena and chalcopyrite
• Early pyrite grains are also fractured and heavily included
• Early pyrrhotite is completely recrystallised in some sections. In others it is a late mineral
• Galena grains are bent in some sections and show ductile deformation
• Early days, but a vague metal zonation is evident downhole (ie vertically).
• The shallow intersections of sulphides are commonly pyrite-pyrrhotite, with minor sphalerite and galena. These are commonly massive and may exceed 2m in width
• Pyrrhotite is dominant downhole, pyrite is minor to absent at depth
• Downhole chalcopyrite is more abundant, with pyrrhotite and lesser pyrite, rarely massive, mostly in stringers and veins and fractures
• Arsenopyrite is a minor sulphide mineral throughout and unusually cited. It is more abundant in the lower mineralised zones
• Possible remobilisation of some sulphide minerals, in particular sphalerite and chalcopyrite, rarely galena
Hydrothermal alteration characteristics

- Characterised by locally intense chlorite alteration and silicification
- Green chlorite alteration of the hosting mudstones is intimately associated with sphalerite and chalcopyrite stringer zones
- Black chloritic alteration of the hosting sediments occurs in the uppermost sulphide zones with more abundant pyrite and pyrrhotite
- Carbonate veins are relatively early and typically recrystallised
- Gangue minerals proximal to sulphide horizons are coarser grained and commonly recrystallised (green chlorite and quartz, in particular)
Timing relationships - preliminary

- Metamorphic conditions attained greenschist facies. Peak biotite grains replaced by chlorite and stilpnomelane.
- Early recrystallised carbonate veins have stilpnomelane selvedges.
- Metamorphic biotite possibly replaced by hydrothermal chlorite.
- Sulphide formation is pre-syn deformation and possibly syn-post metamorphisms (though overprinting by a later retrograde event is possible).
- Multiple generations of sulphide formation.
• Matrix correlations of key metals in selected drillhole intersections reveal the following:

  – Overall poor correlation between most metals except Zn/Cd
  – Cu correlates moderately well (0.7-0.8) in some intersections with Bi, Co, Sb
  – Au/Ag generally well correlated, but not always
  – As does not correlate well, except with gold, rarely
  – Zn/Pb generally correlate well

• This data indicates the involvement of multiple fluid stages plus the effects of local remobilisation (particularly of Zn and Cu)
Downhole geochemistry
• Mallee Bull Cu-Ag-Au-Pb-Zn-Co Discovery
  – 8km east of May Day Au-Ag-Pb-Zn-Cu deposit; adjacent to historic 4-Mile goldfield
  – Coincident EM and magnetic geophysical anomalies
  – Favourable geological position in volcaniclastic turbidite sequence age in the Lower Amphitheatre Group
  – Favourable structural position located on “nose” of anticline; high strain environment
  – Ease of access, 3 km off major road
  – Perseverance required; several rounds of drilling necessary
  – High-grade massive sulphides intercepted in July/August 2011
  – Complex multigeneration base metal deposit with significant Ag and Au
  – Mineralisation is pre-syn deformation and possibly metamorphism
  – Deposit located near the Nymagee-Wagga lineament
  – Similar to other Cobar-style deposits such as Chesney, CSA and Shuttleton
  – Early stages of exploration and drilling