Wambo Underground
Outburst Management

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Peabody Energy – NSW Portfolio Overview

Wilpinjong
- Opencut
- 100% owned
- Thermal

Wambo
- Opencut & Underground
- Majority Owned *
- SSCC / Thermal

Newcastle Office
- Marketing and Logistics office, managing the execution of sales/trade

Metropolitan
- Underground
- 100% owned
- HCC / SHCC / Coarse

Port Kembla Coal Terminal
- 16 Mtpa capacity
- User group owned
- Contracted for Metropolitan tonnes

NCIG
- 66 Mtpa capacity
- User group owned, with Peabody shareholding currently 15.8%

PWCS
- 145 Mtpa capacity
- User group owned

- Contracted for existing and organic expansion potential from equity operations

* Subject to Third party B Class Shareholding entitling 25% profit share
Wambo Ownership and History

• Wambo is a combined open-cut and underground mine that has been operating since 1969 and was acquired by Peabody in 2006. (50 years)
• Located in the Hunter Valley of New South Wales, Wambo is a well established premium thermal coal mine which rails to the Newcastle Port’s for export.
• Wambo primarily exports to Japan, Korea and China.
• In 2018, Wambo complex mined 7.7 Mt.
• Wambo is one of Peabody’s largest operating mines and has a workforce of approximately 566 permanent Peabody employees.
Coal Handling and Preparation Plant

Clean Coal Stockpile Capacity >750,000 tonnes

ROM Coal Receipt Bin 400
Wambo Overview (Aerial)
The Mine - UG

Nominal 3.7 mtpa mine (2019 3.4 mtpa)

3 heading mains and 2 heading gate road layout

1 x Joy LW – 250 m wide (1400 – 1800m blocks)

4 x continuous miners
  - 1 x super unit gate road
  - 1 x super unit mains

1-2 x UIS Drill rig (sometimes)
## Simple Yet Challenging

### SIMPLE
- Highwall entry mine
- 2 km UG
- Layout
- New equipment
- Benign LW operating conditions
- Land ownership
- Residential location
- Environmental consent conditions (within OC void)
- Low CAPEX input
- Dry seam

### CHALLENGES
- Portal distance from admin
- Significant structural geology
- Soft/weak roof
- Multi seam workings
- Limited data
- Multi mine operations (UG)
- Relocating infrastructure
- Scheduling / short panels / Lead time
- Open cut interaction - Blasting
Coal Seams

- Multiple seam lithology
- Target
  - Whybrow
Workings

- Wambo Open Cut
- Multi Seam UG
  - Wollemi (Whybrow)
  - Homestead (Whybrow)
  - North Wambo (Wambo)
  - South Bates (Whybrow)
  - South Bates (Wambo)
  - South Bates Extended (Whybrow)
  - United (Glencore) (Arrowfield)
South Bates Whybrow Extended

Highwall entry

Current Mine Workings
General Outburst Management Strategy

- Wambo UG workings contains a combination of above and below threshold coal
- Surface to seam and inseam compliance sampling is used to find boundary between above and below threshold coal levels
- Threshold x 2
  - DRI 900 (Mining in outburst control zones)
  - Defined threshold values (DRI 900 equivalent from geogas)
- Drill and drain above threshold coal
- Resample
- Issue ATM when below threshold
Reservoir Prediction / Project Feasibility

- Vertical compliance boreholes used for feasibility
  - Full working section sampled for gas
- Reservoir prediction generally lower total gas content
Current Threshold Limits

Whybrow Extended Seam Defined Threshold Limits

Above Threshold

Below Threshold - Gas Drainage Implementation trigger zone

Below Threshold

At 900 DRI and average seam gas composition, the outburst and drainage thresholds were calculated as:

- Outburst Threshold of 7.89 m³/t @ a seam gas composition of 40 % CH₄
- Outburst Threshold of 10.10 m³/t @ a seam gas composition of 92 % CH₄

- Drainage thresholds (Defined Threshold Value – 2 x std deviations) were determined as:
  - Drainage Threshold of 6.36 m³/t @ a seam gas composition of 40 % CH₄
  - Drainage Threshold of 8.81 m³/t @ a seam gas composition of 92 % CH₄

AND DRI 900

Strategy to sample virgin and drained coal to confirm below threshold
Drilling Challenges

- Multiple coal ply’s (A ply and B ply)
- Variable seam characteristics
  - Thickness
  - Grades
  - Geology / structure
- Minimal data on seam
- Variable target seam 0.8m to 1.5m
  - Multiple branches
- Hard band / Roof (AS ply)
  - Sandstone erosional channel
- Cowpat / Clay interburden
  - Typical clay – moisture sensitive
Mine Working Section

- Target Drainage seam A ply
  - Higher gas content
  - Generally Thicker
- Essentially 2 Coal seams

Coal / Sandstone – HARD + ABRASIVE

AS Ply

A Ply

B Ply

Clay Band – 0.3m

C Ply

0.8m – 1.5m Approx.

1m Approx.

Drilling section
Gas Content in coal

<table>
<thead>
<tr>
<th>Core Sample</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>≈ 5% total gas – 0.4 m³/t</td>
<td>≈ 15% total gas – 1.2 m³</td>
<td>≈ 80% total gas – 6.4 m³/t</td>
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Aim to pass on both DRI and Threshold.
A Few samples have **passed** on one threshold and **failed** on the other.

Nominal 8 m³/t and **940 DRI**

75 - 85% CO₂
15 - 25% CH₄
Hole Flows and Perm

- Tight solid coal
- Low flowing
  - 5-15 l/s each hole
  - 16,000m of holes discharging ≈ 80-100 l/s
- Primary and Secondary cleats filled with calcite
  - Low pore space
- Predominantly Q3 gas
- Direction of holes have minimal impact on flow
- Boreholes remain stable
Current Gas Drainage - SBX

- Primary target A ply
- Secondary confirmation of gas in C ply is below threshold
- 2 drainage stubs at current
- Drilled up dip for water management
- Tight spacing of holes
  - 10m
- Early access exploration holes drilled
Recent previous Wambo UG mines

South Bates Whybrow Seam

South Bates Wambo Seam
Other Challenges

- Gas drainage is a bolt on process at Wambo when required and is not considered another standard process but more of a hinderance.
- Frontline management have limited exposure to gas drainage process and practical management of gas drainage holes.
- Mine schedule prevents long lead times on holes:
  - Short panels / fast moving.
- Generally gas is noticed first with CM trips and sumping in as we progress into deeper higher gas areas:
  - Change in operating / cutting cycle required in gas drainage areas.
- Low LW SGE considering residual gas content.
- Gas management strategy for hole gas make:
  - Typically vented into a return.
Summary / Key Learnings for Wambo

- Vertical compliance/Reservoir assessment can vary to inseam horizontal (aggregate/composed vs single point sample)
- Utilising a combination of DRI and Threshold values for compliance can add an additional layer of complication
  - Currently looking at submitting a HRA to utilise threshold only
- Wambo requires tight spacing due to low flow / tight lead time
  - Other options such as fracing not currently explored due to minimal drainage area
- Gas drainage and hole management isn’t part of day to day operations and not second nature to persons at Wambo
  - Refreshing personnel on practices every
Questions?