



# DENDROBIUM MINE – GAS DRAINAGE IN POTENTIAL FUTURE MINING DOMAINS

27<sup>TH</sup> JUNE 2019

Alaster Wylie - Operations Manager

Erin Lee - Compliance Superintendent

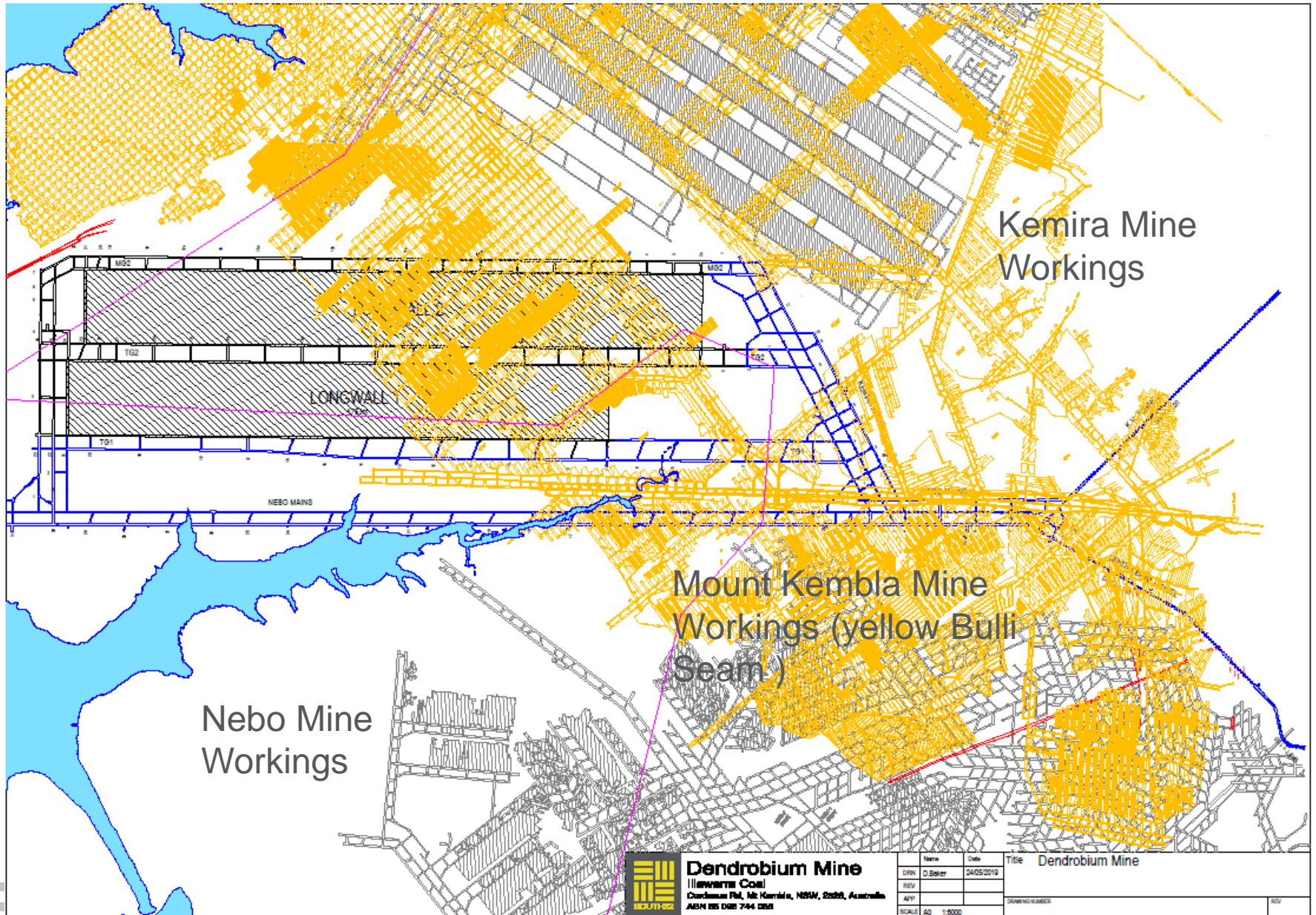
Wayne Green - Mining Engineering Manager



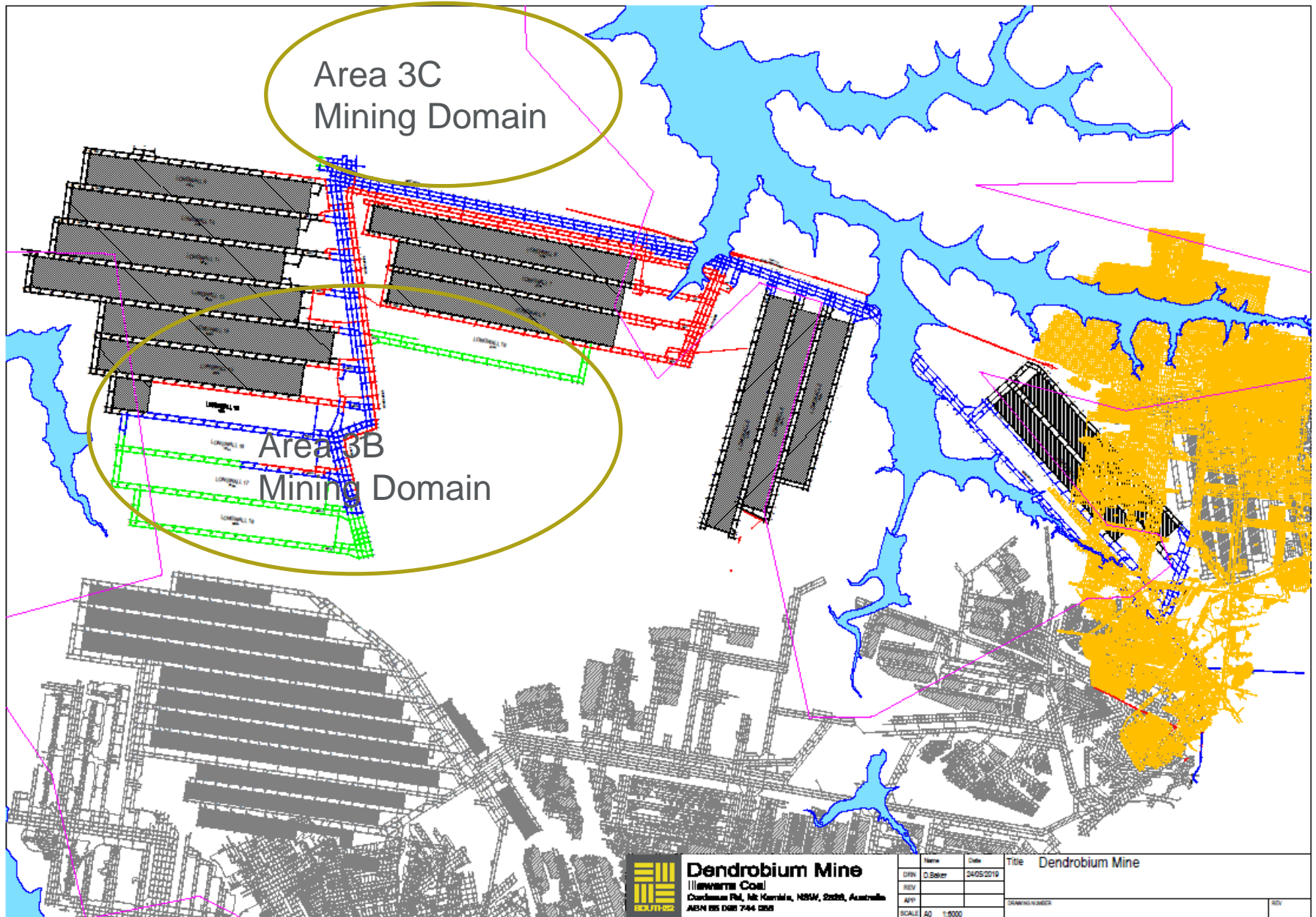
## Dendrobium Mine

- Commenced Longwall operations in 2003 – operating a 300m wide longwall with surface facilities situated on former Nebo Mine site. Close proximity to community.
- Mine is located approximately 9km from Port Kembla, ROM coal is transported by a dedicated rail line to a CHPP located inside Bluescope Steel Pty Ltd.
- Mine has approved consent to mine up to 5.2 mtpa ROM production
- The mine operates in the Wongawilli Seam No 3 seam @ 280m - 400m depth of cover.
- Seam is 10m thick and the working section is the bottom 3.9 metres.
- Output product is primarily a high fluidity metallurgical coal.
- Gas content is variable across the lease but generally less than 5m<sup>3</sup>/t in current Area 3B mining domain.
- Low propensity for spontaneous combustion
- Mine discharges + 7mL of water a day into a licensed discharge point.

# MINE PLAN – ADJACENT MINES



# MINE PLAN





No history of outburst in the Wongawilli Seam over 125 years of operation

Underground in-seam drilling carried out primarily for exploration, structure definition and as part of consent conditions.

Dendrobium has a outburst threshold that has been developed for the Wongawilli Seam – gas contents are considered as part of the ATM process.

Gas content in the current Area 3B mining domain continues to reduce towards the southern lease boundary.

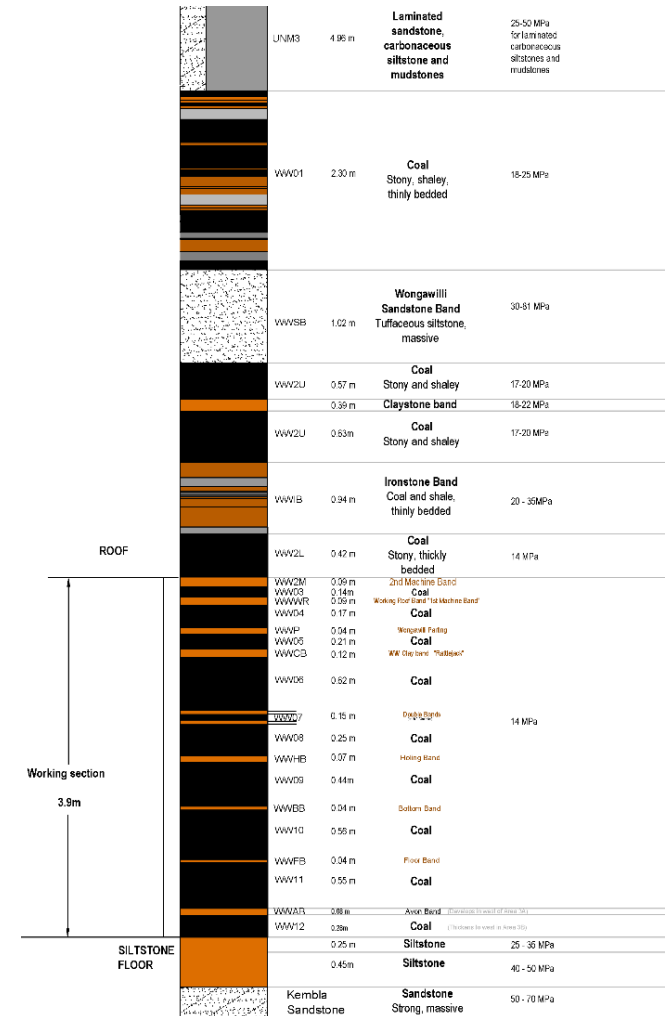
Dendrobium has four remaining longwall blocks in Area 3B post the completion of the current LW15 block. Extraction of each longwall block is scheduled to take 10 months.

The working seam is overlain by the Bulli, Balgownie and Cape Horn seams with the American Creek and Tongarra seams located below the Wongawilli seam.

From a gas perspective the thickness, ash content and proximity to the working seam of each of the adjacent seams is fairly consistent across Area 3B.

# WONGAWILLI FULL SEAM PROFILE – AREA 3B

- Total Seam Thickness: 9 – 10 m
- Working Section Thickness: 3.9m (at base of seam)
- Highly banded seam with numerous claystone partings
- Immediate 6m of coal roof is weak and laminated except for the Sandstone Band which is hard (30-80MPa) and relatively competent.
- Depth of Cover: 280 – 400 m (in Area 3B)
- Occurs about 20 m below Bulli Seam
- Coal Strength ~14MPa
- Relatively High Raw Ash: 26 – 29 %
- Very Low Phosphorous: ~0.003 %
- Medium Sulphur: ~0.65%
- High Vitrinite: 80 – 95 % & high coking properties



# WONGAWILLI SEAM OUTBURST THRESHOLD

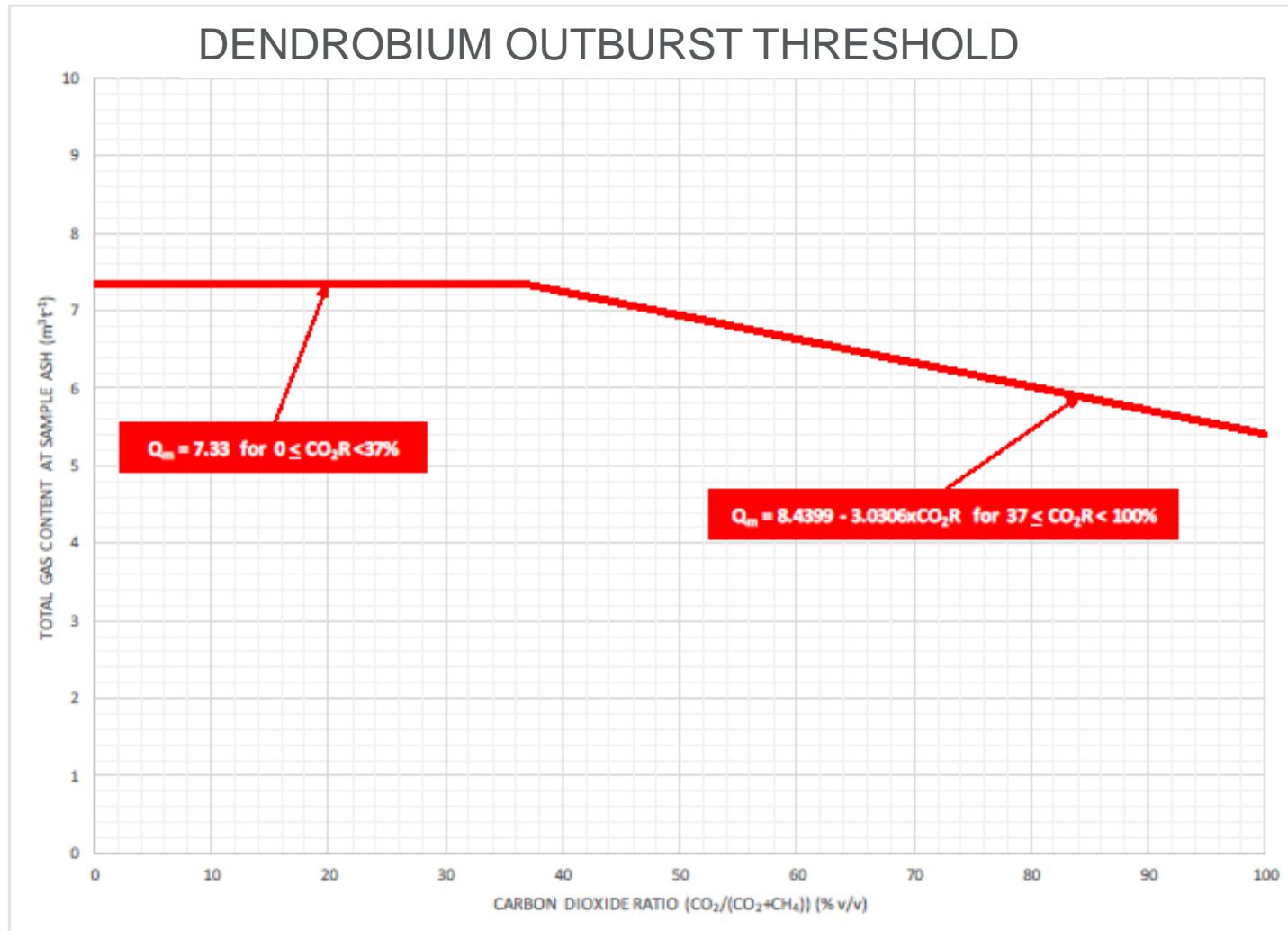
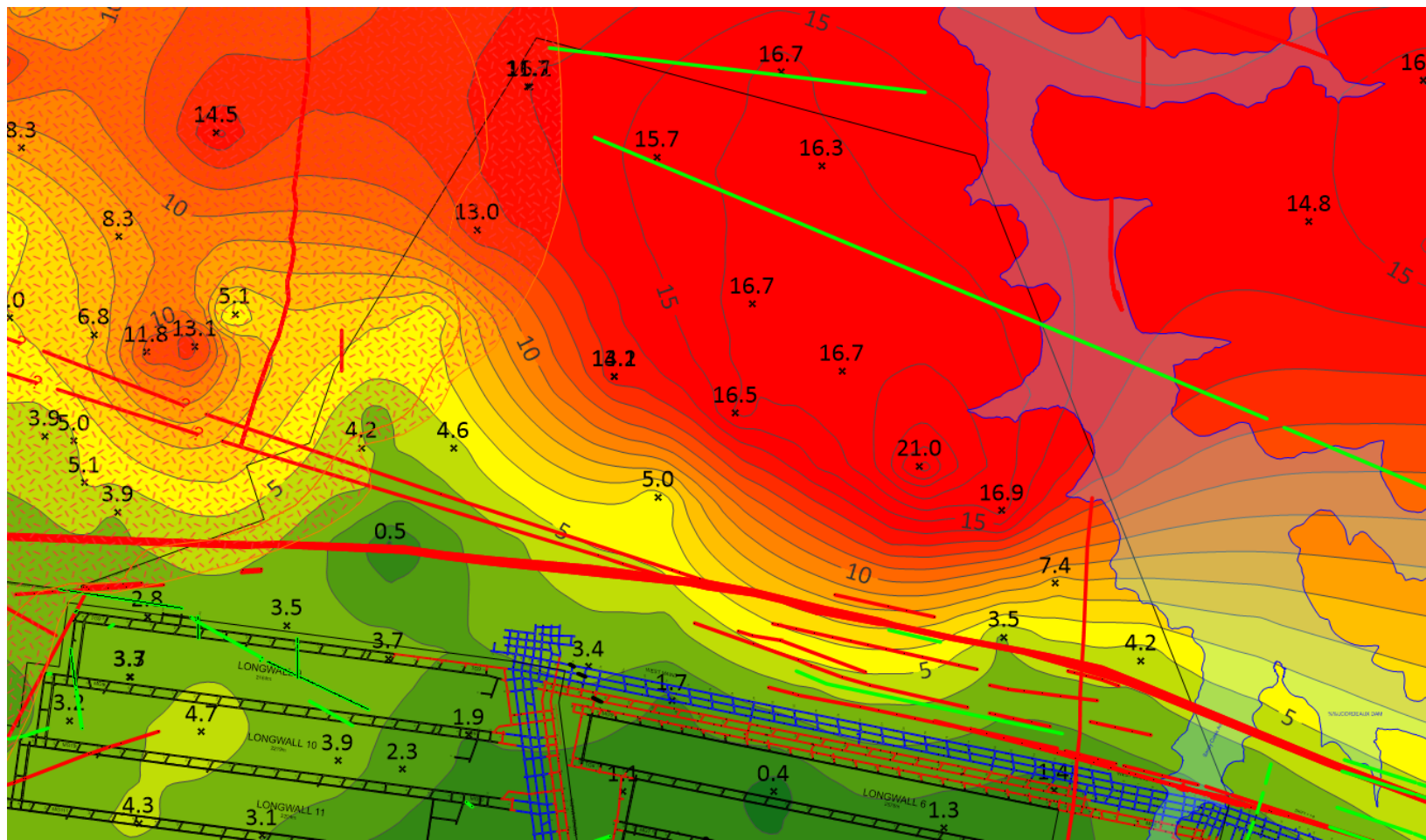
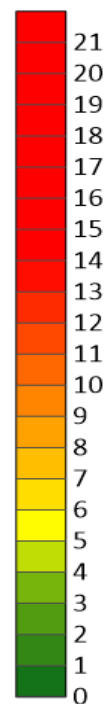


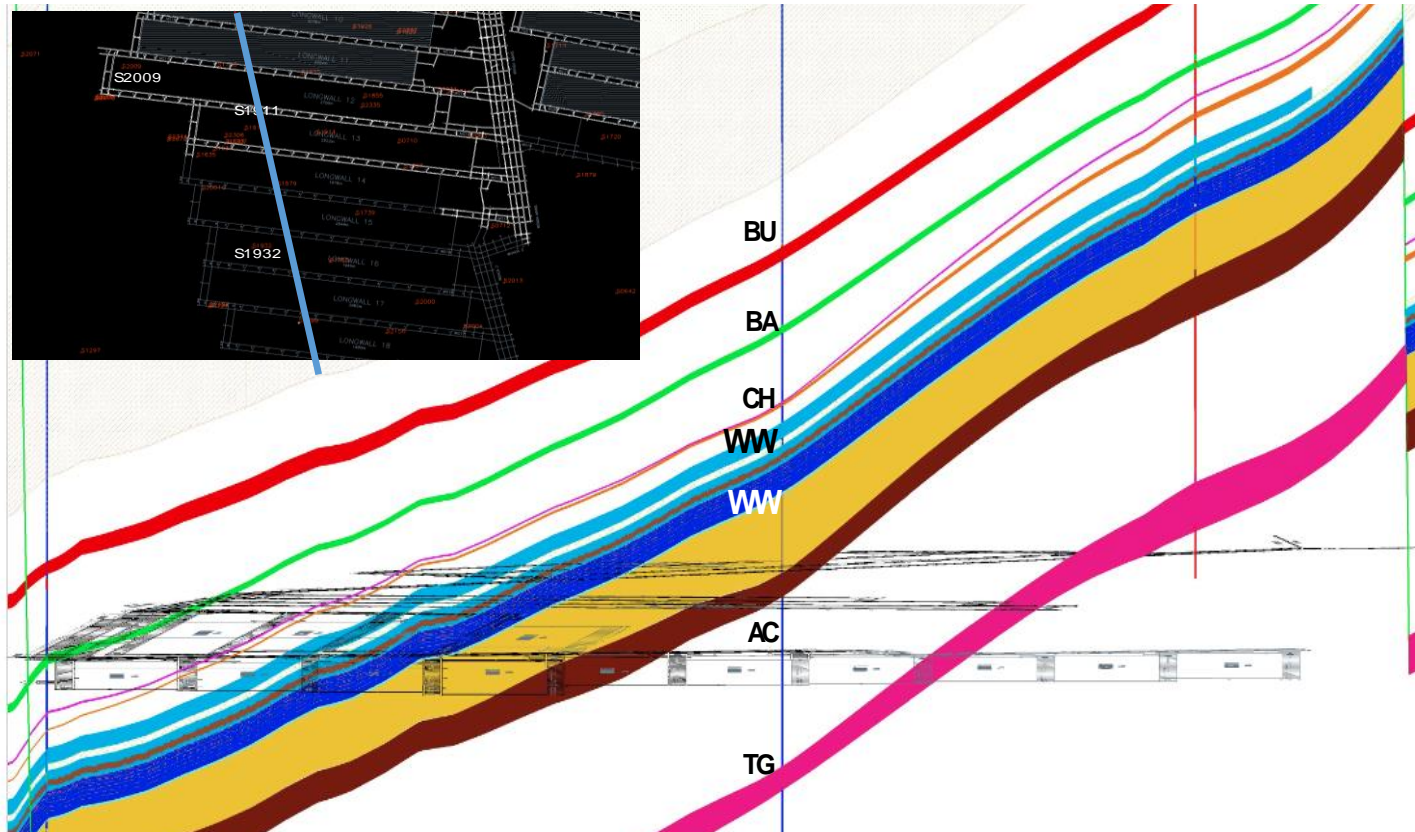
Figure 1 – Dendrobium Outburst Threshold for Wongawilli Seam<sup>2</sup>

# WONGAWILLI AREA 3C SEAM GAS CONTENT (M<sup>3</sup>/T)





# SEAM STRATIGRAPHY



# AREA 3C GAS DRAINAGE ISSUES

Gas content in Wongawilli Seam is above outburst threshold levels

Thick seam – high Specific Gas Emission (SGE)

Overlain seams also have increased virgin gas content

Area 3C has an in-situ gas content of 12-16m<sup>3</sup>/t – meaning drainage has to reduce in-seam content by 9-13m<sup>3</sup>/t

Area 3C is Carbon Dioxide rich

There is little operational experience draining the Wongawilli Seam

Necessity to drain 3 different seam horizons –separated by impermeable stone bands.

No gas drainage infrastructure in place

Potential Impact of Low Vertical Permeability – influencing drainability of Area 3C

The stone bands within the Wongawilli Seam have been measured as having almost zero permeability

This zero permeability may mean it is necessary to drill separate horizons within the seam

There are additional gas bearing seams in both the roof (Bulli Balgownie and Cape Horn seams) and the floor (American Creek and Tongarra Seams) where both up and down holes may be required

# AREA 3C GAS DRAINAGE ISSUES

The drilling of upholes may be difficult due to swellable strata immediately above the Wongawilli Seam

Gas reservoir quantity in Area 3C has been predicted to be in the order of 120m<sup>3</sup>/m<sup>2</sup>

Basal section of the Wongawilli seam is expected to account for approximately 95m<sup>3</sup>/m<sup>2</sup>

Longwall gas reservoir is significant – modelling by Palgas <sup>(Blanch 2014)</sup> shows weekly average emission rates of up to 5000l/s of Co<sub>2</sub>

