

Tahmoor Outburst Event March 2018



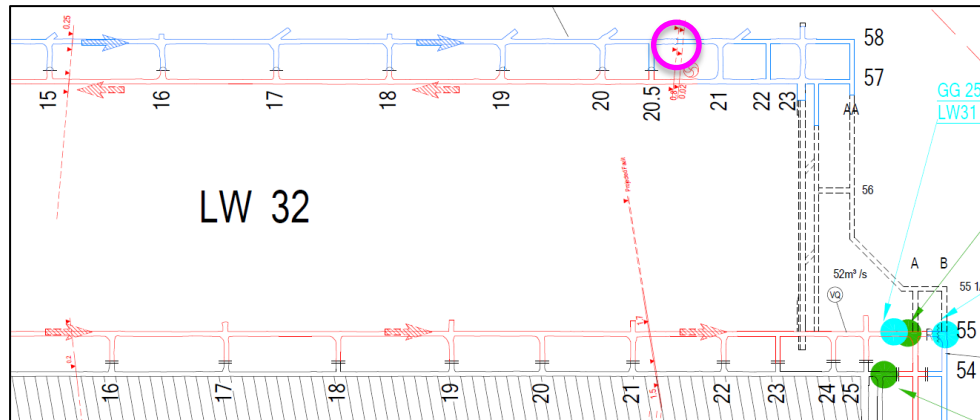
Event Summary

Tahmoor mine had a small Outburst, approximately 200m³ of CO₂ and less than 100m³ CH₄, that occurred in 912 Panel 20-21A on Sunday 11 March.

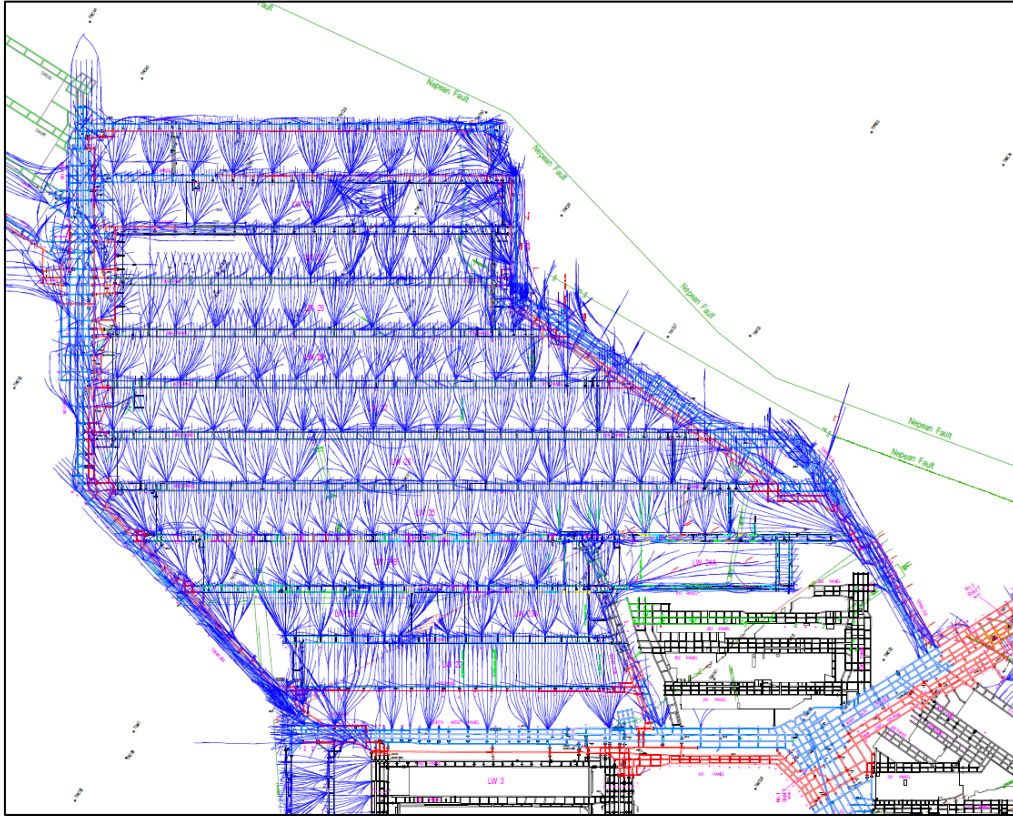
The event occurred whilst on remote mining operations (grunching), but did occur during the trimming process whilst personnel were at the face.

The immediate situation was managed exceptionally well by the personnel present at the time and no injuries were sustained.

The event constituted a failure of the Outburst Management Plan and as such warranted an immediate review of the Outburst RA and Outburst Management Plan.



Background - Geology



Nepean Fault on Eastern extremity:

- Estimated 30-35m down-throw fault
- Identified only by surface seismic exploration
- A number of attempts underground to identify from in-seam drilling
- Change direction of 810 Mains panel at 21c/t

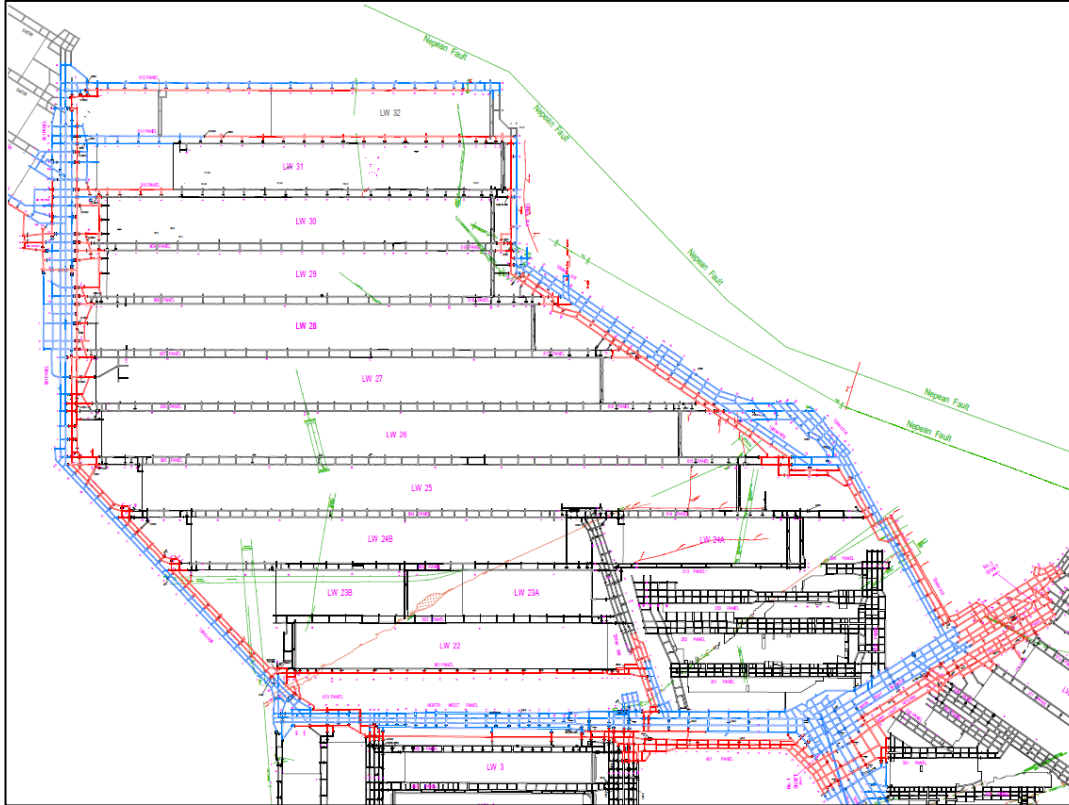
Drilling patterns

- Standard cross block fan pattern from adjacent gate road
- Pattern differences on eastern end due to drilling anomalies

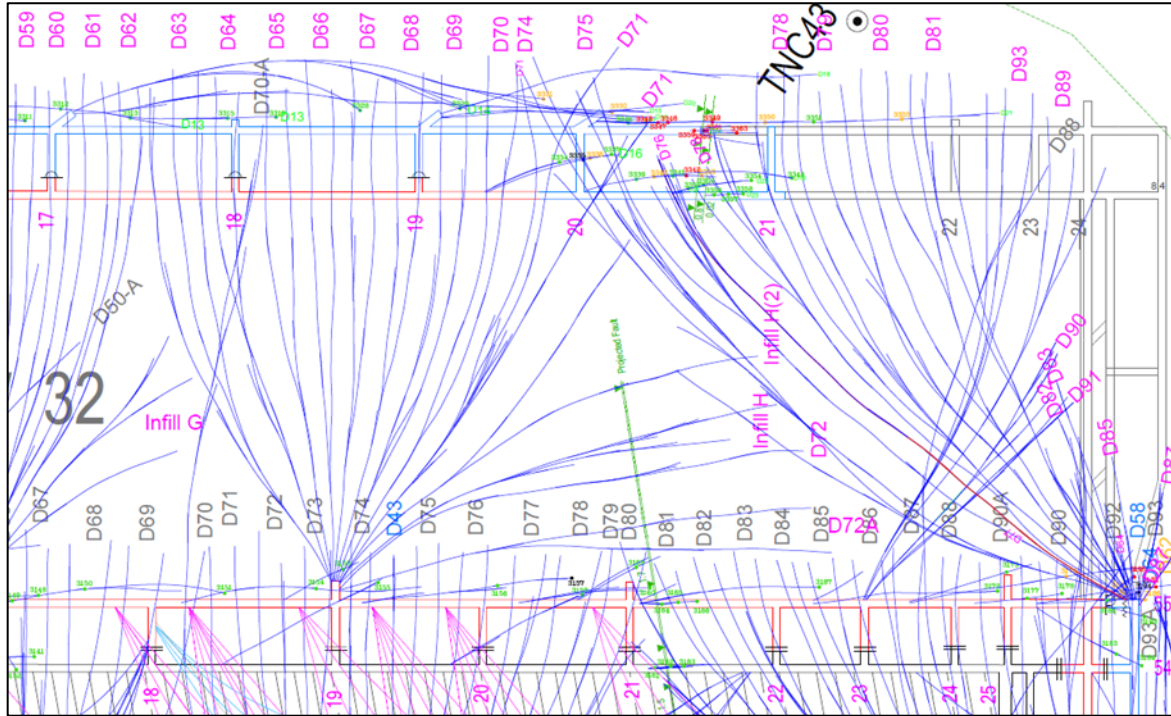
Background - Geology

Nepean Fault on Eastern extremity:

- As we mine closer to the Nepean fault projection, a number of 0.5m – 1.5m reverse thrust fault have been intersected
- None of these are parallel to each other, or project through to next block
- Resultant horizontal stress around the bottom of 912 has increased from a normal background of 15-20MPa to 25-29MPa
- Increase stress has lead to a number of bogged drill strings during drilling operations, both within LW blocks and on the Eastern side of the Mains



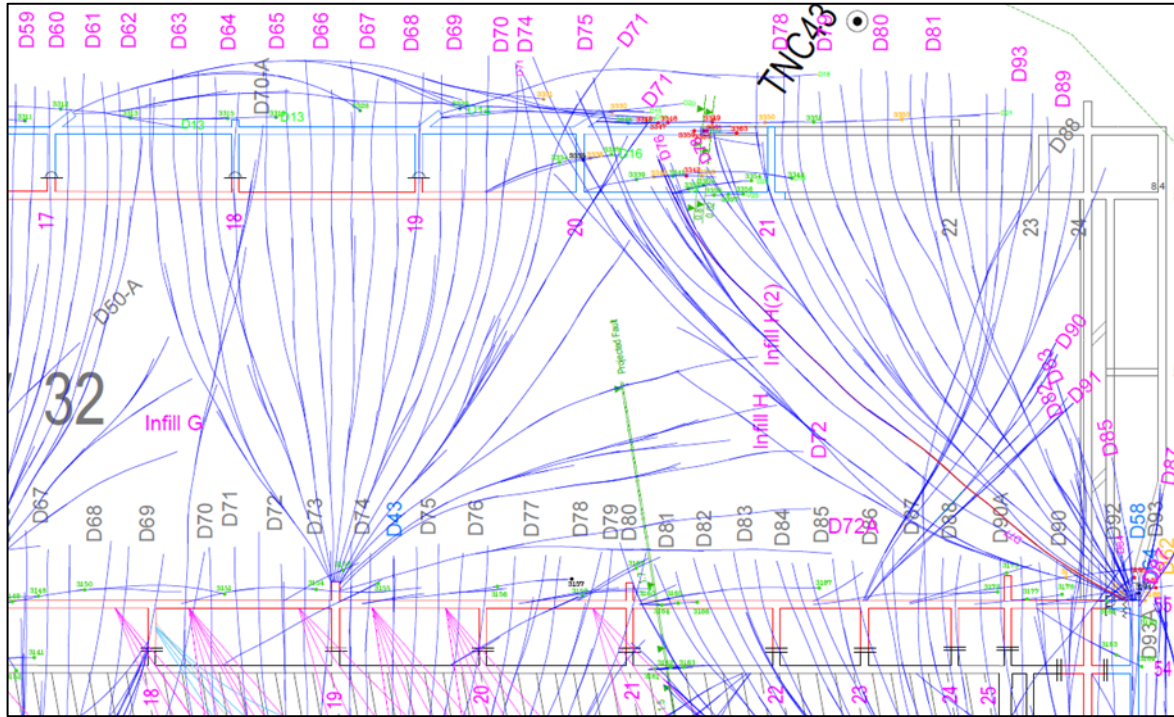
Background - Drilling



Attempts to drill and drain the area:

- Timing and scheduling constraints led to normal drill pattern not being implemented at 21c/t 911 panel.
- Additional holes from 19c/t and 55c/t to provide coverage
- Drilling difficulties, such as excessive fines, led to 19c/t drilling being suspended in July 17
- Different angle from 55c/t successful for first two holes (D74 and D75), however encountered more difficult drilling due to excessive fines, holes collaring and collapsing in subsequent holes – eventually losing drill string in D76. Drilling was suspended in Dec 17

Background - Drilling



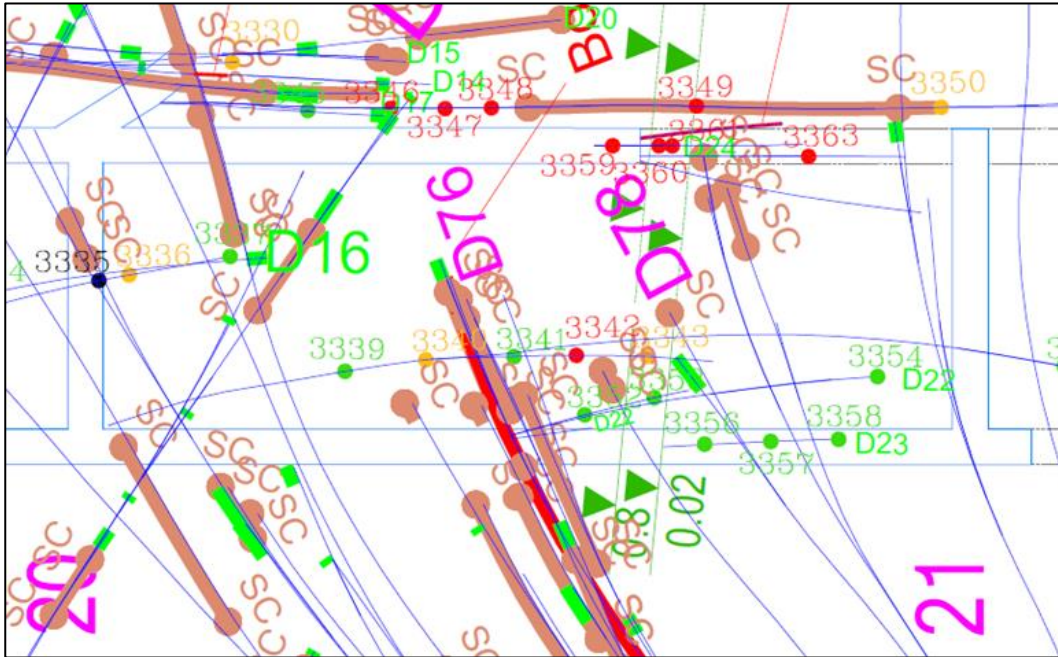
Attempts to drill and drain the area:

- Next plan was to drill flanking holes from the panel travel road once close enough
- A number of holes were attempted from 17c/t and 19c/t, which met similar difficult conditions in the same place I/B 20c/t. Again the drilled string was bogged for 24 hours from 17c/t

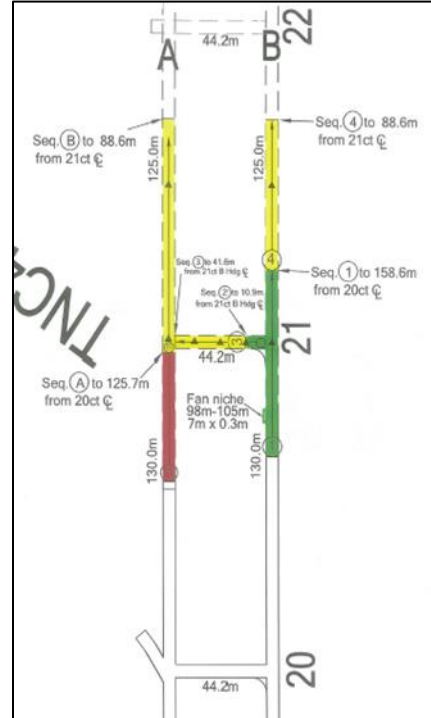
Background - Sampling

Sampling was conducted in both A and B hdgs in accordance with the Outburst Principal Mining Hazard Management Plan :

- Results in B hdg were below DTV indicating sufficient drainage to mine unrestricted
- B heading was at 129m at time of event
- This allowed an accurate projection of the fault for A hdg, and sampling was conducted according to the OPMHMP
- These samples were above DTV, and therefore remote mining, or grunching would be employed as it had countless times in the past
- Samples in the area around the event in A hdg ranged from 10.51m³/t to 15.38m³/t at a composition of approximately 65% CO₂ and 35% CH₄. The nearest sample to the location of the event was 10.88m³/t

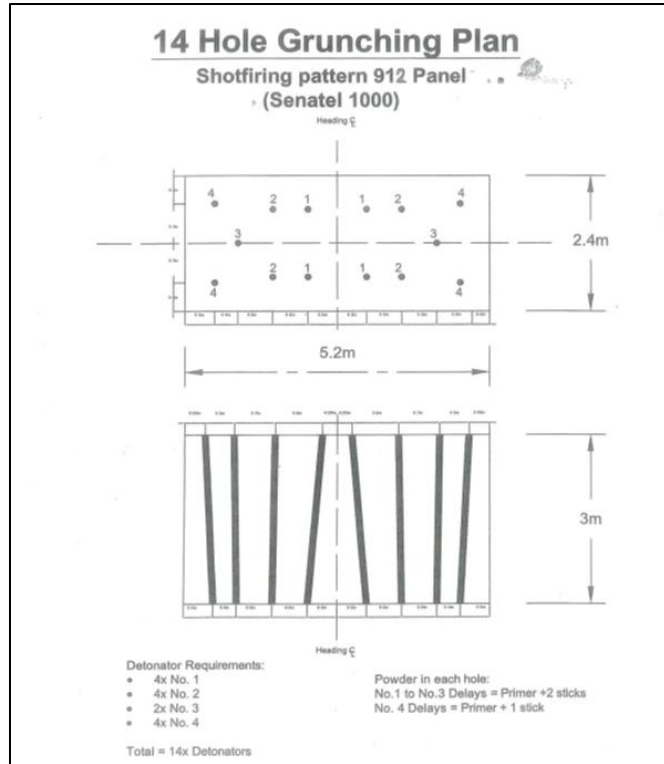


ATM and Grunching Process



- Grunching of the affected area commenced on 27 February 2018 at 32.6m inbye 20c/t.
- Approximately 14 rounds of grunching were completed between that date and Friday 9 March.
- The pattern used for grunching was consistent with that used successfully in the past utilising a 14 hole pattern to 3m depth.
- In the week preceding the event, the roof conditions in the roadway deteriorated to the point that production in A heading was halted to install secondary support to the face.

ATM and Grunching Process



- During this time it was determined that the 3m shot depth may be contributing to the deteriorating conditions, so an alternate shot plan for 2m depth was determined.
- On Friday 9 March the shotfiring Deputy's contacted the Production Manager and MME regarding difficulties keeping the top row of shot holes open.
- An alternate shot pattern was agreed between the appointed shot-firers and management utilising 10 holes concentrated on the mid to lower section of the seam, to 2m depth.
- On Saturday 10 March two rounds were fired using the alternate shot-firing pattern and reported that it resulted in successful removal of the coal face on both occasions.

The event

- At 12.10pm on Sunday 11 March, the shot-firing Deputy fired a round at A hdg face approximately 80m inbye 20c/t. He waited the required time for gasses to clear then inspected the face and reported that the shot had successfully removed the coal.
- The crew returned to the face and commenced the process of trimming and supporting the area in accordance with procedures. The Deputy requested that the miner driver trim the remaining 150-200mm to the back of the shot holes in some areas as it was evident that there were short butts left, and the Deputy did not want the danger of them being still in the face when drilling the next round.
- At approximately 1.45pm the miner driver was trimming from mid-face towards the floor when two pressure bumps were heard in quick succession (around one second apart), and coal and roof slumped down from the left side of the face.
- The gas monitors on the miner driver and the Deputy, who was standing with the miner driver at the time of the event, began to alarm almost immediately, and the power to the miner tripped due to greater than 1.25% CH₄.
- The Deputy ordered his crew to immediately withdraw from the face. He then made sure his crew, and the crew on the miner in B hdg, were all safe. He then contacted the Undermanager, who rang the Manager of Mining Engineering. Site and district SHR's, a representative of the regulator, and site management attended the site to conduct an investigation.

The event

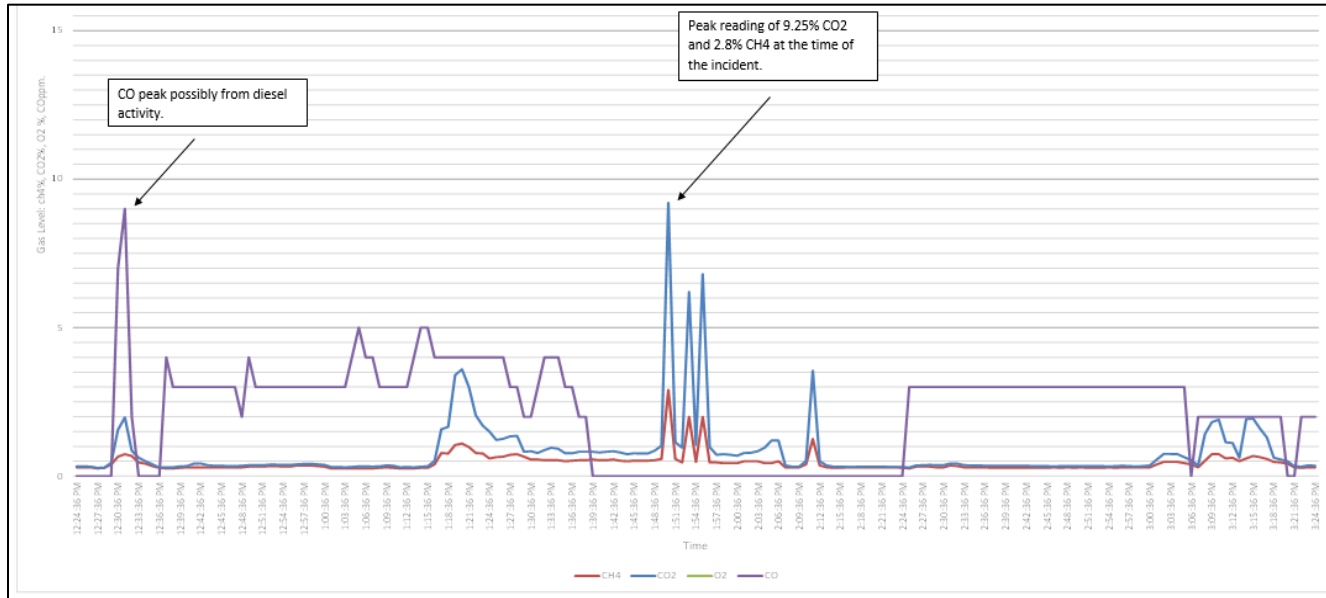
Upon inspection of the face there was evidence of

- A small conical cavity in the top left corner of the face, including fine coal had slumped out of the cavity.
- The first signs of the same structure projected across from B Hdg.
- Coal from the mid to RHS of the face having bumped marginally forward whilst remaining mostly intact.



The event

- Gas monitors were located in three places in the panel at the time of the event – one on the Deputies belt, one on the LHS of the miner in front of the bolting pods, and one on the baffle in the return air stream from the fan. The peak results from these monitors were as follows:
- Deputy – 9.3% CO₂, 2.8% CH₄; LHS of miner – 6.0% CO₂, 1.5% CH₄; Fan return air stream – 3.7% CO₂, 1.15% CH₄



The event



- Monitoring was also in place at the outbye end of the panel return, the peak readings at this point were 1.02% CO2 and 0.53% CH4.
- In approx. 30m3/s of air this equates to a peak flow of 300 l/s CO2, or over the 45 minute period to return to background levels a total of 200m3 CO2 and 65m3 CH4

The event



- It can be seen that in previous shots the release of gas has coincided with the shot

Review process

A Risk Assessment was conducted on the 14 March to review the Outburst Principal Mining Hazard Management Plan. It involved a number of management staff, workforce representatives, panel deputy and Glencore technical staff.

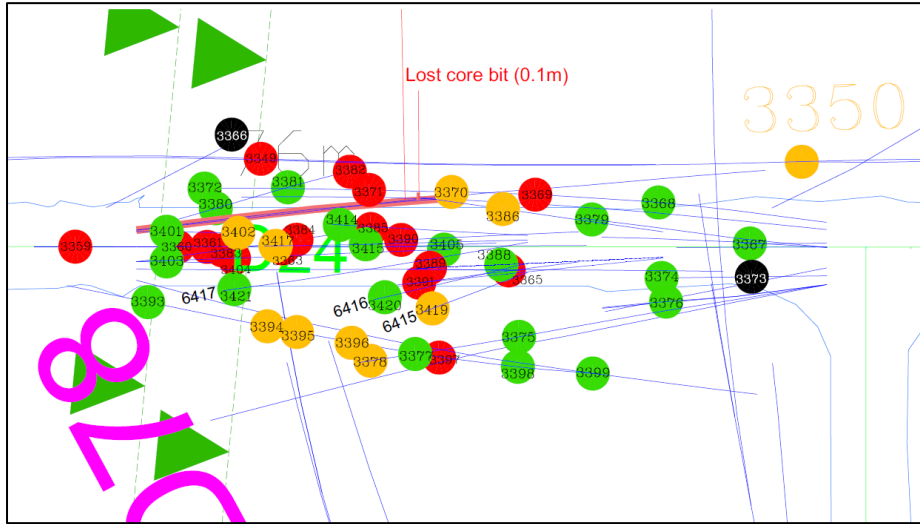
The key outcomes of the RA review to move forward were as follows:

- Investigate remote mining methods that have all mining conducted from an area remote to the face (no trimming whilst personnel present). No further remote mining to be conducted until this process was established.
- Implement an upper limit threshold on remote mining activities based on structured and unstructured coal. This would in turn drive the necessity for further drilling and drainage, even to permit the use of remote mining.
- Amend OPMHMP to state the prioritisation of drilling and draining an area prior to authorising remote mining activities
- Define the process to be utilised if a core sample cannot be taken greater than 2m from a borehole

Mining post event

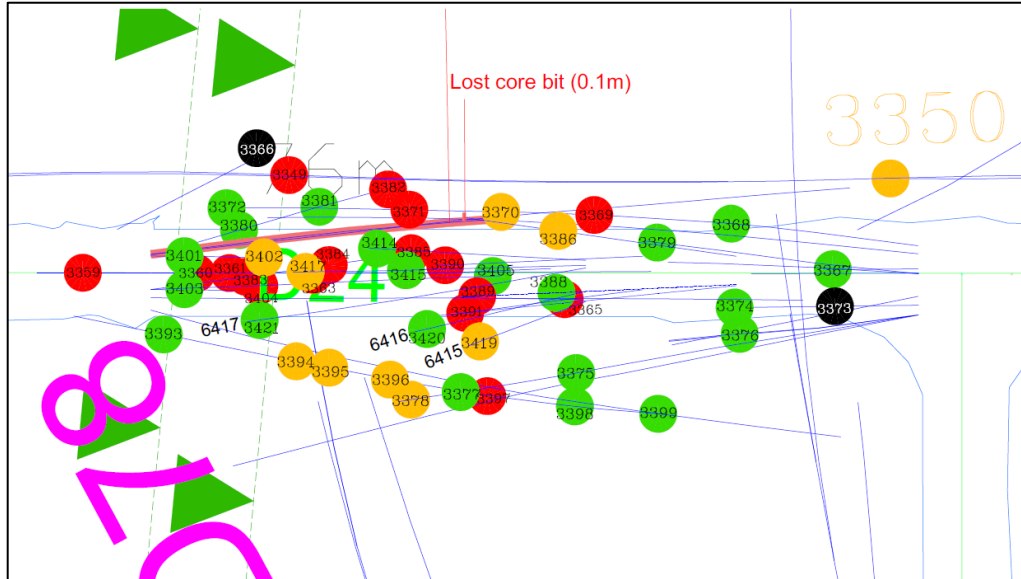
A Prohibition Notice was served on Tahmoor subsequent to the event. It stated that the area inbye the event location was not to be mined until a satisfactory method of mining was determined.

Tahmoor responded to the Notice stating that the area would not be mined until the gas content was reduced below the existing thresholds for unrestricted or restricted mining. Remote mining would not be utilised until a full assessment of the process was conducted. This was considered acceptable to the Regulator and the Prohibition Notice was lifted.



- At this time there was 45m of coal to mine
- A series of holes were drilled into the 45m zone from O/B face as well as inbye the zone (B hdg and the C/T were driven based on unrestricted core sample results)
- Unrestricted cores obtained to mine I/B face back O/B.
- Applied a 5m standoff from pass cores – were not 100% certain of fault location at that point in time.
- Applied “worst” sampling across the cross section of the face, due to 2m sampling from borehole rule

Mining post event

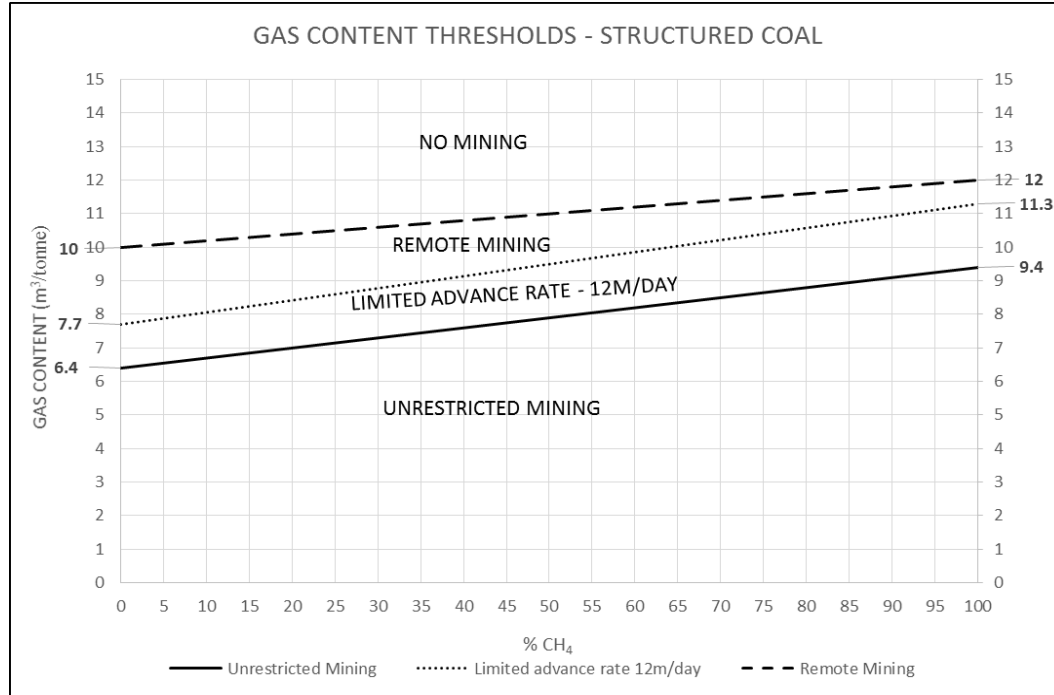


- Process of mining appeared to relieve or re-distribute stress, and aided the gas desorption process.
- This process was far more effective in draining the coal than the drill and drain method used in the preceding weeks. Holes were collapsing as soon as rods were retrieved, in certain cases
- Mining continued in small sections, mining one side of the zone and sampling the other
- After 44 core samples, the area was successfully negotiated and the roadway was holed.

Key Outcomes

1. Investigate alternate remote mining processes in place throughout the industry that utilise the mining equipment to mine the coal whilst personnel are removed from the face, i.e there is no excavation that reduces the coal barrier (other than barring down loose material to make the area safe for work) whilst personnel are at the face.
2. Review the grunching process to provide methodology such that there is no requirement for excavation that reduces the coal barrier through further removal of coal from the face or ribs (other than barring down loose material to make the area safe for work) whilst personnel are at the face after the shot has been fired. This will require a review of the shot hole pattern so that the result from the shot provides the desired profile. The grunching process will not be used by the mine until such controls are in place.
3. Amend the Outburst Principal Mining Hazard Management Plan to include reference to prioritising the reduction of gas content to below remote mining thresholds through the drilling and drainage process prior to consideration of remote mining methods. This practice is to be included in the Authority To Mine checklist.
4. Implement an upper limit of 10m³/t in 100% CO₂ to 12m³/t in 100% CH₄ in structured coal above which no mining will occur and include in the Outburst Principal Mining Hazard Management Plan. Also included an upper limit of 18m³/t in unstructured coal which would initiate a review of mining conditions and methodology. (Reference to no mining limit)

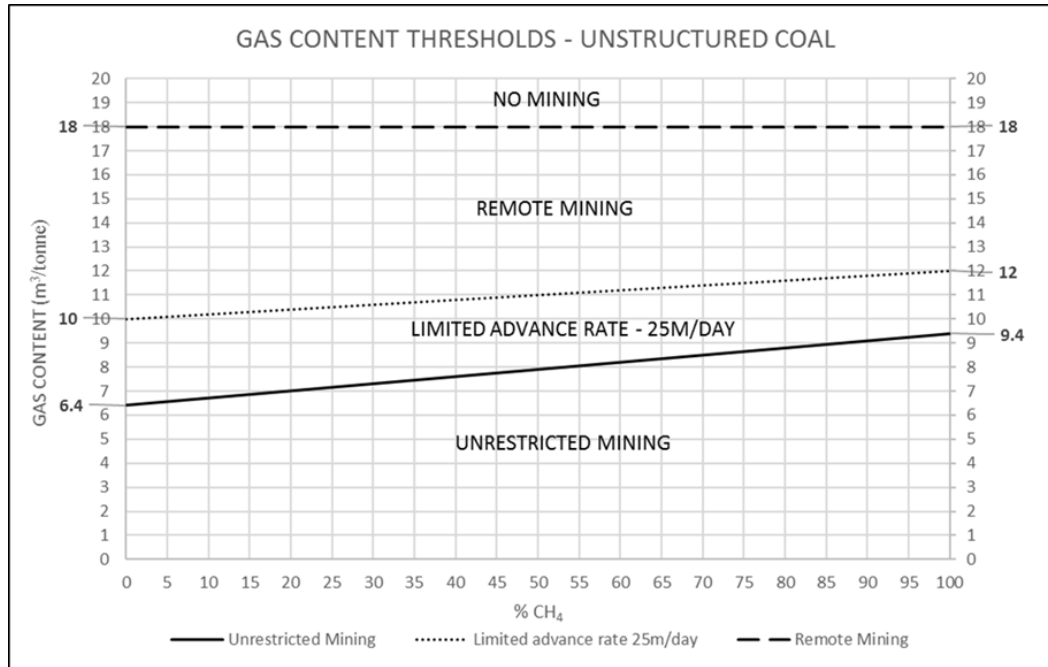
Amendments to OPHMP



Upper limit for Structured coal:

- By limiting the gas content, it reduces the amount of gas available to be released and the level of energy involved.
- The recent event occurred in an area that had been sampled to be 10.88m³/t (35/65, CH₄/CO₂).
- Based on a single "fail case" data point, an upper limit for structured remote mining of 10m³/t in 100% CO₂ to 12m³/t in 100% CH₄ should be applied, approximately corresponding with the gas content in the area of the event.

Amendments to OPHMP



Upper limit for Unstructured coal:

- Tahmoor has an extensive history of remote mining through unstructured high gas content areas without initiating an outburst.
- Therefore, for unstructured coal, the group determined it to be acceptable that an upper limit of 18m³/t (regardless of composition) should trigger a review of mining conditions/methodology based on that gas content being considered the extent of the "normal" gas content range observed in Tahmoor North.

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