

EMPOWERED

North Goonyella Outburst Incident Learnings

June 19, 2013

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Introduction



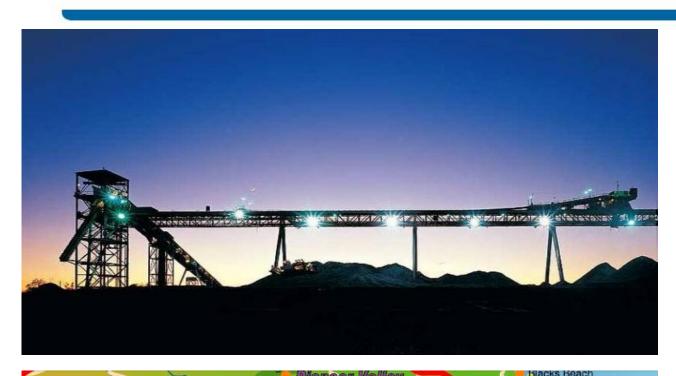
- North Goonyella Coal Mine & Outburst History
- Outburst incident May 2012
- Lessons learnt

"We ought not to look back unless it is to derive useful lessons from past errors and for the purpose of profiting by dear-bought experience"

George Washington

North Goonyella – Bowen Basin (QLD)







It isn't Wollongong....

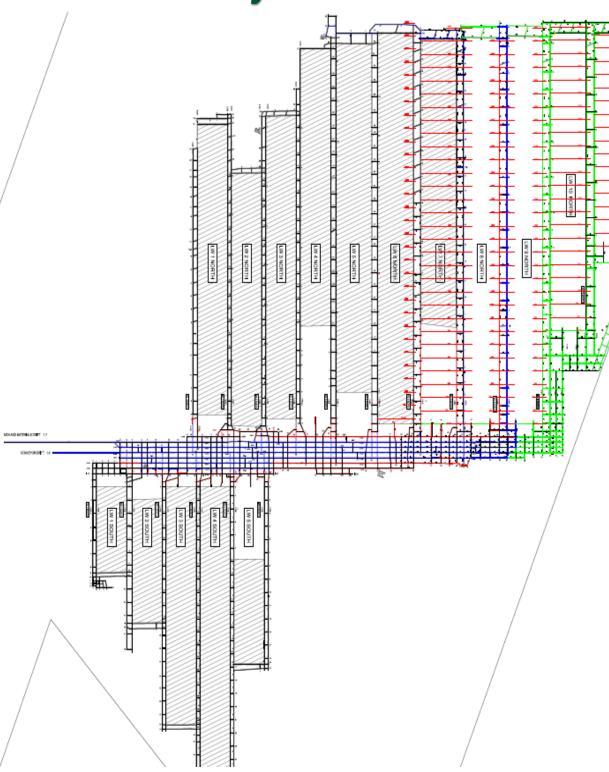


But at least its warm in winter!!!

North Goonyella – Bowen Basin (QLD)



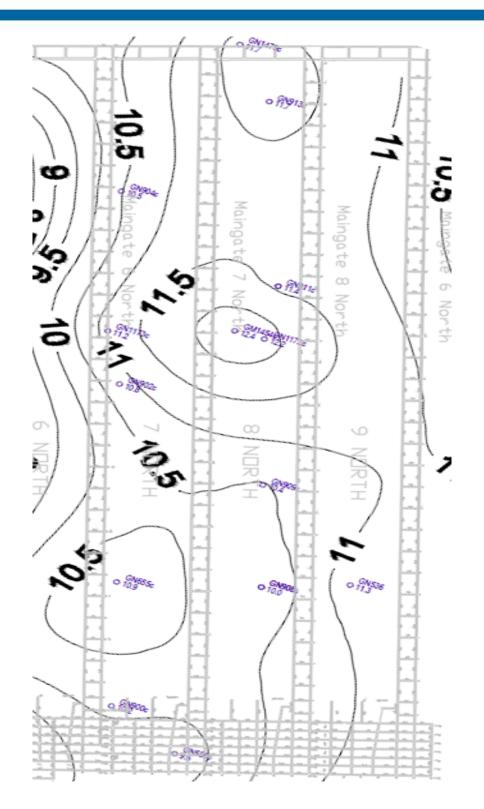
North Goonyella Coal Mine



- LW mining since 1994
- 300m wide ~ 3km long blocks
- Highly structured geology
- Increasing gas content (predominantly CH₄) with increasing depth of cover
- 1:10 seam dip (gateroads mined on strike)
- Permeability ~ 1mD to 5mD
- 6.5m seam (GM)

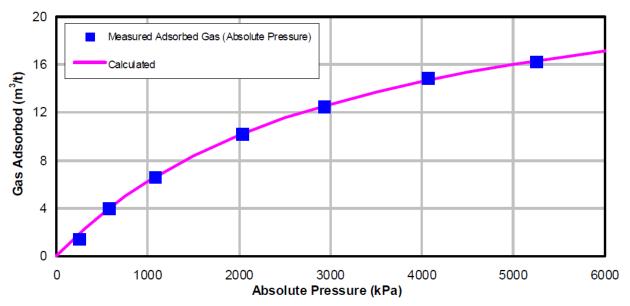
Gas content & Permeability





- Virgin gas content increasing with depth of cover
- Seam permeability gradually reducing challenging current gas drainage hole spacing

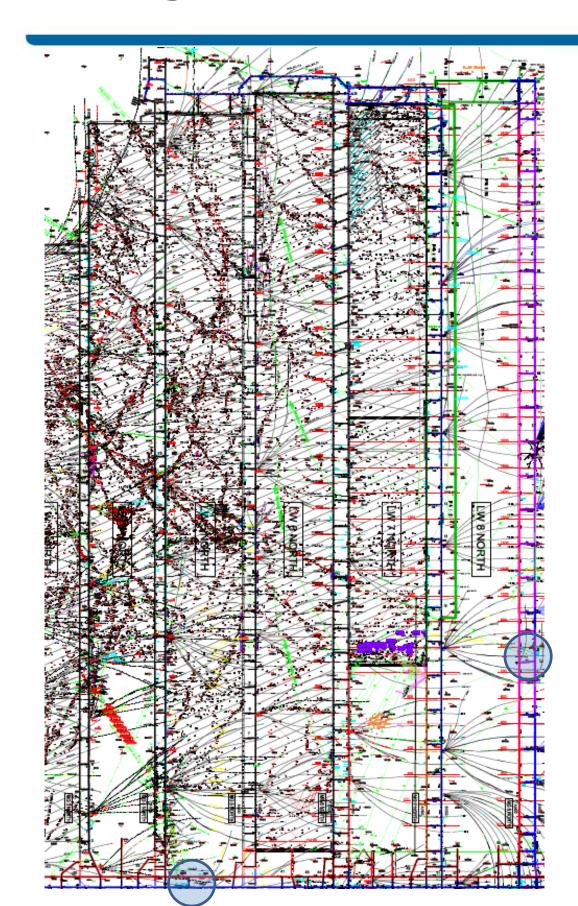
Methane Isotherm at As Received Moisture Basis Conducted at 40°C, NG1639



Virgin Gas Content (m3/t)

Geological plan & Outburst History

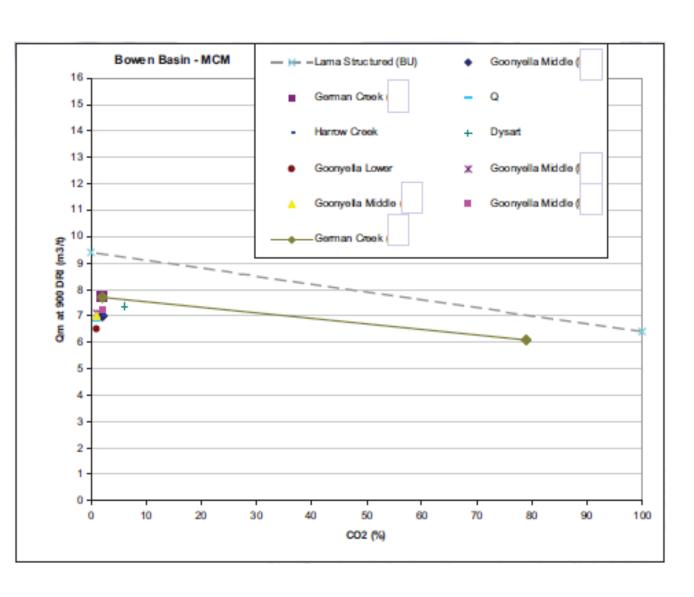




- Geology can prove very difficult to accurately predict with numerous smaller faults that frequently change direction and magnitude
- Several larger structures/faults have impacted on the mine plan over the life of the workings
- Seam is soft and friable
- Some structures do contain mylonite material
- A small outburst was recorded on 22nd October, 2001 at 36c/t in the mains headings

Outburst Threshold Limit

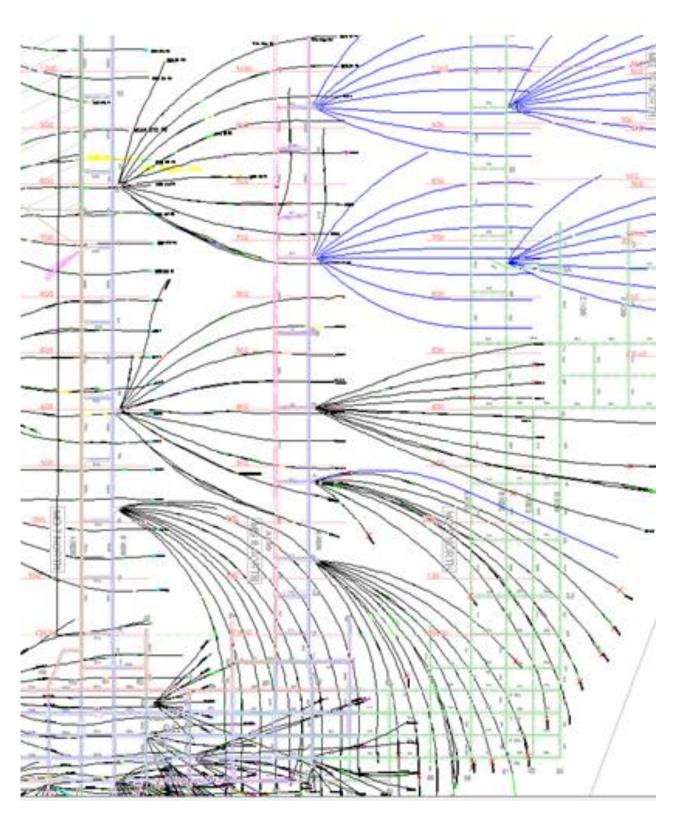




- Outburst threshold limit at NGC – 7m3/t (DRI900)
- Gas drainage typically reduces in-situ contents to ~ 3m3/t prior to development
- Composition >95% CH4
- Protective barrier of 15m around area to be conformed
- UIS holes vented/flared to surface via vertical boreholes (12") – gas risers

Outburst Management (2012)





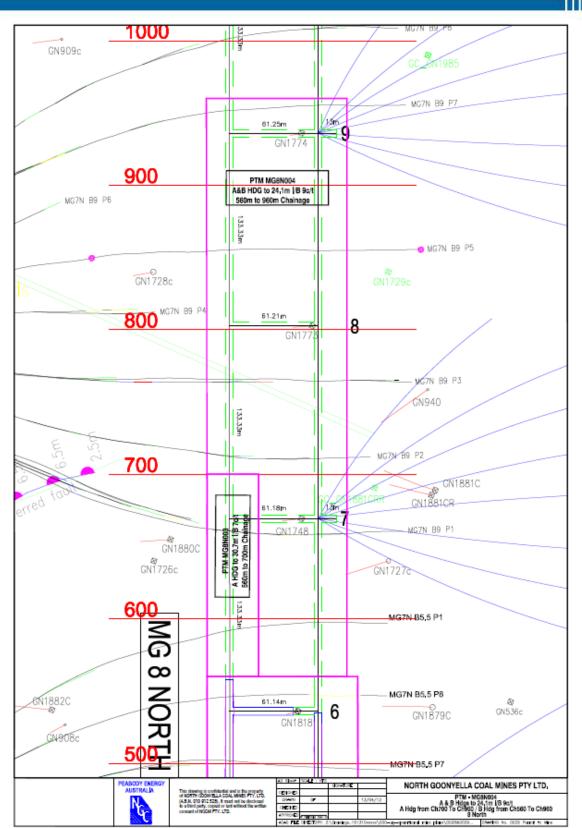
- Gas conformance achieved from surface drilling (deviation up to ~ 15m)
- Worst anticipated location tested re: geological info, gas content, drilling performance etc
- Cross-block pattern ~ 50m hole spacing
- Holes drilled ~ 50m beyond gateroad on virgin side
- Targeted cross-measure drainage (GLA1) & coring
- Limited SIS drainage
- Core spacing ~ 150m

Permit to Mine (PTM)



- Permit to Mine (MG8N004) issued for 8N 560m to 960m (6c/t to 9c/t) – April 19
 - Identified structured zone, difficult drilling conditions from 7N (P4)
 - Thinning interburden between GM seam and GLA1 (undrained lower seam ~ 5m-7m below)
- 6 x surface & 2 x U/G conformance cores along with in-seam borehole information within thresholds

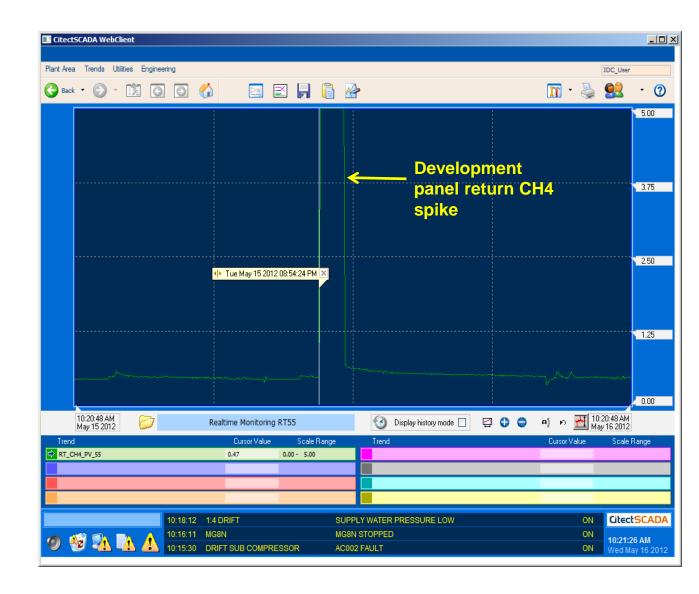
The rigors of a sound O/burst Mgt Plan PTM process should ensure complacency does not spill into mine planning practices. As Manages we need to continually ask ourselves "What if?" and develop plans to cover these circumstances



Timeline



- 11th May Poor roof conditions experienced in A hdg with CM009
- 13th May increasing CH4 levels encountered during mining resulting in frequent trips to the CM
- 14th May B hdg (CM008) noted slight seam roll (no fault) but continued to control conditions, albeit with thinning of roof coal
- 15th May 2050 hours rib (LHS) slump & roof fall occurred at the B hdg face resulting in the 4 operators at the face being clouded in dust and gas before retreating to fresh air (7c/t) auxilliary ventilation intact
- CH4 levels at H40 main upcast shaft rose from 0.67% to 0.92% returning back to 0.67% after 37 minutes
- Permit to Mine MG8N004 revoked



Site of incident



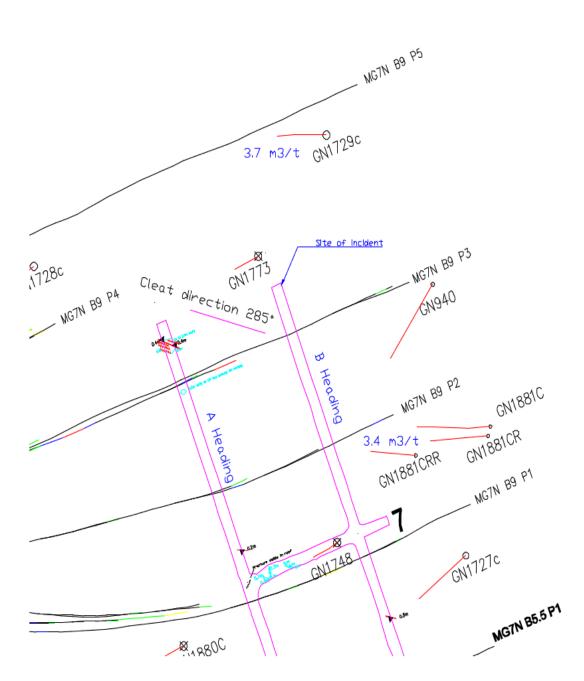


Figure 1 Outburst Site, MG8N B 7-8





Post event investigation



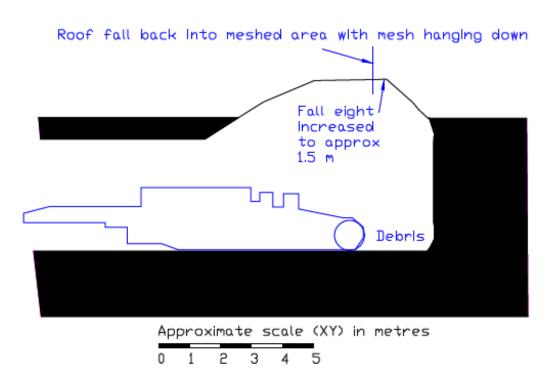
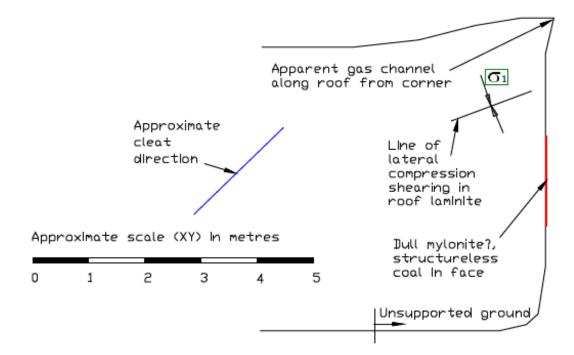


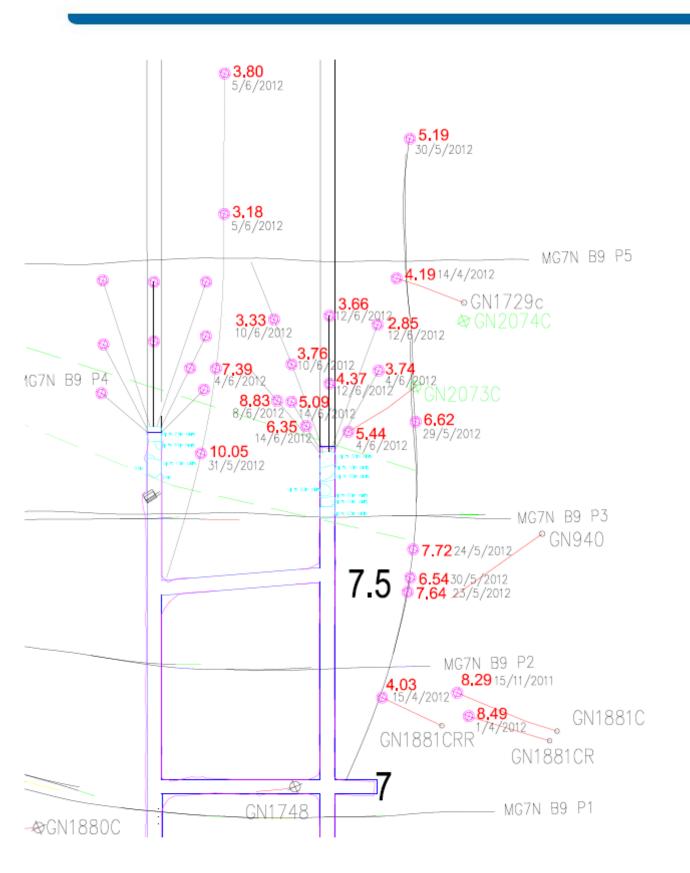
Figure 3 Sketch of Section of Face on Day of Site Inspection (23/5/2012)



- Inspected by external Outburst experts and confirmed to be an Outburst
- Approx 690m3 CH₄
 emitted from the event
 (~50-100t coal mass)
- Highly variable gas contents in surrounding area
- Outburst arrested at last row of roof bolts

Additional drilling & coring

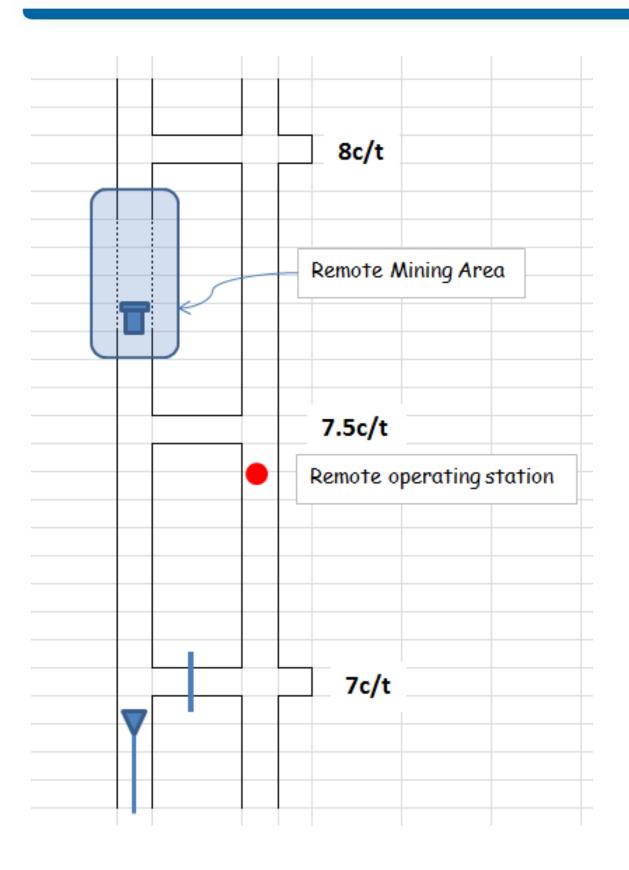




- A program of additional cores was devised to investigate adjacent gas contents
- 7.5c/t driven
- Several cores were taken from a flanking hole (B hdg) out of 7c/t
- Cores (x5) from flanking hole ranged from 5.2m3/t to 7.7m3/t revealing highest gas contents outbye of already mined roadway
- Both faces drilled with a fan pattern of holes with ~ 30 cores
- Results ranged from 1m3/t to 10m3/t
- Very low gas flows from holes being emitted (tight coal area)

What next???



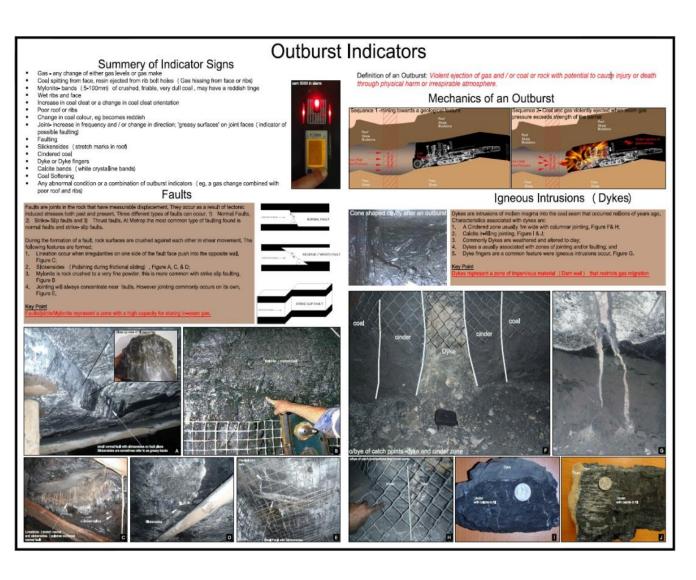


- Based on core results,
 Permit to Mine (PTM) was issued for B hdg
- B hdg driven to 8c/t A hdg
- A hdg unable to provide demonstrable conformance
- ~30m section of roadway to block out pillar
- Options
 - Continue drilling/coring
 - Auger
 - Grunching
 - Remote mining



NGC Outburst Management Review





- Risk assessment review
- Collaboration with Metropolitan
- Workforce training Outburst Awareness
- Reviewed Outburst PHMP & Permit to Mine
- Underground coring program improved accuracy and ability to take multiple cores from any hole
- Use of flanking holes from inseam ahead of mining in estimated worst case locations
- End of hole spacing re: reducing seam permeability reduced to ~ 25m in outburst prone areas

Key Learnings



- Detailed structure evaluation re: outburst potential prior to each panel commencing
- Compliance core program to suit predicted geo-structure
- Coring accuracy: surface 'vs' underground to achieve 'worst case' representative sample
- End of hole spacing suited to conditions
- Importance of completing drill holes
- Flanking holes
- Outburst awareness training





Peaboli ENERGY