Disclaimer

To date no “official” report has been released concerning this incident and investigations are ongoing.

The following presentation is based upon information drawn from numerous sources available in the public domain.

Whilst every effort has been made to substantiate the information the author claims no guarantee that all the information presented is totally accurate.

This presentation is intended to inform the industry and not to pass judgment on any persons actions or decisions.

The views expressed are those of the author and should not be construed as reflecting those of the NSW Mines Rescue Service.

Peter Robbins
Overview of Mine

Location and Operation
Pike River Mine

West coast of NZ’s South Island

Mines the Brunner Seam in the Pike River Coalfield

Production: target 1.0 MTPY

method – CM & pillar extraction (hydraulic)
Mine is located in the Paparoa Ranges
Topography, National Park & Conservation areas restrict surface access
Overview of the Pike River Permit area

Seam outcrop

1.8 km

6 km
Brunner Seam properties

• Depth of cover – 110 to 180m
• High quality coking coal (very low ash & sulphur)
• 8 - 9m thick (average)
• Gradient variable (5 – 15°)
• Spontaneous combustion propensity (Moderate)
• Gas content – approx 4 – 9 m³/t (methane)
Western escarpment of Paparoa Ranges
• Mine accessed by 2.3km stone drift (1 in 11 grade)
• Ventilated by single upcast shaft
• Main mine fan at base of shaft - 125m³/s
Tunnel portal showing conveyor (stone) and slurry pipes (coal transport)
Services in access tunnel
Main Vent shaft

- 4.2 m diameter
- 106 m deep
- No road access
Main Vent shaft

• Rib failure at base of shaft
• 30m shaft blocked
• Shaft plugged and bypass raise driven (2.8 x 2.8)
**Slim line Vent shaft**

- 600 mm diameter
- 100 mm Gas drainage riser (approx 150 – 200l/sec)
Mine offices, bathroom, workshop and store – 1.2km from portal
Coal preparation and handling

Coal transported via slurry pipe 8 km to washery located outside conservation area.
The Mining Process

Inseam boreholes – exploration & gas drainage
Development equipment

Road header & Continuous Miner

Diesel Ramcars
Typical Development Conditions

Roadways 5.0 x3.5m
The Mining Process – Geology

Inseam faults – Grabben structure

Hawera Fault
The Mining Process

Hydraulic Extraction equipment

High pressure water cannon & flume transport
Guzzler to size coal and direct into flumes
The Mining Process

Immediate Roof: Shale & coal rider seam
Upper Roof: Massive sandstone +100MPa

Seam dips 5° – 30°

Panel developed – pillars 20m centres

Floor: Interbedded shales and mudstones

Seam cross section
The Mining Process

Immediate Roof: Shale & coal rider seam

Floor: Interbedded shales and mudstones

Hydro pillar extraction – Pillar extracted between Intake and return
The Mining Process

Seam dip

Panel driven up dip

Pillars extracted down dip

Plan View
The Mining Process

Monitor in action

- 1.3 - 1.4 Mpa pressure
- 80 - 100 l/sec water
Pit Bottom in Stone – Slurry Sumps

Coal slurry ponds

Crushers

Slurry pumps

Diesel bay

Fluming water

Electrical supply equipment

Coal crushed to < 35mm - Slurry 35% – 40 % coal to water
Proposed mine plan – long term
Pike River’s Mining Process and challenge.
Day 1 – Friday 19th November
Mine layout  Friday 19th November 2010
A/S crews enter mine between 1.00 – 1.30pm

D/S crews begin leaving mine between 2.30 – 3.00pm

Crew locations  Afternoon Shift Friday 19th November
Approx 3.00pm Daniel Rockhouse drives LHD towards service bay.

Second LHD blocks road at “Spaghetti” junction.

Afternoon Shift Friday 19th November
Approx 3.20pm Russell Smith enters drift in LHD.

Approx 3.30pm “Taxi” picks up some D/S men at “spaghetti” junction.

Approx 3.35pm “spaghetti” junction cleared & Rockhouse drives to service bay

3.41pm “Taxi” exits drift portal Russel Smith passes stub 3
Explosion
Underground
3.44pm Friday
Day 1

Friday 19th November

- 3.50pm CRO notices u/g power & communications down. Notifies Mine Manager.
- 4.05pm (approx) Manager walks outside & detects “strong diesel” smell.
- 4.10pm (approx) Rockhouse regains consciousness
- 4.20pm Electrician drives into mine Manager drives up to portal
- 4.33pm (approx) Electrician phones from underground

“I think we have had an explosion”
4.35pm  CRO notifies Emergency Services (Ambulance)
4.36pm  Police notified of incident at Pike River Mine.
4.40 - 4.50pm (approx) Manager:
  - Checks who is U/G (tag board)
  - Instructs front gate house to “lock down” mine.
  - Advises corporate office of incident.
4.51pm  NZMRS advised of incident at Pike River Mine
4.54pm  Police leave Greymouth for mine
5.06 pm 4 Ambulances & Rescue Helicopter on route to mine
5.10pm Manager inspects ventilation shaft by air.

Observes light smoke & “blast” damage
5.27pm Police establish “Forward Command Post” at mine

Continuing attempts to determine status of men underground
Meanwhile underground

After regaining consciousness Daniel Rockhouse

- Calls surface to report explosion. Advised to evacuate.
- Begins walking outbye

Locates LHD then Russell Smith unconscious on ground
Attempts to fit SCSR then assists Smith to evacuate.

5.15pm – Rockhouse & Smith exit portal
Evening of Day 1

Friday 19th November

• Incident management team formed.

• Inspections made for damage

• Initial attempts made to determine status of underground environment.

  ✓ Slight flow of ventilation into mine
  ✓ CO, CH$_4$ & CO$_2$ detected at Upcast shaft
  ✓ No flow of gas from Methane drainage riser

• Rockhouse, Smith & electrician medically treated & debriefed.

• Peter Whittal, Pike River Coal CEO travels to mine

• Media briefings released by police.
Day 2

Saturday 20\textsuperscript{th} November

Rescue teams wait for confirmation of ventilation & gas conditions

Concerns over potential for Secondary explosion/s
Media interest in incident increases
Day 3

Sunday 21\textsuperscript{st} November

Drill holes commissioned to further test underground conditions
Topography restricts Drill holes sites

Sampling borehole No 1 (PRDH 43)

Sampling borehole No 2 (PRDH 44)
Sampling borehole drill rig
Drill rig access
- Helicopter only
Location of borehole site
Briefings update families and media

Rescue teams wait to enter mine as limited monitoring shows unstable gas levels underground and possible existence of combustion activity.
Drilling and ventilation shaft monitoring continues.
Day 5

Tuesday 23rd November

• 6.00am  Converted Military ballistics robot enters mine
• 8.00am  Robot breaks down  500m into mine
• Drilling and ventilation  shaft monitoring continues.
• Additional I.S. robots sourced from Australia
• Video footage of explosion shown to families
• Video footage of explosion shown to families
Day 6

• 7.45am  I.S. Robot arrives from Australia and is dispatched to mine for deployment underground

• Gas monitoring shows fluctuating conditions underground

• Borehole breaks through – 95% CH₄
Robot deployed via main portal (limited success)
Some video footage of drift conditions obtained
2\textsuperscript{nd} Explosion
Underground
2.37pm  Wednesday 24th
Rescue operations halted
Activities move to recovery operations
Day 7

Thursday 25th November

- Monitoring of underground environment continues
- Drilling of second gas sample borehole continues

IMT review mine stabilisation and recovery options
GAG unit arrives from Australia (QMRS)
Day 8

Friday 26th November

GAG unit is assembled and tested
3rd Explosion
Underground
3.39pm Friday 26th
Upcast shaft  Day 9 - post 3rd explosion
4th Explosion
Underground
2.00pm  Sunday 28th
The dilemma - What now?

Seal mine or Inert (natural or artificial)?
IMT’s Concerns

Seal mine ?
Where ?
How?

Inert Mine ?
What - $N_2$ ?
GAG ?
$CH_4$ ?

Where ?
How?
Portal to be sealed

GAG site

Decision made to inert mine with GAG unit
Portal sealing – sea container surrounded by void filling foam
Day 12

Tuesday 30th November

- 6.30am  PUR foam around portal seal autoignites.
- Monitoring of mine atmosphere continues
  - unstable & often explosive
    - noticeably less airflow into mine since 4th explosion
- Preparation of pad for GAG commences
- Portal sealing work continues later in day
- Dr David Cliff (SIMTARS) joins recovery team onsite
• Portal sealed
• Monitoring of mine atmosphere continues
Day 13

Wednesday 1st December

- 10.00pm Gag unit commences operation
• GAG continues to operate to extinguish fire.
• GAG shutdown for repairs (4 - 5<sup>th</sup> Dec)

• NZ Fire service establish pumping system to cool surrounds of upcast shaft (> 150ºC)

• Police Commissioner commences process of handing back control of mine to Pike River Coal.
Active fire out – Shaft successfully capped

GAG operational for a week
Day 25 – 30

Monday 13th - Saturday 18th December

- Monitoring of mine atmosphere continues
Day 31

Floxal nitrogen unit established to replace GAG (running 18 days)

Sunday 19th Dec
• GAG and Floxal unit operate in tandem

• Monitoring of mine atmosphere continues

• Gases rise rapidly into explosive range when GAG shut down for maintenance

• Gas levels and temperatures frequently fluctuate

• Plans made to seal around slimline shaft (leakage detected by tracer gases)
Day 53  
Tuesday 11th January 2011

- Panel of ‘experts” review data and brainstorm options
- GAG unit shutdown for maintenance
Day 54

• 1.30pm Sealing around “slimline” shaft completed.
• GAG unit remains shutdown
• Panel of ‘experts” Risk Assess options

Day 55

• 12.30pm Gas levels in mine stabilise and indicate CH₄ rich inert atmosphere.
• 6.00pm Police Commissioner announces
  ✓ decision to hand back control of mine to Pike River Coal.
  ✓ GAG unit will be returned to QMRS
Current status – 1st July 2011

• Mine in hands of Pike River Coal administrators and up for sale.
• Underground environment is essentially stable. (90% CH\textsubscript{4})
• Further attempts with robots (unsuccessful)
• Additional boreholes completed (photos taken)
• Mine drift re-entered Mon 27\textsuperscript{th} June – New substantial seal build just inbye entrance to replace emergency seal at portal mouth
• Inquest and Royal Commission investigations in progress.
• Royal commission – Phase 1 -11\textsuperscript{th} to 22nd July 2011
  - Phase 2 - 5\textsuperscript{th} to 23\textsuperscript{rd} Sept 2011
Image of two SCSR Cache boxes in pit bottom FAB
Phase One: Context - The NZ regulatory environment, interaction of mining law and other law in NZ & the resourcing and implementation of mining law.

Phase Two: Search and Rescue - The cause of the loss of life, the search, rescue and recovery operations


Phase Four: Policy Aspects – comparing NZ & other selected countries mining regulation & practice, their interaction with environmental, conservation and other legal requirements. Resourcing, administration and implementation of, mining law and practice.
What can the Australian coal industry learn from these events?
To remember the Pike 29.