PIKE RIVER MINE DISASTER

What went wrong

STEWART BELL

CIC FAIOH MRACI CChem PSM

Commissioner for Mine Safety and Health

Pike River

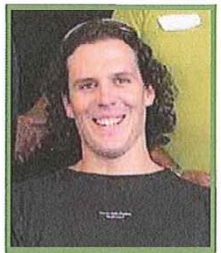
- 19th November 2010 - 31 men went to work at the Pike River Mine and 29 never returned home
- The Royal Commission was established in late December 2010
- The Commission was chaired by Justice Graham Panckhurst, with David Henry and the author as the other Commissioners
- The final report was presented to the Governor General of New Zealand on the 30th October 2012
- The lessons from Pike River must be remembered

Pike River Mine

Atarau, Greymouth, New Zealand

Conrad Adams
43, Greymouth

Daniel (Dan) Herk
36, Runanga



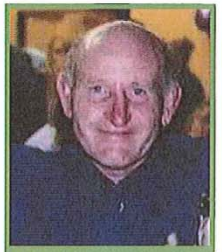
David (Dave) Hoggart
33, Greymouth

Richard (Rolls) Holling
41, Blackball

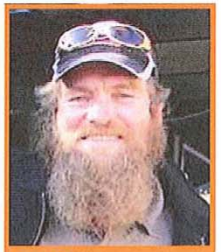
Koos Jonker
47, Limpopo, South Africa

Peter (Pete) Rodger
40, Perth, Scotland

Blair Sims
28, Greymouth



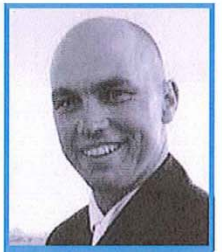
Keith Valli
62, Nightcaps



Terry Kitchin
41, Runanga

Joshua (Josh) Ufer
25, Charters Towers, QLD, Australia

Zen Drew (Verhoeven)
21, Greymouth



Kane Nieper
33, Greymouth

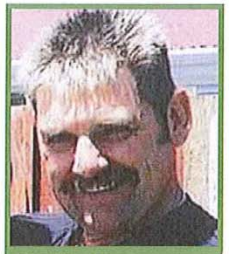
Riki (Rik) Keane
28, Greymouth

Pike River Coal

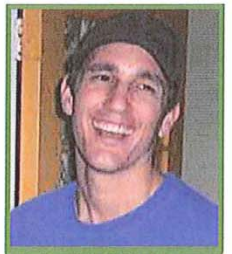
Subtech Services

Malcolm Campbell
25, St. Andrews, Scotland

Glenn Cruse
35, Greymouth



Allan Dixon
59, Runanga

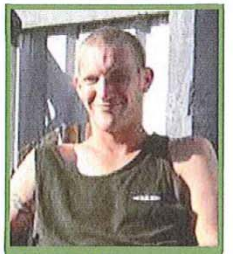


Christopher (Chris) Duggan
31, Dunollie

William (Willie) Joynson
49, Maryborough, QLD, Australia

Stuart (Stu) Mudge
31, Runanga

Peter O'Neill
55, Runanga



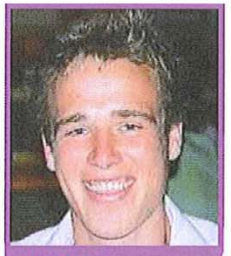
Brendon Palmer
27, Greymouth

Samuel (Sam) Mackie
26, Christchurch

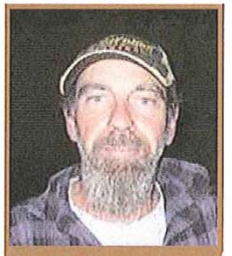
Milton (Milt) Osborne
54, Ngahere

Joseph Dunbar
17, Christchurch

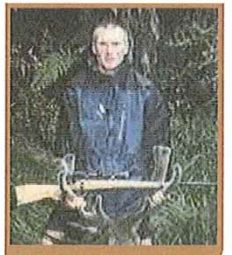
Benjamin (Ben) Rockhouse
21, Singleton, NSW, Australia



Michael Monk
23, Greymouth



John Hale
45, Hokitika



Andrew (Huck) Hurren
32, Hokitika

Francis Marden
41, Barrytown

VLI Drilling

Boyd Kilkelly Builder

Graeme Pizzato Contracting

CYB Construction


PIKE RIVER COAL
UNDERGROUND TAG BOARD
IN
PIKE RIVER COAL
ALL CONTRACTORS & VISITORS
MUST SIGN IN WITH THE
CONTROL ROOM OFFICER
BEFORE GOING UNDERGROUND
Work Safe
Play Safe
Home Safe

Pike River

The first explosion occurred at around 3.45 pm on the 19th November

The second explosion 24th November 2.37pm

The third explosion 26th November 3.39pm

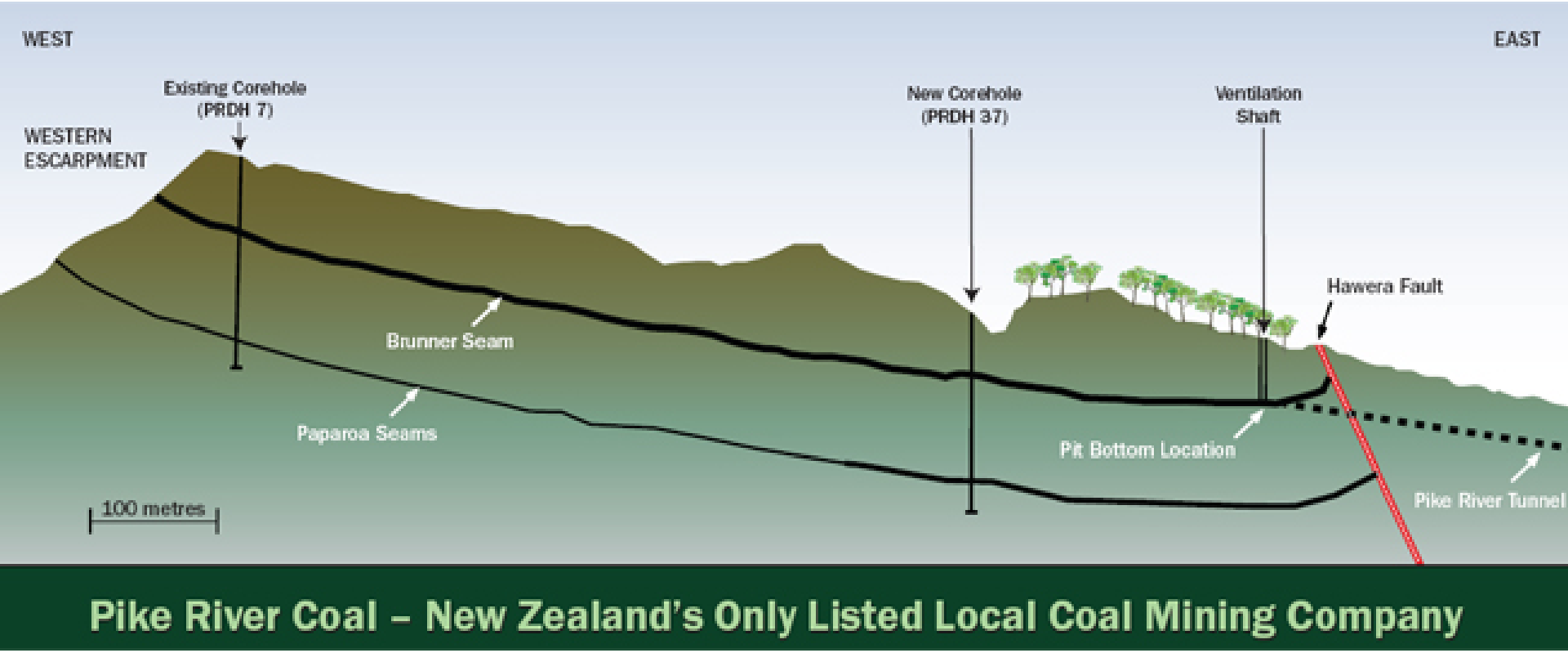
The fourth explosion 28th November 1.50pm

Re-entry into the mine has not been achieved to date

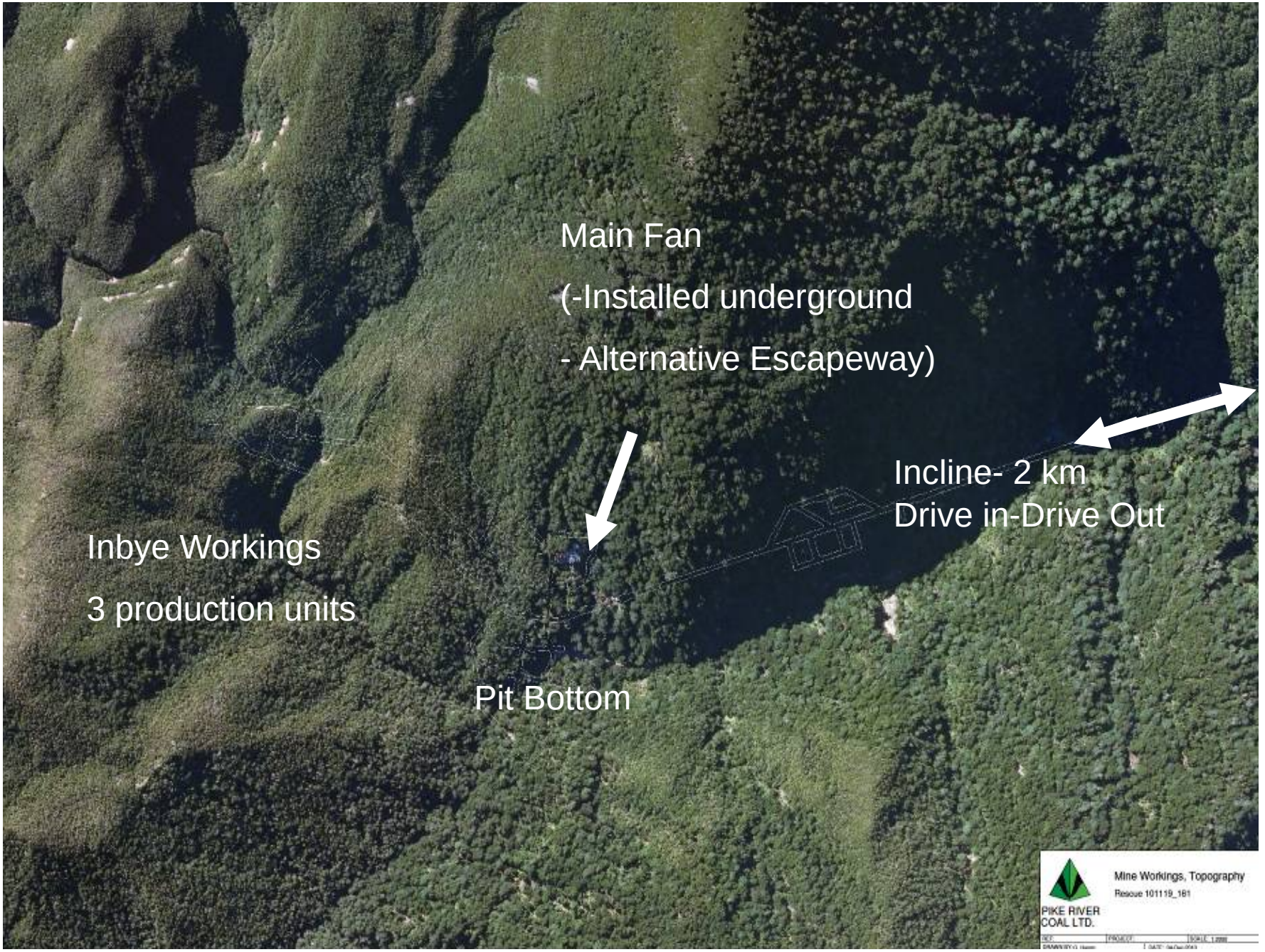
Figure 8.10: The surface fan after the first explosion


Australia
New Zealand
New Zealand
Three Kings Islands
North Island
Kaitaia
Whangarei
Great Barrier Island
Auckland
Thames
Bay of Plenty
Hamilton
Tauranga
Whakatane
38°
Waikato River
Taumarunui
New Plymouth
Gisborne
Wanganui River
Napier
Hawke Bay
Tasman
Sea
Wanganui
Cook Strait
Palmerston North
Masterson
Nelson
Lower Hutt
Westport
Blenheim
Wellington
42°
Greymouth
Wairau River
South Island
Christchurch
Ashburton
Timaru
Canterbury Bight
Cromwell
Oamaru
Lake Te Anau
Clutha River
Pacific
Ocean
Dunedin
46°
Foveaux Strait
Invercargill
Stewart Island
©maps.com
166°
170°
174°
178°

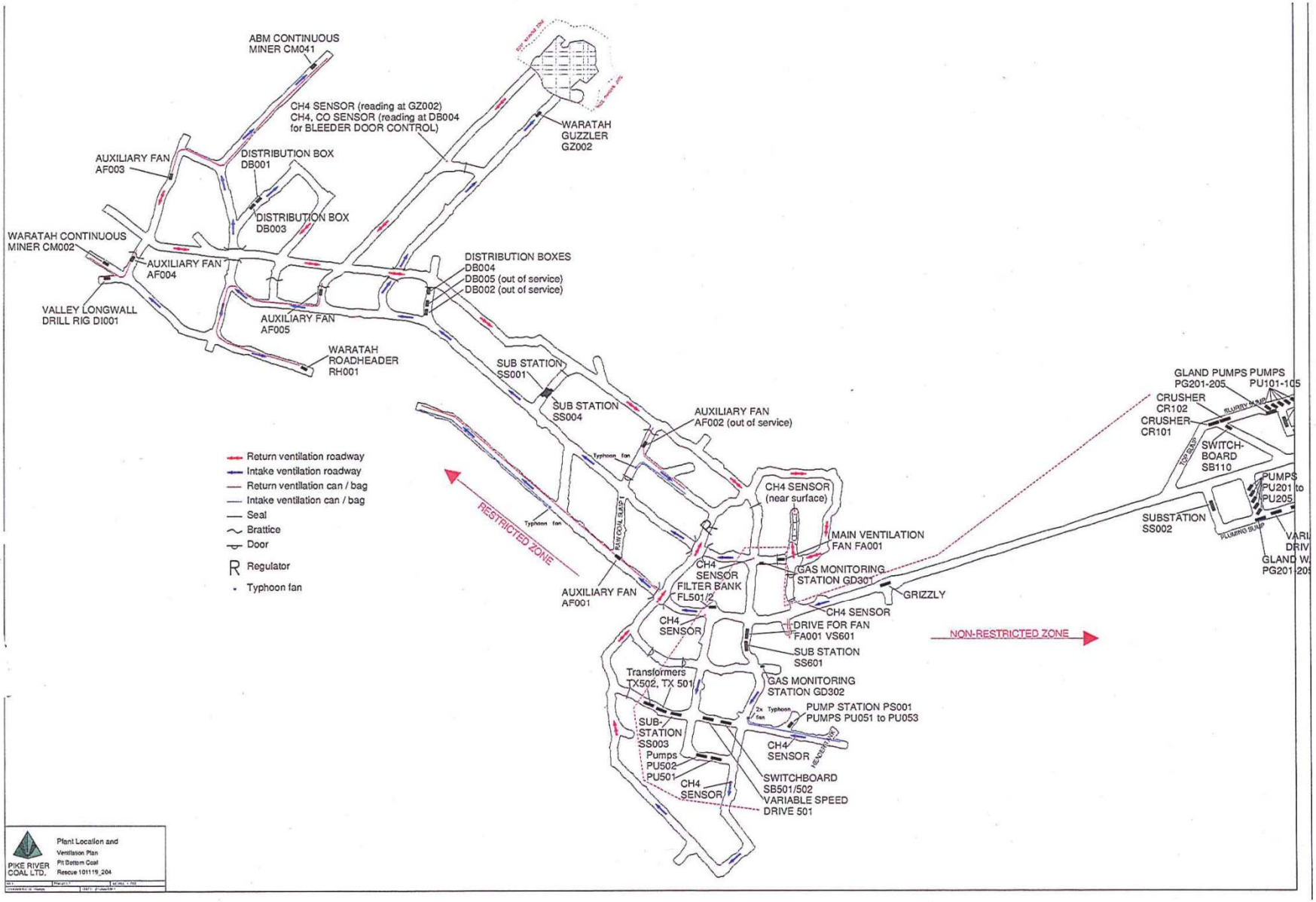
Rugged Terrain

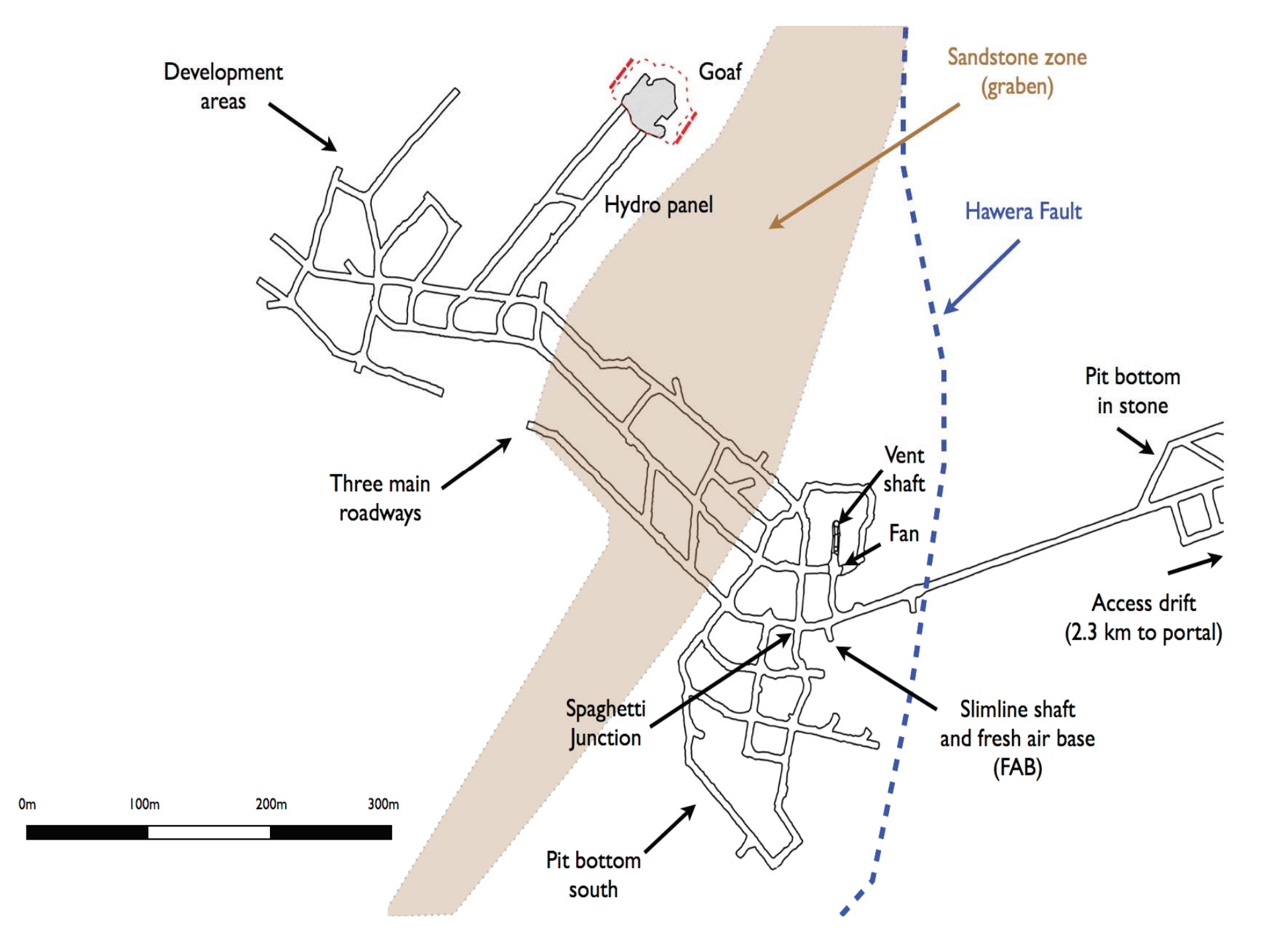


Pike River Coal – New Zealand's Only Listed Local Coal Mining Company


Main Fan
(-Installed underground
- Alternative Escapeway)
Incline- 2 km
Drive in-Drive Out
Inbye Workings
3 production units
Pit Bottom
Mine Workings, Topography
Rescue 101119_161
PIKE RIVER
COAL LTD.

Pike River Mine Plan



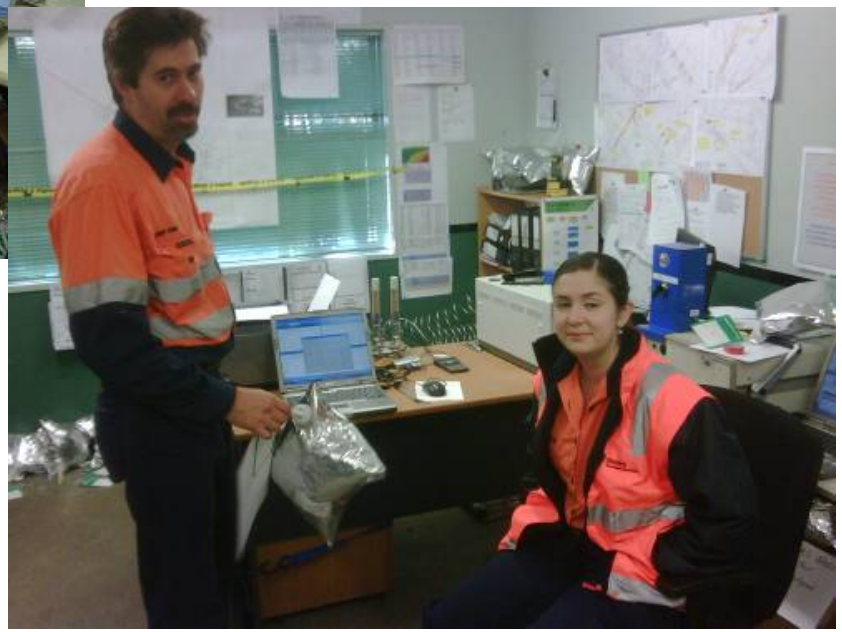

Development areas
Goaf
Sandstone zone (graben)
Hydro panel
Hawera Fault
Pit bottom in stone
Three main roadways
Vent shaft
Fan
Access drift (2.3 km to portal)
Spaghetti Junction
Slimline shaft and fresh air base (FAB)
Pit bottom south
0m
100m
200m
300m

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)


HUJ

Gas monitoring



Monitoring

Loading GAG unit and equipment onto NZ Hercules and final space

Górniczy Agregat Gaśniczy (GAG)

Pike River – QMRS Logistical Operations

- 160,000 m^3 mine volume
- 71 days involvement
- 39 days of Jet Operation
- 706 hours of product delivery
- 63,212,000 m3 of product
- 25,416,000 m3 of inert gas
- 1,504 litres per hour - fuel
- 1,061,869.89 litres of fuel
- Fuel cost $700,834 NZ
- 649 shifts over 71 days
- 7,788 hours
- 1,134 person nights accommodation.
- 246 people movements (flights)
- 36 people involvement
- Air Travel - $96,063
- Accom. - $101,591
- Transport/meals/misc – $129,383

First Steps Back In

What happened at Pike River

- Methane explosion. Significant volume of gas involved possibly related to the hydro panel goaf collapsing. Weak explosion inbye the main fan.

- This would have resulted in an oxygen deficient atmosphere with high CO levels. Anyone who didn't escape from the mine in the first 1-2 hours was not going to survive

- Source of ignition not clear but most likely electrical possibly linked to the earthing system and VSD induced harmonics

- Other possibilities included contraband, diesels and frictional ignition

What Happened

- If entry to the mine stone drive is achieved this could be clarified by examining the VSDs
- No-one survived the initial blast other than the two miners who escaped
- Sealing the mine would possibly have avoided the final three explosions
- There was no clear window of opportunity to re-enter the mine

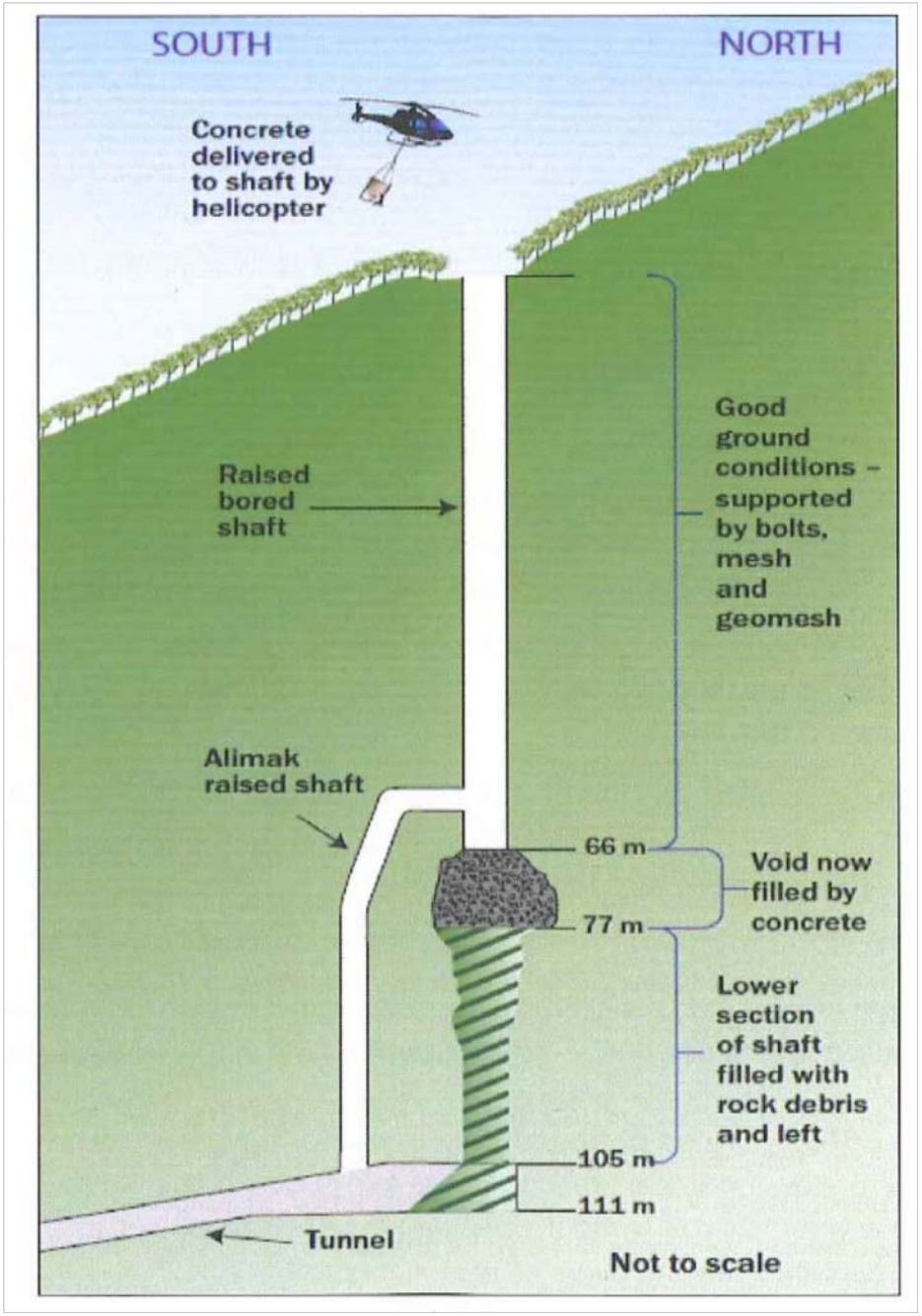
What went wrong

- Pike was a problem mine from the start, constant changes to the mine plan
- 7 mine managers in 2 years
- Lack of consistent leadership
- Difficult topography, mountainous terrain, high rainfall
- Bad geology- faults and grabens, poor delineation of the coal seam
- Gas issues- high methane content coal
- Hydromining commenced too early before the ventilation was stabilised.
- Pike needed the best of everything

What went wrong

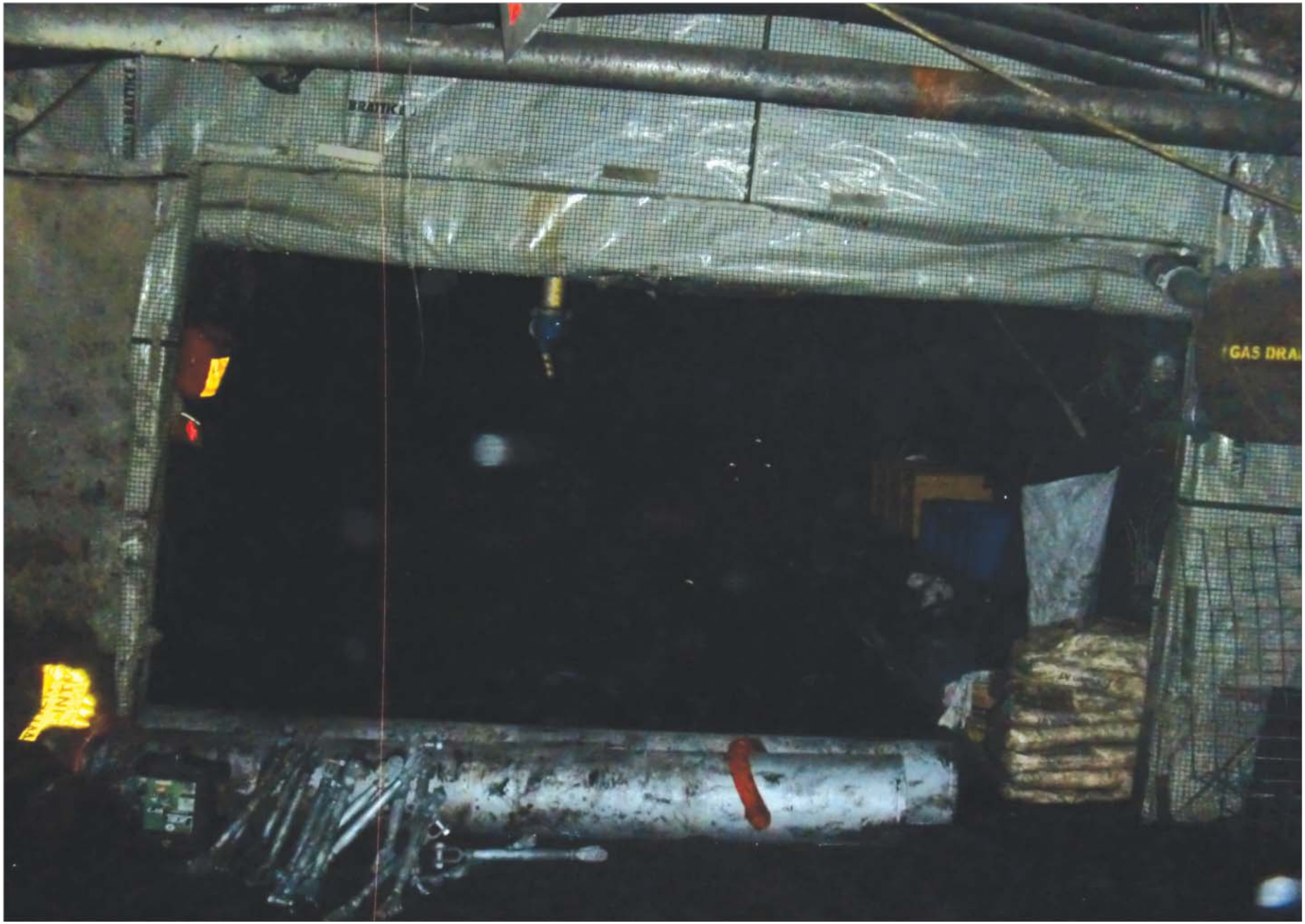
- The commission identified a range of issues
- Production versus safety. The mine was always under financial stress
- Methane drainage issues- free venting of methane into the return
- Expert consultants engaged but advice often not taken, ventilation, methane drainage and hydromining
- Unique electrics- high usage of VSD’s- issues with restricted zones
- Lack of worker involvement in safety
- SHMS not fully developed
- Risk assessment processes were flawed

NO EFFECTIVE SECOND MEANS OF EGRESS


SOUTH
NORTH
Concrete delivered to shaft by helicopter
Raised bored shaft
Good ground conditions – supported by bolts, mesh and geomesh
Alimak raised shaft
66 m
Void now filled by concrete
77 m
Lower section of shaft filled with rock debris and left
105 m
111 m
Tunnel
Not to scale

FRESH AIR BASE


FAB
GAS DRAINAGE

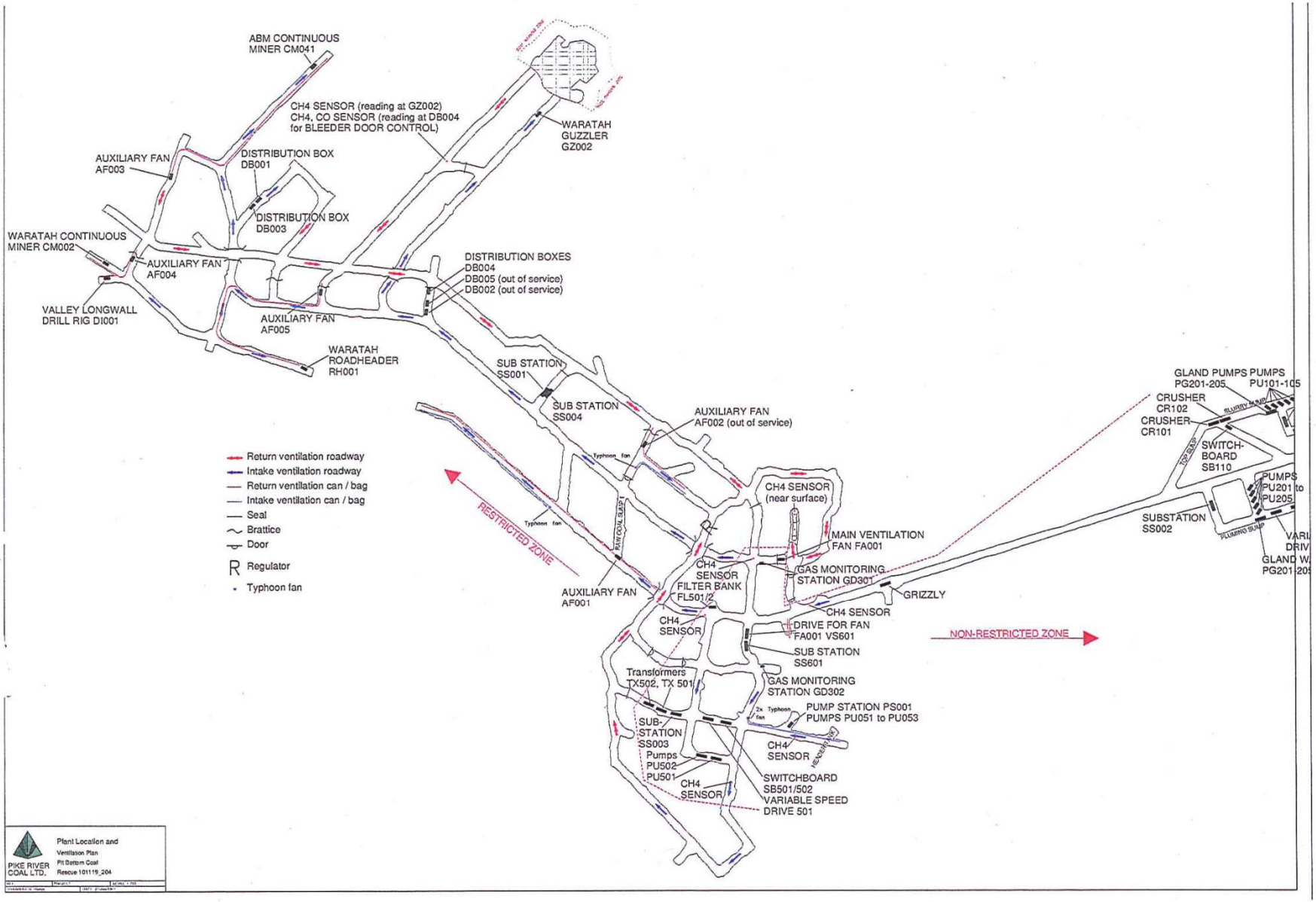

GAS DRA

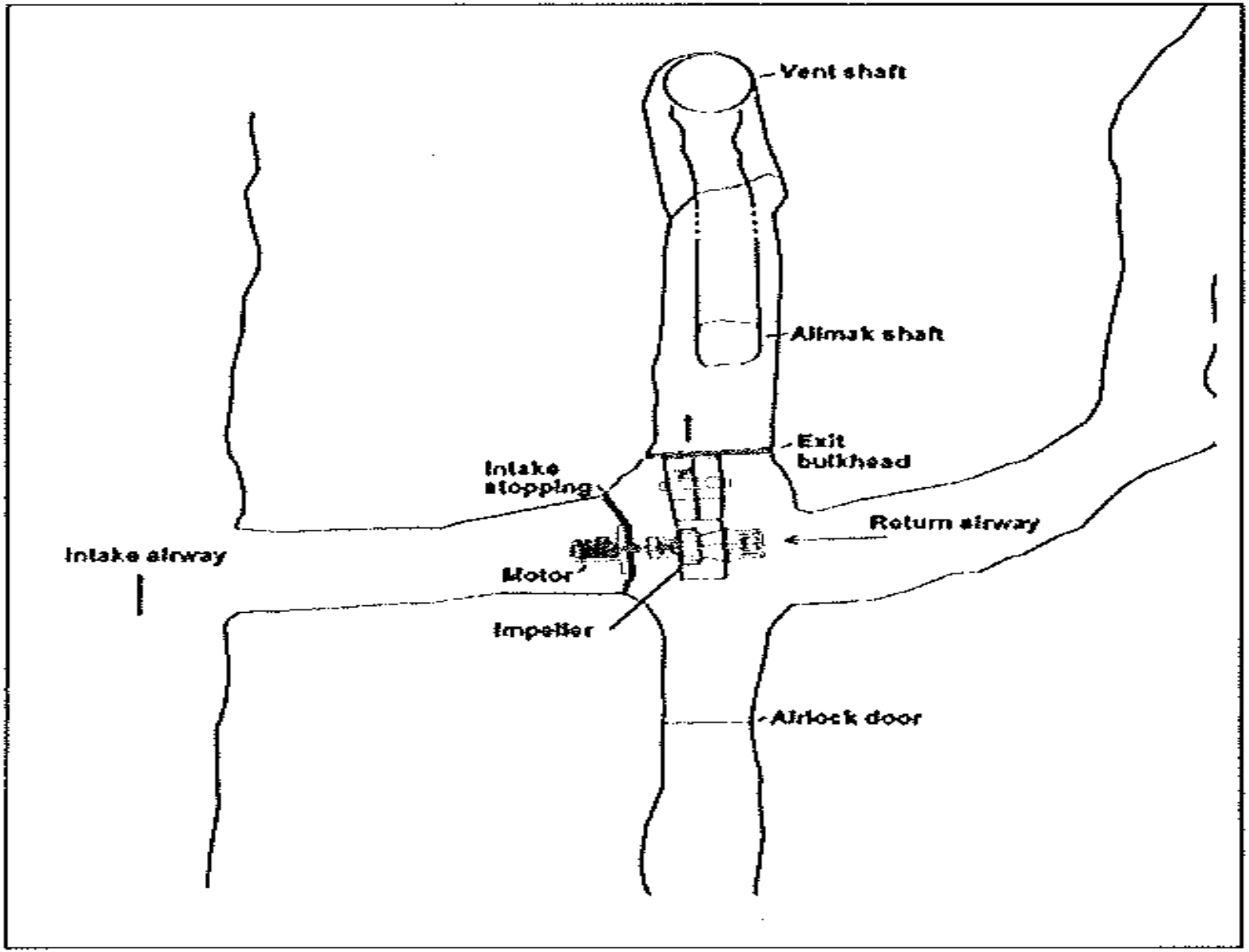
UNDERGROUND MAIN FAN

– VENTILATION SHORTFALL

– POORLY BUILT STOPPINGS

Pike River Mine Plan




Vent shaft
Allmak shaft
Exit bulkhead
Intake stopping
Return airway
Intake airway
Motor
Impeller
Airlock door

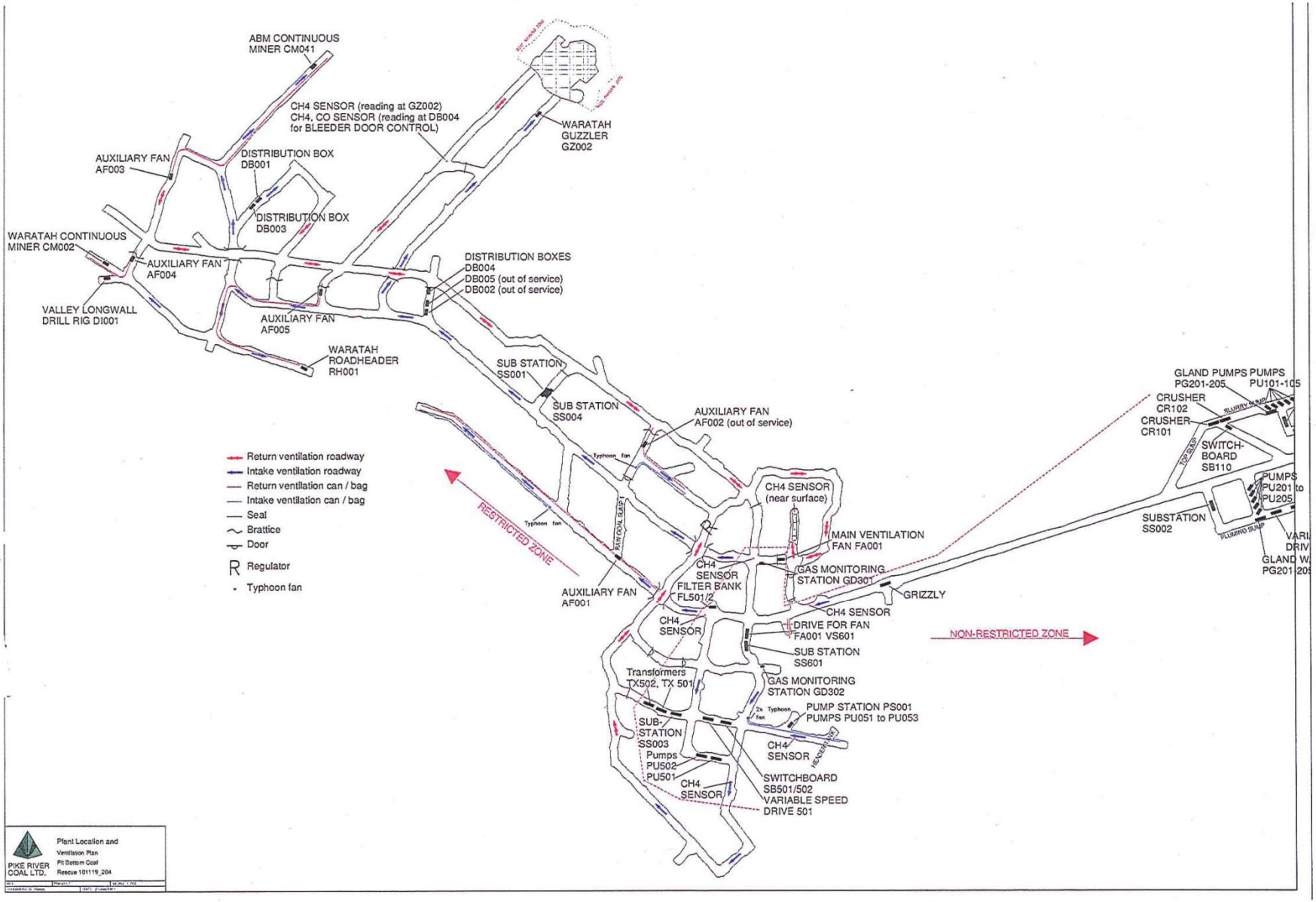
What went wrong

- Lack of experienced miners- not enough mentors
- contraband issues
- Poor contractor control. Poor training
- Lack of an effective regulator. Only 2 mines inspectors
- Problems with the rescue and recovery effort- non mining incident controller
- Next of kin issues
- Ineffective corporate governance

COMPROMISED GAS MONITORING SYSTEM

NO OPERATIONAL GAS MONITORS IN THE MAIN RETURN

Pike River Mine Plan



What the gas monitoring should have been

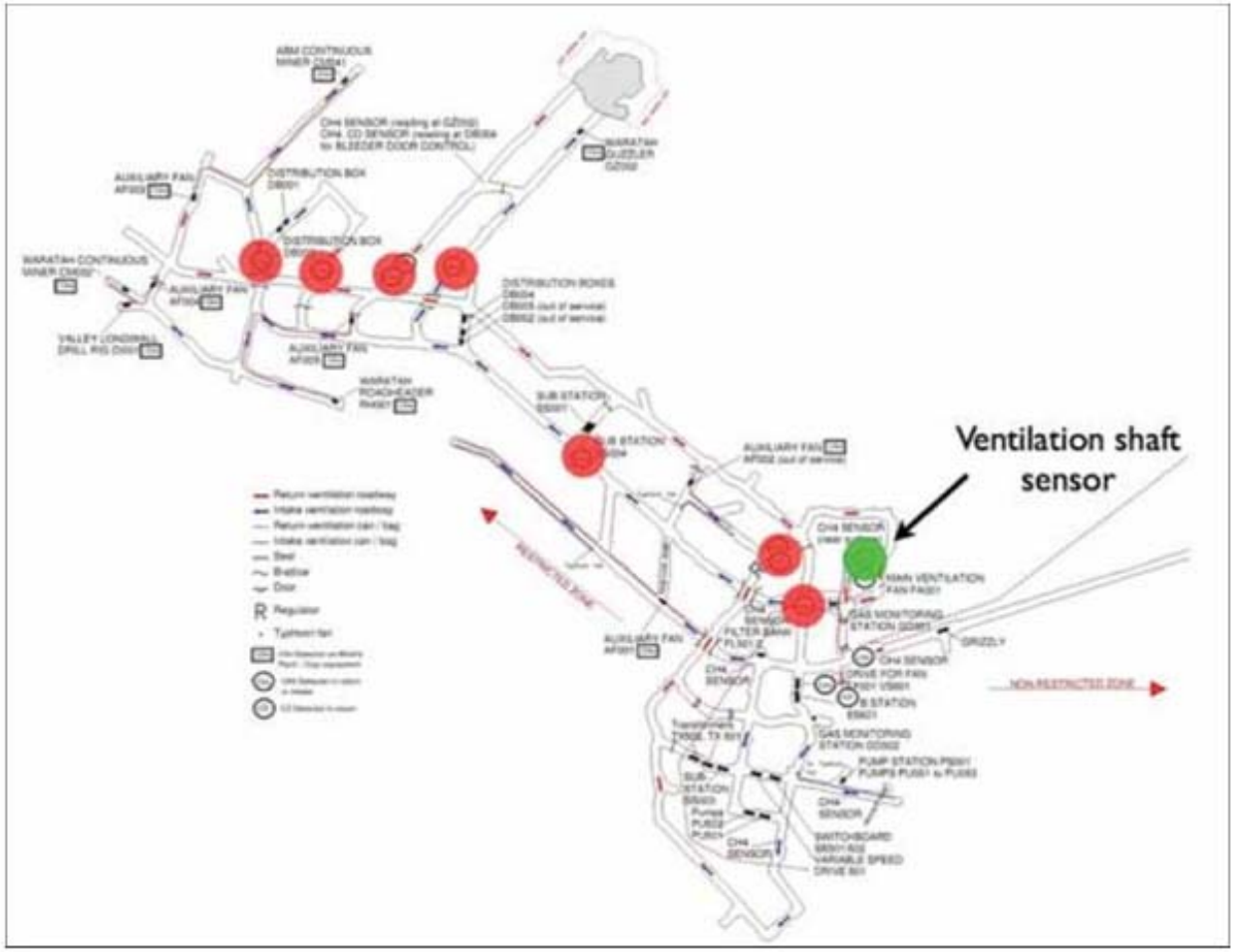


Figure 10.2: Plan of required gas sensors at Pike River under Queensland legislation[27]

Monitoring system failure was evident

Problems with the sensors in the ventilation shaft

19. There were several problems with the gas sensors in the ventilation shaft. First, the sensor at the bottom of the ventilation shaft stopped working on 4 September 2010, nearly 11 weeks before the explosion, and was never repaired or replaced.[31] Indeed, the control room operator's screen on the Safegas system was permanently annotated to say the sensor was 'faulty' and 'waiting for spare'.

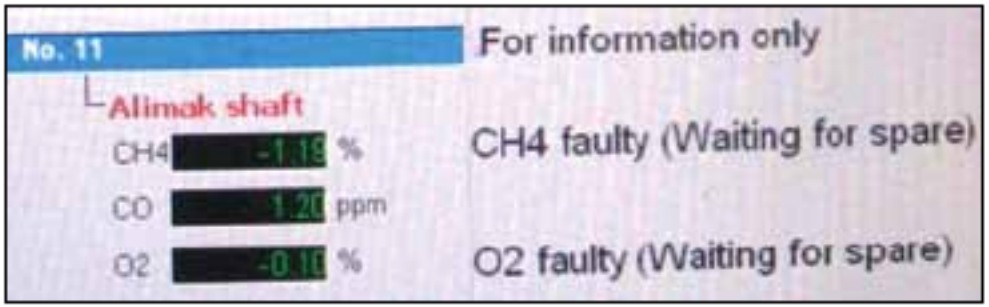


Figure 10.4: Control room operator's screen on the Safegas system[32]

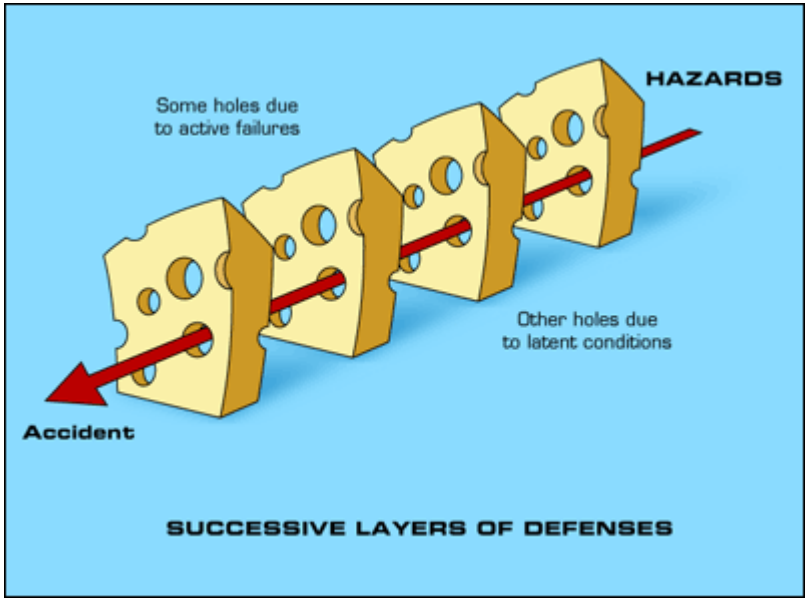
POORLY INSTALLED SYSTEMS


FAB

OVERALL

IN EVERY AREA WE LOOKED AT, THERE WERE PROBLEMS

Swiss Cheese Model



Applicability to Australia

- Qld and NSW Inspectorates are jointly examining size requirements for explosion panels in mine fans.
- Variable speed drives need to be assessed?
- Ensure risk assessments are done properly and that the controls are the focus
- Training of mine workers re self escape
- Role of the Board

Applicability continued

- Don’t short circuit incident investigations
- Cultural issues such as dealing with families after events such as Pike need to be addressed
- Inexperienced mine workers
- The rescuer model
- Leadership failed
- **Don’t think this can’t happen here**

In conclusion

- We don’t have any choice here
- Australia and New Zealand must learn from this disaster
- 29 of our colleagues paid the ultimate price


Every miner home safe
and healthy every day

Decisions – in a nutshell