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xstrata coal

Beltana

Blakefield South Mine

Ventilation System

Gas & Coal Outburst Seminar
1st December 2010

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Beltana Operation

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- Beltana comprises of all longwall mining operations on the Bulga Complex mining lease
- One of the most productive u/g mines in Australia producing c.7Mtpa
- 335 people employed plus contractors
- Total of 5 seams to be mined until 2042
- Beltana No1 mining the Lower Whybrow Seam - currently extracting last block LW14
- Blakefield South mining 307 section of the Blakefield Seam - LW01 retreated 1350m (1670m to go)
- Coal transported via conveyor to the Bulga Complex CHPP
- Railed to Newcastle for sale as Export Thermal & PCI Coal

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Agenda

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- Introduction
- Seam & Mine Layout
- Ventilation Design Strategy
- Development Gas Emissions & Control
- Longwall Gas Emissions & Control
- Production Rate Effects & Volumetric Requirements
- Frictional Ignitions
- Outbursts
- Spontaneous Combustion
- Goaf & Surface Interconnection
- Primary Ventilation System Design, Rationale & Control Strategy
- Ventilation System Design Summary
- Gas Utilisation & Carbon Abatement

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Introduction

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- Ventilation Design has a direct influence on the productivity and cost effectiveness of the Blakefield South operation.
- Encompasses Ventilation, Seam Gas and Spontaneous Combustion Management.
- Therefore, the selection of an appropriate ventilation strategy to manage the operational risks is paramount.

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The Seam & Working Section

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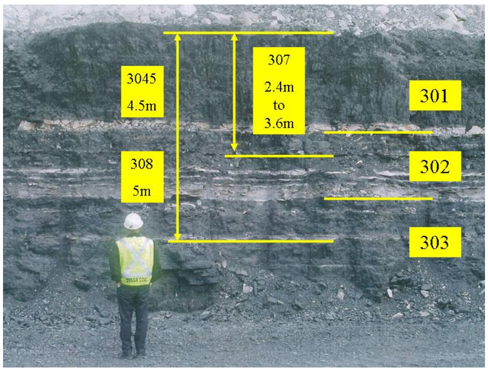
Typical Seam Section

307 section extraction height
- range 2.6-3.6m
- average 3.1m
- Aust industry average 3.3m

8/01/11



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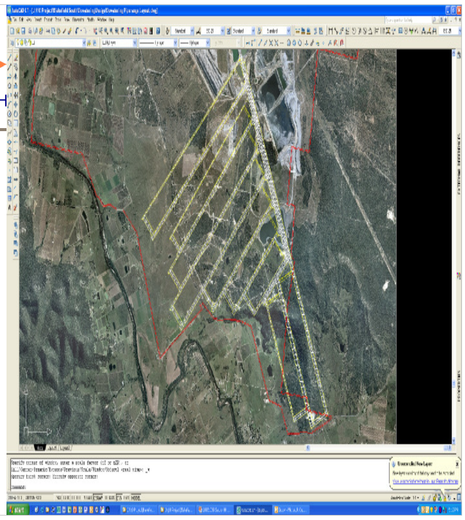
Mine Layout

<u>Key features</u>:
- LW 400m wide (2.6-3.6m H) (LW1 325m)
- Development (min 3.2m x 5.4m)
  - 3 hdg gateroads
  - 7 hdgs mains
- Force / Exhaust Primary Ventilation System
- Used as access for Glen Munro, Woodlands Hill & Piercefield seams



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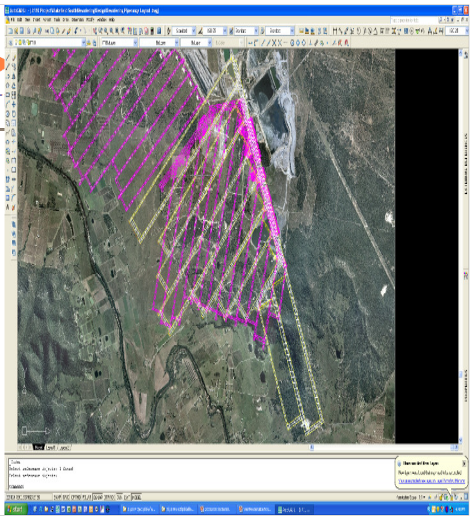
Blakefield & Whybrow Workings



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Ventilation Design Strategy

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- Determine the most likely range of **seam gas emission** and hence management requirements in the Blakefield South seam.
- Consider other generic risks likely to be present:
  - Frictional ignition
  - Outburst
  - Spontaneous combustion
  - Consequences of Blakefield South goaves caving through to the old South Bulga workings and to the surface.
  - South Bulga Mine & Beltana Mine & Blakefield South Mine histories

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Development Gas Emissions

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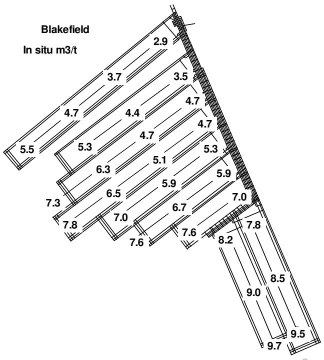
- Gassy conditions on development:
  - significant inseam virgin gas contents 4-10m3/t
  - predominantly methane
  - high permeability circa 100-200mD
  - 1.5-2.5m 303 ply in floor of the working section.



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Development Gas Emissions & Control

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- Not feasible to develop without pre-drainage:
  - Rib emissions affecting hazardous zone.
  - Floor coal emission.
  - Propensity for frictional ignition (geology of immediate roof, siderite nodules, prior experience in South Bulga workings).
  - Gas contents exceeding outburst thresholds in deeper horizons (OMP req'd for inbye-end of some blocks when seam gas contents rise above 7m3/t methane).
- Controls:
  - Seam gas pre-drainage
  - Maximise volumetric capacity
  - High standards for ventilation control devices

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Development Gas Emissions & Control

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SIS medium radius holes to pre-drain and capture for development:

- Bulga Surface Pre-Drainage Project utilising Surface to In-Seam (SIS) wells
  - Vertical wells for gas & dewatering,
  - Horizontal/lateral holes with up to 2200m in-seam builds for gas capture
  - Targeting <4m3/t residual gas
    - **Achieving 2-3m3/t after c.18mths**

Provision for additional u/g pre-drainage
Gas directed to flares

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SIS configuration

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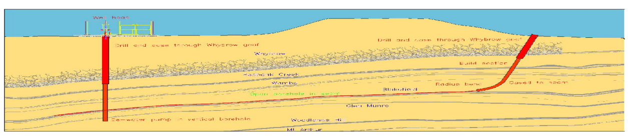
Pre-drainage

Surface to In-seam (SIS) borehole drill collar
Up to 2.2km in-seam

Vertical production well: water then gas out



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Surface to In-Seam

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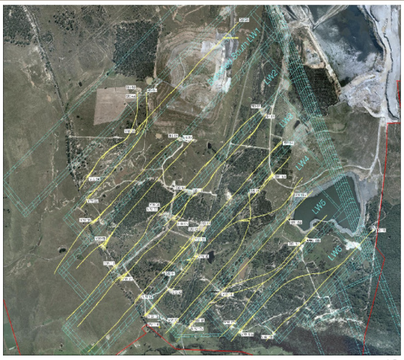
SIS pre-drainage drilling for longwalls 1 through 6

Primarily for development, will also reduce gas reporting to longwall return

Drilling complete July 2008, total spend $32M

Mitchell Drilling main contractor, continuous on project for 22 months no LTI's

Total of 54,600m drilled



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Surface to In-Seam

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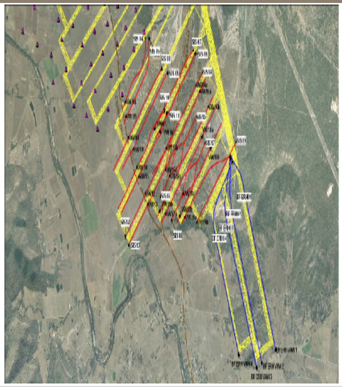
Similar requirement for pre-drainage drilling for longwalls 7 & 8

·Inseam builds up to 3500m

- Beyond capabilities of SIS
- Utilise ERD technology



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Development in Gassy Conditions

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- Design to operate mine at production rates c.7Mtpa
- World-wide, underground coal mines in similar gassy conditions utilising two heading gates are production limited to 3-4 Mtpa & are development constrained
- Three heading gateroads employed for:
  - high volumetric capacity (development & longwall)
  - allowance for low extraction height in some areas
  - longwall tailgate access
  - built-in contingency for delayed holing of the next maingate development panel
  - contingency for less than effective surface gas pre-drainage performance – allows flexibility for u/g pre & post drainage drilling operations if required during both development & longwall panel operations

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Gateroad Development Configuration Options

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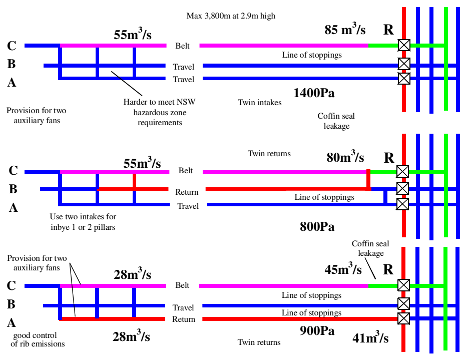

Preferred option

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Development Ventilation Control Devices

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- High standards for ventilation control devices
- Main Headings:
  - 5psi rated concrete stoppings c/w rated man-doors
  - 2psi rated overcasts
- Gateroads:
  - 2psi rated plaster stoppings c/w rated man-doors
- General:
  - Steel lockable louvre regulators
  - Steel belt seals
  - Steel vehicle doors c/w man-doors & pneumatic control

Longwall Specific Gas Emissions

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- South Bulga Mine experience:
  - 700–1,000 l/s CH4 SGE for 3-3.5 Mtpa: c. 6-8 m3/t SGE
- Blakefield South – very gassy conditions:
  - SGE @ inbye-half Longwalls 1-6 c.12-15 m3/t, with potential of 17-20 m3/t. Due to:
    - significant undrained coal seams in close proximity to the roof and floor of the working section
    - interconnecting goafs (known significant seam gas emission occurred in overlying, but shallower, Lower Whybrow seam workings)

Longwall Specific Gas Emissions

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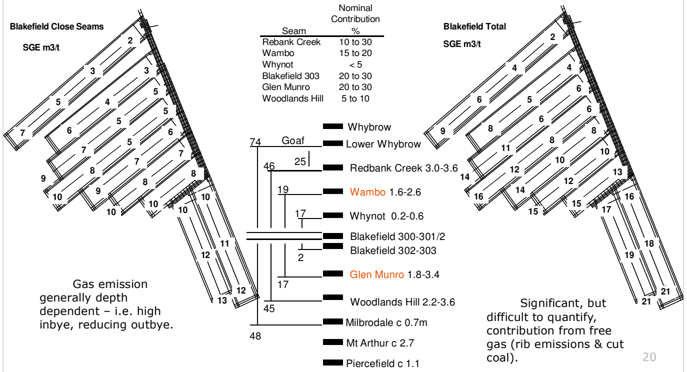

Gas emission generally depth dependent – i.e. high inbye, reducing outbye.

Significant, but difficult to quantify, contribution from free gas (rib emissions & cut coal).

SGE - consequences of high production

South Bulga (observed) — United (observed)

Average production			Seam Gas Emission l/s For						
tpy	tpw	tpd	SGE 2	SGE 4	SGE 6	SGE 8	SGE 10	SGE 15	SGE 20
2.0	41,667	5,952	207	413	620	827	1,033	1,550	2,067
2.5	52,083	7,440	258	517	775	1,033	1,292	1,938	2,583
3.0	62,500	8,929	310	620	930	1,240	1,550	2,325	3,100
3.5	72,917	10,417	362	723	1,085	1,447	1,808	2,713	3,617
4.0	83,333	11,905	413	827	1,240	1,653	2,067	3,100	4,134
4.5	93,750	13,393	465	930	1,395	1,860	2,325	3,488	4,650
5.0	104,167	14,881	517	1,033	1,550	2,067	2,583	3,875	5,167
5.5	114,583	16,369	568	1,137	1,705	2,273	2,842	4,263	5,684
6.0	125,000	17,857	620	1,240	1,860	2,480	3,100	4,650	6,200
6.5	135,417	19,345	672	1,343	2,015	2,687	3,359	5,038	6,717
7.0	145,833	20,833	723	1,447	2,170	2,894	3,617	5,425	7,234
7.5	156,250	22,321	775	1,550	2,325	3,100	3,875	5,813	7,750
8.0	166,667	23,810	827	1,653	2,480	3,307	4,134	6,200	8,267

48 wk/year — *7 day/wk* — *1.5 Peak factor* — 750 *l/s capacity* / 1500 *l/s capacity* — *Op range*

BKS LW01 actuals — Blakefield South (predicted)

- Regardless of how SGE is calculated, effect of high production rates is to make even low SGE values significant i.e. beyond dilution capacity of practicable vent circuits
- Before post-drainage: 1.8% av & 2.6% peaks (~2900 & 4400l/s)
- Post-drainage: 0.8-0.9% av & 1.2% peaks (~1200 & 1800l/s) + 5000-5700l/s post-drainage (includes pre-drainage?) = 6000-7500l/s total SGE

Longwall SGE & Control

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- Seam gas emission at plan production rates will exceed the dilution capacity of practicable ventilation rates i.e. *Ventilation alone will not manage longwall gas emissions*
- Production relies on goaf post-drainage effectiveness:
  - Design is configured to exceed modelled capacity requirements with an operating range 3,000 – 6,500 litres/sec methane

Longwall SGE and Control: Post Drainage

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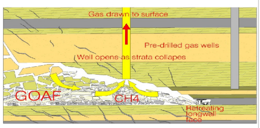
Traditional approach

- Drill vertical goaf wells in advance of longwall face retreat
- As longwall face passes, vertical well opens to goaf
- Gas extraction plant on vertical goaf well collar draws gas from the goaf



Issues for Blakefield South

- Goaf drainage is a "make or break" issue
- Vertical goaf wells tendency to "neck off" (experience at United, Grasstree, & others)
- South Bulga Mine Whybrow goaf remobilisation has potential to exacerbate vertical neck-off (SCT geotechnical modelling)
- Establishment of boreholes through existing overlying Whybrow goaf is problematic
- No landholder access agreements in place for significant areas of the mine plan (Corporate policy to not seek access if landholder not receptive)
- Significant gas expected from coal below working section, difficult for verticals to deal with floor gas effectively

Longwall SGE and Control: Post Drainage

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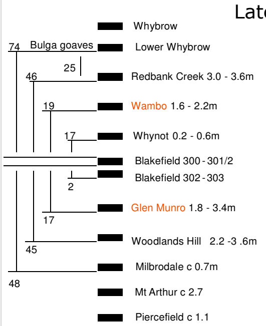

Lateral (near horizontal) boreholes:

- Established in coal seams above & below mining horizon
  - targeting Wambo & Glen Munro seams
- Blakefield Seam extraction causes massive, transient de-stressing, increase in permeability & decrease in seam pore pressure, initiating gas desorption
- Boreholes see high purity gas liberated into vertical cracking and horizontal de-laminations induced by longwall caving
- Captures seam gas before it moves into goaf void
- Goaf gas extraction plants apply suction to remove gas

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Lateral boreholes for post-drainage

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LW01:

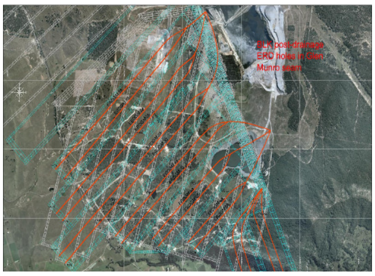
- Completed 3004md + 2200md B/H's in Wambo seam (above Blakefield)

Future LW's also 2x B/H's in Wambo + 1x B/H in Glen Munro (below the Blakefield)

- Completed 3359md in LW2 GM including a vert well intersect at 3321md

Also have 4-7 vertical intersection wells per B/H to draw gas from laterals, spaced along the trajectory

As verticals are lost due to goaf necking, goaf gas extraction plants draw from next outbye hole.



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Lateral boreholes & Vertical Wells for post-drainage

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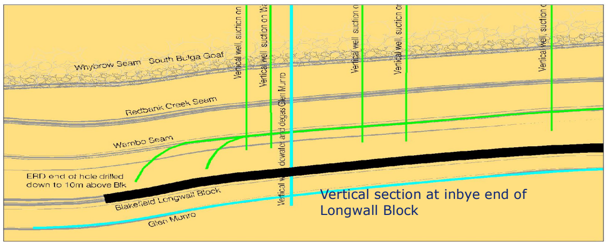

Vertical section at inbye end of Longwall Block

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ERD Gallagher Horizontal Directional Drill Rig

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Capable of drilling up to 4kms long, & >300mm dia.

Electrically powered

Survey module with full geo package 20m behind steerable bit

Uses magnetic triangulation to range & intersect vertical wells

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HDD ERD Rig

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Drills +200m/day, capable of 300m/day, achieved 1300m/12hrs tripping

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Mud Pumps & Filtration System

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Goaf Drainage Vacuum Pumps

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Initially used 2x ex-United gas engine goaf plants 1200l/s.

700mm dia buried trunk pipe range.

New vacuum pump installation operational 12/11/10, 14,000l/s gauge capacity.

Goaf gas directed to flares, power generators in the future.

Power generators tolerant of low purity gas.

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Longwall SGE and Control: additional provisions

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Additional Post Drainage:

- Trial vertical goaf wells where surface access & Whybrow goaf interaction allows
  - 4/4 successful to-date
- Underground cross-measure and horizontal goaf drainage as fall back position
- Alternative to ERD based on short SIS boreholes, starting from "how far and how big diameter can we drill with cheapest, proven drill rigs and techniques"

Blakefield Seam gas contribution:

- SIS pre-drainage for gas less than 0.25% at commencement of hazardous zone

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Longwall Ventilation Configuration

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- Base case circuit employs:
  - Three heading gateroads:
    - maximise air quantity for dilution
    - Allows use of a back-over T/G corner goaf circuit to manage gas
  - maingate intake, antitropal face and tailgate return with:
    - various modifications to T/G & M/G circuits available for access and variations to adjacent M/G development holing schedule
    - preferable to holeout next M/G prior to longwall start-up but cannot be relied upon. This is not necessary with 3-hdg gateroads.
- Maingate can operate as three intakes, or two intakes with an off-side return.
- Tailgate with intake air for:
  - additional gas dilution capacity
  - diesel equipment access during production (for stone dusting, secondary support, prep for maintenance, and other tasks). Minimises longwall downtime that would otherwise be problematic when the tailgate methane concentration remained above 1.0% during maintenance shifts.
- Perimeter bleeder roadway:
  - Design allows operation with or without bleeder
  - Provides additional gas dilution capacity

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Ventilation Circuit – Worst Case

Face near startup, next gate road not holed, back return not available

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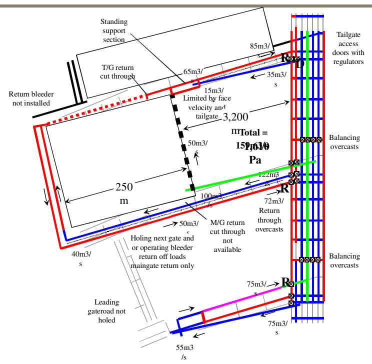

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Ventilation Circuit – Best Case

Face near startup, next gate road holed and or back return available

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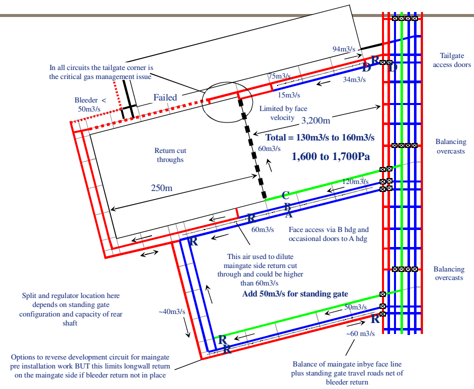

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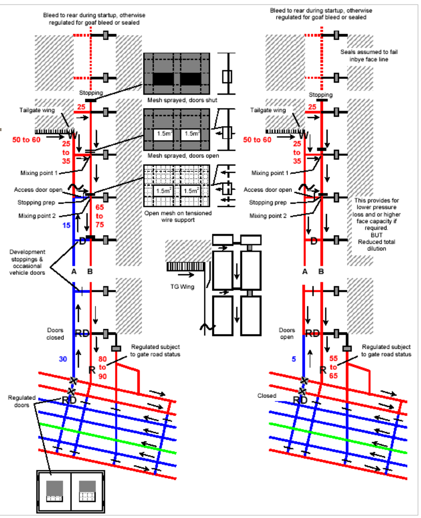
Longwall tailgate ventilation circuit (LW02 & beyond)

– with & without access

- Tailgate brattice wing employed
- c/t i/b T/G open to pull gas away from T/G drive
- Centre road progressively sealed as LW retreats



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Longwall Ventilation Control Devices & Goaf Sealing

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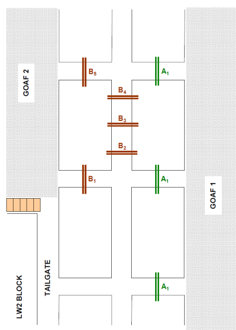
- High standards for ventilation control devices
- Maingate Chain Pillar (A1) & Final Seals:
  - 20psi overpressure rated concrete seals c/w gas sample tubes & vict pipes (for gas decanting, inertisation, dewatering pump delivery)
    - Tested design at full scale
  - Selected seals employ use of 20psi overpressure rated hatches (for simultaneous final sealing or pressure control/ decanting gas on active LW)
- General:
  - Steel lockable louvre regulators
  - Geotechnical assessment of seal sites & pillar designs completed (w.r.t. floor/roof/ribs competency, single & double abutment loads, convergence, heave)
  - Removal from goaf areas of conductive material likely to be insulated from the general mass of earth



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Longwall Ventilation Control Devices & Goaf Sealing

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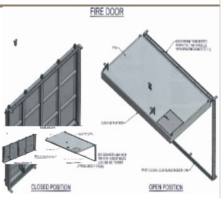
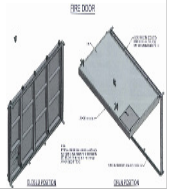
- Tailgate Centre Roadway on producing longwall:
  - 10psi overpressure rated 'fire door' (B2)
    - Used in Qld as a panel emergency seal, installed in 'open' position
    - Rated hand brake winch operated from the c/t. The door resides in the open position & when required, winch firstly lifts the door slightly & the roof latches let go & allow the self locking door to be lowered to seal the area
    - Purpose:
      - **regulate differential pressure across tailgate corner (tailgate gas management)**
      - **Seal centre road (spon comb management)**
  - Looking at alternatives: pumpable bag seals
- General:
  - Tailgate intake/return 2psi overpressure rated plaster stoppings c/w rated man-doors (ex-dev)





Nominal Volumetric Requirements

- 4 intake & 3 return main hdgs
- 3 hdg gateroads
- In addition: 80m3/s allowance for Blakefield North commencing while gate road and longwall panels remain inbye.
- Max mine pressure of 4kPa.

	Low m^3/s	*Low* m^3/s	*Moderate* m^3/s	*Moderate* m^3/s	*Max* m^3/s	*Max* m^3/s
LW Tailgate	80	90	90	90	90	90
LW Maingate return	30	70	40	40		20
Holed gate				50	70	40
Rear LW bleeder			45		45	40
Total Longwall	110	160	175	180	205	190
Leading gate	80	80	80	80	80	80
Lagging gate	60	60	60	60	60	60
Mains Development	50	50	50	50	50	50
Total Development	190	190	190	190	190	190
Garage	10	10	10	10	10	10
Fuel Bay	10	10	10	10	10	10
Inbye leakage	20	20	20	20	20	20
Outbye Leakage	40	40	50	50	60	80
Total Other	80	80	90	90	100	120
Total Mine	380	430	455	460	495	500
Main Intake velocity m/s	5.5	6.2	6.6	6.7	7.2	7.2
Return velocity m/s	7.3	8.3	7.9	8.9	8.7	8.9
No1 & 2 shaft diam m	6	6	6	6	6	6
Area m^2	28.3	28.3	28.3	28.3	28.3	28.3
Velocity m/s	13.4	15.2	16.1	16.3	17.5	17.7

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Frictional Ignitions

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- Significant inseam gas contents 4-10m3/t, +90% CH4
- High permeability circa 100-200mD
- Gas 'blowers'
- Presence of siderite nodules
- South Bulga experienced 7 frictional ignitions in development
  - occurred prior to the introduction of pre-drainage
    - Maintain <0.25% methane at start of hazardous zone
    - Reduced incidence of gas 'blowers'
  - Associated with present of siderite nodules in Whybrow seam

Blakefield South therefore susceptible to frictional ignitions.

Pre-drainage mitigates the hazard.

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Outbursts

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- Outbursts relatively low risk due to:
  - seam gas contents being below or only 1 to 2m3/t above normal threshold limiting values at inbye end of some LW blocks
  - relatively high permeability of seam
- Outburst management plan:
  - "Permit to Mine" system enables approval for development & longwall mining in regions originally identified as above threshold values
  - Borehole intersection procedures established

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Spontaneous Combustion

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- Low to medium (Class II) spon comb propensity for roof (280, 290) & floor (303) & working section (300-302) coal (determined from R70 self-heating rate, crossing point temperature, & minimum self-heating temperature indices.
- Both pillar and goaf events have occurred elsewhere in the same coal measures.
- Longwall extraction to the top of the 300 ply (leaving approx 1.5-2.5m floor coal): mitigates propensity of goaf spon comb.
- Seams in the immediate roof pose a spontaneous combustion hazard due to Blakefield/Whybrow/surface goaf interconnection & potential for leakage paths.
- A wider longwall, with strata and gas constrained production, retreats more slowly and therefore goaf atmosphere management becomes important.

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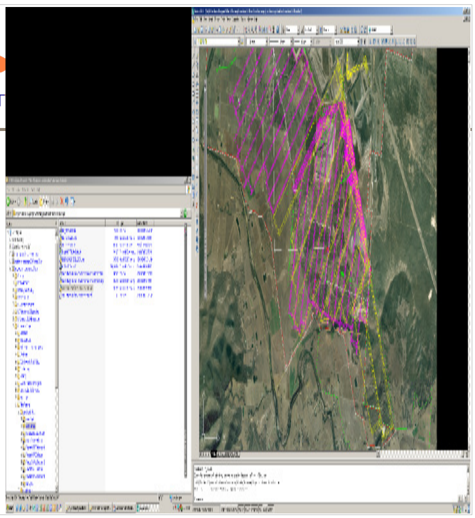
Blakefield & Whybrow Workings

- 70-100m interburden
- DOC:
  - South Bulga 50-180m
  - Blakefield South LW's 1-6 110-280m



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Rationale for a force exhaust ventilation circuit

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- South Bulga goaves connected to surface and, with chain pillar failure, all South Bulga goaves will be interconnected to some degree.
- 400m wide goaves in the Blakefield seam will fully connect with South Bulga goaf voids & surface at low DOC.
  - Potential for South Bulga goaf to recharge with seam gas to above atmospheric pressure i.e. it would be necessary to put a positive pressure on the longwall face.
- Significant potential for leakage from surface and ingress of goaf atmospheres from South Bulga workings both as a result of Blakefield South ventilation pressure and during changes in barometric pressure. Results in an:
  - increased propensity for spontaneous combustion in working section or roof seams
  - increase in the ingress of methane rich and or oxygen depleted atmospheres to operating longwalls

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Goaf & Surface Interconnections

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- *This issue requires additional controls beyond those normally associated with recovery of gassy coal reserves.*
- Specifically, the mine's primary ventilation system incorporates a pressure balancing (force-exhaust) ventilation system.
  - It is designed to minimise pressure differential between Blakefield to Whybrow workings to surface
    - NB: the risk of problematic leakage increases with applied differential pressure
  - It provides a control strategy for pressure balancing on the longwall face reducing the risk associated with these leakage paths

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Primary Ventilation System Design Vs Hazard Mitigation

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	Exhaust	Forcing	Force-Exhaust
Dev gas rib emissions	-	-	-
LW specific gas emissions	Air flows into goaf on fan stoppage, provides best buffer volume for gas make.	Goaf gas flows out of goaf on fan stoppage	Flow dependant on neutral point position. Flows at reduced volume. Ability to manage South Bulga goaf emissions.
High Production rates	-	-	-
Frictional ignitions	-	-	-
Outburst	-	-	-
Spontaneous combustion	High DP across sealed goafs relative to surface	High DP across sealed goafs relative to surface	Reduced DP across sealed goafs relative to surface
Active Goaf & Surface Interconnection	High DP & potential leakage paths from surface to Blakefield	High DP & potential leakage paths from Blakefield to surface	Neutral or slightly +/- DP, reduced leakage between Blakefield & surface

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Strategy for Setting and Control of the Circuit

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The principle of pressure balancing & key to this strategy is:

- Panel regulators determine mine resistance and air distribution through the circuit
  - Regulator changes are only required to alter ventilation distribution in the circuit
- Surface fans control the total airflow & total applied pressure and location of the neutral point:
  - Neutral point (where relative pressure to surface is zero) can lie anywhere in the circuit and is dependent on the relative operating points of surface fans
  - If regulators remain unchanged then the neutral point only moves with panel retreat or changes in surface fan duty.

It is only possible with a force-exhaust system that you can apply a slightly positive pressure if required to balance with South Bulga workings.

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Movement of Neutral Point

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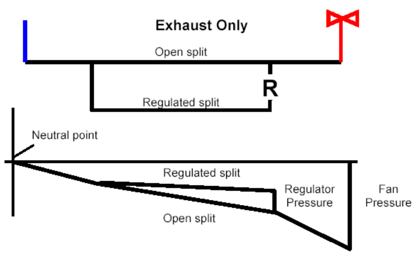

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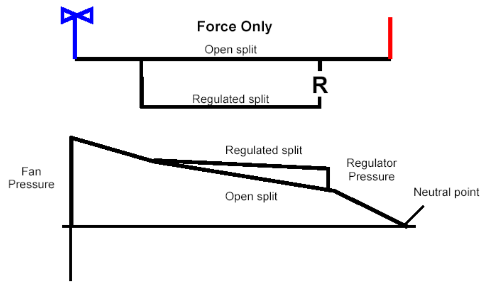
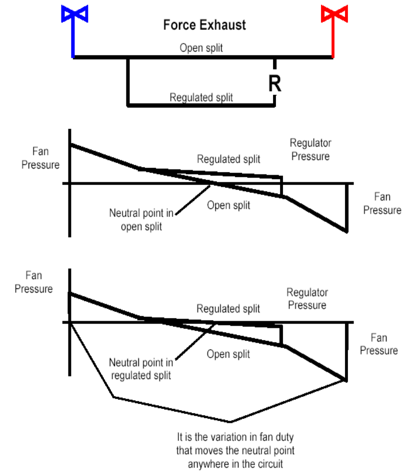
Movement of Neutral Point

xstrata coal





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Advantages of a force-exhaust circuit

- Overseas experience with pressure balancing using auxiliary & booster fans to control ingress of gas from other workings.
- Full circuit pressure balancing is less complex than longwall only boosters (control/electrical systems & two different pressure regimes in main returns).
- Nothing prevents reverting to a conventional exhaust ventilation system (for example during longwall relocation or at other times that monitoring proves leakage not to be an issue).
- System works with or without a bleeder roadway.
- Negates need to supply inert gas to South Bulga workings (need to do if do not pressure balance and a leakage path exists. In any case, unlikely that sufficient inert gas could be supplied, & be able to maintain the tailgate above 19.5% O2, and also have to goaf drain).

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Disadvantages of a force-exhaust circuit

- In an exhaust only system, failure of surface fans results in an increase in underground absolute pressure causing the goaf gas fringe to retreat into the goaf. But in a neutral or positive system, fan failure will result in gas being emitted from the goaf.
- Need to review failure modes and interlocks for a fail safe strategy.
- Additional capital required for fan installations.
- Lack of understanding of design principle for management, workforce & external consultants.
- All mine access via ventilation airlocks or conveyor seals.
- Mine access ventilation airlock & conveyor seals design.
- Ventilation management far more complex than exhaust or forcing systems.

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Force-Exhaust Ventilation System Components

- Primary Ventilation Fans:
  - 3 Forcing Fans on No.1 Shaft 6m dia 115m deep
  - 3 Exhausting Fans on No.2 Shaft 6m dia 155m deep
  - VVVF speed controlled centrifugal fans each 1.2MW 3.3KV
  - Control system designed around SIL's
  - Only 2 fans required at each shaft to maintain designed ventilation rates – built in redundancy & contingency
- Three sets of airlock doors in parallel at pit bottom – vehicles inbye, vehicles outbye and pedestrians.
- Belt seal with pressure chambers installed to control leakage in the belt drift.
- All panels set up with conventional regulators for manual adjustment & control.

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Force-Exhaust Ventilation System Components

- Pressure transducers located at key points in the circuit (absolute in LW T/G & M/G, & DP across main doors and regulators) - forms the basis for control.
- Investigation into IS ultrasonic flow measurement – trial underway with unit undergoing IS certification process.
- Real time and tube bundle gas monitoring systems.
- All components operate and report under the mine's control system (Citect).

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Pit Top & Main Ventilation Fan Locations

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Pit Top & Main Ventilation Fan Locations

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#1 Shaft Primary Fans Installation

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#2 Shaft Primary Fans Installation

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Gas Utilisation & Carbon Emissions Abatement

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Decommissioned LMS flaring facility:

- 5x LMS flares, total capacity 700 l/s

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Gas Utilisation & Carbon Emissions Abatement

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Currently flaring all captured gas:

- 3x Energen enclosed flares operating 24/7
- Custom designed
- total capacity 2,700 l/s
- 21x greenhouse emissions reduction factor
- fully automated turn-up and turn down in response to gas make

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Gas Utilisation & Carbon Emissions Abatement

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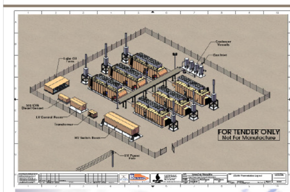

9MW power generation under construction:

- Commissioning Oct 2011
- 3 stand alone gas fired reciprocating engine generator units (Jenbacher, Austria)
- connected into grid to offset Bulga Complex power usage
- Investigating option to operate in "island" mode when grid is down powering critical infrastructure

Other gas utilisation strategies under investigation:

- Gas off-take agreement (capture methane & pipe gas to third party)
- 25MW generation for Bulga complex
- 120MW generation for XCN

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Gas Utilisation & Carbon Emissions Abatement

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Other gas utilisation strategies under investigation:

- Ventilation Air Methane (VAM) abatement - Corkys VAM RAB trial under construction:
  - Reverse flow thermal reaction based on 30yrs of coke oven design with high thermal mass.
  - Design & install of single trial unit commenced
  - Design compatible with full system deployment, including vent air capture system
  - Contracted design to manage ~30m3/s at 0.4%-1.2% CH4
  - Deliver commissioned operating unit at end of trial

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Summary

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Provides a ventilation strategy that simultaneously addresses high seam gas emission rates and spontaneous combustion risk.

The ventilation system:

- Designed to operate mine at production rates c.7Mtpy
- 7 heading mains / 3 heading gateroads for high volumetric capacity, longwall tailgate access, and built-in contingency for delayed holing of the next maingates
- Rear panel perimeter bleeder roadway
- High volumetric capacity Force–Exhaust Primary Ventilation System (pressure balanced) up to maximum 580m3/sec
- Pre-drainage of working sections by SIS & UIS infill
- Effective goaf post-drainage system.
- Recognised that regardless of the primary ventilation system, there will likely be periods of gas make due to falling barometer and interconnecting goafs that will exceed ventilation dilution & gas extraction capacity.

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Summary

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- Provides a ventilation strategy that simultaneously addresses high seam gas emission rates and spontaneous combustion risk.
- Nothing new in the control of the mine ventilation circuits including real time monitoring and feedback control of fans.
- Management of change: different primary ventilation system to that used in coal mines (Australia or elsewhere).
- Increased resources required to manage this mine's ventilation system due to a significant gas reservoir combined with the risk of frictional ignitions, spontaneous combustion, interconnection with old workings & surface, and outburst. This applies whether you use a force-exhaust system or not.

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BELTANA VISION

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To be leaders in health, safety, environment and community management and maintain our industry cost ranking in a changing mining environment through innovation and performance.