



**BATHURST**  
RESOURCES LIMITED

**Health and Safety  
Stand Alone Coal  
Exploration  
AUSIMM 2015**

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# Definition of a Mining Operation (HSEA)

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## 19M Meaning of mining operation

In this Act, **mining operation**—

- (a) means the extraction of coal and minerals and the place at which the extraction is carried out **and**
- (b) includes any of the following activities and the place at which they are carried out:
  - (i) exploring for coal;
  - (ii) mining for coal or minerals;
  - (iii) processing coal or minerals associated with a mine;
  - (iv) producing or maintaining tailings, spoil heaps, and waste dumps;
  - (v) the excavation, removal, handling, transport, and storage of coal, minerals, substances, contaminants, and wastes at the place where the activities described in subparagraphs (i) to (iv) are carried out;
  - (vi) the construction, operation, maintenance, and removal of plant and buildings at the place where the activities described in subparagraphs (i) to (iv) are carried out;
  - (vii) preparatory, maintenance, and repair activities associated with the activities described in subparagraphs (i) to (iv); and
- (c) includes—
  - (i) a tourist mining operation;
  - (ii) a tunnelling operation; but
- (d) does not include—
  - (i) exploring for minerals;
  - (ii) an alluvial mining operation;
  - (iii) a mining operation wholly on or under the seabed on the seaward side of the mean high-water mark;
  - (iv) a quarrying operation.

Section 19M: inserted, on 16 December 2013, by [section 11](#) of the Health and Safety in Employment Amendment Act 2013 (2013 No 95).

If standalone coal exploration is defined a *mining operation* then what competencies do staff have to have?

- SSE must be appointed and hold relevant certificate of competency Reg 8.
- Mine manager exempted from requirements under reg 16(2)(a)
- Unclear as to whether a supervisor is required. Reg 31 requires a supervisor for each production shift.

**Normal meaning of production shift is extraction of coal?**

Why is Coal Exploration inherently more dangerous than other exploration ?



## Outburst Potential



# What are the Extra Hazards with Coal Exploration?

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- Coal Seam derived methane released by drilling burning or exploding at the surface
- Drilling intersecting abandoned mine workings releasing irrespirable and explosive gases

# What are the Potential Extra Hazards caused by Coal Exploration?

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- Drilling equipment abandoned in a hole causing a hazard to underground mining
- Hydrostatic head of groundwater from unsealed holes causing potential inrush into workings
- Unsealed holes allowing fresh air to enter mine workings



# Methane not just the domain of coal exploration/mining

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- The presence of methane gas in metal/nonmetal mines around the world is more common than one might imagine

*[Edwards and Durucan 1991]*

## Example

In Western Australia a drill hole caught fire at a surface diamond drilling operation after methane was intersected. Flames were observed at the drill hole and extended to the top of the drill mast. The fire continued to burn for about 24 hours.

# Many Documented Methane Occurrences in Metal Mines

- Scandinavian iron ore deposits include methane and other hydrocarbons in boreholes that intersect pitch and asphalt within the deposits, and methane and nitrogen in boreholes and fissures in arsenic and sulfide ores
- Canadian Shield mines contain methane, other hydrocarbons, and sometimes hydrogen and helium [Fritz et al. 1987; Andrews 1987]
- In the United Kingdom, granites in Cornwall and Aberdeen and iron ore deposits in Cleveland all report hydrocarbon gases associated with overlying bituminous shales. Also, Derbyshire lead mines have reported methane along with bitumen.
- In Eastern Europe, petroleum and gas has been observed in igneous and metamorphic rocks in Yugoslavia, in some copper mines in Hungary, and in mica schists containing limestone intrusions in Romania.
- In Australia, hydrocarbon gases are reported from copper mines and from Precambrian rocks at Kalgoorlie. The usual type of methane encounter is a diamond drill blower and methane is readily dispersed
- The Republic of South Africa has combustible gases in almost all gold and platinum mines, as well as kimberlite pipes. Along with the methane, there can be hydrogen and helium. The usual assumption is that the methane is associated with overlying Karoo strata, which are coal-bearing [Searra 1990; Eschenburg 1980; Jackson 1957]. The gas is transported downward through the rock dissolved in water.

# Principal Hazards

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- As per the 2013 regulations are defined as...
  - any hazard that could create a risk of multiple fatalities in a single accident or in a series of recurring accidents at the mining operation.

## **Site senior executive is responsible for identifying principal hazards and having principal hazard management plan**

The general purposes of the principal hazard management plans are to:

- a) identify the nature of all principal hazards at any mining operation
- b) set out the measures that will be used to ensure that all principal hazards are effectively managed

# Risk Assessment

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“A process is in place to assess the inherent risk of harm to mine workers from identified hazards at the mining operation and to identify the controls required to manage that risk”; reg 55

# Collaborative Approach

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Discussions around the requirements for exploration under the regs highlighted opportunities to convene a tripartite assessment

## Advantages:

- Reduced cost for facilitators
- Reduced total attendance time for contractors
- Ability to draw on a much greater pool of knowledge from three companies
- Gained a critical mass that enabled a more diverse group of attendees

# Combined Coal Exploration Risk Assessment

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- Westport, Nov 2014
- 5 days
- Both SENZ and BRL/L&M matrix used as probability descriptions varied
- Externally Facilitated by SLR Consulting

# Combined Coal Exploration Risk Assessment

Representatives from:

- Major coal explorers (L&M, SENZ, BRL)
- Drilling contractors (Alton, Ecodrilling Drillforce)
- Helicopter contractors (Mt Hutt, Airwest and Garden City)
- Mines Rescue
- Geophysical and site preparation contractors

Name	Position	Organisation	10.11.14 BBRA	11.11.14 Aviation	12.11.14 Emergency /Worker Health	13.11.14 Drilling	Site Preparation and Rehab 14.11.14	14.11.14 Traffic and Roads
Hamish McLauchlan	General Manager Exploration	Bathurst Resources	☑	☑	☑	☑	☑	☑
Eden Sinclair	Resource Geologist	Bathurst Resources	☑	☑	☑	☑	☑	☑
Rob Kitchen	Field Technician	Bathurst Resources	☑	☑	☑	☑	☑	☑
Fiona Bartier	General Manager Projects	Bathurst Resources	☑	☑	☑	☑	☑	☑
Mark Lionnet	Geology Team Leader	SENZ	☑	☑	☑	☑	☑	☑
Tony Lyons	Director	Eco-Drilling	☑	☑	☑	☑	☑	☑
Grant Skewes	Operations Manager	Eco-Drilling	☑	☑	☑	☑	☑	☑
Bruce Carey	Manager	Branch Management	☑	☑	☑	☑	☑	☑
Stu Gornie	West Coast Base Manager	Mt Hutt Helicopters	☑	☑	☑	☑	☑	☑
Cory Ibbotson	Director	Alton Drilling	☑	☑	☑	☑	☑	☑
Kelvin Trask	Contract HSE Manager	Alton Drilling	☑	☑	☑	☑	☑	☑
AJ De Witt	Slimline Engineer	Weatherford	☑	☑	☑	☑	☑	☑
Regean Graham	Helicopter Pilot	Garden City Helicopters	☑	☑	☑	☑	☑	☑
Dion Edgar	Helicopter Pilot	Garden City Helicopters	☑	☑	☑	☑	☑	☑
Glenville Stiles	Contractor	NZ Mines Rescue	☑	☑	☑	☑	☑	☑
Johnny McNee	South Island Coal Quality Manager	SENZ	☑	☑	☑	☑	☑	☑
Allan Rosanowski	Director	Airwest Helicopters	☑	☑	☑	☑	☑	☑
Hamish Pescini/Andy O'Loan	Geological Services Superintendent - Stockton	SENZ	☑	☑	☑	☑	☑	☑
Greg Hogan	Managing Director	L&M Group Ltd	☑	☑	☑	☑	☑	☑
Josh Kershaw	CEO	Mt Hutt Helicopters	☑	☑	☑	☑	☑	☑
Bruce McKeown	Operations Manager	Drillforce	☑	☑	☑	☑	☑	☑
Zane Brown	Director/Operations Manager	Drillforce	☑	☑	☑	☑	☑	☑
Chris Cowan	Helicopter Pilot	Self Employed	☑	☑	☑	☑	☑	☑
Brad Radloff	Facilitator	SLR Consulting	☑	☑	☑	☑	☑	☑
Karen Belousoff	Facilitator	SLR Consulting	☑	☑	☑	☑	☑	☑

# Learnings

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- Highlighted the benefits of having a huge depth of experience in the room
- Importance of attendees understanding the risk matrix or in this case risk matrices
- Benefits of external facilitator/s
- Challenges of running a risk assessment with more than 12 people in the room
- Five full days in a row is tough to complete



# Outcomes

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BBRA highlighted the need for PHMP for:

- Aviation
- Transport/Roads
- Drilling
- Site Preparation
- Explosives/blasting

PCPs for:

- Worker Health
- Emergency Response
- Control of Energy

# Principal Hazards

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- ◆ 1<sup>st</sup> Equal Ranking
  - ◆ Operations – Aviation Helicopter accident/incident
  - ◆ Operations - Vehicle Transportation of Equipment and Personnel to and from Site

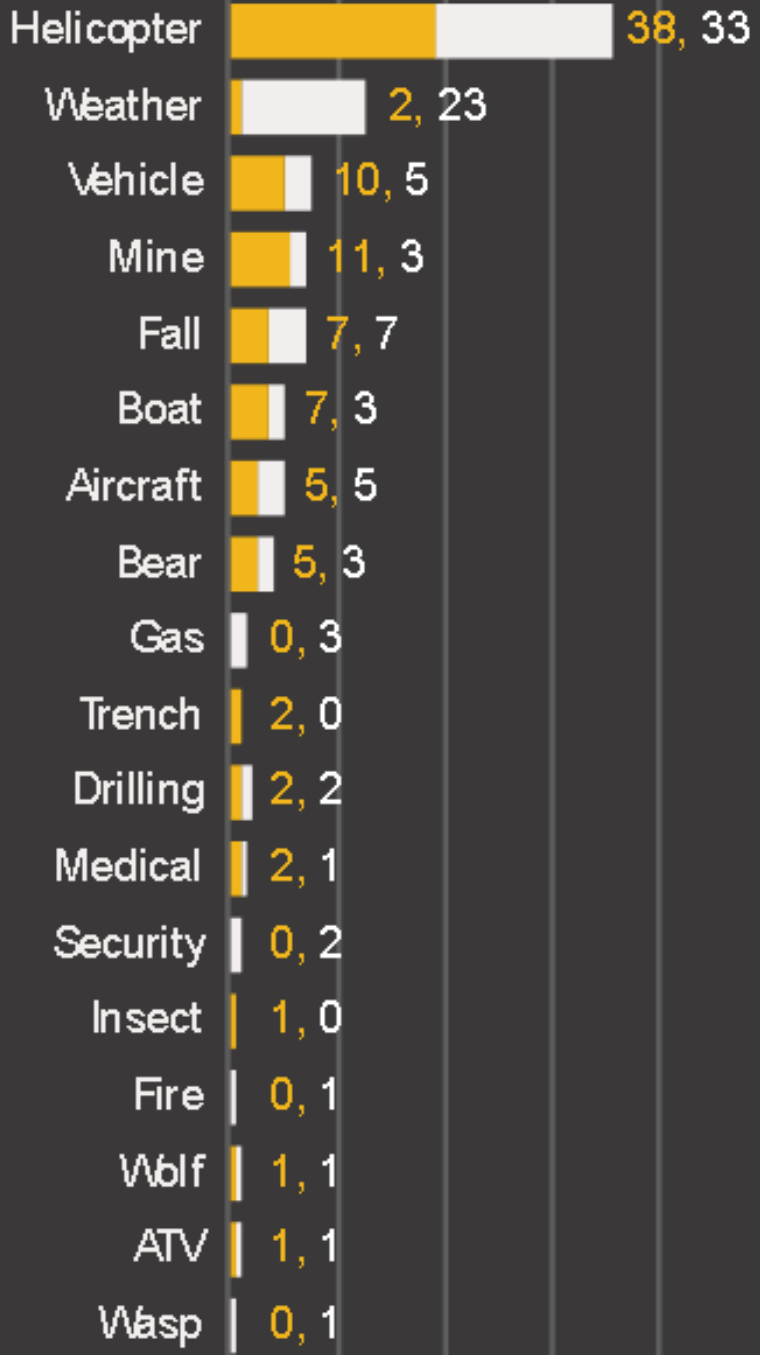
All represent potential for Multiple Fatalities in a “could occur in years to decades” (second lowest) event

# Principal Hazards

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- ◆ 2<sup>nd</sup> Equal Ranking
  - ◆ Existing and Potential Spontaneous Combustion in Historic Underground Workings resulting in explosive or irrespirable atmosphere
  - ◆ Underground Gas/Water Service Line - Gas or pressure Outburst
  - ◆ “In Hole” Generated Gas Outburst or Explosion

All represent potential for Multiple Fatalities in a “exceptionally unlikely” event



# Fatalities in Mineral Exploration in Canada by Primary and Secondary Cause 1980-2014

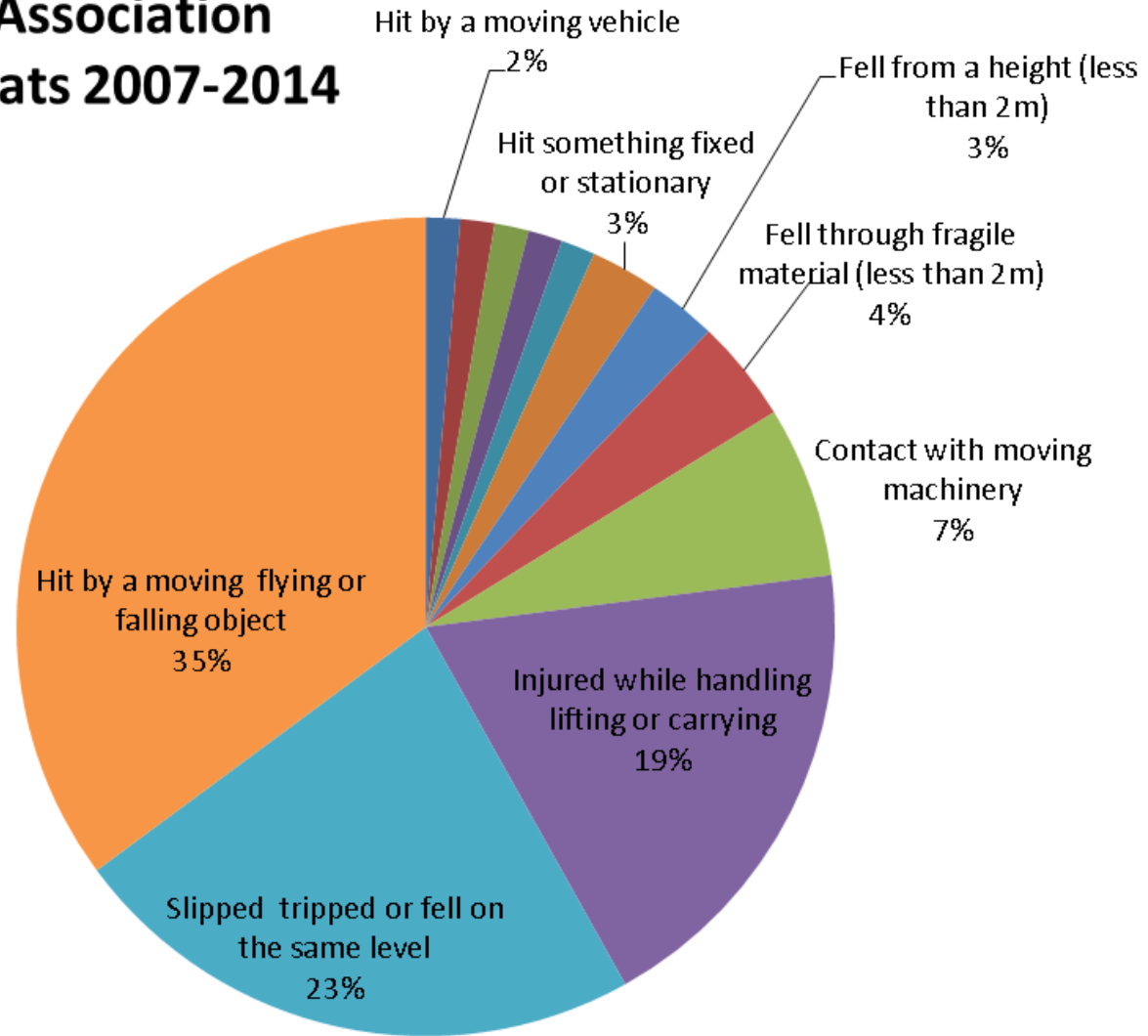
Nearly six million exposure hours per annum



# Fatalities in Mineral Exploration 1990-2010

Company	Year	Country	Cause	Category 1	Category 2	No. of Deaths	Personnel
Major	1990	Chile	Aircraft crash/hypothermia	Aircraft	Weather	4	Pilot/Geologist/Field
Major	1991	Chile	Boat capsized in squall	Boat	Boat	1	Geologist/Field
Other	1992	Australia	Driller was caught between mast and truck when moving drill mast	Drilling	Drilling	1	Driller
Major	1994	Chile	Vehicle accident/sleeping/alcohol	Vehicle	Alcohol	1	Geologist/Field
Other	1994	Ecuador	Helicopter crash - weather/pilot error	Helicopter	Weather	5	Pilot/Geologist/Field
Other	1995	Australia	Driller caught between rotating rods and mast	Drilling	Drilling	1	Driller
Major	1996	Philippines	Shot by guerrillas	Security	Security	1	Geologist
Major	1996	Turkey	Truck rolled	Vehicle	Vehicle	1	Driller
Other	1997	Australia	Helicopter crash, blade hit geologist standing by	Helicopter	Helicopter	1	Geologist/Field
Other	1997	Australia	Vomiting, unconscious due to heat exhaustion	Weather	Weather	1	Geologist/Field
Major	2000	Chile	Snowstorm	Weather	Weather	2	Driller
Major	2000	Argentina	Truck driven off the road	Vehicle	Vehicle	1	Driller
Major	2002	Chile	Murder of two geologists by thieves	Security	Security	2	Geologist
Major	2003	Chile	Vehicle accident/sleeping	Vehicle	Vehicle	1	Geologist
Other	2003	Mexico	Geologist swarmed by bees	Insects	Bees	1	Geologist
Junior	2004	Eritrea	Murdered	Security	Security	1	Geologist/Field
Midsize	2005	Chile	Aircraft crash/hypothermia	Aircraft	Weather	6	Pilot/Geologist/Field
Junior	2008	Chile	Helicopter crash	Helicopter	Helicopter	1	Field
Major	2008	Papua New Guinea	Mudslide onto exploration camp	Weather	Weather	10	Geologist/Field/Other
Junior	2010	Republic of Congo	Aircraft crash en route to executive site visit of exploration project	Aircraft	Aircraft	11	Pilot/Geologist/Other
Junior	2010	United States	Driller helper's clothing caught in moving drill equipment	Drilling	Drilling	1	Driller

# British Drilling Association Major Accident Stats 2007-2014



**No fatalities reported in the period**

# Where to from here ?

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- Companies produce their own PHMP documentation
  - PHMP Templates already existing for companies with mining operations so were modified to suit exploration
- Agreed on a collaborative approach on SOP's to try to achieve consistency between contractors, companies and operations
  - Potential to include key mineral explorers
- Complete Control of Energy and Blasting Risk Assessments























