

# minesafe

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Government of Western Australia  
Department of Mines and Petroleum  
Resources Safety

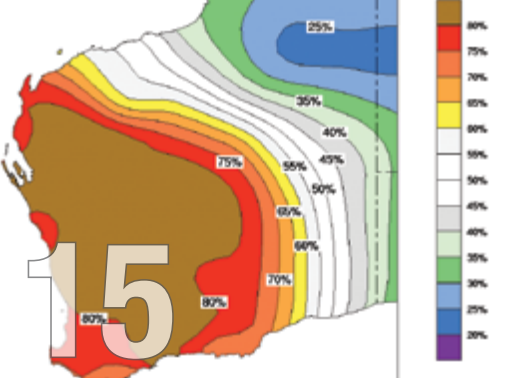
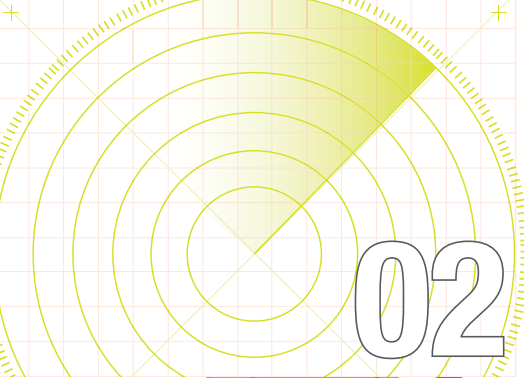
## Drilling code nears target

PRIORITY MINES SAFETY TARGETS FOR THE REGULATOR

MANAGING RISKS FROM UNDERGROUND STORAGE OF EXPLOSIVES

PETROLEUM AND DANGEROUS GOODS SAFETY ON REFORM RADAR





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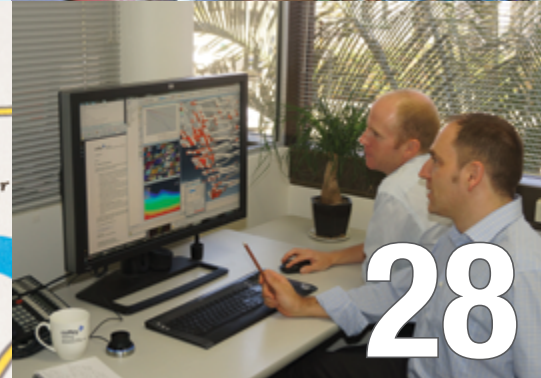
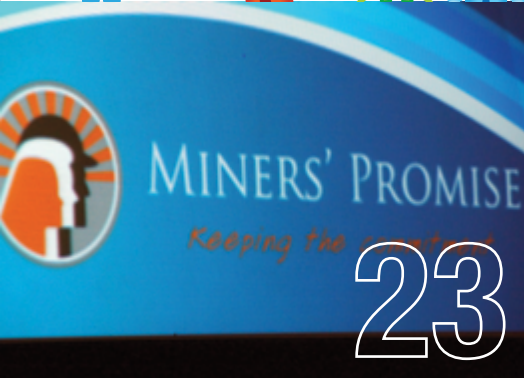
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**W**elcome to the first issue of *MineSafe* for 2012. There is a lot happening in the Western Australian resources industry. The number of workers has officially passed 100,000 as the State enters a period of sustained growth expected to last many years.

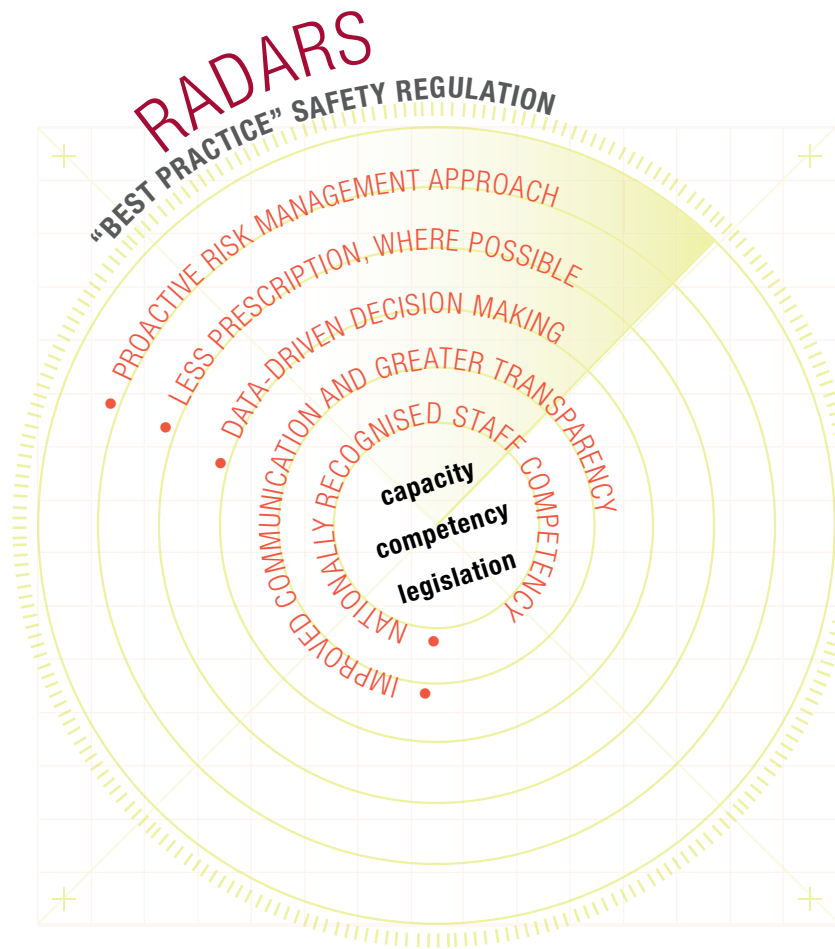
Not only must industry respond to this increased level of activity but so must the safety regulator. The safety reform process underway at Resources Safety is well advanced, with many initiatives now implemented for mines safety. This includes the creation of focus groups to address merging issues and, with the first wave of recruitment and training completed, the establishment of multi-skilled inspectorate teams that better match the varied nature of the industry.

There should be something of interest for all readers in this issue of *MineSafe*. In particular, I direct your attention to the safety alerts at the back of the magazine. If you don't already receive email alerts for Resources Safety, check out page 43 to find out how to subscribe to this service.

**Simon Ridge**  
*Acting Executive Director, Resources Safety*

Scan this QR code for past issues of *MineSafe*





## PETROLEUM AND DANGEROUS GOODS SAFETY ON REFORM RADAR

### PETROLEUM AND GEOTHERMAL ENERGY SAFETY

The focus of the safety reform implementation for Resources Safety, also known as the RADARS strategy, is broadening, coincident with the introduction of cost recovery for safety regulation of the petroleum industry and geothermal energy operations on 1 January 2012. Previously, the State Government has funded the cost of providing petroleum and geothermal energy safety services. However, as the industry has expanded, the cost of providing these services has placed increasing pressure on the government's resources. The levies will ensure that funding available for safety services is maintained at an appropriate level. Industry has been consulted throughout the development of the levies to ensure there are minimal administrative burdens for industry and the regulator.

The revenue generated by the levies will enable Resources Safety to fund existing activities, as well as expanding services through the recruitment of specialist safety and risk analysts, and other safety and health initiatives.

### DANGEROUS GOODS SAFETY

Miscellaneous amendments to dangerous goods safety regulations were gazetted on 1 April 2012, as the first phase of a comprehensive regulatory reform program. In addition to licensing changes, there were a large number of technical amendments.

In terms of safety reform implementation, major hazard facility fees have increased to achieve about 50 per cent cost recovery, and user fees for explosives reserves have increased by 30 per cent to achieve about 80 per cent cost recovery. A second round of increases will apply in 2013 to achieve near full cost recovery for regulation of major hazard facilities and the operation of explosives reserves.

Other reform initiatives will come into effect progressively through 2012. They include:

- a restructure and rationalisation of dangerous goods licence fees
- extending licence terms for dangerous goods drivers and shotfirers to five years
- removing the requirement to inform the regulator when there is a change to the responsible person for explosives and security risk substances (SRS) security.



## AUSIMM AWARD RECOGNISES SAFETY REFORM PROGRESS

**T**he Australasian Institute of Mining and Metallurgy's awards recognise the leadership of those professionals in the minerals sector who have contributed to outstanding economic, environmental and social outcomes across the industry, the professions and the community.

At the 2012 AusIMM Annual Awards Dinner on 16 June, Simon Ridge, Director Mines Safety Branch and State Mining Engineer with Resources Safety, will receive the Jim Torlach Health and Safety Award in recognition of his work in mining safety and reform.

Simon has been a central figure in a determined drive for change in the performance of the regulator and the safety performance of the mining industry. He has guided the introduction of a new approach to safety regulation that presents a balance between promoting safety outcomes, monitoring compliance and initiating enforcement activities.



Simon has taken personal responsibility for the recruitment of suitably qualified and experienced staff, designed and overseen new inspector induction programs, and introduced a new team concept tailored to suit the State's diverse and geographically dispersed mining sector. He has led the push to build both the capacity and competency of the regulator in a very short timeframe. This has been achieved through competency-based training and development programs for all staff.

Simon has made a significant number of presentations to industry to raise awareness of the need to reform within the industry itself.

Simon trained initially in the United Kingdom as a mine geologist, and then graduated in 1988 from the Western Australian School of Mines as a mining engineer. He worked on mines in Africa and Western Australia before beginning a career as a district inspector of mines in Western Australia, where he was employed by the Western Australian Department of Minerals and Petroleum Resources for 13 years. From 2003 to 2009, Simon worked with SafeWork SA in several roles, including manager mining and major hazard facilities. He rejoined the Western Australian mines safety regulator in 2009.



**JAMES MILNE TORLACH**  
(1938-2006)

Jim Torlach made an outstanding contribution to the improvement of safety and health in the mining industry in Western Australia. Jim was responsible for the complete overhaul and modernisation of mine safety legislation, culminating in the development of the *Mines Safety and Inspection Act 1994*.



## DMP ENVIRONMENTAL GUIDELINES UNDER REVIEW

**W**hile large tracts of the State are available for exploration and prospecting, which are essential for the ongoing prosperity of the mining industry in Western Australia, a minimal environmental impact and ongoing emphasis on environmental management are important for industry to meet government and community expectations.

.....

In March 2012, the Environment Division of the Department of Mines and Petroleum released a draft publication, *Guidelines for Environmentally Responsible Mineral Exploration & Prospecting in Western Australia*, and invited public comment by 20 April 2012.

The guidelines were developed for exploration and prospecting in Western Australia to replace the existing *Guidelines for Mineral Exploration/Rehabilitation Activities*, which was originally released in 2007. The new guidelines aim to inform industry of the Department's requirements for Programme of Work Exploration (PoW-E) and Programme of Work Prospecting (PoW-P) applications, including online submissions, and to convey the Department's expectations for environmental management and rehabilitation practices in the exploration and prospecting industries.

Obtaining timely approval for exploration and prospecting operations is important for a business. Application of the new guidelines should reduce approval timeframes.

Further information on the guidelines and publication status is available from the Minerals Environment Branch of the Environment Division.



## TEAMS WORKING TOWARDS COMMON GOAL OF IMPROVED SAFETY REGULATION

**A**ccording to the Macquarie Dictionary, “teamwork” is the work of a team with reference to coordination of effort and to collective efficiency.

A major initiative under the safety reform strategy for Resources Safety has been the adoption of a team approach for the mines inspectorate to provide a spread of experience and expertise within the teams of inspectors assigned to particular regions or activities.

Following an initial settling-in period, the teams were recently adjusted to make it easier to contact the relevant inspectorate and assign appropriate staff to better match the discrete nature of industry.

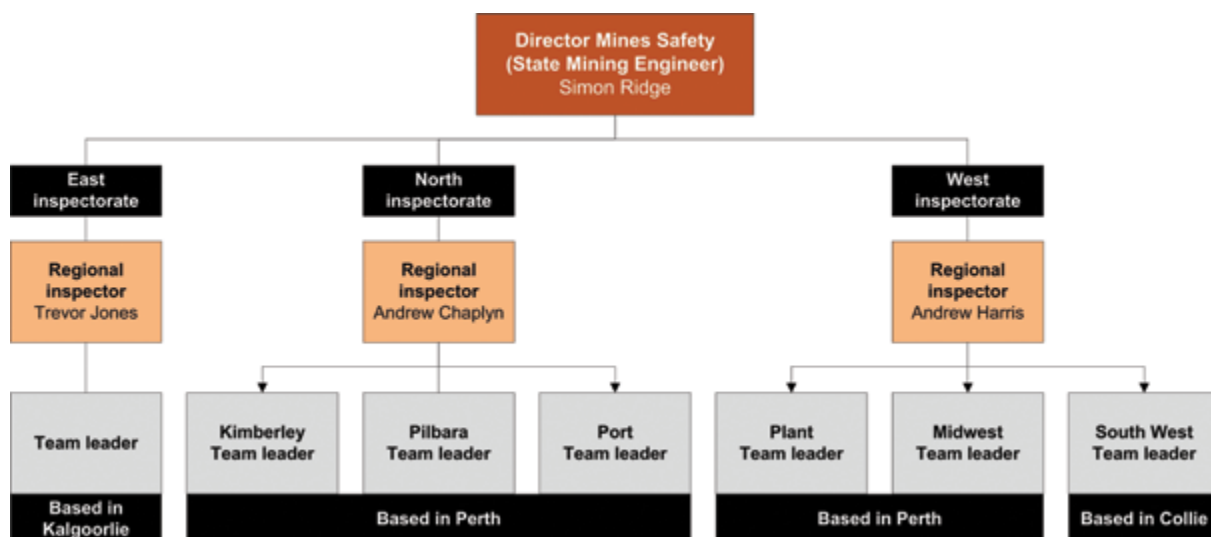
The team covering the East Inspectorate works out of the Kalgoorlie office.

There are three teams within the North Inspectorate, which is based in Perth. There are teams for the Kimberley and Pilbara, and another covering all ports in the State.

The West Inspectorate has a south west team based in Collie and midwest team based in Perth. A plant team is based in Perth and covers sites throughout the State that have extensive plant.

The establishment of teams has led to more effective delivery of regulatory services. For example, site visits are better coordinated, with a focus on risk profiles and desired outcomes. Sites are typically visited by two to three inspectors with complementary disciplines (e.g. electrical, mining engineer, OSH) to add value and reduce duplication should issues arise during an audit or inspection.

Although the reform-related recruitment campaign is now complete, Resources Safety continues to seek suitable specialists in the fields of mining, mechanical and structural engineering to deliver the required level of regulatory services. Further reform of the structure and composition of the teams may also be necessary to address emerging issues.



## DRILLING CODE NEARS TARGET

**E**arlier this year, Resources Safety sought public comment on the draft code of practice for mineral exploration drilling, which was developed with industry input. The public comment period closed on 30 March 2012.

The draft has been revised to address feedback, with additional references and photographs provided. The main amendments are summarised below.

### **Chapter 1 Introduction**

- Clarification and correction of descriptions for drilling methods
- Addition of vacuum drilling method

### **Chapter 3 Rotating and moving parts**

- Minor changes to hazard section, including addition of vehicle-mounted cranes
- Minor changes to risk controls descriptions

### **Chapter 4 Compressed air systems**

- Elaboration of hazard resulting from blown debris
- Reference to material included in air stream when assessing risk

### **Chapter 5 Hydraulic systems**

- Elaboration on risk controls for wear of hoses
- Inclusion of electrical sources as potential ignition points

### **Chapter 6 Hazardous substances and dangerous goods**

- Title change to reflect content
- Extensive rewording to clarify fire risk posed by spills and leaks
- Extension of risks from hydrocarbons to hazardous substances
- Inclusion of need for material safety data sheets and sufficient spill response

### **Chapter 7 Electricity**

- Reference to screening of hydrocarbons in risk controls section

### **Chapter 8 Manual tasks**

- Expansion of hazard section to include wheels with split rims and carrying loads between levels
- Inclusion of break-out systems when assessing the risks
- Clarification regarding non-engineered tooling and handling of wheels with split rims

### **Chapter 10 Falling objects**

- Expansion of hazards to cover other objects, including loads carried by vehicle-mounted cranes
- Clarification of risk control to include edge protection and securing of tools

### **Chapter 13 Dust**

- Clarification of dust exposure assessment





### Chapter 15 Ionising radiation

- Extensive rewording to clarify hazard from radiation exposure
- Clarification of approval requirements for risk controls

### Chapter 16 Extreme weather and bushfires

- Title change to highlight inclusion of content relating to bushfire hazard
- Extensive rewording to elaborate on bushfire ignition sources and threats
- Inclusion of monitoring of supposedly low-threat bushfires

### Chapter 17 Light vehicle movement

- New chapter to focus on hazard associated with light vehicle use in exploration
- Inclusion of text covering loss of control, runaway vehicles, fatigue during travel, stability considerations following vehicle modification, loading or towing and other matters

### Chapter 18 Rig movement (formerly Chapter 17)

- Clarification of rig stability and risk controls

### Photographs

- Inclusion of images that represent leading practice

When completed, the drilling code of practice will be presented to the Mining Industry Advisory Committee (MIAC) for consideration. Once endorsed by MIAC, it will be submitted to the Minister for Mines and Petroleum for approval to publish.

Photo courtesy Rob Mincham

## FOCUS ON CONSTRUCTION

According to the March-May 2012 edition of *Prospect* magazine, published by the Department of Mines and Petroleum, there is more than AUD180 billion worth of resource projects either committed or under consideration for Western Australia over the next few years. It is expected that over 50,000 construction jobs and more than 15,000 permanent jobs will be created.

The construction phase is a dangerous time for workers developing or upgrading mine sites facilities and infrastructure. Accident statistics for the minerals sector have shown a consistently high proportion of fatalities and injuries associated with construction activities.

A number of unique safety issues and processes significantly increase the risk of injury to construction workers. Examples of high risk work activities include:

- scaffolding
- undertaking tilt up or precast construction
- rigging
- working at height
- using cranes and elevated work platforms (EWPs).

The situation may be aggravated by:

- tight deadlines for project completion
- an inexperienced workforce

- large numbers of workers concentrated in one area
- poor contractor management systems.

Construction work associated with mining is a priority target for Resources Safety. The safety regulator's OSH Focus Group is reviewing and revising the inspectorate's systems to improve compliance capacity and capabilities, and add value for external stakeholders by raising awareness of critical issues. The program of work being tackled by the OSH Focus Group includes:

- improving internal systems and processes within the inspectorate
- empowering inspectors with the construction safety knowledge needed to effectively promote compliance and enforce occupational health and safety (OHS) requirements for construction
- developing compliance tools and training to help inspectors identify common construction hazards when auditing or inspecting mine sites
- providing consistent and transparent OHS information about construction work, including the development of audit tools for inspectorate and industry use
- developing guidance for industry on construction-related issues to be addressed when submitting project management plans (PMPs) for approval
- enhancing the regulator's compliance monitoring and targeting by analysing construction accidents and incidents reported to Resources Safety.



### NEW FOCUS ON SHAFTS AND WINDING SYSTEMS

A new focus group for shafts and winding systems is starting up in May 2012. The group will be headed by Jim Boucaut, who has many years of experience in the Eastern Goldfields.

Based in Perth, this focus group has been established to ensure the retention and transfer of corporate knowledge, and a consistent approach to safety compliance for these mining activities throughout the State.





## GET IN ON THE ACT – PARTICIPATE IN RIS PROCESS!

**T**he release date for Western Australia’s proposed new work health and safety legislation is approaching. The Work Health and Safety Bill will cover general industry, while the Mines Work Health and Safety Bill will be largely the same but include additional content that is specific to mining requirements. It is expected that the two Bills will be put before Parliament in the spring session.

At about the same time that the Bills are introduced to Parliament, WorkSafe will seek public comment on the attendant draft regulations covering general industry through a regulatory impact statement (RIS) process. Given that most of the general regulations will be reflected in their entirety in the mining regulations, mining stakeholders should take advantage of this unique opportunity to make their views known to WorkSafe. Resources Safety will undertake the RIS process for the draft mining-specific regulations once the process is complete for the general regulations.

Under the nationally harmonised approach, the proposed legislation contains new concepts such as “person conducting a business or undertaking” (PCBU) and mandates the provision of a workplace health and safety management system (WHSMS) at all mining operations. The WHSMS is to be supported by principal hazard management plans (PHMPs) and principal control plans (PCPs), which will address the specific risks present at a mining operation. Future issues of *MineSafe* will explain these new concepts in greater detail.

In partnership with the Chamber of Minerals and Energy WA and Unions WA, Resources Safety will help stakeholders transition to any new legislative framework by providing information and training.



# DMP LEGISLATIVE PROGRAM AS AT 20 APRIL 2012

## DANGEROUS GOODS SAFETY

Resources Safety continues to progress amendments to reduce the regulatory burden and streamline administrative processes associated with dangerous goods safety legislation. Amendments to the explosives and storage and handling of non-explosives regulations have been gazetted.

The licensing structure for dangerous goods sites in Western Australia has been overhauled. Amendments also included the introduction of a partial cost-recovery regime for the regulation of dangerous goods safety. See page 11 for more details.

## PETROLEUM AND GEOTHERMAL ENERGY SAFETY LEVIES

The *Petroleum and Geothermal Energy Safety Levies Act 2011* and *Petroleum and Geothermal Safety Levies Regulations 2011* commenced on 1 January 2012.

## PETROLEUM SAFETY IN COASTAL WATERS

Also on 1 January 2012, direct responsibility for safety regulation in the State's coastal waters was transferred from the National Offshore Petroleum Safety Authority (NOPSA) to the Department of Mines and Petroleum. Assets in these areas include nine production licences, 22 pipeline licences, one manned and seven unmanned platforms, 18 monopods and tripods, four tanker loading facilities and several vessels from time to time, including diving operations. There are also a number of major subsea pipeline construction projects that will now have to be regulated by Resources Safety, such as Gorgon, Macedon, Wheatstone and Browse.

Copies of the amended coastal waters legislation, namely the *Petroleum (Submerged Lands) Act 1982*, and attendant regulations covering occupational safety and health, offshore facilities, pipelines and diving, are available from the State Law Publisher's website at [www.slp.wa.gov.au](http://www.slp.wa.gov.au)

Transitional arrangements are such that all safety documentation previously accepted by NOPSA remains accepted and in force until such time as there is a legislative requirement for revision and resubmission for acceptance.

For enquiries concerning safety matters in coastal waters, contact the Director Petroleum Safety on 08 9222 3595 or email [alan.gooch@dmp.wa.gov.au](mailto:alan.gooch@dmp.wa.gov.au)



## DANGEROUS GOODS LICENCE REFORMS – PHASE 1

The first phase of a series of reforms to dangerous goods licensing that were announced in September 2011 came into effect on 1 April 2012. The changes will reduce red tape and costs for both industry and the Department of Mines and Petroleum.

Some of the key changes include:

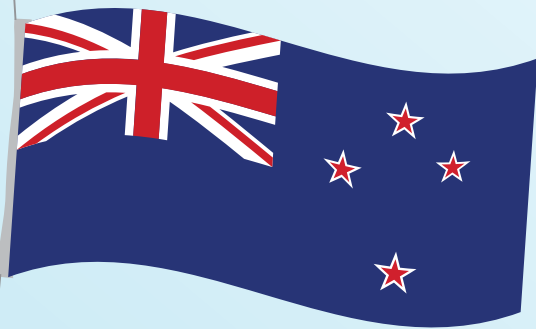
- for mine sites, the regulations now exclude dangerous goods that are in tailings dams, heap leach operations or an unprocessed ore as these are adequately covered under the *Mines Safety and Inspection Act 1994* and accompanying regulations
- a dangerous goods site licence is no longer required if the site is subject to an explosives manufacture licence and the dangerous goods at the site are those used to manufacture the explosives
- management of underground petroleum storage tanks is now required to comply with Australian Standard AS 4897 covering their design, installation and operation
- special risk plan requirements for storage and handling of dangerous goods no longer apply to mine sites
- for transport on a mine site, it is no longer mandatory to remove or conceal explosives markings on vehicles when they are free of explosives
- dangerous goods incident reports submitted to Resources Safety must now include information on the cause of the incident and actions taken as a result of the incident
- the extension of licence terms to five years, with annual payment of fees and no requirement to submit renewal application forms each year
- the ability to align licence expiry dates (without cost) where one entity has several licences at one or more sites
- a grace period of three months for the payment of licence fees, but with a late fee – this prevents licences from automatically expiring, and the licensee having to re-apply for a licence if a fee payment is late
- an increase in fees for major hazard facilities and explosives reserves, with fee increases due in 2013 to achieve near full cost recovery.

### WANT TO KNOW MORE ABOUT THE AMENDMENTS?

Visit the dangerous goods legislation and policy section at [www.dmp.wa.gov.au/ResourcesSafety](http://www.dmp.wa.gov.au/ResourcesSafety) for the information sheet on the amendments, or use the QR code for smart phones.







## ROYAL COMMISSION ON THE PIKE RIVER COAL MINE TRAGEDY

Following the tragedy at Pike River coal mine in November 2010, the New Zealand Prime Minister, John Key, announced the establishment of a Royal Commission on the Pike River Coal Mine Tragedy.

The independent commission is chaired by Hon Justice Graham Panckhurst, a senior High Court Judge. Sitting with Justice Panckhurst is Stewart Bell, Commissioner for Mine Safety and Health for Queensland, and David Henry, Commissioner of Inland Revenue and the Chief Executive and Commissioner of the Electoral Commission.

The Royal Commission was appointed by Queen Elizabeth the Second to inquire into and report on:

- what happened at the Pike River Coal Mine on and after 19 November 2010
- why these events occurred
- the legislative framework for underground coal mining health and safety in New Zealand, and how it compares to other jurisdictions
- what can be done to avoid similar tragedies in the future.

The hearing is currently underway, with the Royal Commission expected to report to the New Zealand Governor General on 28 September 2012.

The terms of reference, detailed transcripts, live streaming and news can be found on the Royal Commission's website at [pikeriver.royalcommission.govt.nz](http://pikeriver.royalcommission.govt.nz)

## THE HUMAN CONTRIBUTION – SOME WORDS OF REASON

*Barry Healy is Resources Safety's Training and Education Officer. He regularly contributes to MineSafe's "Barry's bookshelf" series. Although published some five years ago, the book reviewed here by Barry is well worth reading given the increasing focus on the human factor in the safety equation.*

In his 310-page book entitled *The Human Contribution: Unsafe Acts, Accidents and Heroic Recoveries*, published by Ashgate in 2008, James Reason applies his mind to exploring the human contribution to "both the reliability and resilience of complex well-defended systems". In other words — why is it that humans can screw up safety systems, and what are the qualities of those people who heroically salvage disastrous situations?

Reason, famed for his Swiss cheese safety systems theory, points out that most serious accidents receive detailed investigations, so we tend to learn more about the hazardous human than the heroic one. He winds his way through some interesting psychological theories to explain skill-based, rule-based and knowledge-based performance. Only Reason could explain in plain English why we have the tip-of-the-tongue experience, when we know something but just can't call it to mind when needed.

From this, he builds a general rule that errors arise when the mental processes needed for correct performance are incorrectly specified. When things go wrong, the mind defaults to a response that is frequent, familiar and appropriate to the context — which is fine, except for when it is the wrong context!

There are chapters on why certain individuals violate safety systems, but Reason's most important point is that vastly different types of people have the same safety outcomes because of systematic issues.

The chapters that really strike home contain his descriptions of "heroic" surgeons and pilots who performed extraordinarily in dire circumstances. It is clear that these are the stories that really motivate Reason. People doing fly in, fly out rosters could read about these pilots and feel more secure.

High on the list of attributes of these safety leaders is "realistic optimism", the opposite of despair. When there is a succession of problems, what wins out is the stubborn belief that it is possible to get through the situation — that and calm, accurate communication draw together the collective mindfulness needed to avoid disaster.





## PROPOSED REGULATORY FRAMEWORK FOR DRUGS AND ALCOHOL ON WA MINE SITES

**N**ationally harmonised occupational health and safety legislation is expected to be introduced into Western Australia next year. While regulation 4.7 of the current Mines Safety and Inspection Regulations 1995 addresses the issue of intoxicating liquor or drugs on Western Australian mine sites, the draft Model Work Health and Safety (Mines) Regulations considerably expand the responsibilities of the mine operator with respect to drugs, including alcohol.

These additional responsibilities on mine operators are particularly important given the well-documented use of synthetic cannabinoids such as “Kronic” in the workplace. Although the synthetic cannabinoids detected have been added to the prohibited list, manufacturers have quickly replaced the banned products with other synthetic drugs not on the prohibited list. Commonwealth, State and Territory drug laws are not uniform and legislation has not kept up with these new designer drugs, which numbered in the hundreds by the end of 2011.

Testing for these new drugs is also lagging behind as specially equipped laboratories can currently test for only a handful of the new synthetic drugs, and test results may take a number of days.

Given these circumstances, there are significant implications for the mining industry under the proposed legislation because the mine operator will be required to manage risks to health and safety at a mine associated with fatigue, physical or psychological impairment, and the improper use of drugs, including alcohol.

The key legislative responsibilities for the mine operator relating to drugs and alcohol will be to:

- consult with workers concerning any testing regimes that may be introduced at a mine
- provide an employee education program
- provide an employee assistance program.

It is recommended that drug and alcohol management be integrated into the site’s overall health and safety program.

Part of the consultation process with workers should relate to:

- the type of drug testing to be used, such as oral fluid (saliva) or urine testing
- whether the intent is to measure impairment or to detect residual traces of drugs
- whether there will be a random or “for cause” testing regime
- the procedures to be followed if an employee is suspected of being impaired by drugs or alcohol
- the consequences of testing positive for drugs or alcohol.

A major consideration for all mining and exploration companies is that their drug and alcohol policy be robust and consistent across their sites in Western Australia, and preferably the rest of Australia.

The harmonised legislation will require that there is a single workplace health and safety management system across a mine site. When developing their own drug and alcohol policies, contractors to a mining or exploration company will need to discuss the issue with the company, which may already have drug and alcohol programs in place.

### A HELPING HAND

Guidance on alcohol and other drugs at the workplace is available in the publications section of the Resources Safety website. It is a useful starting point for situations where alcohol or other drugs may have occupational safety and health implications.

Strategies recommended by the guidance note include developing an alcohol and other drugs policy and supporting procedures for all levels of staff — and communicating these — as well as providing information and education on the risks of such use. The risk to all people involved can be reduced by having an alcohol and other drugs policy in place that sets out clearly how to address safety and health risks arising from people impaired by alcohol and drugs.

Workplace policies and procedures that are developed in consultation with workers and safety and health representatives help to avoid confusion and uncertainty, and the participative approach promotes compliance. The benefits of an alcohol and other drugs policy and supporting procedures include:

- meeting the general duty of care obligations
- providing some certainty when situations arise
- demonstrating management commitment to a safe workplace and informing employees and others on acceptable behaviour
- facilitating peer support.



## THE HEAT IS STILL ON

**D**espite summer officially ending and temperatures dropping slightly from their extremes of January and February, it is still possible to suffer heat stress. You should be aware of the potential risks, symptoms and remedial actions for heat stress.

With warmer than normal waters in the Indian Ocean, the Bureau of Meteorology predicts that autumn 2012 will bring:

- warmer than normal days in western and southern Western Australia
- warmer than normal nights in western, central and southern Western Australia.

As shown in Map 1, the chance that the average maximum temperature will exceed the long-term median maximum temperature for April to June is above 60 per cent across western and southern Western Australia.

Map 2 shows that the chance of the average minimum temperature for April to June exceeding the long-term median minimum temperature is above 60 per cent across western, central and southern Western Australia, with probabilities exceeding 80 per cent over much of this region.

So, although the autumn months are here, workers should not become complacent about their heat protection regimes. Apart from direct heat-related illnesses, excessive heat may increase the risk of injury to workers. Sweating can cause workers to lose their grip of tools or equipment, or cause fogging of safety glasses. Hot surfaces can cause burns.

While working in hot conditions is obviously a risk factor, the risk may increase if a worker is 65 years of age or older, is overweight, has heart disease or high blood pressure, takes medications that may be affected by extreme heat, or is under the influence of drugs or alcohol.

Wherever possible, avoid exposure to extreme heat, sun and humidity. Where this is not possible, take precautions. There is an abundance of online information on how this might be done, as well as articles in past issues of *MineSafe* and a toolbox presentation on the Resources Safety website.

### Volume 19, no. 1, May 2010 – The heat is on

Information about a thermal stress campaign at the Argyle diamond mine

### Volume 18, no. 3, December 2009 – All about heat

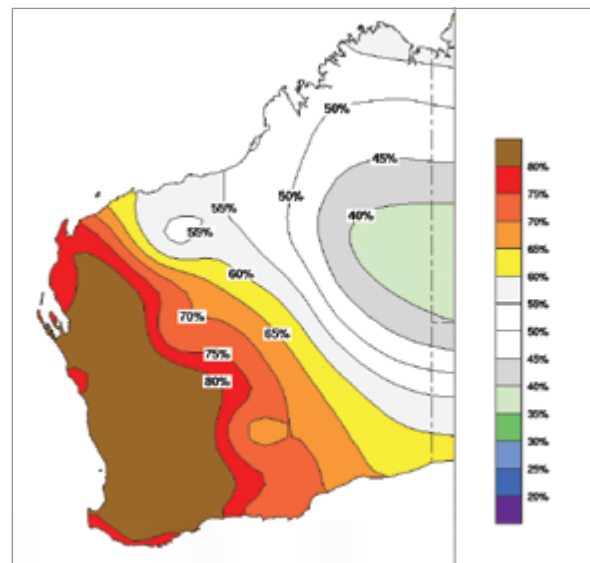
Handy guide to heat stress terminology and risk factors, and includes a recommended acclimatisation schedule for hot working conditions

### 2009 toolbox presentation – Heat stress

Covers thermoregulation; heat gain, storage and loss; heat strain and related illnesses; risk factors for heat strain; and risk assessment and control

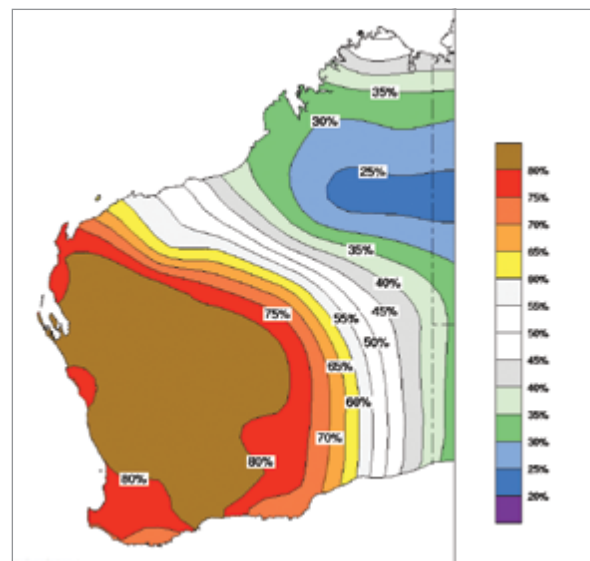
Map 1

Chance of exceeding the median maximum temp April – June 2012



Map 2

Chance of exceeding the median minimum temperature April – June 2012



Source: Australian Bureau of Meteorology ([www.bom.gov.au](http://www.bom.gov.au))



## MANAGING RISK FROM UNDERGROUND STORAGE OF EXPLOSIVES

**In recent years there has been a definite trend of increased use of underground magazines for explosives storage in Western Australia. While this practice avoids some of the downsides of traditional surface storage, it creates new challenges that may not have been recognised or properly addressed, particularly the potential effects of unconfined blasts.**

A review of research papers indicates that the overpressure from unconfined underground blasts is more destructive than is generally understood. Blast waves propagate significantly further through underground tunnels than on the surface. Cross-cuts and corners have limited effect and only decrease the overpressure by some 10 to 25 per cent for high pressures. Pressure waves may be intensified as they reflect off walls and other surfaces, resulting in peak pressures that are greater than the initial blast overpressure.

Resources Safety is concerned that many risk assessments prepared for underground explosives magazines fail to consider these blast effects. Incorrect assumptions about the blast wave behaviour may result in flawed risk assessments.

Most risk assessments rely on the magazine deluge system to extinguish a fire and the ventilation system to adequately manage any fumes. Mines must also consider the possibility of total control failure and a subsequent detonation of all explosives within the magazine.

The consequences of an unconfined explosion of many tonnes of explosives within an underground mine must not be underestimated — they could be fatal. Potential effects include:

- damage or destruction of ventilation fans
- people and plant both near and away from the magazine being thrown against walls and objects
- collapse of the mine or parts of the mine, with isolation of access and escape routes.

It is possible that refuge chambers may not be adequately engineered to withstand the forces of the blast or the resulting reverse-blast wave (backdraft). Any rescue scenario is likely to involve challenges and difficulties unlike other anticipated emergencies.

Resources Safety strongly recommends that mines with underground explosives magazines take the actions listed below.

- Review existing risk assessments and ensure the potential effects of an unconfined explosion are adequately addressed.
- Ensure crib rooms and other non-production facilities are adequately separated from the magazine. As a rule of thumb, a separation distance of twice the vulnerable facilities distance specified in Table 3.2.3.2 of Australian Standard AS 2187.1 for the NEQ stored is suggested, as measured through tunnels and passages. For example, the separation distance between a crib room and a magazine storing 15 tonnes of explosives would be 2,200 m.
- Develop an emergency response plan for the worst-case scenario of an unconfined explosion at a magazine.
- Minimise the quantity of explosives stored underground – consider using a combination of surface and underground storage to meet production needs.





## PRIORITY MINES SAFETY TARGETS FOR THE REGULATOR

**A**s outlined in the last issue of *MineSafe*, Resources Safety is committed to open consultation with the mining industry when setting priorities for its annual operational plans.

The Chamber of Minerals and Energy Safety and Health Conference held in March 2012 provided a golden opportunity for the safety regulator to seek broader feedback on its current set of priority targets for the minerals sector, and find out what else is of particular concern to industry. Over 200 survey forms were submitted on the day.

Previous industry consultation, including input from the Ministerial Advisory Panel, has confirmed the priorities listed below.

- Facilitate the introduction of principal hazard management plans (PHMPs)
- Promote the appropriate use of risk management tools
- Empower safety and health representatives
- Support the advancement of a resilient safety and health culture in mining
- Implement the occupational health and safety compliance strategy for mineral exploration and drilling
- Promote the use of traffic management and confined space audits
- Ensure mines address occupational health and safety issues associated with the construction phase of mining operations
- Promote a risk management approach for the guarding of machinery.

Resources Safety also has responsibilities for implementing the Western Australian Government's decision in relation to the harmonisation of occupational health and safety laws as they apply to mining operations.

To ensure broad industry representation, the survey has also been sent to mine, exploration and service company managers and safety and health representatives, with an invitation to respond by 1 June 2012.

The collated results will be used by Resources Safety to guide the setting of priorities for 2013 and enable the mines inspectorate to review its operational plans. Where necessary, safety awareness programs will be adjusted, and inspection and audit schedules refined, to ensure the best use of available resources.

A report summarising the survey results will be published on the Resources Safety website and in the next issue of *MineSafe*.



Australian Work Health and Safety Strategy 2012-2022

Public comment now open

### HAVE YOUR SAY ON AUSTRALIAN WORK HEALTH AND SAFETY DIRECTIONS FOR THE NEXT DECADE

The framework for work health and safety in the nation for the next decade, the Australian Work Health and Safety Strategy 2012-2022 was released on 26 March for an eight-week public comment period closing on Monday 21 May 2012.

The draft strategy establishes targets and priorities for the progression of work health and safety in Australia. The ultimate vision is for "healthy, safe and productive working lives by 2022".

To find out more about the Australian Work Health and Safety Strategy 2012-2022, and to provide comment, go to the public consultation section at [www.safeworkaustralia.gov.au](http://www.safeworkaustralia.gov.au)

# TESTING OF EARTH LEAKAGE PROTECTION DEVICES ON MINE SITES

Regulation 5.24(1) of the Mine Safety and Inspection Regulations 1995 requires the person responsible for the safety of electrical equipment at a mining operation to ensure that an earth leakage protection device is provided for:

- all alternating current circuits installed in underground mines, quarries, or as part of a dredge (other than a floating treatment plant)
- all circuits providing alternating current supply to portable, mobile or moveable equipment.

Occasionally, Resources Safety receives queries about the testing of these devices, which detect earth leakage current and isolate the electrical supply to protected circuits, socket outlets or electrical equipment when the current flow to earth exceeds a predetermined value.

The following information is provided to assist mine sites in understanding the requirements for earth leakage protection of the circuits specified above.

## EARTH LEAKAGE PROTECTION DEVICES – LOW VOLTAGE CIRCUITS

For low voltage circuits where the alternating current does not exceed 1,000 V, the circuits specified above must have an earth leakage protection device that incorporates a readily accessible means for testing the operation of the device. Residual current devices (RCDs) are a form of earth leakage protection device that is provided to final sub-circuits to isolate the electrical supply to socket outlets if the current flow to earth exceeds 30 mA.

Regulation 5.24(2) requires the earth leakage protection device to operate at an earth leakage current not exceeding 1 A for low voltage circuits. This must be achieved in the context of safe touch voltage limits (i.e. appropriate engineering judgement must be applied to this regulatory requirement). The earth leakage protection device should operate, in a reasonable time frame, in accordance with clause 3.2.3 of Australian Standard AS/NZS 3007.2:2004 *Electrical installations – Surface mines and associated processing plant*.

Australian Standard AS/NZS 3000:2007 *Electrical installations*, also known as the Australian/New Zealand Wiring Rules, further explains where to install RCDs within low voltage circuits.

## EARTH LEAKAGE PROTECTION DEVICES – HIGH VOLTAGE CIRCUITS

Where a high voltage circuit supplies alternating current exceeding 1,000 V, the circuits specified above must have an earth leakage protection device.

Regulation 5.24(2) requires the earth leakage protection device to operate at an earth leakage current not exceeding 2 A for high voltage circuits. This must be achieved in the context of safe step and touch voltage limits (i.e. appropriate engineering judgement). The earth leakage protection device should operate, in a reasonable time frame, in accordance with clause 3.2.3 of AS/NZS 3007.2:2004.

## MAINTENANCE – SURFACE OPERATIONS

Regulation 5.27 requires a mining operation to have a system for maintaining all electrical equipment and installations in safe working order.

As a minimum, the maintenance system should include the testing of earth leakage protection devices every six months by means of the test facility and every 12 months by injection testing.

## MAINTENANCE – UNDERGROUND OPERATIONS, QUARRIES AND DREDGES

Regulation 5.27 requires monthly testing of earth leakage protection devices installed in underground mines, quarries, or as part of a dredge (other than a floating treatment plant).

## MAINTENANCE RECORDS

All earth leakage protection test results, or the location of the results, must be recorded in the electrical log book.

It is also strongly recommended that an adhesive label be attached to all earth leakage devices identifying the date of testing, as well as the person who carried out the testing. For large switchboards with more than one device, a combined label for the entire board can be used.

## CONSTRUCTION

To comply with regulation 4.22, construction work at mining operations must be carried out in accordance with Australian Standard AS/NZS 3012:2010 *Electrical installations – Construction and demolition sites*. This standard requires all final sub-circuits of construction wiring to be protected at the switchboard by an RCD with a maximum rated residual current of 30 mA, to provide protection for all socket outlets.



**Portable equipment** means any equipment that is intended to be normally held in the hand during use or which can be carried by a person.

**Mobile equipment** means any equipment that is too heavy to be portable equipment but is capable of being moved without discontinuing its electric power supply during its use.

**Moveable equipment** means any equipment that is too heavy to be portable equipment but that is moved about between periods of use with its electric power supply disconnected.

## WHO CAN CARRY OUT THE TESTING OF EARTH LEAKAGE PROTECTION DEVICES?

Only a licensed electrician may test earth leakage protection devices where the electricity supply exceeds 1,000 V alternating current.

For low voltage circuits where the alternating current does not exceed 1,000 V, a competent person may undertake the following RCD testing provided they use the socket outlet when conducting the operating time test.

Two types of testing must be conducted for RCDs used in mining operations:

- push button test (in-built test facility)
- operating time test (an RCD tester may be used).

For all other low voltage circuits where RCD testing requires hard wiring, an operating time test must be conducted by a licensed electrician.

When an RCD fails one or both of the above tests, the competent person is responsible for recording the outcome and immediately placing “out of service” tags against further use. The faulty RCD must be serviced or replaced by a licensed electrician.

## WHO CAN CARRY OUT THE TESTING AND TAGGING OF PORTABLE EQUIPMENT?

Regulation 5.27 requires quarterly examination, testing and tagging of portable equipment used in heavy operating environments such as workshops, mining area, processing area, construction sites and similar places.

Regulation 5.27 also requires periodic examination and testing of portable equipment at such intervals as may be necessary to ensure safety.

For low voltage portable equipment where the alternating current supply does not exceed 1,000 V, a competent person may perform testing and tagging provided they use the socket outlet. For all other low voltage portable equipment where the test requires hard wiring, a licensed electrician must conduct the equipment testing and tagging.

As long as the tags identify the date of examination and testing, as well as the person who carried out the examination and testing, mining operations may either use their own tagging system or choose to follow Appendix F of AS/NZS 3012:2010.

All test data must be recorded in the electrical log book, or an entry made describing where the test results can be found.

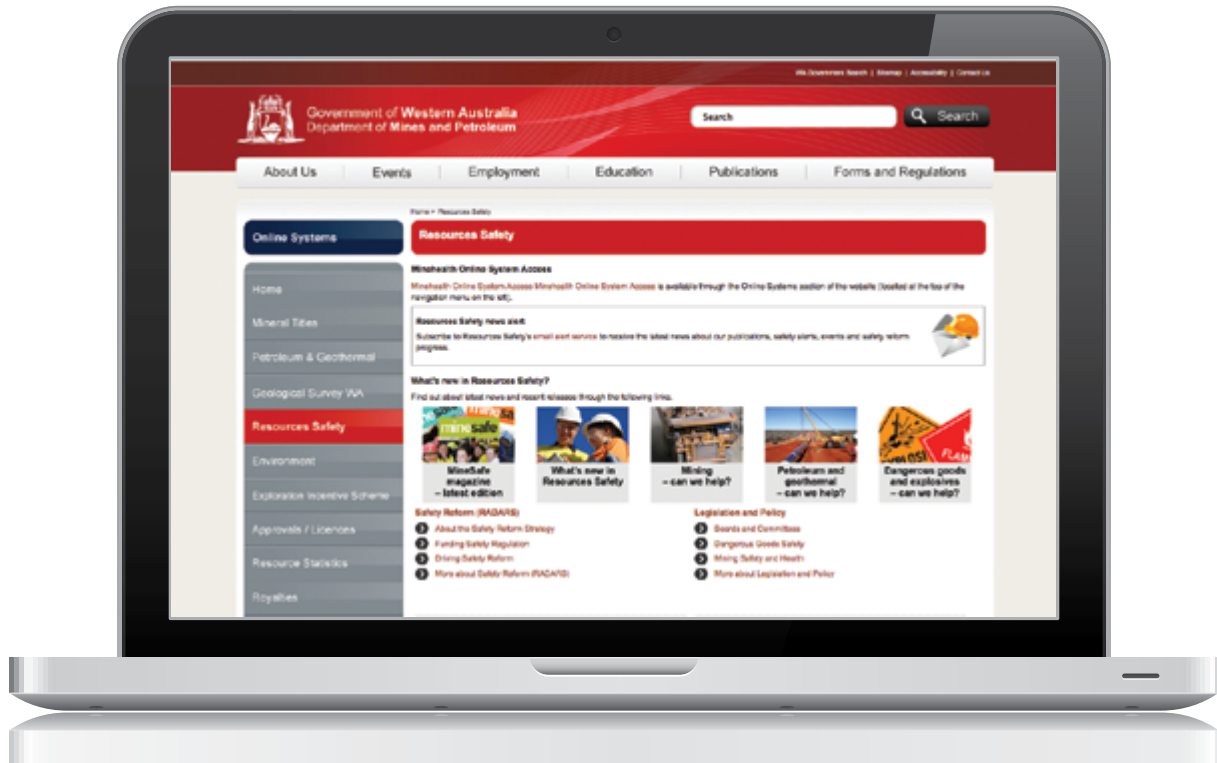
## WHAT IS MEANT BY A “COMPETENT PERSON”?

People must be competent for the tasks they are assigned. This means they must have the knowledge and skills necessary to perform the task safely. Competency is gained through training and experience while being supervised or mentored.

Assessment of competency should be evidence based and verified before work commences. Competency may be verified:

- by recognition of prior learning (RPL)
- by on-site recognition or validation of current competency (RCC or VOC)
- via the operation's training and development program.





## ONLINE ONE-STOP SHOPS NOW OPEN

To assist in locating key information online, Resources Safety has developed a series of one-stop shops or quicklinks.

The mines safety quicklinks page provides a single entry point for the following activities:

- dangerous goods and explosives on mine sites
- shotfirers
- mine surveyors
- small quarries and sand pits
- mineral exploration.

The dangerous goods safety quicklinks page provides a single entry point for the following groups:

- mine sites
- licensed companies and businesses
- licensed individuals
- unlicensed companies
- homeowners.

Assess the quicklinks pages through the “What’s new” icons at [www.dmp.wa.gov.au/Resources Safety](http://www.dmp.wa.gov.au/Resources%20Safety)

Further quicklinks are planned, and the current pages are “works in progress”. Feedback is welcome on how the content or structure might be improved, or ideas for other topics that could be tackled. Please send suggestions to [RSDComms@dmp.wa.gov.au](mailto:RSDComms@dmp.wa.gov.au)



# LIFTING THE BAR ON RAISING AWARENESS

**A**s part of the safety reform strategy being implemented at Resources Safety, it is recognised that best practice regulators proactively engage with all stakeholders.

This can be through formal consultative forums, ongoing liaison or specific workshops or seminars. However, good regulators also ensure that their engagement with industry does not create an unethical relationship and regulatory capture.

Other activities that characterise best regulatory practice include promoting safety through publications, online assistance and by means of other safety awareness campaigns. The quality and relevance of these promotional activities are essential elements in achieving better safety outcomes because all stakeholders need to be informed of current requirements, proposed changes and any shared learning from occurrences.

The new approach to safety regulation needs to balance the promotion of safety outcomes, compliance monitoring and enforcement. It needs to be evidence-based and risk-oriented, and focus on reducing the likelihood of a serious incident in all aspects of industry's activities.

For Resources Safety, a key performance indicator in terms of raising awareness about safety and health issues is the number of published technical communications and safety alerts, such as safety bulletins and significant incident reports.

Since the last issue of *MineSafe*, nine safety alerts have been released, with three safety bulletins and five significant reports issued by the State Mining Engineer, and one safety bulletin by the Director Dangerous Goods. Safety alerts are immediately available on the Resources Safety website in the publications sections and under the "What's new" icon. Subscribers to Resources Safety's email alert service receive weekly notifications about the latest releases.

The latest batch of safety alerts covers a range of issues. There have been some unusual fire incidents, one involving flammable gas underground and the other resulting in burns from hydrocarbons

in a truck's air conditioning system. In another incident, the fall-back arms on a tyre handler became projectiles when they weren't retracted as a tyre position was being changed. Elsewhere, a worker drove his 4WD into a stationary loader, possibly as the result of a micro-sleep episode. The importance of assessing whether on-road vehicles are suitable for underground use, and determining additional maintenance requirements, is reiterated in the incident report on the loss of control of a water truck in a decline.

The safety bulletin on the earthing of ANFO loaders used underground has been amended to be consistent with the earthing requirements (clause 4.2.2) of Australian Standard AS/NZS 1020:1995 *The control of undesirable static electricity*, which specifies a total resistance to earth of not more than 1 MΩ.

The mines inspectorate is also concerned that, over a three-month period, there have been two serious crush injuries from pedal-controlled skid steer equipment — under the same circumstances. People may not recognise the crushing hazard associated with this type of equipment if there are cramped conditions and a lack of guarding.

Another worrying trend is the number of incidents involving falling scaffold tubing, placing anyone below at risk of serious injury. Petroleum Safety Significant Incident Report No. 02/2011 (see *MineSafe* vol. 20, no. 1) is a reminder of the severe outcomes that can result from falling objects. A worker at a well site became a quadriplegic with limited hand movement after being struck by a falling handrail when a draw works skid was being moved.

A dangerous goods safety bulletin has been issued to highlight problems with underground mining equipment being returned to the surface for routine maintenance and repairs — but with unpackaged explosives still on board!

Resources Safety has also released a poster about confined space entry that complements the Mine Safety Matters pamphlet on working in a confined space. It can be downloaded from the publications section of the Resources Safety website or contact [RSDComms@dmp.wa.gov.au](mailto:RSDComms@dmp.wa.gov.au) to order hard copies.







**W**hen setting up a safe system of work, using inspection checklists can assist small mines (typically fewer than 25 workers) to identify workplace hazards requiring attention.

Resources Safety has prepared a small mine checklist, which is available in the online one-stop shop for small quarries and sand pits. The one-stop shop also contains a “management system for small mines” audit tool that can be used when an operation starts up to ensure the appropriate safety standards have been implemented. The audit tool can then be used at regular intervals or when changes are made to confirm that the management systems are still adequate.

Similar checklists are available from other jurisdictions. For example, the New South Wales Department of Primary Industries has developed a useful guide for small surface operations. This general workplace inspection checklist is designed to assist employers in identifying workplace hazards. It is available as safety tool IGA010 in the resources section at [www.dpi.nsw.gov.au/minerals/safety](http://www.dpi.nsw.gov.au/minerals/safety)

Such checklists are intended to provide:

- a basic, consistent and documented systematic approach to identifying and controlling hazards
- a tool that can lead to improved safety standards and outcomes within individual workplaces.

While primarily designed for small operations, these documents may also be used by larger companies as a basis for developing a more detailed checklist for each workplace.

An operator intending to use either or both of these checklists should keep in mind that they are provided for general information only and need to be modified to meet the specific needs of each workplace.

Companies intending to adopt or incorporate the New South Wales checklist should note the limitations contained within the disclaimer, and consider what needs to be included to make it relevant for Western Australian legislation, codes and guidance material. Despite this proviso, it is still useful to seek out other resources as both a cross-check and to identify any gaps.



## MINERS' PROMISE

*Keeping the commitment*

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### CITY COMPETITION KEEPS PROMISES

**M**ajor sponsor PWR fulfilled a long-term vision when 12 teams and 96 emergency response personnel from Western Australian resource projects came to Perth to compete in the inaugural MERC: Mining Emergency Response Competition, which was held over the weekend of 3-4 December 2011.

The competitors were joined by more than 80 volunteers, including five from Resources Safety, who filled a variety of roles such as adjudication and acting as casualties.

MERC has its own brand and volunteer governing committee, comprising industry-based representatives with many years of experience in running successful mining emergency response competitions. The aims are to:

- provide a safe, practical and realistic training experience, encouraging competitors to build skills that are vital to effectively manage emergency situations
- encourage individuals to continually raise the bar in their pursuit of knowledge and experience
- showcase industry's commitment to the health and safety of its workers
- support charitable organisations that focus on the mining industry.

The unique and beautiful metropolitan location at Burswood Park provided a rare opportunity for families and friends to watch team members demonstrate their emergency response skills. The Bureau of Meteorology had promised a hot weekend, and the weather delivered. Fortunately, there were plenty of large shady trees and hydration stations to provide relief for spectators and participants alike.

All proceeds raised from the competition in 2011 were promised to Miners' Promise, an organisation providing assistance to families and individuals who are confronted with the death or permanent disability of a family member employed in the resources sector. Helen Fitzroy, the founder of Miners' Promise, was the guest speaker at the St Barbara Ltd Awards Ceremony. Thanks to the support of competing teams, sponsors and volunteers, MERC 2011 donated over \$45,000 to Miners' Promise.

For MERC 2012, the timing has been changed to earlier in the year, covering the weekend of 6-7 October 2012, which is in the school holidays — and promises cooler weather! Miners' Promise will again be a beneficiary of fund-raising efforts.

Please contact [enquiry@themer.com.au](mailto:enquiry@themer.com.au) to register your interest or visit [www.themer.com.au](http://www.themer.com.au) for further information as it becomes available.



## COMPETING TEAMS

- Barrick [Barrick Australia Pacific]
- BHP Nickel West [BHP Billiton]
- Birla Nifty Copper Operations [Aditya Birla Minerals]
- Carosue Dam Emergency Response Team [Saracen Gold Mines]
- FMG Permanent Emergency Services (PEST) [Fortescue Metals Group]
- FMG Volunteer Emergency Services (VEST) [Fortescue Metals Group]
- Hope Downs [Rio Tinto]
- Minara Veterans [Minara Resources]
- Murrin Murrin Operations [Minara Resources]
- St Barbara [St Barbara]
- Sunrise Dam Gold Mine [Anglogold Ashanti Australia]
- West Angelas [Rio Tinto]

## HONOUR BOARD

- |  |   |
|--|---|
| <b>Overall first place</b>   | Sunrise Dam Gold Mine                   |
| <b>Overall second place</b>  | BHP Nickel West                         |
| <b>Overall third place</b>   | West Angelas                            |
| <b>Confined space rescue &amp; breathing apparatus (BA) skills</b> | Sunrise Dam Gold Mine                   |
| <b>Emergency response readiness scenario</b>                       | BHP Nickel West                         |
| <b>Fire fighting &amp; BA skills</b>                               | West Angelas                            |
| <b>First aid scenario</b>  | BHP Nickel West                         |
| <b>Hazardous chemicals &amp; BA skills</b>                         | Carosue Dam Emergency Response Team     |
| <b>Rope rescue</b>   | West Angelas                            |
| <b>Team safety</b>   | West Angelas                            |
| <b>Vehicle extrication</b>   | Sunrise Dam Gold Mine                   |
| <b>Best captain</b>  | Michael Nugus,<br>Sunrise Dam Gold Mine |
| <b>Overall BA skills</b>   | BHP Nickel West                         |
| <b>Overall first aid</b>   | Sunrise Dam Gold Mine                   |
| <b>Outstanding volunteer</b>                                       | Angela Whitehead, KCGM                  |

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CONFINED SPACE RESCUE AND  
BA SKILLS



BHP Nickel West



Minara Veterans

FIRE FIGHTING AND BA SKILLS



St Barbara



West Angelas

HAZCHEM AND BA SKILLS



Carosue Dam



Murrin Murrin

EMERGENCY RESPONSE  
READINESS SCENARIO



FMG VEST



BHP Nickel West

FIRST AID



Birda Nifty



FMG PEST

ROPE RESCUE



Barrick



West Angelas

All photos SH



# 2011 MINE EMERGENCY RESPONSE COMPETITION

## VEHICLE EXTRICATION



## INDIVIDUAL AWARDS



## BEHIND THE SCENES – VOLUNTEERS AND SPONSORS



All photos SH



**JOB**

SUCCESS

Job interview

TRAINING

EXPERIENC

Careers

RICULUM VIT

## DOES TRAINING PAY A SAFETY DIVIDEND?

**A**ustralian social trends statistics for 2009-10, published in June 2011 by the Australian Bureau of Statistics, show the rate of occupational health and safety (OHS) training within the Australian mining industry is relatively high at 92 per cent.

.....

The proportion of people in the non-mining primary industries (agriculture, forestry and fishing) who had received formal OHS training was low (52%), despite a relatively high injury rate.

In 2009-10, about 80 per cent of workplace fatalities occurred in the goods-producing industries, including construction (28 deaths), non-mining primary industries (26), manufacturing (15), transport and storage (14) and mining (6). A comparison of the OHS training figures and number of workplace fatalities shows an interesting relationship. The highest fatality rate, at 6.9 fatalities per 100,000 workers, was in the non-mining primary industries, which have a low training rate. This fatality rate was almost double that for the mining industry, which was 3.5 per 100,000 workers.

Being able to identify, process and understand what is going on around you is important to staying healthy and safe — and information, instruction, training and supervision all play important roles.

## ADDRESSING GEOTECHNICAL UNCERTAINTY – FROM FIGHTING FIRES TO FORECASTING

*Dr Stephan Arndt (FAusIMM) is Principal, Numerical Modelling, at Coffey Mining. He believes that it is time for industry to seriously consider the place of numerical modelling in mine planning and risk reduction. What do you think of Stephan's discourse on this issue? Send contributions to this discussion to the MineSafe Editor at [RSDComms@dmp.wa.gov.au](mailto:RSDComms@dmp.wa.gov.au)*

The way we do things in the mining industry will inevitably have to change – that is my expectation looking at the “established” ways in geomechanics, geotechnical design and data collection. Why?

Firstly, most advances over the last decade have been merely incremental, while elsewhere there were step changes in the use of computer power and 3D analysis capabilities. Although the mining industry had some large budget research collaborations as well as small innovative companies entering the services market, there was no real paradigm shift as seen in other industries. I assume that the larger this technology gap gets, the more obvious the potential will become. A 2011 keynote lecture from a senior engineering manager at General Motors described how the company's goal for a simulation aided engineering “First Time Capable” prototype, which was stated 15 years ago, is now reality. When do we expect to have the virtual mine in our computers — not just 3D geometry but a virtual prototype including all disciplines, including financial life-of-mine scenarios validated with geomechanics?

Secondly, there are discussions regarding the current skills shortage. There doesn't seem to be a fix available in the short term. Will the worldwide growth that the industry is aiming for – just looking at the number of new exploration projects – be sustainable with the internationally available workforce? New technology already fills the gap between engineering supply and demand in some disciplines.

Thirdly, it is time to see data as an investment, not a cost. The same economy that determines a reserve with drill holes to satisfy the bank or shareholders should be applied to geotechnical logging, stress measurements and material testing to satisfy our demand for a successful operation. It might eventually free up those geotechnical engineers caught up in “firefighting” everyday. With more CPU power in a Smartphone than in the average desktop computer ten years ago, computers are no longer the bottleneck and geotechnical data becomes the key enabler.

Michael E. Porter, author of several books on strategy and competition, states that technological change often happens in a disruptive way. I experienced this in my own company, which upset a market balance and, in some cases, strongly divided opinions on which tools to use. This came about when a finite element analysis (FEA) software program was introduced to the mining industry — software already widely used in aerospace, automotive and other industries for three decades. At the same time that large open pit projects had 2D

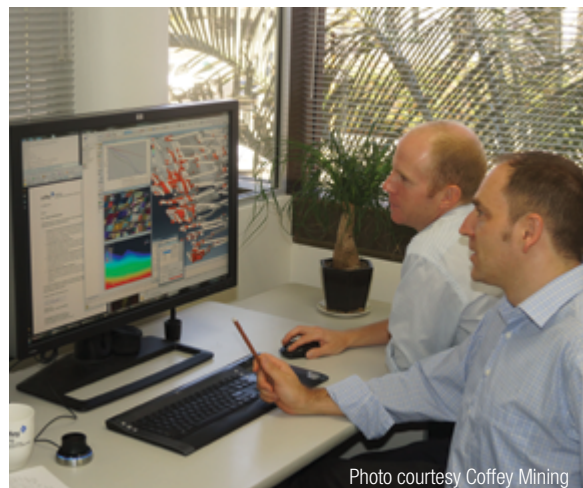


Photo courtesy Coffey Mining

Dr Stephan Arndt (right) and Steve Weller, Coffey Mining, reviewing model forecasts from a 3D mine-scale simulation

sections analysed with FEA or limit equilibrium, solving detailed 3D open pit models with millions of variables and parallel computing and more realistic behaviour was now possible. How can this potential technological change play out in the mining industry?

Change needs a driver. In the aerospace industry, the primary driver is weight. The Airbus A380 would never have gotten off the ground without state-of-the-art work flows, highly integrated analysis tools, computer performance and new materials. The automotive industry was driven by fierce market competition to embrace simulation aided engineering. The oil and gas sector is gearing up to meet new challenges. There will be no evolutionary pressure in the mining industry to advance its methods if rising commodity prices make it profitable to start digging before you have an optimal plan. However, safety and risk reduction can be this driver. I believe Australian mining has some of the highest safety standards in the world and is in a position to leverage that leading role. Can we afford to wait for accidents and losses to result in (more) rules and regulation, or should we identify the benefits and gain on both the economic and safety balances?

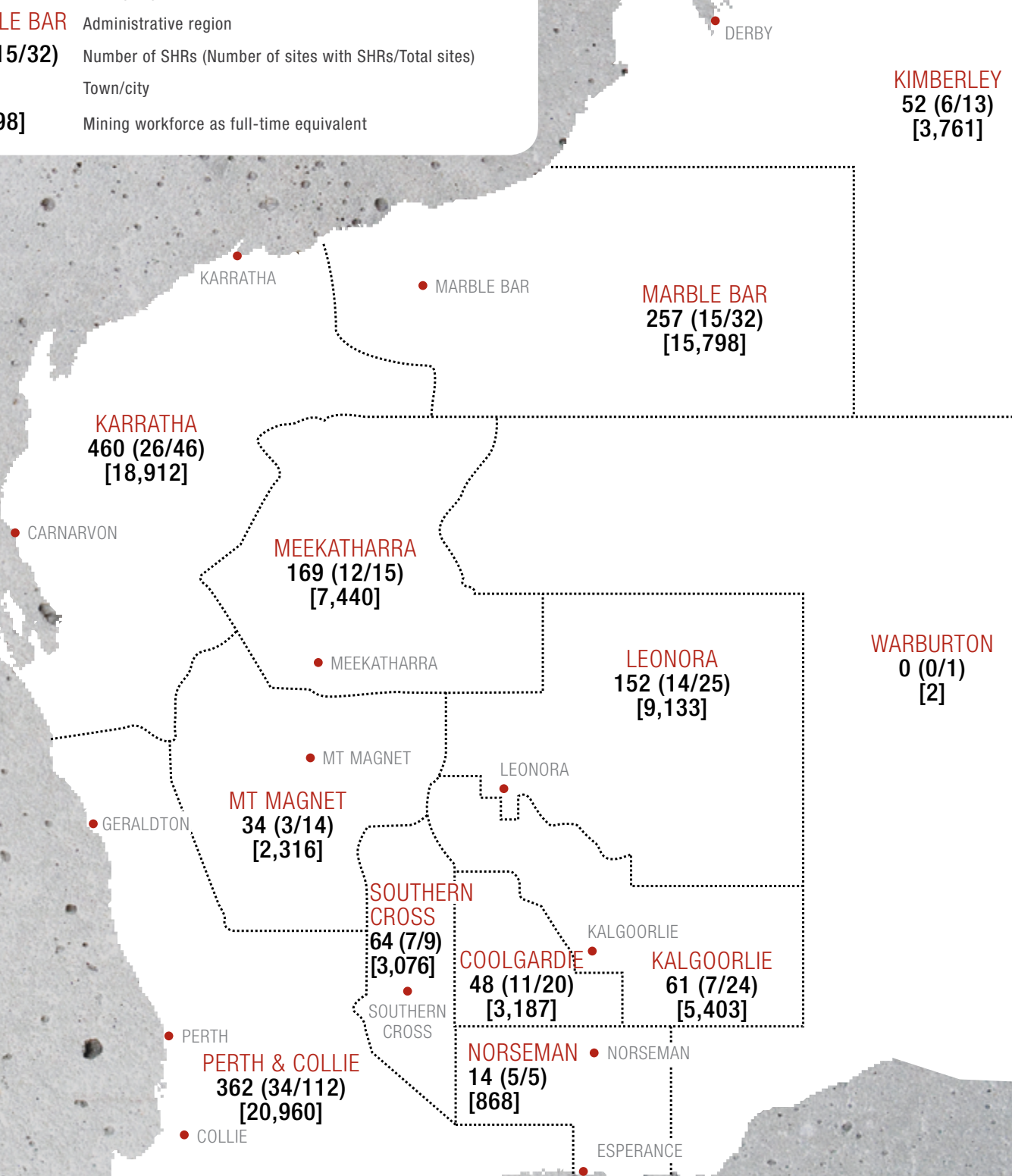
The idea of geomechanics simulations and computer power forecasting scenarios in a virtual life-of-mine experiment is often criticised because the geotechnical environment has materials with high uncertainty of properties, such as strength. However, computers can provide the tools to quantify uncertainty, leading either to an understanding of the possible range of answers or the need for more data. Another problem is that knowledge can be seen as a liability. No geotechnical manager will be challenged for doing what he is tasked to do. If individuals push the envelope and bring in innovative ideas, they will have to take on the consequences themselves. As more risks are identified, more need to be addressed. One example is using modelling tools to forecast seismic event probability. Seismic events and rock bursts can have severe consequences, making it hard to justify not using possible forecasting tools.

What expectations do we have for mine planning and geotechnical design processes in the future and within an environment of increasing computer power and emerging methods – including what is already available? Asking and answering these questions might give us an opportunity to stay ahead of a disruptive change.



## DISTRIBUTION OF SAFETY AND HEALTH REPRESENTATIVES AS AT 30 NOVEMBER 2011

- ..... Mining registrars administrative boundary
- MARBLE BAR** Administrative region
- 257 (15/32)** Number of SHR's (Number of sites with SHR's/Total sites)
- Town/city
- [15,798]** Mining workforce as full-time equivalent



Total active (incl. C&M) mine sites = 317  
 Mine sites with SHRs = 141  
 Total SHRs = 1,920  
 SHRs attached to mine sites = 1,683  
 Others (e.g. exploration) = 247\*  
 \* includes 4 SHRs on Christmas Island

MONTHLY EXPLORATION WORKFORCE

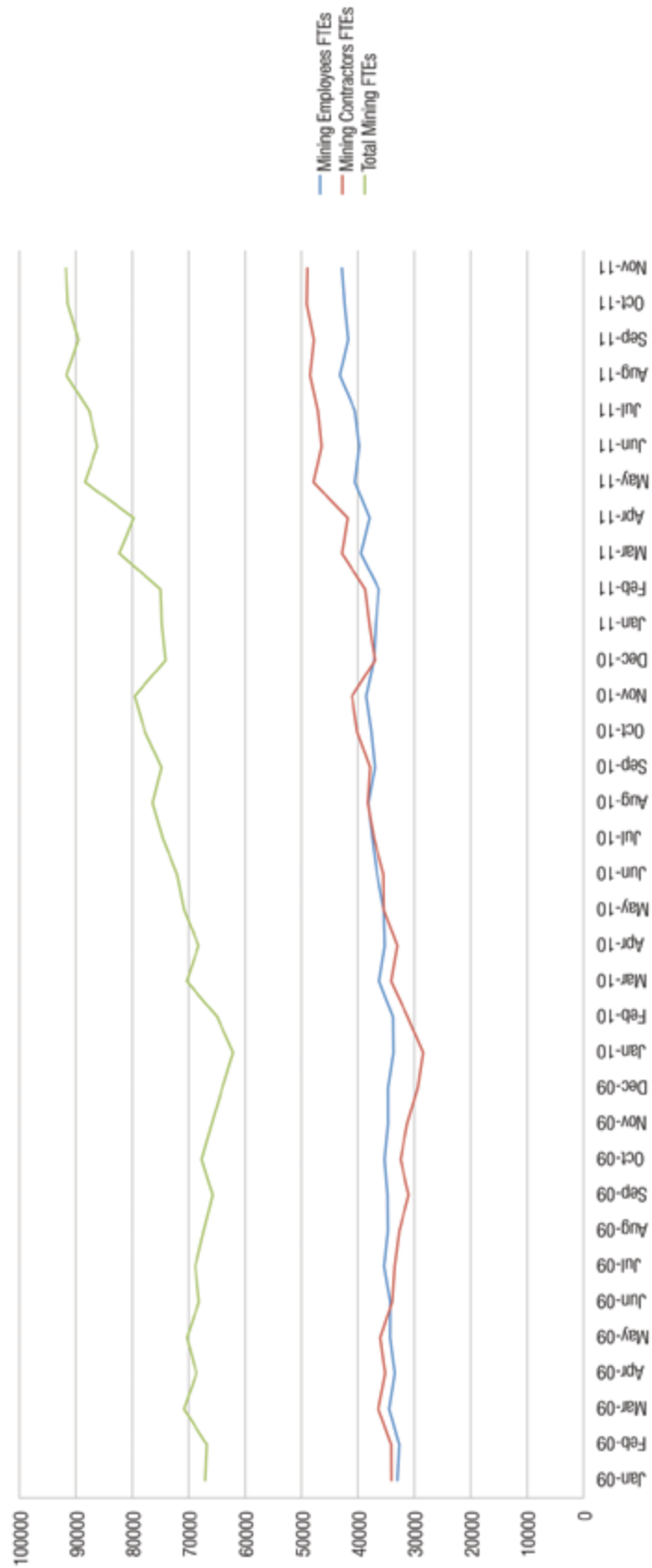
NOTE: From 1 July 2009, monthly mining workforce figures are plotted as full-time equivalent (FTE), where 1 FTE = 2,000 hours worked per year





# MONTHLY MINING WORKFORCE

NOTE: From 1 July 2009, monthly mining workforce figures are plotted as full-time equivalent (FTE), where 1 FTE = 2,000 hours worked per year





## MINES SAFETY SIGNIFICANT INCIDENT REPORT NO. 174

### MECHANICAL SCALING IGNITES FLAMMABLE GAS UNDERGROUND

ISSUED: 14 FEBRUARY 2012

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#### Summary of incident

An open-cabin jumbo drill was mechanically scaling a development heading at an underground gold mine. Sparks from the scaling process ignited a flammable gas mixture that had accumulated in the backs of the drive. Flames reportedly lasted for seven seconds and extended towards the cabin. There were no injuries or equipment damage.

#### Probable causes

##### Direct

- The rockmass contained pockets of flammable gases, mainly methane and hydrogen, which were released into the drive when development intersected a gas pocket. These gases are light and collected in the backs of the drive.
- It appears that, during scaling activities, friction between the drill bit and rock material created a spark, which ignited the flammable gas mixture.

##### Contributory

- The ventilation at the face was inadequate. Air flow would have been very low, and so the gas released from the rockmass could not be diluted or flushed.
- Ventilation and monitoring procedures were not followed.

- A gas monitor in the jumbo cabin failed to detect the gas in the backs of the drive. Fresh air from ventilation ducting may have reduced the effectiveness of the gas detector.
- The risk management plan was inadequate for all potential exposures to strata gas (e.g. diamond drilling, production drilling, and development activities).

#### Action required

When designing work plans, companies should assess the potential for intersecting gas-bearing strata (e.g. using geological and hydrological data), determine the risks and, where necessary, develop a strata-gas management plan. This should include procedures for monitoring and managing hazardous gases.

All workers who may be exposed to strata-gas hazards should receive adequate information, instruction and training regarding those hazards.

#### Further information

Visit the publication section of the Resources Safety website at [www.dmp.wa.gov.au/ResourcesSafety](http://www.dmp.wa.gov.au/ResourcesSafety) for the following safety alerts.

- Mines Safety Bulletin No. 27 *Diamond drillers intersecting hazardous gases*
- Mines Safety Bulletin No. 74 *Explosive gases associated with mining*
- Mines Safety Significant Incident Report No. 85 *Explosion of flammable gas in underground stope void*
- Mines Safety Significant Incident Report No. 102 *Fatal methane gas explosion - South Africa*

# MINES SAFETY SIGNIFICANT INCIDENT REPORT NO. 175

## TYRE HANDLER'S FALL-BACK ARMS BECOME PROJECTILES

ISSUED: 30 MARCH 2012

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### Summary of hazard

While using a tyre handler, a worker attempted to rotate a wide profile tyre from the vertical to horizontal position, without retracting the fall-back arms. This resulted in the 5 kg fall-back arms breaking off and being projected 40 and 15 metres, respectively, into the tyre bay work area.

There were no injuries but the projectiles had the potential to cause serious injury or death to personnel in the area.

### Probable causes

#### Direct

- The fall-back arms were not placed in the retracted position before the tyre was rotated.

#### Contributory

- Employee induction and training processes did not effectively evaluate the trainees' understanding of the hazards of the tyre changing process and the associated risks.

### Action required

All reasonably foreseeable hazards and risks must be identified and addressed when introducing tyre handling devices to a mine, because they are potentially very hazardous machines. They must only be operated by competent personnel using adequate information, such as operating manuals from the original equipment manufacturer.

If a tyre handling device is modified, the hazards and associated risks must be reassessed and addressed. Retraining and reassessment of operator competency may be required.

### Further information

Visit the publication section of the Resources Safety website at [www.dmp.wa.gov.au/ResourcesSafety](http://www.dmp.wa.gov.au/ResourcesSafety) for the following safety alert.

- Mines Safety Bulletin No. 89 *Earth-moving equipment tyres and use of tyre handling machinery*

## MINES SAFETY SIGNIFICANT INCIDENT REPORT NO. 176

### LIGHT VEHICLE COLLIDES WITH STATIONARY LOADER

ISSUED: 30 MARCH 2012

#### Summary of incident

A worker was returning to a mine site in the mid-afternoon, after completing work off site. He was driving a light vehicle along a straight well-formed gravel road, having just made a 90° left turn. His next recollection was waking up while crashing into a stationary loader. The loader had broken down several weeks earlier and could not be moved off the road. Its location was delineated with orange traffic cones.



Incident scene (flagging tape added after the incident)

#### Probable causes

##### Direct

- From the incident description, it is possible that the worker experienced a micro-sleep.

*Note: A micro-sleep, described by ICAO (2011:A-3), is: "A short period of time (seconds) when the brain disengages from the environment (it stops processing visual information and sounds) and slips uncontrollably into light non-REM sleep. Micro-sleeps are a sign of extreme physiological sleepiness."*

#### Action required

There are many causal factors that may increase the likelihood of experiencing micro-sleep episodes. Employers and employees need to be aware of such causal factors.

#### Further information

The International Civil Aviation Organisation has a website dedicated to fatigue management at [www2.icao.int/en/FatigueManagement](http://www2.icao.int/en/FatigueManagement) with documents and toolkits that may be useful.

Visit the publications section of the Resources Safety website at [www.dmp.wa.gov.au/ResourcesSafety](http://www.dmp.wa.gov.au/ResourcesSafety) for a code of practice and guideline on working hours that may provide useful guidance.



# MINES SAFETY SIGNIFICANT INCIDENT REPORT NO. 177

## BURNS FROM HYDROCARBON GAS FIRE IN TRUCK AIR CONDITIONING SYSTEM

ISSUED: 18 APRIL 2012

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### Summary of incident

While starting a haul truck, the operator reported hearing a loud bang when the air conditioning system vents blew out, followed by a flash and flame. He received minor burns to his chest and arms. Nylon components of his clothing, including the fly net on his hat, melted. He was treated on-site.

The original R134a gas was removed from the air conditioning system and had been replaced with M30 hydrocarbon gas.

### Probable causes

#### Direct

- The original equipment manufacturer (OEM) had installed the approved R134a gas in the air conditioning system. The R134a gas had been removed and replaced with M30 gas, which is a hydrocarbon with an increased fire risk because of the lower explosive limit (LEL) and, therefore, is not approved by the manufacturer.

### Contributory

- Lack of awareness of the increased risk of fire when hydrocarbon gases are substituted in air conditioning systems.
- The air conditioning gas supply connections were not secure, allowing gas to leak from the system into the housing.
- The air conditioning fan, which is not intrinsically safe, is likely to have provided an ignition source when the vehicle was turned on.

### Action required

Given manufacturers have not approved the use of these refrigerants, mine management should perform a full risk assessment of such practices to ensure fire risks are addressed, and the integrity of air conditioning systems is maintained, incorporating adequate ventilation and appropriate leak detectors.

### Further information

Hasse, V., 2010, Guidelines for the Safe Use of Hydrocarbon Refrigerants, Deutsche Gesellschaft für Technische Zusammenarbeit (German Technical Cooperation), Eschborn, Germany, 320 pp.

Available at [www.ubf-aca.be/pdf-en/Proklima%20guidelines%202010.pdf](http://www.ubf-aca.be/pdf-en/Proklima%20guidelines%202010.pdf)

## MINES SAFETY SIGNIFICANT INCIDENT REPORT NO. **178**

### WATER CART LOSS OF CONTROL AT PORTAL – INADVERTENT ACCESS TO UNDERGROUND

ISSUED: 18 APRIL 2012

#### **Summary of incident**

An on-highway water truck was being used to water down the decline portal at an underground mine. The truck brakes were applied before reversing down to the portal and appeared to operate satisfactorily. However, the primary braking system failed when nearing the portal. An attempt to apply the secondary braking system (i.e. handbrake) also failed, allowing the water truck to roll over a hundred metres backwards into the decline, narrowly avoiding a light vehicle travelling towards the portal.

There were no injuries but the incident had the potential to cause serious injury to personnel in the area.

#### **Probable causes**

##### **Direct**

- The primary and secondary braking systems failed.

##### **Contributory**

- The scheduling of brake maintenance and component replacement was not adequate for vehicles operating in an underground mine.
- Formal procedures and training did not cover the use of a water truck in the box cut of the mine.
- There was no risk assessment or change management covering maintenance demands, absent maintenance personnel or training of maintenance personnel.
- There was no audit process to confirm the thoroughness or effectiveness of the pre-start process.



### Action required

Before using an on-highway truck in an underground environment, the mine operator must ensure that competent people assess the vehicle to determine its suitability for the load and other local operating factors. Compliance with the Australian Design Rules and Australian Standards may not be sufficient to confirm its suitability, because the standard operating conditions used to determine compliance may differ from those experienced during underground use.

To avoid a recurrence of this type of incident, the following preventative actions should be considered.

- Develop and implement schedules for the maintenance of vehicles and the component replacement on vehicles, based on the risk assessment undertaken to determine suitability.
- Persons performing work on vehicles must be suitably experienced, trained and competent to perform the task.
- Persons driving vehicles must be suitably experienced, trained and competent to perform the task.
- Responsible persons should conduct an on-site audit of the pre-start process for vehicles and assess the adequacy of procedures.

### Further information

Visit the publication section of the Resources Safety website at [www.dmp.wa.gov.au/ResourcesSafety](http://www.dmp.wa.gov.au/ResourcesSafety) for the following safety alerts.

- Mines Safety Bulletin No. 073 *Loss of control on highway-type vehicles*
- Mines Safety Bulletin No. 072 *Loss of control LME on gradients*
- Mines Safety Bulletin No. 052 *Operation of water trucks in open pit mines (quarries)*
- Significant Incident Report No. 139 *Loss of control of service vehicles*
- Significant Incident Report No. 84 *Loss of control of water cart – fatal accident*

## MINES SAFETY BULLETIN NO. 97

### EARTHING OF ANFO LOADERS USED UNDERGROUND (RE-ISSUED)

ISSUED: 6 FEBRUARY 2012

#### Introduction

This safety bulletin replaces Mines Safety Bulletin No. 83, dated 23 March 2009. The bulletin has been amended to be consistent with the earthing requirements (clause 4.2.2) of Australian Standard AS/NZS 1020:1995 *The control of undesirable static electricity*, which specifies a total resistance to earth of not more than 1 MΩ.

The pneumatic loading of ammonium nitrate based explosive generates electrostatic charge at a significant rate. Without effective controls, charge accumulation on the delivery hose can rapidly exceed energy levels capable of initiating explosive devices.

Requisite practice for safeguarding against this hazard is to prevent charge from accumulating by providing an efficient discharge path to ground through the use of semiconductive hosing and effective earthing of the loader.

#### Requirements

Mines Safety and Inspection Regulation (MSIR) 8.41 prescribes the essential requirements to safeguard against this hazard:

- (3) A person must not use a pneumatic loader to load bulk AN-based explosive unless the loader, charging hose and earthing arrangements are safe and efficient and in accordance with the manufacturer's and supplier's recommendations.

- (4) A person using a pneumatic loader to load bulk AN-based explosive must ensure that the explosive is loaded through a semi-conductive hose or tube having a resistance of not less than 15 thousand ohms per metre and not more than 2 MΩ for its total length.
- (5) A person charging bulk AN-based explosive must ensure that he or she removes any gloves and is effectively earthed to drain off any static electrical charge before handling and connecting any electric detonators.
- (6) A person must not use water lines, compressed air lines, wire covered hoses, rail or permanent electrical earthing systems as a means of earthing.
- (7) A person must use protected type detonators when pneumatic loading and electric firing.

These requirements are consistent with recommendations detailed in Australian Standard AS 2187.2:2006 *Explosives – Storage and use – Use of explosives*.

#### Comments

Although non-electric initiating techniques are less susceptible to static than equivalent electrical systems, they are not to be regarded as immune and the requirements should be applied equally to all blasting systems.

#### Hoses

Semiconductive loading hose is necessary to:

- provide an adequate discharge path to ground for static charge generated during operation of the loader
- present a sufficiently high resistance to extraneous ground currents that may be present and transmitted to the blast hole via the hose.

Fully conductive hose is hazardous. To safeguard against unsatisfactory replacement, semi-conductive hose should be readily identifiable. One brand of hose referred to as "LO-STAT" is black with a prominent yellow stripe along its length.

Hose conductivity is known to vary with age and usage. Periodic replacement or testing is necessary to ensure safe values are maintained.

### **Earthing**

The discharge path to ground is not complete unless the loader is effectively earthed.

Earthing may be effected by connecting a flexible electrical cable between metal parts that are in electrical contact with the loader hose and an electrode in fixed contact with the ground. The cable, electrode and connections must be reliable, appropriate for the environment and afford the required resistance. The total resistance between the loader hose and ground should not exceed 1 M $\Omega$ .

Certain materials, including galvanised steels, zinc, copper and alloys of these materials can form impact sensitive explosive compounds in the presence of ammonium nitrate. They should not be used in locations where contact with ANFO cannot be avoided.

### **Electrodes**

Earthing provided by physical contact of the loader with ground, contact of the hose within the borehole, and any chains or similar arrangements trailing on the ground below vehicles are regarded as supplementary earthing and not sufficiently reliable.

ANFO loaders permanently installed on mobile plant or operated from an elevating work platform may use extended out-rigger stabiliser legs as grounding electrodes, provided adequate conductivity levels have been confirmed by initial and periodic testing.

Rock bolts may also be used as grounding electrodes, provided an effective connection can be made and periodic sample testing in that area of the mine has shown that the ground conductivity levels afforded do not exceed 1 M $\Omega$ .

The use of water lines, compressed air lines, wire covered hoses, rail or permanent electrical earthing systems as a means of earthing is prohibited.

### **Recommendations**

A prominent notice should be displayed on or near ANFO loading apparatus requiring the "equipment to be effectively earthed prior to use in accordance with MSIR 8.41".

However remote the possibility, accidents caused by premature ignition of explosives are potentially lethal. Accordingly, these requirements should be widely communicated to all persons involved with the operation and maintenance of ANFO loaders.



## MINES SAFETY BULLETIN NO. 98

### SERIOUS CRUSH INJURIES FROM PEDAL-CONTROLLED SKID STEER EQUIPMENT

ISSUED: 23 MARCH 2012

#### Summary of hazard

Recently, there have been two serious incidents involving pedal-controlled skid steer equipment where the operator's leg was crushed in a pinch point, resulting in serious fractures. The incidents occurred in a three-month period and the circumstances were the same. This safety bulletin is prompted by concern that many employers, supervisors, operators and contractors may not be sufficiently aware that cramped conditions and lack of guarding lead to a crushing hazard associated with this type of equipment.

In both incidents, the operator had stretched his right leg over the entrance step in front to relieve cramping. The resulting shift in weight had transferred pressure to the left foot, activating the boom control pedal and causing the boom to descend. The operator's right leg had been crushed between the entrance step and a cross member on the boom.

In both incidents, the operator was experienced in this style of equipment. The operator was wearing a seat belt, the safety lock-out bar was lowered and the boom was partially raised. The operator's cabin had meshed sides but no door at the front. Signage inside the skid steer unit indicated the pinch point. The equipment was new and all safety devices were found to be functioning correctly when tested following the incident.

#### Contributory factors

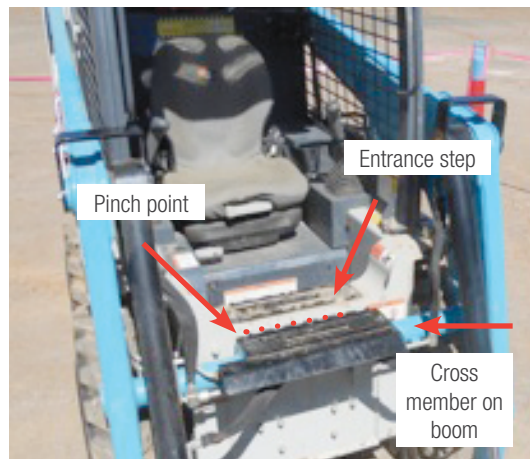
- The confined cabin space can restrict operator movement, leading to leg cramps.

- There is no physical barrier to prevent the extension of a limb into the area of the pinch point.
- Foot pedal controls can be inadvertently activated by a shift in the operator's weight.

#### Recommendations

Under regulation 4.4(3) of the Mines Safety and Inspection Regulations 1995, employers are required to "ensure that any moving machinery that creates a risk of injury to an employee through inadvertent contact is screened or guarded to prevent such contact." For skid steer equipment with confined cabin space and a pinch point hazard, this may be achieved by:

- installing a cabin door (e.g. meshed or fully enclosed tempered glass with a stone guard) that is interlocked to the operation of the machine
- ensuring doors, if provided by the supplier, are not removed when the unit is placed into service
- supervisors encouraging operators to take regular breaks and stretch.



Example of skid steer involved in both incidents showing line of pinch point between entrance step and cross member on boom

# MINES SAFETY BULLETIN NO. 99

## SCAFFOLD TUBING – FALLING OBJECTS HAZARD

ISSUED: 30 MARCH 2012

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### Summary of hazard

Incidents have occurred recently at mines where scaffold tubing has fallen from one level within a fixed plant to the ground, placing personnel below at risk of serious injury.

In one instance, a bundle of scaffold tubes was being carried down a flight of stairs when a tube slid free from the grip of the scaffolder. It bounced through the railings, falling about 25 metres and landing about 4 metres from personnel passing by outside of the exclusion zone.

In another instance, a scaffold tube passed through the apertures in the walkway grid mesh, landing within the exclusion zone delineated by another work group.

### Contributory factors

- Carrying a number of scaffolding tubes without first securing them in a bundle.
- Failure to use a scaffold stillage to transport scaffold tube between levels.
- Size of exclusion zone was inadequate for falling scaffold tubes bouncing out of the drop zone.
- Failure to adequately cover the grid mesh walkway to prevent scaffold tube from passing through the mesh apertures.

### Recommendations

- Scaffold tubing should be tied together so that each tube is properly secured, with no more than three tubes carried at a time.
- Use engineer-certified scaffold stillages to transport scaffold tubing from one level to another. The stillage should not be overloaded and all tubing should be adequately secured within the stillage. Stillages should not be used if damaged or distorted.
- The exclusion zone for work above should be sufficiently large to account for scaffold tubing bouncing out of the drop zone.
- Where the grid mesh apertures are large enough to allow scaffold tube or other tools or items to pass through, all walkways in the work area should be covered with planking or plywood sufficiently thick to ensure falling tools and items cannot pass through.
- Where falling objects are identified as a task hazard, consider the use of controls such as catch nets, lanyards, tool straps, or tool buckets. Signage warning of the hazard should be applied at the appropriate traffic areas before commencing the task.
- When developing safe systems of work for scaffolding operations, mine sites should apply the same rigour and standards as used for other workplace activities.

## DANGEROUS GOODS SAFETY BULLETIN NO. 112

### INADEQUATE SECURITY INVOLVING EXPLOSIVES IN UNDERGROUND MINING EQUIPMENT

ISSUED: 19 APRIL 2012

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#### **Background**

There have been two incidents within the past month where explosive items were left unaccounted for in underground elevated work platforms and charge baskets at mine sites. The explosives were only discovered some time later, after the equipment returned to the surface. In one case, welding work was carried out on the machinery in very close proximity to the explosives (boosters and a detonator) before they were discovered.

#### **Hazard**

Insufficient inventory control of explosives can lead to the loss of explosives. When certifying equipment as free from explosives at the end of an explosive task, a lack of care and attention could lead to death or serious injury.

#### **Requirements**

Explosives should be regarded as attractive and accountable items, and it is a legislative requirement for explosives to be controlled and managed by a responsible person at all times. A complete audit trail relating to the supply, issue and use of explosives is required. Where explosives are unaccounted for, their loss must be investigated and measures taken to ensure that the loss does not occur again.

#### **Recommendations**

To reduce the likelihood of an explosives security breach or explosives being left unaccounted for in or on machinery, users should:

- ensure that a minimum of two persons certify machinery and equipment as free from explosives
- ensure that adequate resources, including sufficient lighting, are available to conduct a thorough inspection of equipment
- conduct stock reconciliation actions against blast plans, both pre- and post-blast
- conduct appropriate magazine stock reconciliation against explosive use in accordance with the explosives regulations
- provide refresher training for persons involved in the consigning, issuing and receiving, use and disposal of explosives.



## 2012 IMPORTANT DATES

Details will be provided at [www.dmp.wa.gov.au/events](http://www.dmp.wa.gov.au/events) as they become available.



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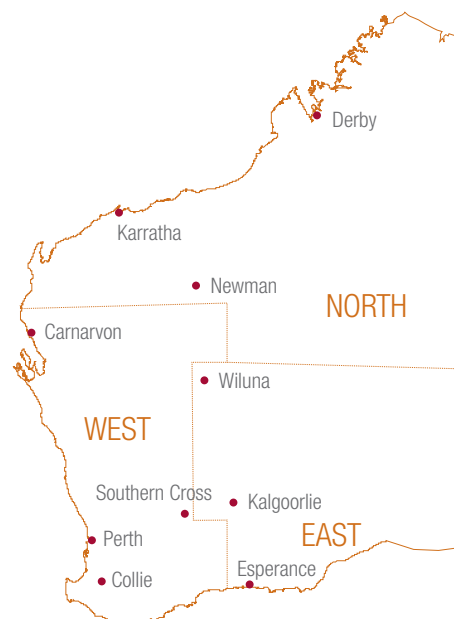
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