

**NSW  
Resources  
Regulator**

TARGETED ASSESSMENT PROGRAM

# **Fatigue management practices – NSW coal mines**

February 2019



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## Executive summary

This report summarises the findings and recommendations of targeted assessments undertaken in relation to the management of risks associated with fatigue. These assessments, undertaken throughout 2017 and 2018, were completed at 15 open cut coal mines in NSW.

These targeted assessments took an in-depth look at the identification and implementation of control measures for the risk of fatigue. The targeted assessments were undertaken by a multi-disciplined team of NSW Resources Regulator inspectors and included both desktop and on-site evaluation.

The findings of the assessments are grouped into two areas - those that are specific to the principal hazard of fatigue and those that could be generally applied to all aspects of risk management.

General findings highlight issues with the risk assessment process for fatigue, such as:

- workers at some mines not being provided with adequate information and training, with respect to fatigue effects and management, prior to participating in a risk assessment
- risk assessments not including a person who is a content matter expert having regard to the nature of the hazard
- supervisors not being trained on the implementation of fatigue management controls.

The specific findings identified that:

- supervisors were consistently working hours in excess of the limits defined in the fatigue management plan
- control measures had been identified but not implemented consistently across all areas of the mine site for all workers
- crib breaks were identified as a control but there were no systems in place to monitor and verify that crib breaks were being taken by workers
- napping in cabins of mobile plant during second crib was common practice to manage fatigue in workers on night shift, yet the process was not identified in risk assessments nor documented in the fatigue management plan
- journey management plans were not reviewed on a regular basis
- use of active fatigue detecting technological systems provide an engineering solution to continuous monitoring of operator fatigue, offering a higher order control that is consistent and autonomous.

# Background

## Targeted assessment program

The targeted assessment program (TAP) provides a planned, intelligence-driven and proactive approach to assessing how effective an operation is when it comes to controlling critical risk. The program applies the following principles:

- a focus on managing prescribed 'principal hazards' from the WHS (M&PS) Regulation.
- evaluation of the effectiveness of control measures implemented through an organisation's safety management system
- consideration of the operation's risk profile and the targeting of operations deemed to be highest risk.

The objective of the risk profiling is to identify the inherent hazards and the hazard burdens that exist at individual operations in each mining sector in NSW. The information is then used to develop the operational assessment and inspection plans that inform the program.

Each TAP is undertaken by a team of inspectors from various disciplines, such as electrical and mechanical engineering, who work together with the operation's management team to undertake a thorough assessment of the control measures associated with the relevant hazard and their implementation.

## Scope

Involving a multidisciplinary team of inspectors, the scope of the targeted assessment included two elements:

- a desktop assessment of:
  - compliance against legislation with respect to managing risks to health and safety associated with worker fatigue
  - controls the mine uses to prevent and mitigate worker exposure to health and safety risks due to fatigue related impairment
  - means the mine utilises to monitor the effectiveness of those controls
- a workplace assessment of the implementation of those controls.

## The process

The process for undertaking a TAP generally involves the following stages:

- Preliminary team meetings and the preparation of documents.
- Information and assessment requirements discussed and supplied to the relevant mine.
- Execution of a two-day on-site assessment involving:
  - a site desktop assessment of all relevant plans and processes
  - a discussion with the mine management team on the legislative compliance of the relevant plans
  - the inspection of relevant site operations.
- Discussion and feedback to the mine management team on the findings and actions that need to be taken by the operators in response.

## Risks of fatigue at work

Mine operators have identified fatigue as a contributing factor to numerous incidents in the mining industry. Shift work and the nature of the mining industry require workers to have irregular and long hours in a high-risk working environment.

Human fatigue is a state of impairment that can include physical and/or mental elements, including reduced alertness and performance. It is typically associated with inadequate sleep, extended time awake or the time of day.

## Obligations

Under the *Work Health and Safety Act 2011*, a person conducting a business or undertaking (PCBU) has the primary duty of care to ensure, in so far as is reasonably practicable, workers are not exposed to health and safety risks arising from the business or undertaking.<sup>1</sup> This duty includes eliminating the exposure to fatigue risks, for example, by appropriate rostering and maintaining a work environment that is designed to prevent fatigue. If it is not reasonably practicable to do so, then risks must be minimised, so far as is reasonably practicable, according to the hierarchy of controls.

The Work Health and Safety (Mines and Petroleum Sites) Regulation requires a mine operator to manage risks and implement a range of control measures including:

- managing risks to health and safety associated with worker fatigue (clause 43)
- providing workers with suitable and adequate information, training and instruction about the implementation of control measures in relation to fatigue (clause 104)
- consulting with workers about developing and implementing strategies to protect people from risks to health and safety arising from fatigue (clause 121)

<sup>1</sup> Section 19 Work Health and Safety Act 2011

## Elimination and control

Mine operators should identify risk areas in relation to fatigue and select the most effective controls to eliminate or minimise those risks. More than one control measure may be required to reduce worker exposure to appropriate levels.

Control measures that will minimise the risks of fatigue include:

- ensuring work schedules enable sufficient sleep opportunities
- monitoring to identify the onset of fatigue and worker impairment
- implementing work arrangements such as breaks or job rotation.

Whatever strategy is adopted, it should be underpinned using the hierarchy of controls.

## Targeted assessment for fatigue

The NSW Resources Regulator's strategy is to ensure that workplaces with higher exposure to risks – for example, workplaces that schedule shifts of more than 12 hours or schedule consecutive night shifts – are implementing a range of measures to control the risks of fatigue.

The hazard of fatigue at mines is a subject of targeted assessments that focuses on how worker exposure to fatigue is managed.

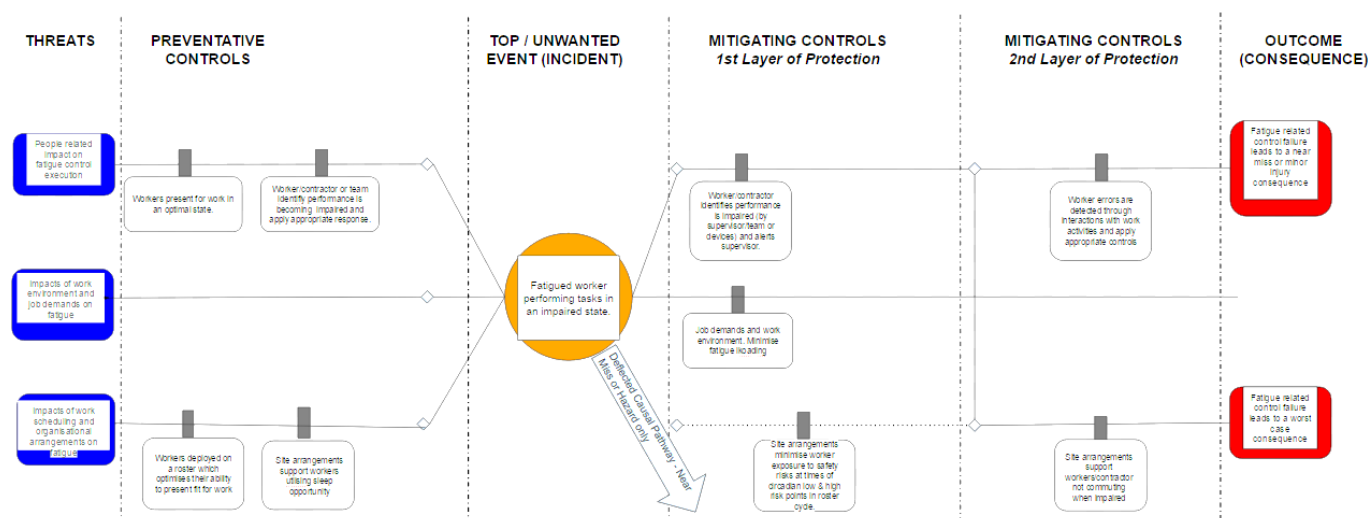
Key categories assessed:

- identification, assessment and risk controls for fatigue and associated risks
- preventative controls, that is, controlling the likelihood of fatigue developing
- mitigating controls, that is, controlling the effects of fatigue
- monitoring for worker exposure to fatigue
- verifying the effectiveness of controls.

## Bow-tie risk assessment

When developing this targeted assessment program, the NSW Resources Regulator completed a bow-tie risk assessment of the health and safety risks due to fatigue. The bow-tie risk assessment was facilitated by appropriately qualified external facilitators and involved both NSW Resources Regulator inspectors and external representatives with appropriate technical expertise.

Figure 1: Bow-tie risk assessment



## Assessment findings

The assessment team concluded that at each of the sites subject to the targeted assessment, mine operators had acknowledged their obligations with regard to the provisions of the Regulations related to the management of risks associated with fatigue.

It was also evident that several mine operators assessed had made a considerable investment in technology-based solutions and infrastructure to assist in the detection and management of risks associated with fatigue.

For those sites that had embarked on a critical control pathway, the targeted assessments revealed some issues with the identification and implementation of critical controls to manage risks associated with fatigue, and more generally, with the process of developing and reviewing controls. While these issues were not relevant at all of the sites assessed, the findings provide some valuable information that should be considered when developing critical controls.

The findings of this assessment are grouped into two categories:

- General findings to inform all aspects of an operation's safety management systems and provide valuable information and insight across all sectors and operation types.
- Specific findings to inform and improve safety management systems to address this principal hazard.



## General findings

### Risk assessments

Issue	Recommendation
Fatigue risks were typically only considered as part of risk assessments associated with the development of rosters. Mine sites did not have a specific risk assessment related to the management of all risks associated with fatigue.	The operator of a mine must manage risks to health and safety associated with worker fatigue. <sup>2</sup>
Risk assessments did not include a person who was a content matter expert having regard to the nature of the hazard.	The mine operator must ensure that a risk assessment is conducted by a person who is competent to conduct the particular risk assessment having regard to the nature of the hazard. <sup>3</sup>
Some mine operators did not adequately consult with workers or give them a reasonable opportunity to express their views and contribute to the decision-making process in relation to the risk assessment process.	The mine operator is required to give workers a reasonable opportunity to express their views and contribute to the decision-making process. <sup>4</sup>

### Implementation, monitoring and review of control measures

Issue	Recommendation
Mine operators had identified control measures in their management plan but had failed to consistently implement, monitor and/or review the control measures for fatigue. <sup>5</sup>	The implementation and review of control measures must be consistently applied across all areas of the mine site including the preparation plants and workshop and maintenance areas.

<sup>2</sup> Clause 43 WHS (M&PS) Regulation

<sup>3</sup> Clause 9(2) WHS (M&PS) Regulation

<sup>4</sup> Section 48 WHS Act

<sup>5</sup> Clause 37 WHS Regulation

## Information, training and instruction

Issue	Recommendation
Mine operator had not provided training to workers before workers participated in the risk assessment for fatigue.	The mine operator must ensure that workers participating in a risk assessment are provided with adequate information, training and instruction to enable them to effectively participate in the development and implementation of strategies to protect workers at the mine from risks to health and safety arising from fatigue. <sup>6</sup>
Supervisors had not been trained on fatigue management controls and the fatigue management plan.	Mine operators must provide fatigue management training and instruction to all workers, including supervisors. <sup>7</sup>  All mine operators relied on supervision as a control in fatigue management plans. Supervisor interaction with workers was identified as a key element in monitoring workers for fatigue. For supervisors to be effective in performing this monitoring function effective training is essential.
Mine operators had not reviewed the information, training and instructions on managing fatigue for supervisors.	Mine operators must ensure that information, training and instructions provided to all workers is reviewed and as necessary revised to ensure that they remain relevant and effective. <sup>8</sup>
Workers did not always have an appropriate level of understanding of the operation of fatigue monitoring systems. Workers' views on the effectiveness and intent of technology-based systems that monitor an individual's physiological parameters varied depending on the amount of training provided.	At sites where workers were well-trained and had a sound understanding of how the monitoring system operated, workers had a higher level of "trust" in the system and responded to system alarms and warnings more effectively.

<sup>6</sup> Clause 104(2)(e) WHS (M&PS) Regulation

<sup>7</sup> Clause 104(2)(b) of the WHS (M&PS) Regulation

<sup>8</sup> Clause 107 WHS (M&PS) Regulation

## Specific findings

### Fatigue management plan

Issue	Recommendation
Mine operators did not have systems in place to monitor contractors' compliance with the fatigue management plan. Contractors were not always effectively monitored. Hours of work and roster patterns of itinerant contract workers were not considered in monitoring.	Operators should have systems in place to monitor compliance with the fatigue management plan for all workers on site i.e. staff, employee workers and contractors.
Mine operators had identified crib breaks as a control in the fatigue management plan but did not have systems in place to ensure that workers were taking crib breaks.	Supervision of workers should include ensuring that workers have taken crib breaks. Mine operators should consider documenting the timing and duration of crib breaks in the fatigue management plan or procedure as a control.
Napping in cabins of mobile plant during second crib was common practice to manage fatigue in workers on night shift yet the process was not identified in risk assessments nor documented in the fatigue management plan.	Where napping in cabins of mobile plant during second crib has been identified as an effective control to manage fatigue in workers on night shift, the process should be documented in the fatigue management plan or procedure and communicated to the workforce.

### Shift length and minimum break between shifts

Issue	Recommendation
Supervisors at some sites were routinely working shifts of 14 hours or longer in breach of the fatigue management plan. Shift supervisors were often not considered in the same way as workers regarding the management of fatigue. The mine operator had identified a minimum break between shifts as a control measure but had failed to ensure that this break was enforced for supervisors.	Mine operators must minimise, as far as is reasonably practicable, the risks of fatigue impacting on the health and safety of all workers.

## Journey management plans

Issue	Recommendation
The mine operator had not implemented journey management plans for workers in accordance with the fatigue management plan.	Where journey management plans are identified as a control measure for workers at risk e.g. workers travelling more than one hour to and from the mine site, operators must ensure that plans are implemented for those workers.
Journey management plans were not reviewed on a regular basis.	Mine operators should ensure that there is a process in place to trigger the review of journey management plans. It is recommended that workers' living arrangements during the work roster period are documented in the journey management plan and that plans include triggers for review.

## Active fatigue detecting technological systems

Issue	Recommendation
To date there has not been widespread implementation of this technology across the industry. Those operations that have implemented the technology, primarily on haul truck fleets, are much better able to accurately monitor the fatigue related events which are occurring and respond accordingly. The system, importantly, provides an engineering solution to continuous monitoring of operator fatigue, offering a higher order control that is consistent and autonomous.	Mine operators need to consider the requirements of WH&S Regulation 2017 Clause 36 Hierarchy of control measures when assessing the adequacy of the controls implemented to manage the risk of fatigue. An engineering control is required to be applied so far as is reasonably practicable. Administrative controls and personal protective equipment (PPE) may not be adequate.

## Where to now

Targeted assessments provide an account of the issues observed at a mine site at a point in time. Some of the findings resulted in notices being issued, including notices of concern, under section 23 of the WHS (M&PS) Act, and improvement notices, under section 191 of the WHS Act.

The matters addressed by the notices reflect the findings of the NSW Resources Regulator inspectors. In summary these findings are listed below.

Notice	In relation to
Improvement notices, s 191	<ul style="list-style-type: none"><li>→ Supervisors were working in excess of 14 hours, in breach of the fatigue management plan.</li><li>→ Workers were working in excess of the recommended number of shifts in breach of the fatigue management plan.</li><li>→ The operator had identified a minimum break between shifts as a control measure but had failed to monitor this to ensure that the minimum break between shifts was maintained.</li><li>→ Journey management plans were identified as a control measure for particular workers but were not implemented and confirmed for those workers.</li><li>→ The implementation and review of control measures for minimising the risk that a worker will be exposed to fatigue were not consistently applied across the mine site (i.e. production, workshop and coal handling and preparation plants).</li></ul>
Notices of concern, s 23	<ul style="list-style-type: none"><li>→ Control measures for fatigue were not implemented in accordance with the fatigue management plan.</li><li>→ Workers were not provided with information, training and instruction before participating in the risk assessment.</li><li>→ Supervisors had not been adequately trained in fatigue control measures.</li><li>→ The documented fatigue management procedure was not aligned with the embedded practice of napping in equipment cabins during crib breaks on nightshift.</li><li>→ Supervisors were not conducting routine fatigue interactions with workers on night shift to assess their fatigue.</li><li>→ The fatigue management procedure was silent with regard to the length of, and spacing between, crib breaks.</li></ul>

The targeted assessment process identified many common issues around the approach taken by mine sites to manage the risk of fatigue to the health and safety of their workers. It also highlighted broader issues that are common across mine sites associated with the process of developing, implementing and reviewing risk assessments, management plans and procedures.

The NSW Resources Regulator expects that all mines will review their procedures and practices in consideration of the findings in this report.

## Further information

For more information on targeted assessment programs, the findings outlined in this report, or other mine safety information, please contact the NSW Resources Regulator. You can find the relevant contact details below.

Type	Contact details
Email	<a href="mailto:cau@planning.nsw.gov.au">cau@planning.nsw.gov.au</a>
Incident reporting	To report an incident or injury call <b>1300 814 609</b>
Website	<a href="http://resourcesregulator.nsw.gov.au">resourcesregulator.nsw.gov.au</a>
Address	Resources Regulator 516 High Street Maitland NSW 2320

## Appendix A: Legislative requirements relating to fatigue management

The appendix provides a list of certain legislative requirements for the management of risks associated with worker fatigue referred to in this report as provided by the *Work Health and Safety Act 2011*, the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014* and the *Work Health and Safety Regulation 2017*.

Legislation, section/clause	Legislative requirements
WHS (M&PS) Regulation, clause 9	<a href="#">Management of risks to health and safety</a>
WHS (M&PS) Regulation, clause 14	<a href="#">Content of safety management system</a>
WHS (M&PS) Regulation, Clause 43	<a href="#">Fatigue</a>
WHS (M&PS) Regulation Clause 104	<a href="#">Duty to provide information, training and instruction</a>
WHS (M&PS) Regulation, clause 107	<a href="#">Review of information, training and instruction</a>
WHS (M&PS) Regulation, clause 121	<a href="#">Duty to consult with workers</a>
WHS Regulation clause 36	<a href="#">Hierarchy of control measures</a>
WHS Act, section 19(3)(c)	<a href="#">Primary duty of care</a>
WHS Act, sections 47-49	<a href="#">Consultation with workers</a>