



**NSW
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INVESTIGATION REPORT

Bulga Open Cut dump truck collision



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Disclaimer: The information contained in this publication is based on knowledge and understanding at the time of writing (July 2019). However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date and to check currency of the information with the appropriate officer of the NSW Department of Planning and Environment or the user's independent advisor.

Executive summary

At about 3.30am on Monday 23 July 2018, an unloaded Caterpillar 793D dump truck (DT139) was being driven along a haul road at the East Pit of Bulga Open Cut Mine. As the truck approached an intersection, the driver saw a grader, dump truck and water cart at the intersection. The truck driver stopped the vehicle at the intersection to give way to the grader, dump truck and water cart in accordance with the mine's road rules.

At that time, an unloaded Caterpillar 793C dump truck (DT122) was being driven along the same haul road behind the other dump truck. The driver of DT122 saw DT139 coming to a stop. He lifted his foot from the accelerator to allow his truck to slow with the intention of stopping behind DT139. At this time, the driver of DT122 became unresponsive. It is possible that the driver suffered a micro-sleep or a medical episode that rendered the driver unresponsive.

The front of DT122 hit the rear of DT139. Vehicle data records show that DT122 was travelling at 41 km/h in sixth (top) gear at the time of the collision. There is no evidence on the plant data records to support any action on steering, emergency braking or application of retarder by the driver.

The cabin of DT122 collided with the rear edge of the tray body of DT139. This resulted in the two pillars of the operator's cabin being pushed inward toward the driver. The force of the collision shunted DT139 forward about 20 metres.

An emergency response was activated. The driver of DT122 was trapped in the cabin with his right foot twisted between the brake and accelerator pedals. Onsite rescue personnel freed the driver from the cabin and transported him to hospital by road ambulance. The driver suffered a fractured tibia, laceration to right eye and minor cuts and bruises.

Investigation findings

Key findings from the investigation are as follows:

- The investigation did not identify any breaches of work health or safety legislation in relation to the incident.
- Following the incident, the mine operator further strengthened its risk controls in relation to the monitoring and management of worker fatigue.
- The driver had several fatigue-related events, both on day and night shift following the incident, and it is possible that these were related to the driver's pre-existing medical condition.

The mine operator has demonstrated a willingness to comply with its obligations under the *Work, Health and Safety Act 2011* and has fully cooperated with the investigation. Notably, this included waiving legal professional privilege over a number of key documents, which allowed the Regulator to assess the matter in a timely and thorough manner.

Accordingly, having regard to the above factors the Regulator has determined to take no further action in relation to the matter.

Recommendations

Mine operators have a duty to identify hazards and manage risks to health and safety associated with worker fatigue and the movement of plant in accordance with the *Work Health and Safety Act 2011* and *Work Health and Safety (Mines and Petroleum Sites) Act 2013* and Regulations.

It is recommended that mine operators and contractors:

- implement strategies to eliminate or minimise risks associated with fatigue
- implement real-time fatigue monitoring systems
- implement systems to encourage workers to self-report fatigue and medical conditions
- engage with workers about the effective management of fatigue and medical conditions
- review roster cycles
- install proximity detection and collision avoidance systems on mobile plant.

Workers must take reasonable care of their own health and safety and comply with reasonable instructions issued by their employer. Workers should report to their supervisors when they are fatigued and avoid undertaking safety-critical or high-risk tasks, including monotonous work such as driving haul trucks. Workers should report any medical conditions that may affect their level of fatigue and work with their employer to implement effective risk control measures.

Purpose of the report

The report has been published under section 70(1)(b) of the *Work Health and Safety (Mines and Petroleum Sites) Act 2013* to share safety learnings about the incident and prevent similar incidents from occurring.

Investigation overview

Major Investigations Unit

The Major Investigations Unit investigates serious workplace incidents in the NSW mining, petroleum and extractives industries. The unit's role is to carry out a detailed analysis of significant incidents and report its findings to enhance industry safety and to give effect to the NSW Resources Regulator's Compliance and Enforcement Policy.

Legislative authority to investigate

Investigators have the authority to investigate this matter as the incident occurred at a mining workplace. In accordance with departmental policy, the incident was reviewed and determined to be of a serious nature and was allocated for an investigation. The investigation was conducted under the *Work Health and Safety Act 2011* and the *Work Health and Safety (Mines and Petroleum Sites) Act 2013*.

Investigators are appointed as government officials under the WHS Act and are deemed to be an inspector for the purposes of the WHS Act. The Regulator has also delegated some additional functions to investigators, including exercising the power to obtain information and documents for the purposes of monitoring compliance with the WHS Act.

The incident

The incident details

An unloaded Caterpillar 793D dump truck (DT139) was being driven along a haul road at the East Pit of Bulga Open Cut Mine about 3.30am on Monday, 23 July 2018. As the truck approached an intersection, the driver saw a grader, dump truck and water cart at the intersection. The truck driver stopped the vehicle at the intersection to give way to the grader, dump truck and water cart in accordance with the mine's road rules.

At that time, an unloaded Caterpillar 793C dump truck (DT122) was being driven along the same haul road behind the other dump truck. The driver of DT122 saw DT139 coming to a stop. He lifted his foot from the accelerator to allow his truck to slow with the intention of stopping behind DT139. At this time,

the driver of DT122 became unresponsive. It is possible that the driver suffered a micro-sleep or a medical episode that rendered the driver unresponsive.

The front of DT122 hit the rear of DT139. Vehicle data records show that DT122 was travelling at 41 km/h in sixth (top) gear at the time of the collision. There is no evidence on the plant data records to support any action on steering, emergency braking or application of retarder by the driver.

The cabin of DT122 collided with the rear edge of the tray body of DT139. This resulted in the two pillars of the operator's cabin being pushed inward toward the driver. The force of the collision shunted DT139 forward about 20 metres.

An emergency response was activated. The driver of DT122 was trapped in the cabin with his right foot twisted between the brake and accelerator pedals. Onsite rescue personnel freed the driver from the cabin and transported him to hospital by road ambulance. The driver suffered a fractured tibia, laceration to right eye and minor cuts and bruises.

The photograph below shows the final resting position of the two trucks after the collision.

Figure 1: Final resting position of DT122 and DT139



Figure 2: Damage to front and cabin of DT122



The mine

Bulga Open Cut is an open cut mine on Broke Road about 15 km southwest of Singleton. The mine is a dragline, truck and shovel operation. The mine produces semi-soft coking coal and thermal coal. Product coal from the mine is transported by rail to the port of Newcastle for export to China and Japan.

Bulga Coal Management Pty Ltd is the mine operator, which manages the complex on behalf of the Bulga Joint Venture. Bulga Coal Management Pty Ltd is owned by Oakbridge Pty Ltd, which is the majority shareholder (87.5%) of the Bulga Joint Venture. Glencore is the majority shareholder of Oakbridge Pty Ltd. The Bulga Open Cut coal mine occupies mining authorisations MLA 525, ML 1547, ML 1717, CL 219 and CL 224.

Incident location

The incident occurred with mining lease ML1547. The below topographical map identifies the mining lease boundaries of Bulga Open Cut and the incident location.

Figure 3: Incident location within ML1547



Parties involved

Mine operator

Bulga Coal Management Pty Ltd is the appointed mine operator of the Bulga Open Cut Coal Mine.

Labour hire contractor

At the time of the incident, the injured worker was employed by WorkPac Mining Pty Limited. The worker was employed as a trainee operator assigned to Bulga Coal. The contract was for the period of a traineeship, Certificate III in Surface Extraction Operations.

Illumination

The incident occurred at 3.30am. No lighting equipment was installed on the haul road or at the intersection. Both dump trucks had been retrofitted with upgraded LED lighting. Both trucks were fitted with LED identification signs. Prestart checks on both dump trucks records all lighting as functional with no defects recorded.

The roadway

The incident occurred on a main haul road, known as Swan Lake Road. The surface roadway is of hard, compacted clay. The grade of the roadway at the point of impact was +3.5% with a cross grade of 2.0%. The photograph below is of the roadway leading to where the collision took place. The two dump trucks involved in the incident can be seen in the centre of the photograph.

Figure 1: Roadway where collision occurred



Weather conditions

The weather conditions at the time of the incident were recorded as dry, clear and calm. Visibility was described as good. Bureau of Meteorology data shows that no rainfall was recorded at the three nearest weather observation points to Bulga Open Cut. The minimum temperature recorded was -1.7° at the Singleton observation point. Bulga complex meteorological records observed the temperature as 5° at the time of the incident.

The mobile plant

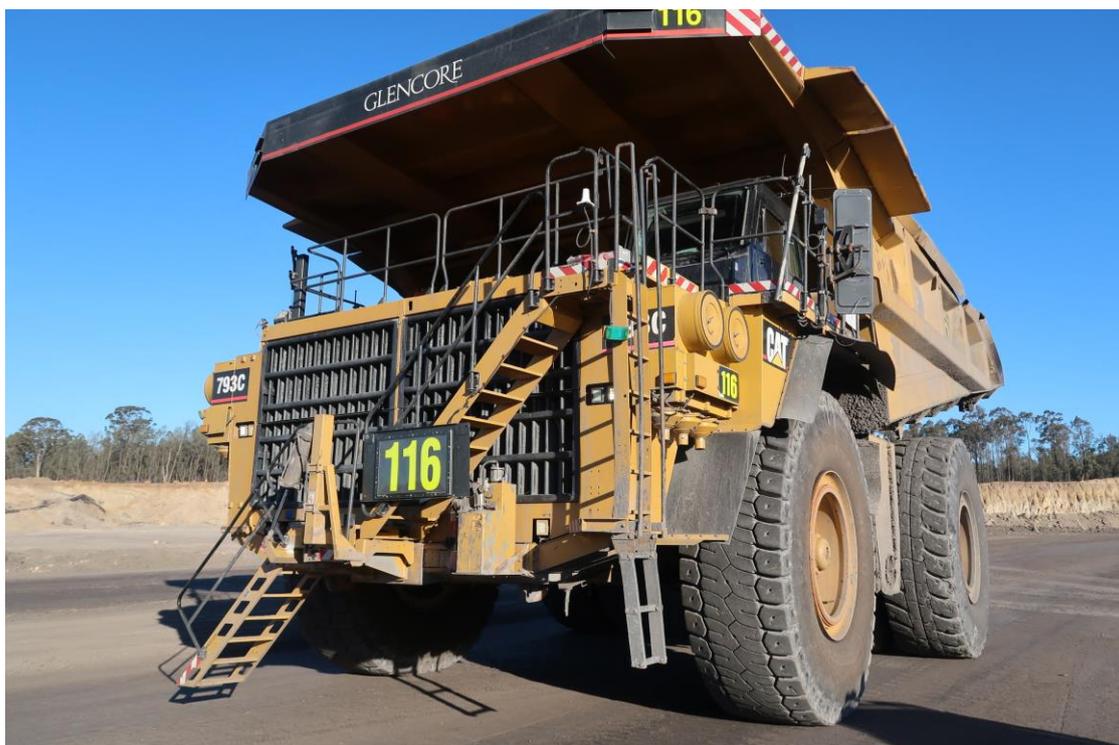
The mobile plant involved in the incident was a Caterpillar 793C dump truck. The dump truck had a gross operating weight of 384,000 kg and a payload capacity of 218,000 kg. The specified maximum speed of the vehicle was 54.3 km/h. The transmission had six forward gears and one reverse gear.

The dump truck had about 77,469 operating hours and was serviced on 21 June 2018, about 4.5 weeks before the incident (as per 1900 hours service requirements). At the time of the service the dump truck had about 76,926 operating hours. No defects were detected and the dump truck was deemed safe to operate.

A pre-operational checklist and defect report was completed by the driver at the start of night shift on Sunday 22 July 2018. The dump truck was deemed safe to operate.

The photograph below is of a similar dump truck. The vehicle below was also being used at Bulga Open Cut.

Figure 2: CAT793C dump truck



The worker

The injured worker was employed by WorkPac. The worker was a trainee operator assigned to Bulga Coal Management. The worker was employed on a contract for the period of a traineeship, Certificate III in Surface Extraction Operations. The worker's ordinary hours were based on a standard work week of 35 hours averaged over a period of no more than four weeks. Additional reasonable hours may have been worked in rostered arrangements.

Induction and training

The worker began employment at WorkPac on 10 October 2017. He completed several training packages, including *Work Safely* and *Follow WHS Policies and Procedures*, and *Apply Risk Management Processes*.

The worker began work on site at Bulga Open Cut on 16 October 2017. The worker completed several training and assessment packages, including *Site Familiarisation Assessment*, *Fatigue Management Awareness*, *Fatigue Check Training*, *Emergency Response Awareness* and *B Safe Behavioural Safety Program*.

The worker completed the Bulga Open Cut Mobile Equipment Induction Assessment on 16 October 2017. The worker began the *Bulga Open Cut Mechanical Dump Truck Competency Based Assessment*. The worker was authorised to train by the training co-ordinator. The competency-based assessment included completion of an operator diary.

The worker completed the *Bulga Open Cut Mechanical Truck Theory Assessment* on 18 October 2017. Starting on 24 October 2017, the worker recorded 11 shifts operating a dump truck under full supervision. The shifts were six day shifts and five night shifts, operating about 137 hours.

The worker signed to acknowledge an obligation to comply with site policies, rules and procedures, and relevant legislation on 21 November 2017.

Competency

The worker was signed off as competent on 22 July 2018. This sign off occurred on the same shift and just before the incident. The worker had accumulated a total of 524 logged operating hours before being signed off as competent.

Note: The *Commence Minimal Supervision* section of the *Bulga Open Cut Mechanical Dump Truck Competency Based Assessment* for the worker was not completed.

Health

The worker completed a pre-placement medical detail certificate on 16 August 2017. The medical assessment noted that the worker had a pre-existing medical condition that could be appropriately managed, and the worker was certified as fit for the proposed position.

The medical certificate was valid for 12 months and needed to be renewed annually.

The medical certificate was amended and extended for a further 12 months on 11 July 2018.

The worker and his employer, WorkPac, developed a medical management plan to manage the medical condition. The medical management plan was provided to Bulga Coal Mine as part of the site induction approval process.

Legislative considerations

Section 19 of the WHS Act places a primary duty of care on Bulga Coal Mine as a person conducting a business or undertaking (PCBU) to ensure, so far as reasonably practicable, the health and safety of workers engaged and whose activities in carrying out work are influenced or directed by the person while the workers are at work in the business or undertaking.

Section 25 of the WHS Act requires Bulga Coal Mine to ensure, so far as reasonably practicable, that plant is without risks to health and safety of persons.

Section 28 of the WHS Act requires a worker (includes an employee of a labour hire company) to take reasonable care for his or her own health and safety and take reasonable care for the health and safety of others and comply with any reasonable instructions, policies and procedures given by their employer, business or controller of the workplace.

Clause 39 of the Work Health and Safety Regulation 2017 requires Bulga Coal Mine to ensure that information, training and instruction provided to a worker is adequate.

Clause 9(1) of the Work Health and Safety (Mines and Petroleum Sites) Regulation 2014 places a duty on Bulga Coal Mine as a mine operator to manage the risks to health and safety associated with its mining operations.

Clause 23(1) of the WHS (MPS) Regulation requires Bulga Coal Mine to identify all principal hazards associated with its mining operations. In relation to each principal hazard identified, clause 23(2) requires Bulga Coal Mine to conduct a risk assessment that involves a comprehensive and systematic investigation and analysis of all aspects of risk to health and safety associated with the principal hazard.

Clause 24 of the WHS (MPS) Regulation requires Bulga Coal Mine to prepare a principal hazard management plan for each principal hazard associated with its mining operations.

Risk controls

Primary duty of care

At the time of the incident, Bulga Coal management had implemented a site safety management system. The site health and safety management system (SMS) was aligned with the Glencore HSEC Management System Framework and Glencore Coal Assets Australia (GCAA) HSEC standards. The safety management system included fatigue management of workers. Relevant documents of the SMS include, but are not limited to, *Glencore Health and Safety Policy*, *GCAA Health and Safety Standards*, *Bulga Health Control Plan*, *Bulga Fatigue Management Plan*, *Bulga Fatigue Management Plan Risk Assessment* and *Bulga Fatigue Check Form*.

Supply of plant

The Caterpillar 793C was a mining truck manufactured by Caterpillar Incorporated. Caterpillar Inc. specialises in the manufacture of heavy equipment and supplies heavy vehicles used in mining throughout the world. The Caterpillar 793C haul and dump truck was a rigid, two axle and six-wheel truck, common in the mining industry. Other manufacturers of similar trucks include Hitachi, Liebherr and Komatsu.

DT122 was serviced on 21 June 2018, about four and half weeks before the incident.

A pre-operational checklist and defect report was completed for DT122 by the worker at the start of the night shift on Sunday 22 July 2018. The dump truck was deemed safe to operate.

Vehicle data records retrieved from DT122 confirmed the braking system to be operating correctly before the incident.

DT139 was a Caterpillar 793D. The Caterpillar 793D was essentially the same as the Caterpillar 793C model with some minor upgrades. The 793D had a similar gross operating weight of 383,749kg and the same payload capacity of 218,000 kg as the 793C.

A pre-operational checklist and defect report was completed for DT139 by a worker at the start of day shift on Sunday 22 July 2018. The dump truck was deemed safe to operate.

Worker taking reasonable care

The worker completed numerous training assessments at Bulga Open Cut on 16 October 2017. The training assessments included a site familiarisation and fatigue management. Fatigue management training included completion of a *Bulga Open Cut Fatigue Check*.

The worker attended the shift pre-start meeting on 22 July 2018. The worker confirmed his attendance during a recorded interview. The worker informed investigators that the topic of fatigue was discussed at the pre-start meeting.

The worker completed a pre-operational checklist and defect report for DT122 before starting his task. At 7.21pm on 22 July 2018, the worker logged into DT122's vehicle information system. This system is known as Modular and records the dump trucks' movements during the shift, including assigning shovels, load amounts, stops and delays. Stoppages of work, including crib and toilet breaks, are recorded as delays. Once the truck is ready for assignment, the status is changed to 'ready'.

During the shift, the worker operated for a total of 6.15 hours of the total shift, which included 2.41 hours of unscheduled delays such as training, crib breaks and toilet breaks. The incident occurred 8.3 hours into the shift. The last break taken by the worker was at 3.00am, about 40 minutes before the incident.

Training and instruction

At the time of the incident, Bulga Open Cut had implemented site induction and numerous training packages to their employees and contractors. Bulga Coal Mine training included safety awareness, fatigue management and fitness for work.

At the time of the incident, the worker had completed Bulga Coal Mine's induction training and held authorisations required to:

- work at Bulga Open Cut
- operate haul trucks.

At the time of the incident, the worker had completed training assessments such as:

- *Managing a Mining Lifestyle* DVD assessment
- mechanical dump truck competency-based assessment
- mechanical truck theory assessment
- surface vehicle interaction
- vehicle hierarchy theory/practical assessment.

At the time of the incident, the worker had completed WorkPac induction and training, which was consistent with the traineeship required to work at Bulga Open Cut. At the time of the incident, the worker had completed training assessments such as:

- comply with site work processes/procedures
- work safely and follow WHS policies.

Safety management system

At the time of the incident, Bulga Open Cut had implemented a safety management system (SMS) pursuant to clause 13 of the WHS (MPS) Regulation.

Risk assessment

Bulga Open Cut undertook a risk assessment specific to fatigue management in August 2017. An external consultant facilitated the assessment and included Bulga Open Cut management and workers, as well as a union representative. The risk assessment identified 34 items as possible treatment plan actions. Identified actions included:

- a 'request for task rotation' in the fatigue checklist
- putting contractor management plan compliance requirements in the fatigue management plan
- conduct fatigue recognition training
- investigate methods for improving the ability of workers to take rest breaks during night shift.

Fatigue management plan

Bulga Coal Mine's plan for fatigue management (v8.0) was implemented on 12 September 2017. The purpose of the plan was to define the requirements relating to the management of fatigue.

Contracting companies

The fatigue management plan stated that *'all contracting company employees who work at Bulga Open Cut will follow the requirements of the plan'*.

Hours of work guidelines

The fatigue management plan outlined hours of work guidelines. The plan outlined that for shifts of less than 14 hours, the fatigue control was for an 'individual to assess their own fitness for work – completion of a fatigue check if feeling signs and symptoms of fatigue'.

The maximum average weekly work hours specified in the plan was 60 hours in a seven-day period, when averaged over four weeks.

The minimum break required between shifts was 10 hours. The minimum break after a sequence of night shifts was two consecutive night shifts.

Monitoring for fatigue

The plan stated that 'all individuals are required to monitor themselves and others for signs of fatigue'.

Fatigue checks

The plan stated that ‘fatigue checks are designed to assist individuals monitor their fatigue levels and apply appropriate controls. The fatigue check is designed to assist supervisors to apply the appropriate controls where fatigue levels require supervisor involvement’.

Task rotation

The plan stated that ‘there should be sufficiently skilled persons available within work teams so that workers can be rotated through different tasks during the shift to reduce fatigue’.

Health control plan

Bulga Coal Mine’s health control plan was implemented on 1 June 2018. The management plan applied to all Bulga employees and, where appropriate, Bulga contractors and visitors.

Fatigue Management

The health control plan stated that ‘all personnel at Bulga will be provided with relevant information and training to identify and manage fatigue risks during induction or specific training sessions including:

- awareness of fatigue-related hazards
- identifying signs and symptoms of fatigue
- implementing controls to manage fatigue
- using elements of the fatigue management plan
- individual accountabilities for preventing and managing fatigue.

Health assessments and monitoring

The health control plan stated that ‘all forms of medical monitoring and assessments will be carried out by or under supervision of a registered medical practitioner’. Health assessments and monitoring activities include:

- pre-employment medicals
- pre-employment functional assessments
- periodic health monitoring
- audiometric testing
- exit medicals
- risk-based medical assessments
- fitness for work medicals.

Surface transport management plan

Bulga Coal Mine's surface transport management plan was implemented at Bulga Open Cut on 19 June 2018. The purpose of the management plan was to 'specify the control measures that Bulga Open Cut would implement to eliminate or minimise the hazards and risks arising from the operation of mobile plant and equipment'.

Fatigue

The plan stated that 'a person shall not commence or continue to operate any vehicle on the Bulga mine site unless that person is in a fit state to operate the vehicle safely. A person suffering from fatigue during operations shall bring the vehicle safely to a stop and immediately contact their supervisor. The supervisor shall follow the fatigue management plan when they are advised that a vehicle operator is in a fatigued state'.

Minimum distance between moving vehicles

The plan stated that 'vehicle operators following another vehicle shall maintain a safe distance of separation with consideration for road and weather conditions and speed. A minimum separation of 50 metres shall be maintained by following vehicles'.

Sleeping in cabs of heavy equipment

The plan stated 'for the purpose of fatigue management, sleeping in the cabin of equipment shall be permitted providing:

- equipment is not needed for production or maintenance purposes
- the equipment must be parked fundamentally stable
- the ladder must be left in the down position
- the equipment operator must isolate the equipment and verify the isolation. The equipment can be isolated on either the starter isolation or battery isolator
- the equipment two-way must be left on and at an audible level for emergency purposes
- prior to resuming work the operator must conduct a walk around inspection to ensure that the immediate area is safe to resume work.'

Post incident actions

Fatigue monitoring system

Before the incident, a capital project was in progress to install GuardVant Fatigue Monitoring System across the entire Glencore Coal Assets Australia rear dump truck fleet. The dump truck fleet at Bulga Open Cut was included in the project and was due for completion in June 2019.

As a result of this incident, the GuardVant Fatigue Management System was installed on the heavy vehicle fleet at Bulga open Cut and completed in December 2018.

The GuardVant Fatigue Management System is a fatigue monitoring system designed to continuously monitor operators for fatigue and distraction. The system consists of a fatigue monitoring camera facing the operator, forward facing camera, seat vibration alert, speaker alert and 'transit-hound' mobile phone detection.

Identification of fatigue events

The worker returned to full operational duties at Bulga Open Cut in January 2019. On 14 January 2019, while the worker was on night shift, the GuardVant Fatigue Monitoring System detected a 'fatigue event' concerning the worker.

On 15 January 2019: a further 'fatigue event' was detected while the worker was working night shift.

On 16 January 2019: Bulga Coal Mine met the worker to discuss the two fatigue events.

On 18 January 2019: the worker resigned and gave Bulga Coal Mine two weeks' notice.

On 21 January 2019: while the worker was working day shift, a further 'fatigue event' was detected involving the worker. The worker finished work on that day at Bulga Open Cut.

It is not known if the above 'fatigue events' were fatigue-related, or alternatively related to the worker's pre-existing medical condition.

Conclusion

Key findings from the investigation:

- The investigation did not identify any breaches of work health safety legislation in relation to the incident.
- Following the incident, the mine operator further strengthened its risk controls in relation to the monitoring and management of worker fatigue.
- The worker had a number of fatigue-related events, both on day and night shift following the incident, and it is possible that these were related to the worker's pre-existing medical condition.

Recommendations

Mine operators have a duty to identify hazards and manage risks to health and safety associated with worker fatigue and the movement of plant in accordance with the *Work Health and Safety Act 2011* and *Work Health and Safety (Mines and Petroleum Sites) Act 2013* and Regulations.

It is recommended that mine operators and contractors:

- implement strategies to eliminate or minimise risks associated with fatigue
- implement real-time fatigue monitoring systems
- implement systems to encourage workers to self-report fatigue and medical conditions
- engage with workers about the effective management of fatigue and medical conditions
- review roster cycles
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Workers must take reasonable care for their own health and safety and comply with reasonable instructions issued by their employer. Workers should report to their supervisors when they are fatigued and avoid undertaking safety critical or high-risk tasks, including monotonous work such as driving haul trucks. Workers should report any medical condition that may affect their level of fatigue and work with their employer to implement effective risk control measures.