NSW GOVERNMENT

NSW Resources Regulator

INVESTIGATION INFORMATION RELEASE

DATE: November 2020

Worker receives crush injury to foot from hydraulic stabilising jack on jumbo rig

Incident date: 15 September 2020

Location: CSA Mine, Cobar, NSW

Overview

On 14 September 2020, a development drill rig (jumbo) was being relocated back to a development heading face on the 9060-level underground at the CSA mine in Cobar. When relocated at the face, the driller's offsider (nipper) has attempted to plug the face de-watering (Flygt) pump's restrained 1000 volt plug into the jumbo's receptacle at the front left hand wheel guard position when the front left jack leg that was being lowered came down and crushed his right foot.

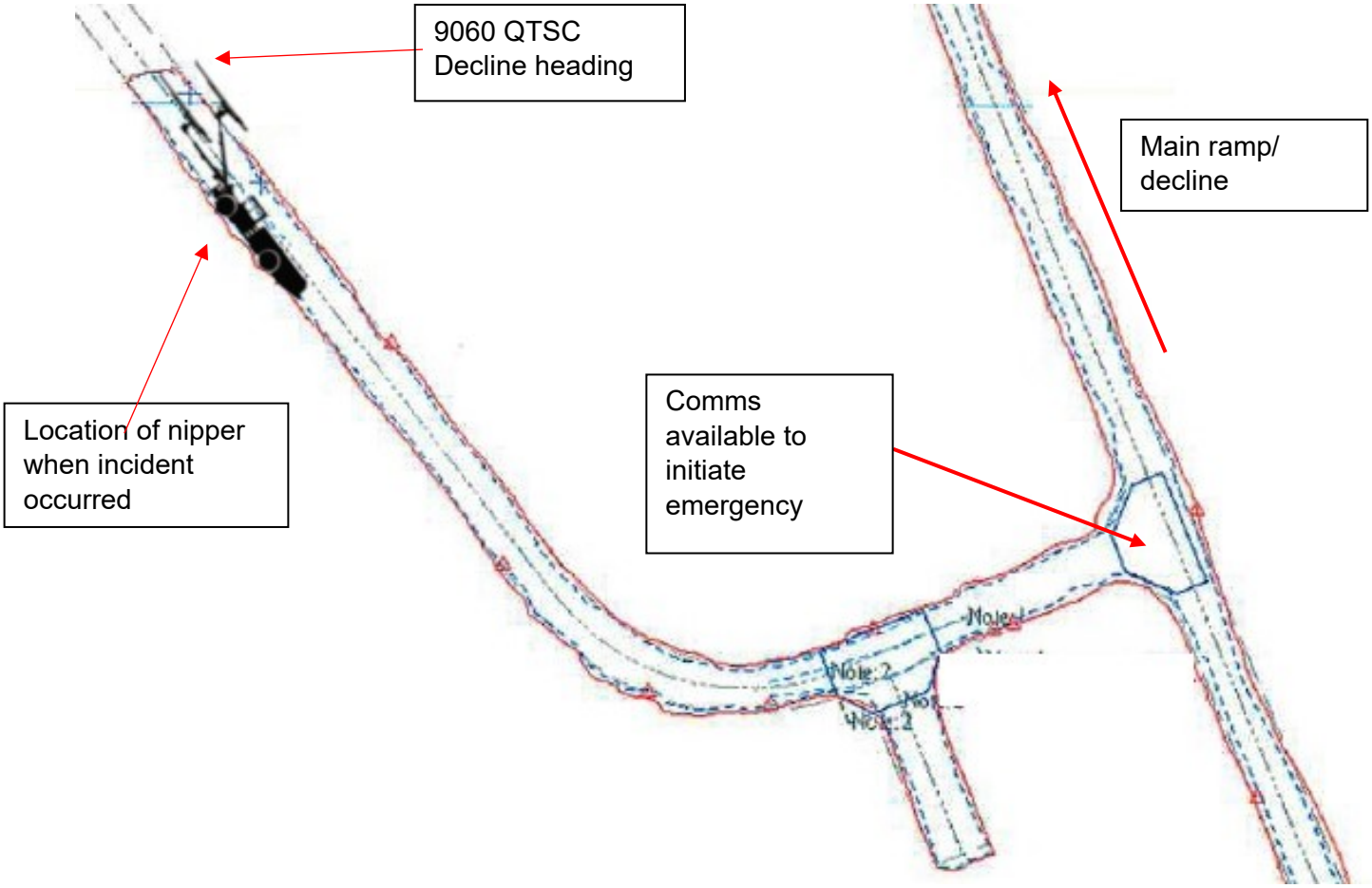
CSA Mine

CSA mine is a large underground metalliferous mine about 12 kilometres northwest of Cobar in Central Western NSW. The mine is owned by Glencore and operated by Cobar Management Pty Ltd. It employs more than 300 people and has an annual production of over 1.1 million tonnes of copper ore.

The incident

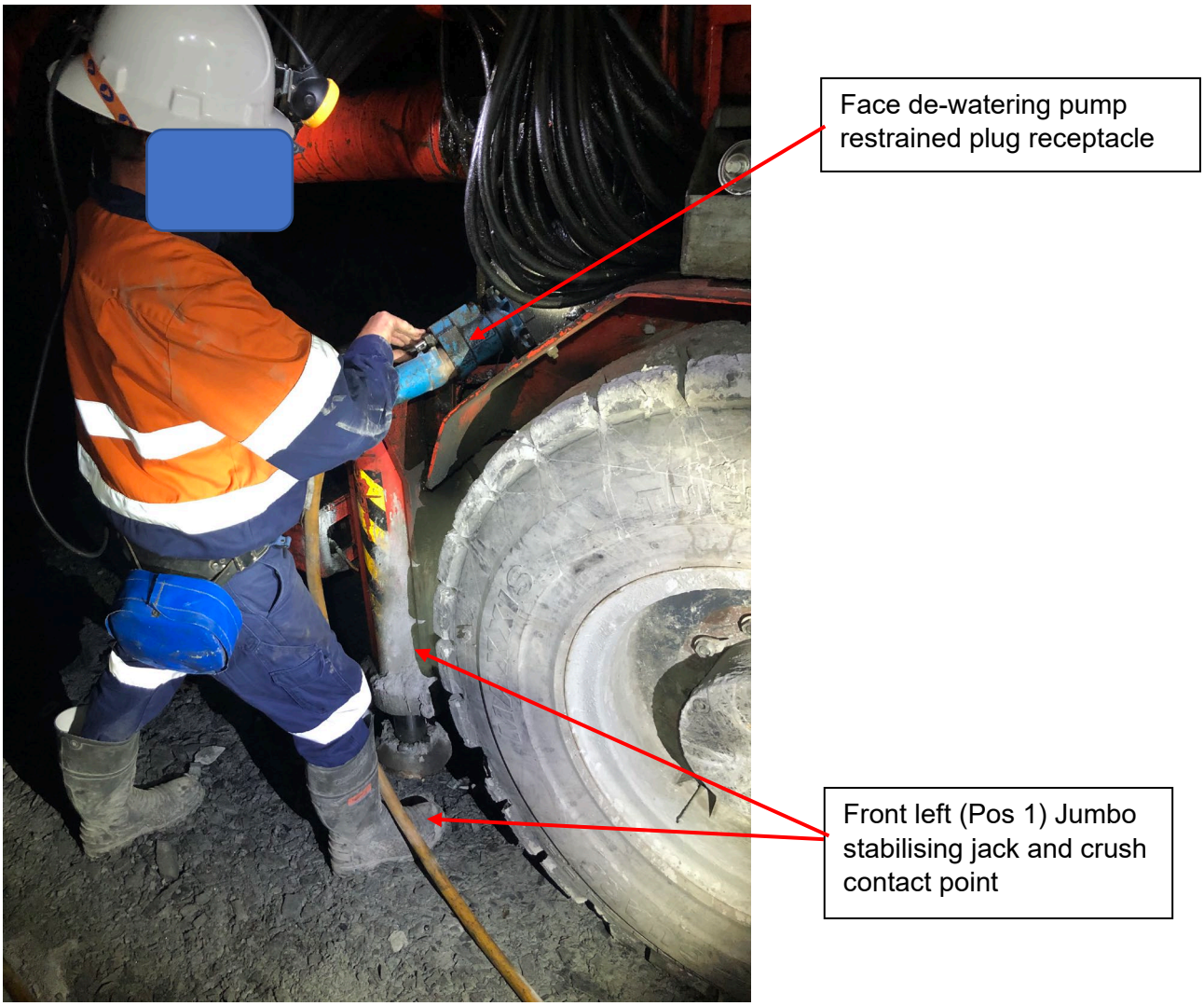
On the morning of 14 September 2020, a Sandvik DD421 Twin Boom Development drill rig (jumbo) was installing ground support to enable progression of the 9060 QTSC Decline Heading (see figure 1). The task was being carried out by two contract workers, an experienced driller and a driller's offsider (nipper) with four months experience in the role. The jumbo was introduced to site from another mining operation and an inspection was conducted on the jumbo on 13 February 2020.

Figure 1. Level plan showing location of jumbo



Prior to the incident, mechanical maintenance personnel had relocated the jumbo away from the active heading to allow maintenance activities to be carried out on level and supported ground. Once completed, the jumbo driller went about tramming the jumbo back to the development heading face under diesel power in order to set up to continue the ground support task. Arriving back at the face, the driller and nipper began preparing the jumbo for operation. When the drill rig is operating under diesel power the rig is capable of tramming to location but cannot undertake drilling activities. Part of the drill rig preparation was to install a 1000 volt face de-watering pump (Flygt pump) into the jumbo's restrained plug receptacle at the front of the jumbo (see figure 2). The restrained plug receptacle had been relocated to the front of the jumbo by the OEM compared to the previous model. The relocation was undertaken due to limited space in the original location. Whilst the nipper was installing the Flygt pump the driller was undertaking other set-up tasks, one of which was to lower the stabilising jacks on the rig from within the cabin.

Figure 2. Re-enactment of nipper's positioning at the time of incident



The driller lowered the front left jack leg (Pos 1) when it contacted the nipper's right foot, crushing it. The driller heard the nipper yell and from his seated position observed the nipper's hand waving inside the jumbo's cabin. The driller immediately raised the jack leg which released the nipper's foot. A maintenance fitter in the vicinity was alerted to the incident and called an emergency over the radio. The nipper was transported to Cobar Base Hospital and transferred to Dubbo Base hospital. The resulting injury to the nipper was an amputation of the big toe and the fracture of his second toe. Figures 3 and 4 below show the boot worn by the nipper at the time of the incident.

Figure 3. Top view of nipper's right boot

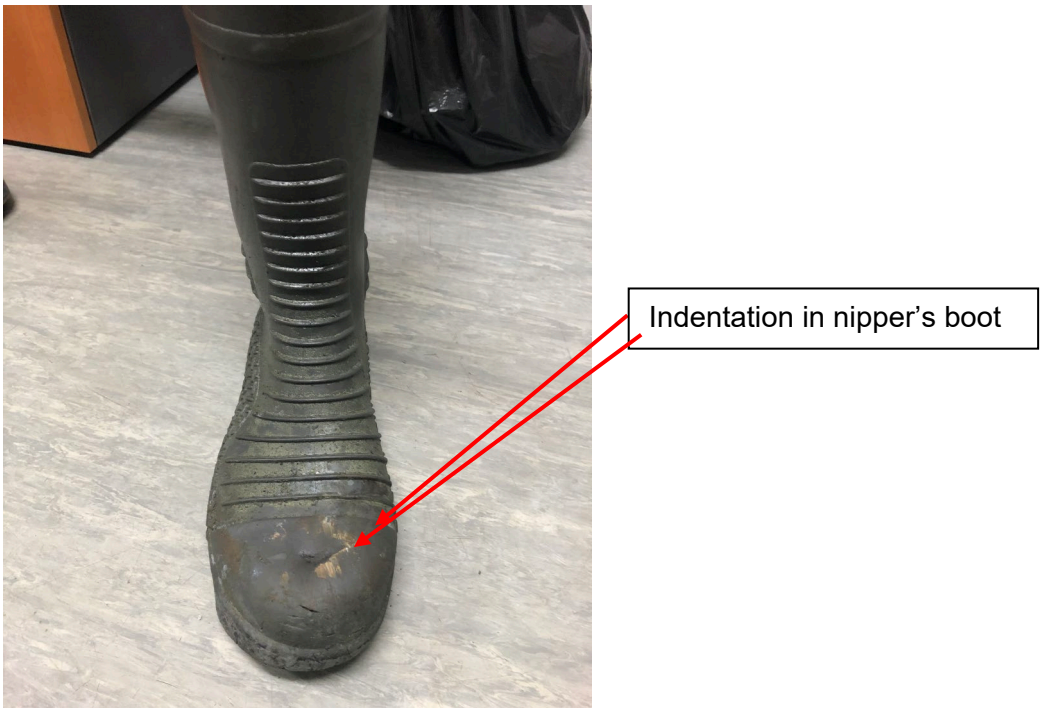


Figure 4. Sole view of the nipper's right boot

The investigation

On the 14th of September 2020, the mine operator notified the NSW Resource Regulator (the regulator) of the incident. An inspector from the regulator was deployed to the mine site and undertook an initial assessment which included an inspection of the incident scene, obtaining documents and statements from witnesses and inspecting drilling plant. On 17 September 2020 a decision was made to undertake a major investigation to understand the incident timeline and identify all causal factors.

Causal Factors

The causal factors for this incident have been separated into three distinct areas:

1. Safe work procedures.
2. Competency of personnel.
3. Fit-for-purpose tools and equipment.

Safe Work Practices

The investigation found the driller and nipper had both been trained in the 'Life Saving Behaviours' as part of the mine's induction package. These behaviours include "never enter danger zones" and "always seek and obtain clear approval before entering mobile equipment operating zones". The nipper was working in and around the front of the drill however failed to ensure positive communications or maintain a line of sight with the driller. In this instance both workers failed to recognise the risks created by their own work and what impact that would have on others in the vicinity.

Procedural and training documentation for the contractor stipulated the isolation requirements for personnel working forward of the front jacks while the drill rig is operating or in the stabilised position (while operating under electrical power, not diesel power – the machine was under diesel power at the time of the incident). The contractor's procedures did not align with the mine's 'Life Saving Behaviours' and did not indicate safe standing zones in relation areas of the plant which present crushing hazards while the rig is being set up, while operating on diesel power. See figure 5.

Figure 5. Excerpt from contractor's drill rig preparation and tramming procedure

Downer

PROCEDURE
DRILL RIG PREPARATION AND TRAMMING

Training and assessment – theory only

Question and Generic Response (Site specific responses may vary)	C	NYC
1. You must have an Approved for Construction (AFC) plan before drilling starts. ☐ True ☐ False	☐	☐
2. When cable bolter or production drilling commences, personnel are NOT permitted past front jacks without operator's permission until all boom movements have ceased and boom emergency stop button is activated, or within 2m of any rotating drill steel. ☐ True ☐ False	☐	☐
3. When tramming: ☐ Stow the boom in horizontal position ☐ Raise jacks and reposition stabilisers to tramming position ☐ Ensure hydraulic hoses are off ground and clear of tram area ☐ All the above	☐	☐
4. If the cable reel alarm sounds what must you do?		

Emphasis placed on hazards being present <u>past</u> front jacks when drilling has commenced.

Procedures and training documents must be underpinned by risk assessment. In this instance the contractor did not identify the risks associated with setting up the development drill rig. A lack of robust risk analysis for the task lead to uncontrolled hazards/consequences (identification of potentially fatal energy sources) remaining present.

Competent people

The investigation found the nipper had only been in the role for four months and had not been passed through all training and assessment competency levels for jumbo operations. The nipper had undertaken only theory elements of the drilling competency assessments before working in that specific role.

The documented initial training assessment phase/ step for the operation of plant is termed 'Full training' and requires close supervision of the candidate in training by a 'trainer'. Based on the available evidence it is reasonable to suggest that at the time of the incident the nipper had not yet developed an appropriate level of situational awareness required to work independently around the drill rig. This further exacerbated the risks of the driller and the nipper working independently setting up the drill rig.

Fit for purpose tools and equipment

The development drill rig

The original equipment manufacturer placement of the pump outlet / receptacle has changed with this version of the DD421 drill rig involved in the incident. The change in position was due to the positioning of the Telescopic Feed Extension (TFX) valving near the tombstone and mounting of the laser barrier (jumbo guard/ boom stop) devices at the rear of the front wheel arch, limiting real estate. Older versions of the DD421 drill rig had the pump outlet / receptacle nearer the cab, at the rear of the front wheel arch. Previous version positioning meant that workers were not exposed to the risk of crush injuries by the jack leg. Figure 6 shows an unmodified DD421 drill rig.

Figure 6. the DD421 development drill rig, colloquially known as a jumbo. (Renderhub/ ArqArt)

Site based assessment of the jumbo as fit for purpose equipment (Introduction to site) had identified the fitment of a laser barrier (jumbo guard/ boom stop) safety system to prevent personnel movement beyond the rear of the wheel arch during boom operation. Introduction to site documentation required a risk assessment be conducted for any equipment modifications identified however, this risk assessment process was not carried out. The re-location of the pump receptacle, which placed personnel near the hydraulically actuated stabilising jack, introduced a potentially hazardous situation for any person connecting a pump to the receptacle.

Figure 7. Position of pump receptacle above jack leg

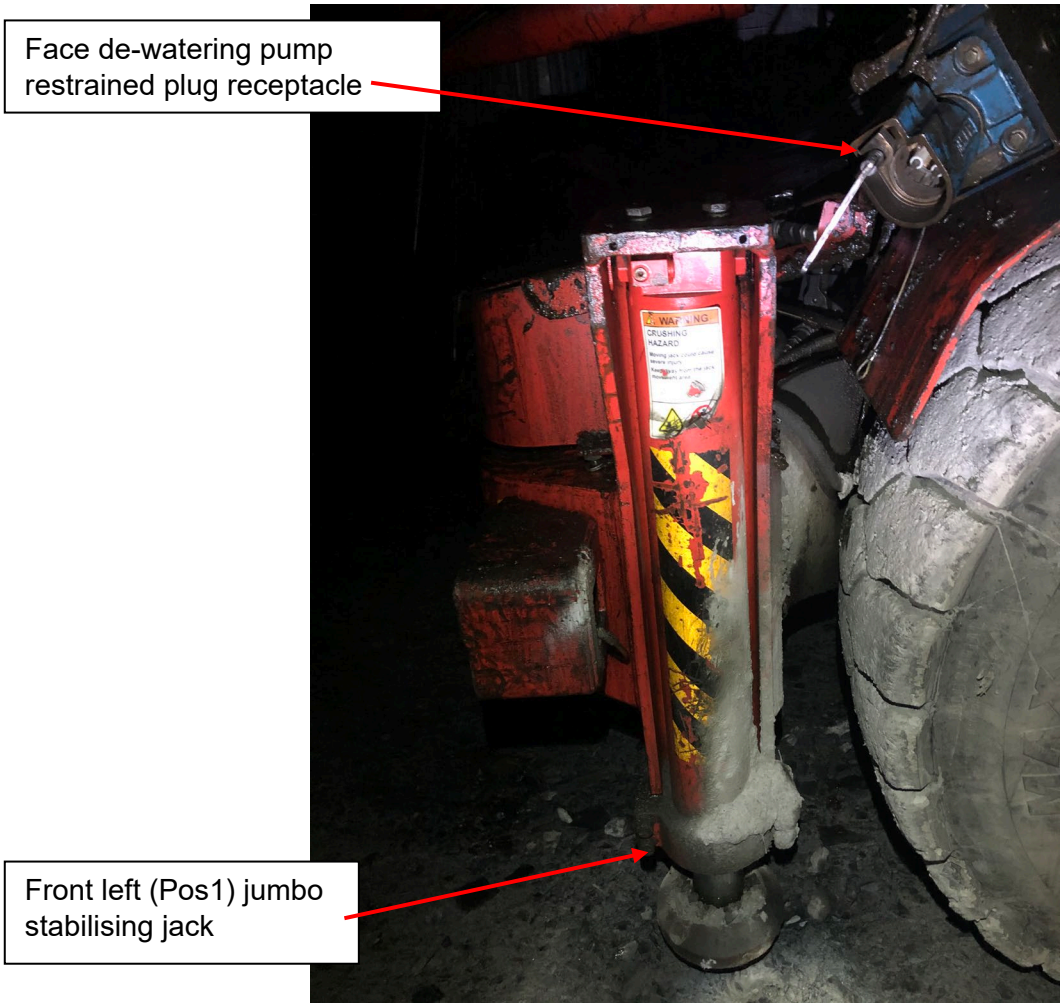


Figure 8. Introduction to site document

CSA-ENG-FRM-4026 – FIT FOR PURPOSE EQUIPMENT REVIEW FOR MEDIUM AND HEAVY MOBILE PLANTS

CSA Mines GLENCORE

Company / Supplier / Contractor		Email	[redacted]
Operator Name	[redacted]		
Operator Contact Numbers	Work: –	Mobile:	[redacted]
Equipment Description: SANDVIK DD421 drill		Date of Manufacture: 2018	
Model: DD421		Equipment Number: UJ005	
Serial Number: LLBDSS739-1		Intended Purpose: Development	
Form Completed by	Name: [redacted]		Date: 11/2/20
Equipment Inspected	Na		Date: 13/2/2020
Site Electrical Engineer Assessed	Name:	Signature:	Date:
Site Mechanical Engineer Assessed	Name:	Signature:	Date:
Maintenance Superintendent Approved	Name:	Signature:	Date:

References

MDG 15 – Guideline for Mobile and Transportable Equipment for Use in Mines
AS1674.2-2007, AS6097A.1, AS2790-1989, AS3000, AS3007, AS5062
NSW Department of Industry and Investment Document EES-014

*** If a shaded box is ticked below in Sections 1 to 8, information is to be provided in the comments section, to demonstrate equipment's suitability or safety.**

1. Plant Safety File	Yes	No	N/A
Are maintenance & operational manuals with the machine?	✓		
Does the manual contain the recommended maintenance periods & procedures?	✓		
Have there been any alterations made to the equipment? Enter summary below in "Modification Details". (If YES then a risk assessment is required in relation to the alterations)		✓	
Does the manual contain a list of all safety devices and their function?	✓		
Has the manufacturer or contractor supplied a list of installed safety critical systems with operational and maintenance instructions? (Check that the Safety Critical Systems checklist has been completed)	✓		

Modification Details:
YUMAR JUMBO GUARD System (Movement prevention personel past front jacks)

Modification identified in Introduction to site document

No risk assessment was conducted to address modification

Figure 9. Damaged and illegible warning signage on opposite jack leg

Underground communications

Poor radio communications in the area meant that maintenance personnel in the vicinity of the incident had to make their way toward the main decline to raise the alarm. This slowed the emergency response for the incident. In this event it didn't contribute to the injuries, however it is still concerning given there are other instances where timely notification of an incident is critical.

Corrective actions

The mining operation is in the process of implementing the following key corrective actions.

Substitution

- Assess the implementation of an air diaphragm pump for use with the jumbo's instead of using Flygt pumps.

Engineering

- Relocation of 1000 volt outlets on affected plant to an area that does not introduce additional hazards.

Administrative

- Develop and implement a training competency and associated safe work instructions specific to personnel classified as nippers working in the underground environment.
- Review and update the mobile equipment introduction to site process to ensure that mobile machinery is fit for purpose and any modifications do not introduce additional hazards.
    - Auditing drill fleet warning signage on jack legs.

Recommendations

Mining operators are recommended to review their safety management systems to ensure:

- work procedures and controls consider the risk of workers being in proximity to equipment under all modes of operation
- no-go zones and safe standing zones for workers should be implemented and communicated to all workers involved in the operation of plant
- maintenance strategies address the legibility and condition of warning signage to ensure it remains effective in informing workers of hazards

- there is a process for mentoring and supervision of new employees working in the mine. This should also be built into the competence management system and should form part of the training program for nippers being developed by the mine.

Further information

Please refer to the following guidance materials:

- MDG15 - Guideline for mobile and transportable equipment for use in mines

The Regulator has issued this information to draw attention to the occurrence of a serious incident in the mining industry. Further information may be published as it becomes available.

Visit our website to:

- learn more about our work on causal investigations and emergency response
- view our publications on other causal investigations.

DOCUMENT CONTROL	
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