Australian Government
Australian Transport Safety Bureau

Office of Transport Safety Investigations

Collision between coal trains MB526 and AH378

Kooragang, New South Wales, on 29 July 2020

ATSB Transport Safety Report
Rail Occurrence Investigation (Short)
RO-2020-013
Final – 4 April 2022

Cover photo: Image taken from signal K31 gantry showing collision site

Source: Office of Transport Safety Investigations

This investigation was conducted under the Transport Safety Investigation Act 2003 (Commonwealth) by the **Office of Transport Safety Investigations (New South Wales)** on behalf of the Australian Transport Safety Bureau in accordance with the Collaboration Agreement.

Released in accordance with section 25 of the *Transport Safety Investigation Act 2003*

Publishing information

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Addendum

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Safety summary

What happened

On 29 July 2020 at 0508, a loaded Pacific National (PN) coal train MB526 collided with the rear of a One Rail Australia (ORA) coal train AH378. MB526 was routed behind AH378 on number 3 arrival road in Kooragang Coal Terminal. At the time of impact, MB526 was moving at approximately 16 km/h. AH378 was stationary due to technical issues that occurred while it was unloading coal.

The collision resulted in significant damage to the rail infrastructure and the derailment of the last two wagons of AH378 and the leading locomotive of MB526. The derailed locomotive and wagons also came into contact with two adjacent stationary trains, BC346 and HV274. These trains sustained minor damage. The driver of the derailed locomotive experienced minor injuries.

What the ATSB found

While AH378 was unloading at Kooragang Island Coal Terminal, several penalty brake applications, associated with a fault in its electronic pneumatic brake system, disabled the train bringing it to a standstill. The crew investigated the faults using a series of technical exercises, which then caused the End of Train (EOT) light on AH378 to be extinguished. The disablement of AH378 constituted a Condition Affecting the Network (CAN) but the crew did not report it to the Kooragang Network Controller as they were required to do. As the Kooragang Network Controller was unaware that AH378 was disabled on number 3 arrival road, they set a signal for MB526 which allowed it to proceed, with caution along number 3 arrival road. When the crew of MB526 saw the shunt proceed signal combined with information they had received earlier, they were expecting any train ahead to be operating farther along the track and illuminated with an EOT light.

The terminal area where the accident occurred was poorly lit by artificial trackside lighting and the absence of the EOT light on AH378 reduced its conspicuity. Light produced by an overhead gantry, above the accident site, may also have caused disabling glare for the drivers of train MB526. In combination, these factors reduced the likelihood that the drivers of MB526 would have seen train AH378 in time to prevent a collision.

The crew's expectations combined with glare from a nearby overhead signal gantry concealed the presence of AH378 until it was too late to avoid a collision.

What has been done as a result

On 1 August 2020, PN issued notices that informed drivers that on receiving a shunt proceed signal within Kooragang Coal Terminal, they must not exceed 8 km/h and should also proceed as if the line ahead is already occupied.

ORA added programmed monitoring of EOT lights into its asset management plan. ORA also circulated safety information (Notice to Drivers -HV-0046) to their drivers which reminded them of the requirement to communicate all conditions affecting the network to network control.

The Australian Rail Track Corporation (ARTC) provided advice to rail operators to clarify, the operation of trains with defective EOT lights. ARTC also updated information contained in the Rail Access Standard general information.

Safety message

This accident highlights the importance of train crews communicating conditions affecting the network to network control. It also emphasises the need for train crews operating in areas of restricted visibility to be prepared to stop short of any obstruction on the track.

Contents

The investigation

Decisions regarding whether to conduct an investigation, and the scope of an investigation, are based on many factors, including the level of safety benefit likely to be obtained from an investigation. For this occurrence, a limited-scope investigation was conducted in order to produce a short investigation report, and allow for greater industry awareness of findings that affect safety and potential learning opportunities.

The occurrence

On 29 July 2020, PN was operating freight train MB526 between Maules Creek and Kooragang Coal Terminal, New South Wales (NSW). Ahead of MB526 was the ORA-operated coal train AH378.

At approximately 0305[1], AH378 entered 3 arrival road in Kooragang Coal Terminal making its way towards number 3 dump station.

At approximately 0325, MB526 departed Branxton Station (215.540 km) in the Up[2] direction with two crew on board, comprising the driver and second person. The two crew had just taken over the train at Branxton and had been informed by the departing crew, that a train was somewhere ahead of MB526 with an extinguished EOT light (referring to, but not identifying, HV274).

At 0352, MB526 approached Lochinvar Station (202.600 km) and made a 35 % brake application. The crew identified no issues with the brakes at the time. At approximately the same time, AH378 commenced discharging at number 3 dump station (177.288 km[3]). The journey of MB526 is illustrated in Figure 1.

Figure 1: Incident location and path of MB526

Source: Geoscience annotated by OTSI

[1] Times in this report are in 24-hour Australian Eastern Standard Time (AEST).

[2] In NSW, trains travelling towards Sydney travel in the up direction, trains travelling away from Sydney are travelling in the down direction.

[3] Kilometre mark in NSW is the distance a section of rail is from Platform 1 Central Station, Sydney, NSW.

While unloading, AH378 experienced several Electronically Controlled Pneumatic (ECP) brake penalties[4] and eventually came to a stand at 0410. The crew of AH378 called for technical assistance from ORA rolling stock maintainers to rectify the situation. AH378 was stationary as the crew and maintainers diagnosed the cause of the ECP penalties.

At approximately 0427, PN coal train HV274 (proceeding under Block Working, due to an extinguished EOT light), entered arrival road 1 and came to a stop a short time later, approximately 45 m before number 1 dump station (177.310 km).

At 0433, the MB526 second crew member called the PN Kooragang team leader on the phone. The team leader advised MB526 that they would be tipping at dump station 3 and that AH378 was ahead of them with approximately half a load to tip.

At 0434, the Australian Rail Track Corporation (ARTC) Kooragang Network Controller, set signal K23 (175.384 km) to a 'shunt proceed' aspect. The controller was unaware of the technical difficulties AH378 was experiencing when this occurred.

At 0451, MB526 entered Kooragang yard limits (170.047 km) and proceeded along a route with clear signals. The crew of MB526 were carrying out several observational duties as they passed the series of signals that authorised MB526 to continue towards number 3 dump station.

At 0457, the AH378 crew ended ECP[5] in an effort to rectify the brake penalties on AH378. It is likely the crew were unaware, that ending the ECP also extinguished the EOT light. The unlit rear of AH378 was located at approximately 176.165 km. The crew of AH378 did not inform the Kooragang Network Controller of this action.

At 0503 MB526 passed signal K17 (174.982 km), which was set at caution, the train was travelling at approximately 18 km/h with the headlights set to Bright to improve visibility in an area of the yard with little or no trackside lighting. At 0503:36, the crew confirmed that points 107 and 111 (175.177 km) were correctly set. After the driver confirmed that they were not on the same arrival road as BC246 (arrival road 4), the driver set the train speed to 15 km/h.

At 0506:07, MB526 entered arrival road 3 and approached signal K23 (175.384 km), the crew confirmed the signal was set to a calling on aspect, meaning they could proceed past the signal. MB526 passed K23 signal in throttle notch 2 at approximately 9 km/h, slowly accelerating to approximately 18 km/h as it later passed the 176.096 km mark. Shortly after passing K23 (0506:15), the crew identified the rear of the earlier reported unlit train (HV274) on arrival road 1 and discussed challenges with seeing an unlit wagon in the dark. During this discussion, MB526's headlight, was switched to Dim mode then switched off (175.495 km). The headlight remained off while the crew continued the conversation until 0506:50 when the headlight was turned back on to Dim mode (175.609 km). MB526's loco data logger shows the train had travelled for approximately 35 seconds and 114 m with the lights off.

When the lights were turned on, unbeknownst to the crew, MB526 was approximately 550 m from the unlit rear of AH378, travelling at 13 km/h and accelerating.

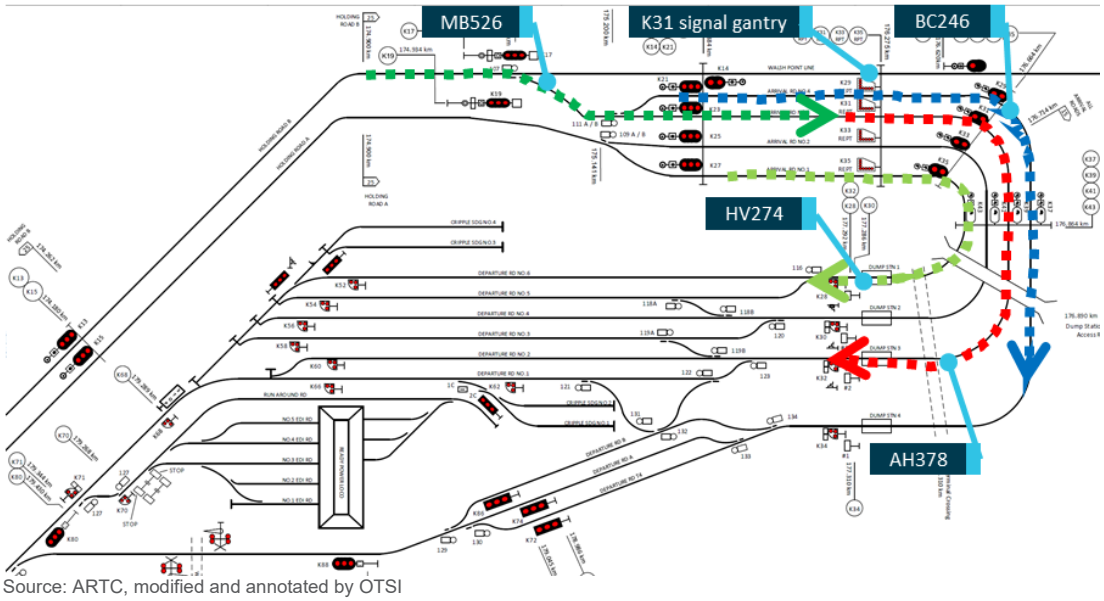
At 0508:47, the driver of MB526 made an emergency brake application after the assistant driver shouted a warning when they saw the unlit rear wagon of AH378 appear close ahead, out of the darkness.

At 0508:49, MB526 collided with the rear wagon of AH378 on arrival road 3 at Kooragang Coal Terminal, between signals K23 and K31 and came to a stop at approximately at 176.160 km (Figure 2).

[4] A penalty occurs when the ECP brake system detects a fault and then automatically applies the brakes.

[5] For an explanation of ECP see page 8. Ending ECP refers to the shutting down of the ECP system.

Figure 2: Kooragang Island with approximate location of trains at time of incident



Source: ARTC, modified and annotated by OTSI

As a result of the collision, MB526's lead locomotive (9211) derailed to the left, impacting and derailing a wagon of ORA coal train BC246 on arrival road 4. The wagon (PHWH0214S) remained upright and coupled to the remainder of BC246. AH378's rear two wagons (PHEH01514D and PHEH01513R), derailed to the right and struck PN coal train HV274, derailing a wagon (NHRH50410Q), this wagon remained upright and coupled to HV274 (Figure 3).

Figure 3: Collision site

Source: OTSI, modified and annotated by OTSI

The incident also resulted in damage to approximately 70 m of rail and concrete sleepers on number 2 and 3 arrival roads.

Context

Train crew

MB526 was operated by two crew: a driver and an assistant driver. Both crew were appropriately qualified. Neither driver was originally rostered to work the morning of the accident. At around 2000 on 28 July, a PN rostering clerk called each driver and requested they undertake a shift

starting 0015 on 29 July. There was a 90-minute stand-up/call time for this shift, meaning the drivers would be called at 2245. The start time for the drivers' shift was subsequently pushed back to 0215 and the drivers were called at around 1215.

The driver and assistant driver, both advised the PN internal safety investigation they went to sleep immediately after accepting the job and achieved a reasonable quality sleep. Based on the available information, the drivers probably each achieved around 4 hours sleep prior to commencing their shift.

Both drivers reported having a sleep-in on the day prior to the accident, and neither reported feeling fatigued at the time of the accident. Considering that the accident did not occur at a time of day typically associated with the nadir of circadian alertness, and that the development of the accident was not indicative of fatigue-related performance problems, the ATSB did not identify fatigue as a contributory safety factor.

Environmental conditions and visibility

On the morning of the accident, the sun rose at 0645, with astronomical twilight starting at 0521. It was not raining at the time of the accident, but rain had fallen overnight, and the ground was wet. Environmental conditions at the time of the accident were dark.

The area where the accident occurred was not lit by artificial trackside lighting except for the overhead gantry signal lights. As MB526 travelled along arrival road 3, the two stationary trains on the adjacent arrival roads 1 and 4 created a corridor and may have blocked ambient light. During interview, the drivers of MB526 recalled that conditions on arrival road 3 were very dark.

MB526 was equipped with a front-facing video camera and the ATSB reviewed footage of the approach along arrival road 3. The video (as captured in Figure 4) showed that conditions were dark, and that after the train drivers extinguished the headlights, nothing was visible outside apart from distant artificial lighting.

Figure 4: Video onboard MB526 three seconds apart, showing outside visibility with headlights on Bright mode (upper), Dim mode (middle) and off (lower)

Source: Pacific National

The rear of train AH378 was 110 m before the overhead gantry signal K31, in MB526's direction of travel. Video footage from MB526 showed that as the train approached the gantry, the gantry lights appeared to produce a halo of light which occluded the surrounding area. The rear of train AH378 only became visible in the video footage a few seconds prior to impact. The drivers of train MB526 did not mention any problems associated with the overhead gantry but did recall that AH378 appeared to "come out of nowhere" (Figure 5).

Figure 5: MB526 front of train CCTV frames over 7 seconds

Source: Pacific National annotated by OTSI

The ATSB investigation did not examine the visibility of trains at the Kooragang freight terminal including around the overhead gantry and relied on the information provided by the drivers and the CCTV footage. While CCTV footage indicated the gantry may have produced glare, the appearance of glare is different in recorded video compared to as seen by the human eye.

The driver also recalled that because the PN Kooragang team leader had advised the crew of MB526 earlier in their journey that the train ahead was dumping at dump station 3 and was halfway through dumping their load, they expected this to be completed and the train to have moved off by the time they arrived at that section of track. Because of this, the driver was not expecting a train to be positioned underneath the gantry and their gaze was focussed further down the track.

Train information

MB526 consisted of three 92 class locomotives and 82 ECP loaded coal hopper wagons. The three 92 class locomotives were arranged with 9211 in the lead, 9203 second and 9207 in the third position. The drivers were operating the train from locomotive 9211.

The 92 class locomotives were 22 m in length and weighed 139 tonnes. They had two 350W headlights and two 100W ditch lights at either end. The locomotives had a crew of two, the driver and assistant driver. The train crew were appropriately qualified.

The 82 wagons were of the NHEH class, which weighed (empty) approximately 22 t each, were arranged in packs of four which had a combined capacity of 432 cubic metres of coal. MB526 was approximately 1325 m in length and the 82 wagons had a combined loaded weight of 9840 t.

AH378 consisted of three XRN class locomotives and 96 PHEH/PHYH coal hopper wagons. The train length was 1478 m, with a total mass of 11348 t. The train was equipped with ECP braking and an extinguished EOT light.

Headlights

The lead locomotive of MB526 had two 350W headlights and two 100W ditch lights. The headlights could be operated in two brightness settings: Bright and Dim. The light switch panel in the locomotive enabled the train driver to turn the headlights on and off and select the brightness setting.

The driver said that after they passed the unlit rear of train HV274, they extinguished their headlights to demonstrate to the assistant driver the difficulties of seeing an unlit train in the dark conditions. At interview the driver said that it was often easier to see an EOT light with the headlights on Dim mode. The driver said that Dim mode offered reduced reflections from adjacent wagons in dark conditions, which allowed the earlier identification of an EOT light.

The front-facing video from MB526 showed the driver turned the headlights to Dim mode before turning the headlights off after passing HV274. When the headlights were turned to Dim mode, visibility ahead of the train was significantly reduced.

ECP and EOT

Electronically controlled pneumatic braking system is an electrically controlled system that applies or releases the service brake on each wagon simultaneously at the driver's command. The system connects from the locomotives to each wagon both electrically and pneumatically. The simultaneous application of braking force on each wagon improves braking performance and assists in train handling.

The system includes a failsafe feature that automatically applies the brakes if the electrical connection between the wagons be broken or the air supply lost.

The ECP cable also provides power to the train EOT light (Figure 6), if the ECP fails or is turned off, the EOT light extinguishes. The EOT light on the rear wagon of AH378 was extinguished at the time of the accident. The last wagon on AH378 also had reflective discs to assist with visibility in lowlight conditions.

The driver of MB526 said that as they were proceeding along arrival road 3, they were looking for an EOT light to locate the train ahead. Having seen the unlit rear of train HV274, the driver assumed this was the train they had previously been advised was operating without an EOT light, and did not think there would be another train ahead that was also operating without an EOT light.

Figure 6: EOT marker light and impact point

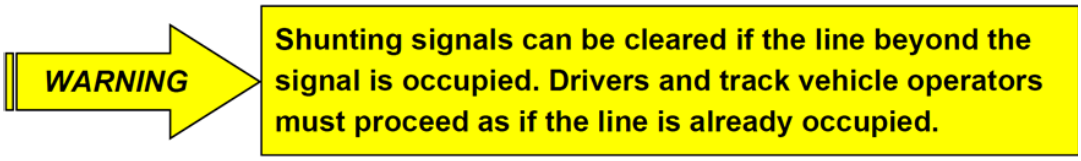
Source: OTSI

Network procedures related to the 'shunt proceed' signal

ANSG 606 Responding to Signals and Signs prescribes the rules for responding to signal indications and signs on the ARTC network. It contains a description of how to interpret and respond to track signals which inform train drivers and qualified workers about the status of the line ahead.

The shunt proceed signal authorised the train driver to pass the signal at restricted speed[6], with the knowledge that another train was occupying the next section. The procedure for responding to a shunting signal included a warning for the driver (Figure 7).

Figure 7: ANSG606 warning to drivers



Source: ARTC

This rule required a driver to travel at a speed that allowed the train to stop within the visible section of the line, short of any obstruction. On a bright sunlit day with unlimited visibility a higher speed could be considered appropriate 'restricted speed', as long as the train could stop short of an obstruction. In low light conditions obstructions appear much closer to the front of the train and

[6] Restricted Speed is a speed that allows rail traffic to stop short of an obstruction within the distance of clear line that is visible ahead.

a lower speed would be appropriate, considering the weight of the train and its effect on stopping distance.

At interview, the driver of MB526 said that because they had received a shunt proceed signal, they did not expect to see a train without a lit EOT light ahead.

Related occurrence

On 26 June 2012, a loaded coal train (Unit 3 BG146) collided with another loaded coal train (Unit 9 BS288) that was discharging at number 2 dump station. The incident occurred very close to the location of the 29 July 2020 incident.

Following the 2012 incident PN issued a Local Safety Notice (LSN No: CH23/12) to train crews. The safety notice described the incident and reminded train crews of the controls already in place to minimise the likelihood of a train collision. These included the PN route knowledge pack for Kooragang Coal Terminal which specified a 15 km/h speed limit for the section where the incident occurred. The safety notice also included a reminder that the Terminal was operated under Yard Working Conditions and that caution signals required the slowing of trains to ensure that the train can be stopped clear of any obstacles that may be on the track.

On 26 September 2012, PN issued a Divisional Safety Notice (DSN 15/12) which superseded the Local Safety Notice. DSN 15/12 imposed a speed limit of 10 km/h on PN trains from signal K13 (174.180 km) until they reached a brick building (adjacent to the position of the July 2020 collision location at 176.160 km). From the point adjacent to the brick building to the dump stations a speed of 5 km/h was imposed (Figure 8). This speed limit was less than the posted 25 km/h ARTC limit.

Figure 8: Kooragang reduced speed limit issued by PN in 2012

Source: PN annotated by OTSI

The PN self-imposed speed limit was discontinued before the time of the July 2020 accident.

ARTC NSW Network Rules and Procedures

Rail movements within the confines of the Kooragang Coal Terminal are subject to a series of network rules and procedures defined by the ARTC. These rules and procedures include instructions for train operators utilising the ARTC NSW network in general and Kooragang specifically.

ANGE 206 Reporting and Responding to a Condition Affecting the Network (CAN), prescribes rules for reporting and responding to unsafe conditions affecting or potentially affecting the ARTC network. This rule mandates that any conditions that can or do affect safe rail operations in the ARTC network must be reported promptly to the Network Control Officer and the appropriate response be implemented.

ANSG 606 Responding to Signals and Signs, prescribes the rules for responding to indications and signs in the ARTC network. It contains a description of how to interpret and respond to track signals which inform train drivers and other qualified workers about the status of the line ahead.

ANSG 608 Passing Signals at Stop, prescribes the rules for passing signals at stop in the ARTC network. This rule provides instruction requiring a driver to communicate with a Network Controller before passing a signal at stop on the wider ARTC NSW network.

ANTR 400 Protecting Trains, prescribes rules for protecting trains in the ARTC NSW network.

ANTR 404 Using Brakes, prescribes rules for using train brakes safely in the ARTC network. This procedure includes a requirement to notify a Network Controller if a train is suffering an abnormality of defect with the brakes.

ANTR 406 Using Train Lights, prescribes rules for using train lights for indication and warning on the ARTC network. It includes a requirement for trains to have at least one white marker at the front and at least one approved red tail light or approved end of train marker at the rear of the last vehicle. The EOT light must be lit in low visibility conditions. This rule also includes a requirement for a Network Controller to arrange for the train to operate as a block train if the EOT is unlit at night. The rule also requires the illumination of a train's headlights on full at all-times on the ARTC network unless required to be dimmed. The headlights must be dimmed when approaching an opposing train, when hand signals are displayed, when approaching workers near the track and during shunting.

ANTR 416 Disabled Trains, prescribes rules for dealing with disabled trains in the ARTC network. The rule includes requirements for a disabled train's crew to report to the Network Controller the nature of the failure and to take steps to protect the train.

ANTR 418 Yard limits, prescribes rules for the safe movement of rail traffic within yards in the ARTC NSW network.

ANTR 420 Shunting and marshalling, prescribes rules for making safe shunting movements in the ARTC NSW network.

ANPR 722 Manual Block Working, prescribes rules to prevent rail traffic entries into occupied blocks of track.

ANSY512 Manual Block Working, prescribes the rules for manually maintaining blocks between rail traffic movements in the ARTC NSW network.

Safety analysis

Communication of Condition Affecting the Network

On the morning of 29 July 2020, the driver of AH378 responded to a series of ECP penalties by contacting maintenance personnel to assist with the fault diagnosis of the brake system. During the fault diagnosis of this system, the crew of AH378 did not report the disablement of the train to the ARTC Kooragang Network Controller as required by network rules including ANGE 206 Condition Affecting the Network (CAN) and ANTR 416 Disabled Trains.

At 0457 when the ECP was ended and the EOT light extinguished, the requirements for managing trains under ANTR406 (Block Working) were not implemented. This occurred because earlier at 0434, the Kooragang Network Controller had not been informed that, and did not notice on their display, AH378 was disabled at the dump station. As a result, they set signal K23 to shunt proceed instead of setting to stop and using block working. The shunt proceed signal allowed MB526 to enter the same section of track towards the already disabled AH378.

While MB526 was approaching the rear of AH378 on arrival road 3, the Kooragang Network Controller was involved in carrying out block working of train HV274, which was operating with an unlit EOT light on arrival road 1. The block working involved an increased workload for the

Kooragang Network Controller. It is likely that the controller, communicating with HV274 and concentrating on ensuring that the correct signals were set to protect the train, did not notice that AH378 was stationary.

Had the Network Controller been informed of or realised that a CAN existed it is unlikely, based on the requirements of block working, that they would have authorised MB526 to enter the section with AH378.

Visibility and headlight use

As the crew of train Pacific National train MB526 travelled along Kooragang terminal approach road 3, their vision of the track ahead was limited by the dark conditions outside. The approach road was unlit by trackside lighting and two other trains occupied the adjacent approach roads 1 and 4, blocking other trackside light sources.

Ahead of train MB526 was train AH378, immediately ahead of the overhead gantry displaying signal K31. Bright lights can sometimes cause visual problems due to extra light being scattered within the eye onto the retina, thereby reducing contrast of the retinal image.[7] Where this causes some loss of visual capability, this is described as ‘disability glare’. Footage from the forward-facing video recorded from MB526 showed that the gantry lights appeared very bright, which may have caused disability glare for the drivers and impaired their vision of the track (and train) ahead.

Without trackside lighting, the ability of the crew of MB526 to see AH378 was dependent on the light produced by either train. Due to maintenance actions, the end of train marker light at the rear of train AH378 was unlit, greatly reducing the conspicuity of the train to oncoming vehicles.

The crew of MB526 turned off their headlights for around 35 seconds as they traversed the dark approach road, before activating the headlights in Dim mode when they were around 550 m prior to the rear of train AH378. The selection of Dim mode met the requirements of ARTC Network Rule ANTR 406, headlights must be dimmed where shunting is taking place.

In Dim mode, the headlights cast much less light, reducing the opportunity of the drivers to identify objects ahead of the train. However, it was not possible to determine whether the use of Dim mode contributed to the late detection of the rear of train AH378, due to the uncertain impact of glare from the overhead gantry. Further, it is noted that the crew were expecting the rear of any trains ahead to be lit and considered that Dim mode might help with detecting lit objects.

In summary, the drivers of train MB526 were operating in a very dark environment, driving towards an unlit obstacle. These visual conditions were very challenging and reduced the likelihood the drivers would see train AH378 in time to prevent a collision.

Train crew expectancy

Prior to entering the section of track occupied by train AH378, the crew of train MB526 received a shunt proceed signal which meant the track ahead may be occupied but implied there was no CAN on the proceeding track such as a disabled train. The crew had received no information that a train was stationary and disabled without an EOT light, ahead of the overhead gantry, in the area possibly obscured by light glare.

At the beginning of their journey, the crew had been informed there was another train operating ahead of them without an EOT light. When the crew sighted train HV246, they assumed that this was the train about which they had been forewarned. Later in their journey, the crew had been informed that a train ahead was halfway through dumping. Based on this information, the drivers expected any proceeding train to be farther down the track, well beyond the gantry.

These preceding events shaped the drivers’ expectations for the route ahead, and where they were looking. The crew were focussed on the section of track farther along the approach road,

[7] Davoudian N, Raynham P, Barrett E. Disability glare: A study in simulated road lighting conditions. Lighting Research & Technology. 2014 Dec;46(6):695-705.

past the curve, and were looking for an illuminated EOT light. The drivers' low expectancy of a train in that section of track, and low expectancy of an unilluminated train reduced the likelihood that they would notice train AH378 in time to prevent a collision.

When interviewed the crew said, that confirming the location of the train with the unlit EOT (HV274) that they had been warned about and the absence of any EOT light in front led them to relax, as the situation appeared as they expected. The driver expected the train ahead was around the corner and was preparing to slow MB526 as they passed the next signal before they reached the turn (Figure 11).

Figure 9: Bend in Kooragang arrival roads

Source: OTSI

Findings

ATSB investigation report findings focus on safety factors (that is, events and conditions that increase risk). Safety factors include 'contributing factors' and 'other factors that increased risk' (that is, factors that did not meet the definition of a contributing factor for this occurrence but were still considered important to include in the report for the purpose of increasing awareness and enhancing safety). In addition 'other findings' may be included to provide important information about topics other than safety factors.

These findings should not be read as apportioning blame or liability to any organisation or individual.

From the evidence available, the following findings were made with respect to the collision between coal trains MB526 and AH378 in Kooragang, NSW on 29 July 2020.

Contributing factors

- Kooragang terminal approach road 3 was unlit by trackside artificial lighting and was very dark. The conspicuity of the stationary train AH378 was reduced by the absence of an illuminated end of train marker. The light produced by an overhead gantry may have caused disabling glare for the drivers of train MB526. In combination, these factors reduced the likelihood that the drivers of MB526 would have seen train AH378 in time to prevent a collision.
- The crew of AH378 did not report the disablement of the train to the network control officer as required under the network rules, ANGE206 Condition Affecting the Network, ANTR 404 Using brakes and ANTR 416 Disabled trains.
- The Kooragang Network Controller did not know or had not noticed that AH378 was disabled at the dump station. As a result, they set signal K23 to shunt proceed instead of setting it to stop and using block working.
- The shunt proceed signal authorised the crew of MB526 onto the section of track occupied by AH378. Based on this and information received earlier in the journey, the crew of MB526 expected any train ahead to be operating farther along the track and that it would be illuminated with end of train lights. The crew's low expectation of the unlit train AH378 immediately before the gantry, reduced the likelihood they would have detected the train in time to prevent collision.

Other factors that increased risk

- The driver of train MB526 deactivated the train headlights while operating along an unlit section of track. This greatly increased the risk of collision with an undetected obstacle.
- The start time initially allocated by PN rostering to the drivers of train MB526 provided a rest opportunity of 2 hours and 15 minutes. This is significantly below the time normally required to achieve sufficient restorative rest. Had the drivers woken at 2245 as planned, they would have experienced an acute sleep debt and an unacceptable risk of fatigue.

Safety actions

Whether or not the ATSB identifies safety issues in the course of an investigation, relevant organisations may proactively initiate safety action in order to reduce their safety risk. All of the directly involved parties are invited to provide submissions to this draft report. As part of that process, each organisation is asked to communicate what safety actions, if any, they have carried out to reduce the risk associated with this type of occurrences in the future. The ATSB has so far been advised of the following proactive safety action in response to this occurrence.

Safety action by Pacific National

On 1 August 2020, PN issued Local Safety Notice 20-71 *Responding to Shunt Proceed Indications*. This notice reminded drivers that when they receive a shunt proceed signal, they must proceed as if the line ahead is already occupied and at a maximum of 8 km/h.

The 8 km/h speed limit was implemented for operations at Kooragang Coal Terminal (from signal K5 at 172.830 km) and Port Waratah Terminal (from signal PW2 at 164.945 km).

PN participated in regular meetings with the ARTC to discuss concerns raised from the incident.

Safety action by One Rail Australia

ORA instigated a review of their asset management plan to include programmed monitoring of EOT lights. On 28 August 2020, ORA also circulated safety information (Notice to Drivers -HV-0046) to all their drivers. This notice reminded drivers of the requirement to communicate with network control all conditions affecting the network. The notice also informed train crew that when ECP is ended the EOT light extinguishes. ORA provided copies of network rules *ANGE232 Responsibilities of Rail Traffic Crews and ARTC Network Rule ANTR416 Disabled Trains* with the notice to drivers.

ORA also participated in regular meeting with the ARTC to discuss concerns raised from the incident.

Safety action by Australian Rail Track Corporation

The ARTC provided clarification advice to rail operators, regarding the operation of trains with defective EOT lights. This advice was in the form of two notices (SAFE Notice and Standing Notice).

The ARTC also updated the information contained in the Rail Access Standard (general information). ARTC plans to undertake a review of the Kooragang Operations Protocol and to conduct a risk assessment to ensure the risk of collision is effectively managed and controlled during operations.

The ARTC met with rail operators to improve safe operations on their network.

General details

Occurrence details

Date and time:	29 July 2020 – 0508 EST	
Occurrence category:	Accident	
Primary occurrence type:	Collision	
Location:	Kooragang, New South Wales	
	Latitude: 32º 52.225' S	Longitude: 151º 46.194' E

Train 1 details

Track operator:	Port Waratah Coal Services	
Train operator:	One Rail Australia	
Train number:	AH378	
Type of operation:	Freight	
Consist:	Coal	
Departure:	Ashton Coal Project, Camberwell, New South Wales	
Destination:	Kooragang	
Persons on board:	Crew – 2	Passengers – 0
Injuries:	Crew – 0	Passengers – NA
Damage:	Substantial, 4 wagons damaged	

Train 2 details

Track operator:	Port Waratah Coal Services	
Train operator:	Pacific National	
Train number:	MB526	
Type of operation:	Freight	
Consist:	Coal	
Departure:	Whitehaven Coal, Maules Creek, New South Wales	
Destination:	Kooragang	
Persons on board:	Crew – 2	Passengers – 0
Injuries:	Crew – 1	Passengers – NA
Damage:	Substantial, 1 locomotive damaged	

Sources and submissions

Sources of information

The sources of information during the investigation included the:

- Australian Rail Track Corporation
- One Rail Australia
- Pacific National
- Sydney Trains

Submissions

Under section 26 of the *Transport Safety Investigation Act 2003*, the ATSB may provide a draft report, on a confidential basis, to any person whom the ATSB considers appropriate. That section allows a person receiving a draft report to make submissions to the ATSB about the draft report.

A draft of this report was provided to the following directly involved parties:

- Australian Rail Track Corporation
- Office of the National Rail Safety Regulator
- Pacific National

Submissions were received from:

- Australian Rail Track Corporation
- Office of the National Rail Safety Regulator
- One Rail Australia
- Pacific National

The submissions were reviewed and, where considered appropriate, the text of the report was amended accordingly.

Australian Transport Safety Bureau

About the ATSB

The ATSB is an independent Commonwealth Government statutory agency. It is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers.

The ATSB's purpose is to improve the safety of, and public confidence in, aviation, rail and marine transport through:

- independent investigation of transport accidents and other safety occurrences
- safety data recording, analysis and research
- fostering safety awareness, knowledge and action.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia, as well as participating in overseas investigations involving Australian-registered aircraft and ships. It prioritises investigations that have the potential to deliver the greatest public benefit through improvements to transport safety.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and Regulations and, where applicable, international agreements.

Rail safety investigations in New South Wales and Victoria

Most transport safety investigations into rail accidents and incidents in New South Wales (NSW) and Victoria are conducted in accordance with the Collaboration Agreement for Rail Safety Investigations and Other Matters between the Commonwealth Government of Australia, the State Government of NSW and the State Government of Victoria. Under the Collaboration Agreement, rail safety investigations are conducted and resourced in NSW by the Office of Transport Safety Investigations (OTSI) and in Victoria by the Chief Investigator, Transport Safety (CITS), on behalf of the ATSB, under the provisions of the *Transport Safety Investigation Act 2003*.

- **Office of Transport Safety Investigations (OTSI)** is an independent statutory body which contributes to improvements in the safety of bus, ferry and rail passenger and rail freight services in NSW by investigating safety incidents and accidents, identifying system-wide safety issues and sharing lessons with transport operators, regulators and other key stakeholders. Visit www.otsi.nsw.gov.au for more information.

Purpose of safety investigations

The objective of a safety investigation is to enhance transport safety. This is done through:

- identifying safety issues and facilitating safety action to address those issues
- providing information about occurrences and their associated safety factors to facilitate learning within the transport industry.

It is not a function of the ATSB to apportion blame or provide a means for determining liability. At the same time, an investigation report must include factual material of sufficient weight to support the analysis and findings. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner. The ATSB does not investigate for the purpose of taking administrative, regulatory or criminal action.

Terminology

An explanation of terminology used in ATSB investigation reports is available on the ATSB website. This includes terms such as occurrence, contributing factor, other factor that increased risk, and safety issue.