



Australian Government

Australian Transport Safety Bureau



ATSB TRANSPORT SAFETY INVESTIGATION REPORT
Rail Occurrence Investigation 2006/011
Final

Collision between
freight train 4AM3
and an
elevated platform vehicle
at North Geelong in Victoria

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ISBN and formal report title: see 'Document retrieval information' on page v.

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DOCUMENT RETRIEVAL INFORMATION

Report No.	Publication date	No. of pages	ISBN
2006/011	8 May 2008	49	978 1 921490 18 7

Publication title

Collision between freight train 4AM3 and an 'elevated platform vehicle' at North Geelong in Victoria 26 October 2006.

Prepared by

Australian Transport Safety Bureau
PO Box 967, Civic Square ACT 2608 Australia
www.atsb.gov.au

Reference No.

May2008/Infrastructure 08118

Acknowledgements

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Front page photo, Figure 11 and Figure 12 supplied courtesy of Department of Infrastructure – Public Transport Safety Victoria.

The ATSB acknowledges the cooperation of all who participated and assisted in this investigation.

Abstract

At approximately 0832 on 26 October 2006 an Adelaide to Melbourne bound Pacific National freight train collided with an elevated platform vehicle containing a worker performing maintenance on the Separation Street overpass at North Geelong in Victoria. The worker was inside the elevated platform vehicle basket which was positioned underneath the overpass and directly above the rail line when it was struck by the train. The worker was seriously injured as a result of the collision.

At the time of the collision the North Geelong site was under the operational control of the North Geelong 'C' signalbox with site protection being provided by a qualified track protector.

The investigation found that a deviation from the formally documented and agreed safety plan, combined with a subsequent misinterpretation and the miscommunication of the relevant safeworking rules and procedures between operational staff, were the primary factors contributing to the collision.

THE AUSTRALIAN TRANSPORT SAFETY BUREAU

The Australian Transport Safety Bureau (ATSB) is an operationally independent multi-modal bureau within the Australian Government Department of Infrastructure, Transport, Regional Development and Local Government. ATSB investigations are independent of regulatory, operator or other external organisations.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within Commonwealth jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to fare-paying passenger operations.

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

Purpose of safety investigations

The object of a safety investigation is to enhance safety. To reduce safety-related risk, ATSB investigations determine and communicate the safety factors related to the transport safety matter being investigated.

It is not the object of an investigation to determine blame or liability. However, 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.

Developing safety action

Central to the ATSB's investigation of transport safety matters is the early identification of safety issues in the transport environment. The ATSB prefers to encourage the relevant organisation(s) to proactively initiate safety action rather than release formal recommendations. However, depending on the level of risk associated with a safety issue and the extent of corrective action undertaken by the relevant organisation, a recommendation may be issued either during or at the end of an investigation.

The ATSB has decided that when safety recommendations are issued, they will focus on clearly describing the safety issue of concern, rather than providing instructions or opinions on the method of corrective action. As with equivalent overseas organisations, the ATSB has no power to implement its recommendations. It is a matter for the body to which an ATSB recommendation is directed (for example the relevant regulator in consultation with industry) to assess the costs and benefits of any particular means of addressing a safety issue.

TERMINOLOGY USED IN ATSB INVESTIGATION REPORTS

Occurrence: accident or incident.

Safety factor: an event or condition that increases safety risk. In other words, it is something that, if it occurred in the future, would increase the likelihood of an occurrence, and/or the severity of the adverse consequences associated with an occurrence. Safety factors include the occurrence events (e.g. engine failure, signal passed at danger, grounding), individual actions (e.g. errors and violations), local conditions, risk controls and organisational influences.

Contributing safety factor: a safety factor that, if it had not occurred or existed at the relevant time, then either: (a) the occurrence would probably not have occurred; or (b) the adverse consequences associated with the occurrence would probably not have occurred or have been as serious, or (c) another contributing safety factor would probably not have occurred or existed.

Other safety factor: a safety factor identified during an occurrence investigation which did not meet the definition of contributing safety factor but was still considered to be important to communicate in an investigation report.

Other key finding: any finding, other than that associated with safety factors, considered important to include in an investigation report. Such findings may resolve ambiguity or controversy, describe possible scenarios or safety factors when firm safety factor findings were not able to be made, or note events or conditions which 'saved the day' or played an important role in reducing the risk associated with an occurrence.

Safety issue: a safety factor that (a) can reasonably be regarded as having the potential to adversely affect the safety of future operations, and (b) is a characteristic of an organisation or a system, rather than a characteristic of a specific individual, or characteristic of an operational environment at a specific point in time.

Safety issues can broadly be classified in terms of their level of risk as follows:

- **Critical safety issue:** associated with an intolerable level of risk.
- **Significant safety issue:** associated with a risk level regarded as acceptable only if it is kept as low as reasonably practicable.
- **Minor safety issue:** associated with a broadly acceptable level of risk.

EXECUTIVE SUMMARY

At approximately 0832¹ on 26 October 2006 an Adelaide to Melbourne bound Pacific National (PN) freight train (4AM3) collided with an elevated platform vehicle² containing a worker performing maintenance on the Separation Street overpass at North Geelong in Victoria. The worker was preparing the support beams of the overpass for painting. At the time of the collision he was working from within the basket of the elevated platform vehicle underneath the overpass and directly above the standard gauge track of the Defined Interstate Rail Network (DIRN) when struck by the train. The worker was seriously injured as a result of the collision.

The train involved in the collision was en route from Port Flat, Port Adelaide through to Appleton Dock, Melbourne with a driver and co-driver as crew. There was only minor damage to the train and the train crew were uninjured.

At the time of the collision the North Geelong site was under the operational control of the North Geelong 'C' signalbox which is located 370 m to the west of Separation Street. The work on the overpass using the elevated platform vehicle was being protected by a qualified Works Infrastructure track protector at the time of the accident.

The emergency response following the accident was timely and effective.

The investigation found that a deviation from the formally documented and agreed safety plan, combined with a subsequent misinterpretation and the miscommunication of the relevant safeworking rules and procedures between operational staff, were the primary factors contributing to the accident.

The investigation concluded that the train crew's actions were appropriate in the circumstances and that there was little effective action they could have taken to prevent or minimise the collision.

Safety actions recommended as a result of the investigation relate to:

- the need to formally communicate changes to safeworking arrangements and safety plans before they are implemented, and
- the need to review and amend as appropriate, the provisions of *TA 20 – Victorian Network Operations*, which incorporates the applicable sections of the *1994 Public Transport Corporation (PTC) Book of Rules*, (network rules), relating to track/site protection requirements and to clarify areas of possible ambiguity.

1 The 24-hour clock is used in this report to describe the local time of day, Eastern Daylight-saving Time (EDT).

2 An 'elevated platform vehicle' is a crane, mounted on a truck or other vehicle, with an enclosed platform or basket on the end where a person(s) can work from. The platform can be lifted to allow work at heights to be conducted.

1

FACTUAL INFORMATION

1.1 Overview

At approximately 0832¹ on 26 October 2006 an Adelaide to Melbourne bound Pacific National (PN) freight train (4AM3) collided with an elevated platform vehicle² containing an employee of McElligott Partners Pty Ltd at the Separation Street overpass at North Geelong in Victoria. At the time of the collision the employee was undertaking maintenance on the support beams of the overpass. He was working from within the basket of the elevated platform vehicle underneath the overpass and directly above the standard gauge track of the Defined Interstate Rail Network (DIRN) when struck by the train.

The maintenance worker suffered serious injuries as a result of the collision when he was violently ejected from the basket of the elevated platform vehicle. He fell onto the locomotive and then to the ground, landing alongside the train.

1.2 Location

The collision occurred at the Separation Street overpass which is 370 metres on the Melbourne side of the North Geelong 'C' signalbox (Figure 1). The overpass is located approximately 69 km from Melbourne (Figure 2, Figure 3 and Figure 4) and carries road traffic travelling along the Princes Highway between the cities of Melbourne and Geelong. The overpass spans Separation Street, the DIRN and three broad/dual gauge rail tracks.

Figure 1: View of the North Geelong 'C' Signalbox



The work site/collision site could not be seen from the signalbox as the track between the overpass and the signalbox curves on a sharp radius with buildings and vegetation in the line of sight between the two.

Figure 2: Geelong, Victoria

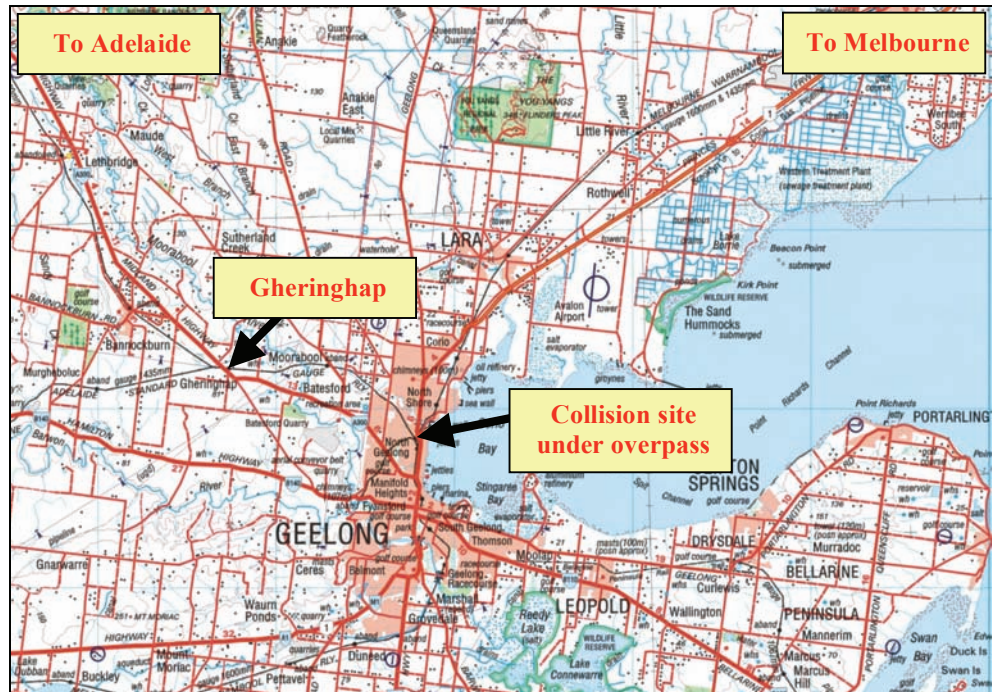


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1.3 Track information

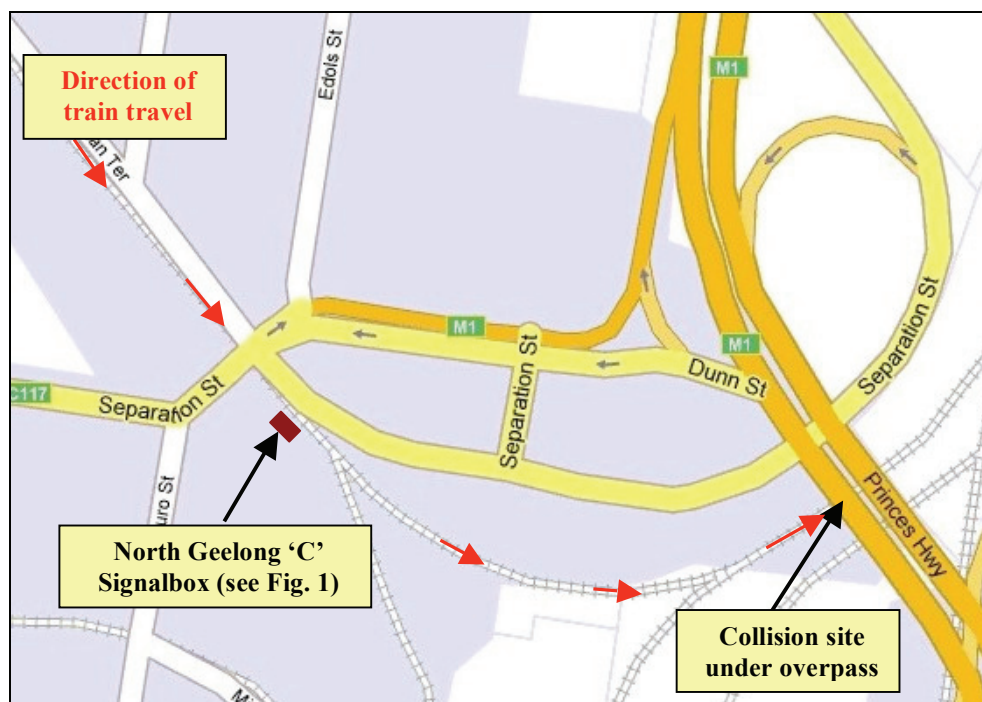
The Australian Rail Track Corporation (ARTC) manages and maintains the dual gauge line from Gheringhap through to the North Geelong dual gauge junction and the DIRN from the North Geelong dual gauge junction to Melbourne. This includes the section of the track directly below the Separation Street overpass where the collision occurred. The Separation Street overpass at North Geelong is owned and maintained by VicRoads, a statutory Corporation within the Victorian Government infrastructure portfolio.

Figure 3: Location of the Separation Street, North Geelong



Map - Geoscience Australia. Crown Copyright ©.

Figure 4: Map indicating location of collision site and direction of travel of train 4AM3



Map – ©2007 Google – Map data ©2007 Mapdata Sciences Pty Ltd PSMA

1.4 Separation Street overpass maintenance project

As part of its ongoing maintenance program, VicRoads identified a need to re-paint the structural support beams of the Separation Street overpass. They decided to engage a contractor to undertake the work which comprised the preparation and painting of the overpass steel beams. The scope of works was however substantially limited to painting span one (Figure 5) directly over the DIRN and span five. The work did not include a requirement to access the adjacent broad/dual gauge tracks.

A specification defining the scope of work was prepared by VicRoads (the principal) with contract No. 6585 eventually being awarded to a private company McElligott Partners Pty Ltd (the contractor) on 17 August 2006.

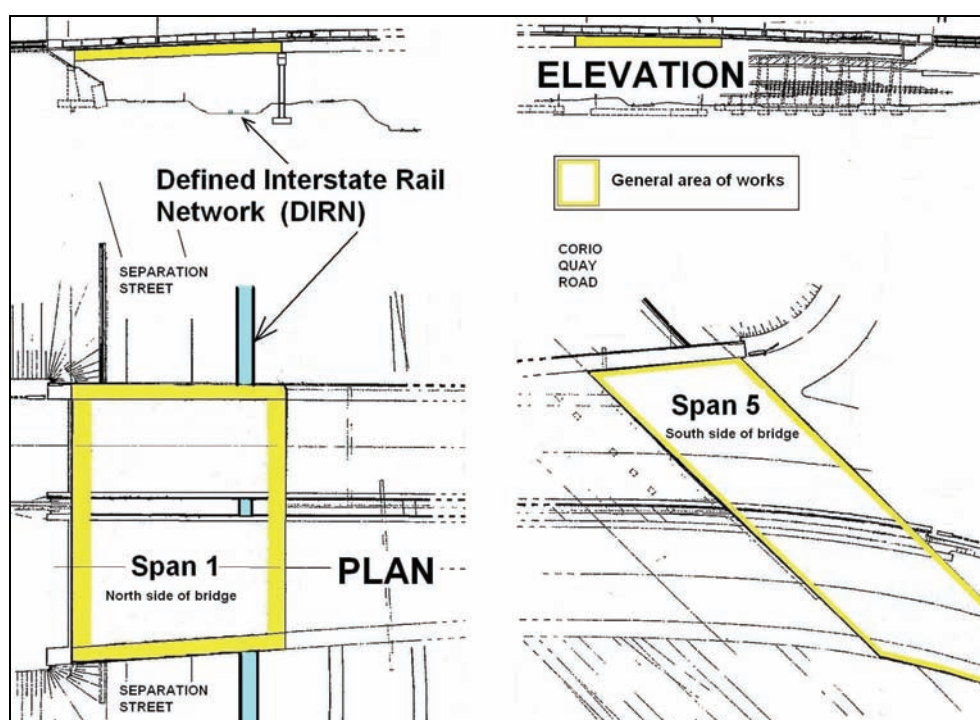
Before undertaking work on the DIRN and within its rail corridor, the ARTC required that third parties such as VicRoads enter into a licence agreement. The licence agreement included a requirement to provide a written safety plan and to define safe systems of work before occupation of the site was permitted.

Specifically, the ARTC licence agreement required that:

The Licensee ... shall provide a written safety plan ('Safe Work Method Statement') detailing those systems to ARTC (including but not limited to name (or supplier) and other relevant details of the Rail Safety Worker) at least seven days prior to any access ...

The licensee has full responsibility for the establishment of safe systems of work for all persons accessing Land and carrying out the purpose pursuant to this Licence.

Figure 5: Overpass showing scope of work, highlighted in yellow (the collision occurred under span 1)



As part of its specification for the Separation Street overpass work, VicRoads required the contractor (McElligott's) to comply with ARTC's requirements regarding access to and the occupation/use of the rail land. Although McElligott's is a reputable company in providing a range of painting/protective coating services, at the time it did not have the expertise to work within the rail corridor. McElligott's management therefore decided to engage a sub-contractor, Works Infrastructure³ (WI) to advise them on any track protection requirements⁴ and draft the rail part of the McElligott's 'Health & Safety Management Plan' (safety plan).

The WI compliance officer for the project subsequently prepared the rail part of the safety plan and associated risk assessment with the plan prescribing:

- that all contractors were to be trained in level one/basic 'track awareness'.
- the use of 'track warrants' for gaining access to the track. (This method of track access requires that the train controller give a written authority to the 'track

³ Works Infrastructure provide engineering and infrastructure management services to public and private rail, road, power, telecommunications, mining and resource sectors in Australia and overseas. They are also contracted to provide rail maintenance services to the ARTC, including the provision of rail safeworking and track protection. The McElligott's contract for the work at the Separation Street overpass was completely separate from WI's rail service contract with the ARTC.

⁴ Safeworking and track protection requirements on the Victorian network, east of Dimboola, are substantially governed by the rules and procedures for Victorian network operations contained in *TA 20 – Victorian Network Operations*, which incorporates the applicable sections of the *1994 Public Transport Corporation (PTC) Book of Rules*, (network rules).

protector'⁵ before occupying a work site. Trains are not allowed to enter the work site until the track protector returns the written authority to the train controller, who in turn authorises the train to proceed through the work site, by means of clearing fixed signals that protect it.)

- That the compliance officer was to brief the track protector regarding the safeworking arrangements.
- That the track protector was to obtain train running information from the ARTC train controller Adelaide or the North Geelong 'C' signaller (if the signalbox was manned).
- That the North Geelong 'C' signaller was to be informed of the work being done.
- That the track protector was to maintain communications with the North Geelong 'C' signaller regarding broad gauge train movements.
- That the track protector was to provide the contractor's employees with safeworking and train running information.
- That the track protector was to obtain a 'track warrant' from train control⁶ Adelaide before work was authorised to commence on site.
- That the track protector was to apply the appropriate network rules in protecting the work site.

A licence agreement was signed by VicRoads and the ARTC on 10 October 2006 and then forwarded to McElligott's on 17 October 2006. The safety plan was prepared on the basis that WI would provide track protection services at the Separation Street site. The relevant section of the safety plan stated:

Rail Traffic Management

The rail traffic management is to be conducted by Works Infrastructure. All works within the rail reserve is to be conducted in accordance with the rail risk assessment and the JSEA⁷. No works within the rail reserve envelope is to be conducted until clearance has been given by the Track Protection Coordinator after the issue of the Track Warrant.

5 A qualified rail safety worker who provides work site protection is commonly referred to as a track protector. The term 'track protector', 'track protection coordinator' and 'ganger' is used interchangeably throughout this report and is a reflection of source documentation such as the *1994 Public Transport Corporation (PTC) Book of rules* and various ARTC agreements and procedures.

6 Although no specific reference is made in Step Number 6 'Job Step' of the WI JSEA (below) regarding obtaining a track warrant from the train controller it can be inferred by reference to 'Job Step Hazard' which reads 'Track Warrant Refused by Train Controller'.

Step No.	Job Step	Job Step Hazard	Job Step Control	Responsibility
6	Subject to Train Running conditions TPC to obtain Track Warrant.	Communication Failure	No work authorised until Track Warrant obtained.	TPC
		Track Warrant Refused by Train Controller	No work authorised until Track Warrant obtained.	TPC

7 JSEA – A Job Safety and Environmental Analysis (JSEA) Worksheet.

Compliance officer - information

The WI compliance officer assigned to the project commenced employment with the Victorian Railways (VR) in 1980. He worked in various operational roles, was an experienced signaller, train controller and had progressed to a position of ‘Signal & Block Inspector’ (a senior railway safety advisor) before being engaged by WI in May 2005. In the position of compliance officer for WI he was responsible for programming works, providing railway safeworking advice, preparing risk assessments and work plans.

At the time of collision he was considered appropriately trained, qualified and fit for duty.

Track protector - information

The track protector on duty at the time of the collision was engaged by WI in July 2005 as a maintenance worker. He obtained his level 4 safeworking qualification on 8 February 2006.

At the time of the collision he was appropriately trained, certified and considered to be competent in protecting work sites like Separation Street. He had been rostered off duty on the 24 and 25 of October 2006 and was fit for duty at the time of the collision.

1.4.1 Site protection – general requirements

Under the network rules and in broad terms, worker protection at a site is achieved by ensuring that workers are either clear of the track before a train enters a work site, or by preventing the train from entering the site in the first place.

Site protection can be achieved using a variety of control mechanisms/procedures as prescribed within the network rules. This may include the use of a track access authorities (track warrants), onsite employees (track protectors), hand signals, ATWs⁸ and/or the use of the train signalling system.

North Geelong ‘C’ – Train signalling system

The train signalling system at the North Geelong ‘C’ site is controlled by hybrid interlocking⁹ (Figure 6 and Figure 7) comprising a mechanical lever frame and relay system. This interlocking controls all trains movements along the DIRN as well as facilitating access into and out of the Geelong Grain Terminal and North Geelong Yard. The mechanical lever frame controls the local yard signals and the relay system controls the signals along the standard gauge track (DIRN). The relay interlocking is interfaced to ARTC’s Centralised Traffic Control¹⁰ (CTC) system

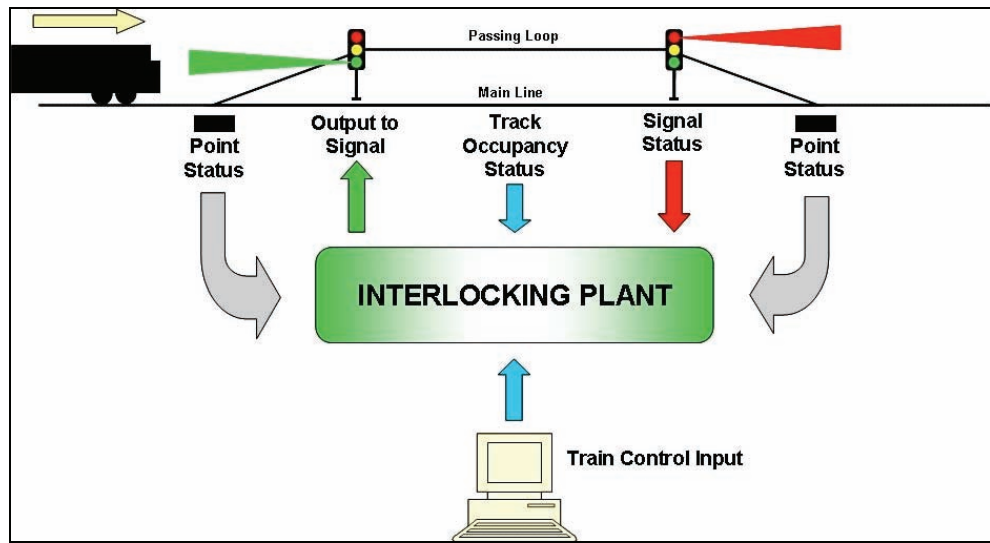
8 Audible track warning signals. Devices to attract the attention of train crews and others. (Source: Glossary for the National Codes of Practice and Dictionary of Railway Terminology)

9 Interlocking – Interaction of equipment control points and/or signals arranged to control the movement of rail traffic from one running line to another, and to prevent conflicting movements. (Source: Glossary for the National Codes of Practice and Dictionary of Railway Terminology)

10 Centralised Traffic Control – A safeworking system of remotely controlling the points and signals at a number of locations from a centralised control room. (Source: Glossary for the National Codes of Practice and Dictionary of Railway Terminology)

and therefore all signals/points connected to this system (standard gauge track) can be remotely controlled and monitored at ARTC's train control centre in Adelaide.

Figure 6: Railway signalling - Interlocking plant



Standard gauge train movements through North Geelong along the DIRN are normally signalled by the ARTC train controller in Adelaide. However, the site must be taken into local control when it is necessary to path train movements into and out of the Geelong Grain Terminal and/or the North Geelong Yard, ie the North Geelong 'C' signalbox is manually controlled using the local control panel and the mechanical lever frame (Figure 7 and Figure 8) operated by a Pacific National¹¹ employee called a signaller. At the time of the collision the North Geelong 'C' signalbox was being manned from 0600 through to 2200 Monday to Friday to accommodate these train movements.

When the signalbox is taken into local control, 'switched-in', the ARTC train controller in Adelaide passes operational control of the North Geelong 'C' site to the signaller. An agreed interface procedure is in place between the ARTC train controller and the signaller to facilitate this transfer of control. Once 'switched-in' the signaller has full operational control of the North Geelong 'C' site and operates all signals locally. The signaller is principally responsible for all safeworking in the immediate vicinity of the site including personnel and trains operating on the DIRN. The network rules prescribe the safeworking procedures and site protection to be applied when in local control. When in local control, the network rules do not allow the use of 'track warrants' to protect a work site.

Operational control of the North Geelong 'C' site can be retained by the signaller for as long as necessary, however, it is a documented requirement that the signaller relinquishes control to the ARTC train controller, ie will 'switch-out' as soon as there are no train movements into or out of the Geelong Grain Terminal and/or the North Geelong Yard.

¹¹ At the time of the collision Pacific National was the accredited track manager for the Geelong Grain Terminal and the North Geelong Yard (part of the regional broad gauge network). On 4 May 2007 the Victorian Government resumed control of the regional rail network, previously operated by Pacific National Network & Access.

Figure 7: Internal view of North Geelong 'C' Signalbox

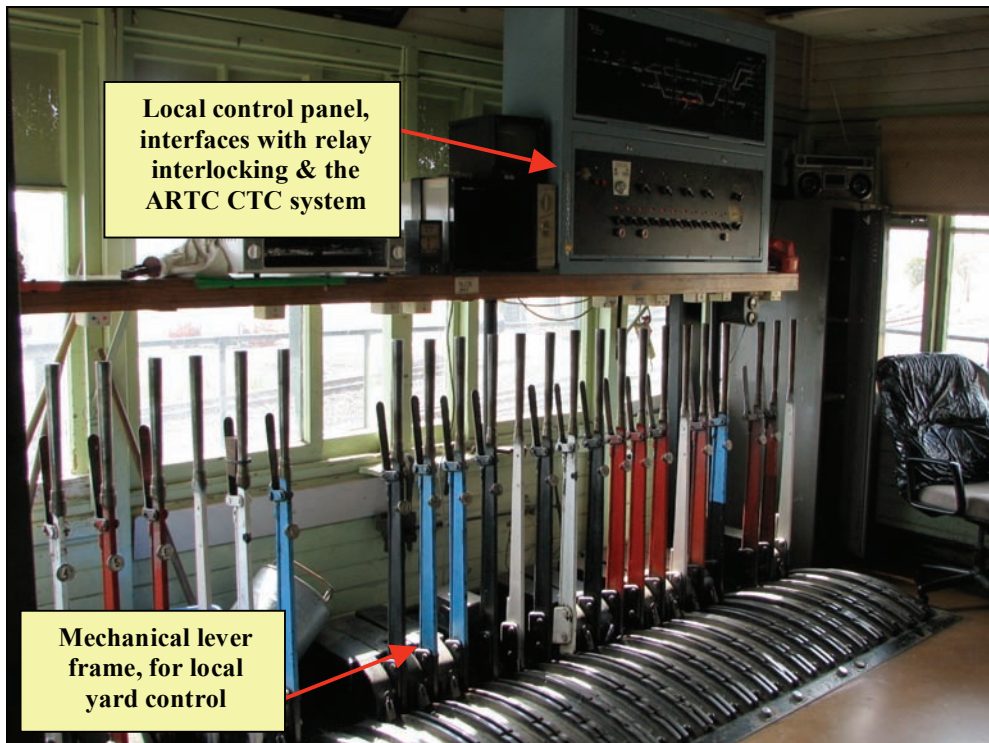
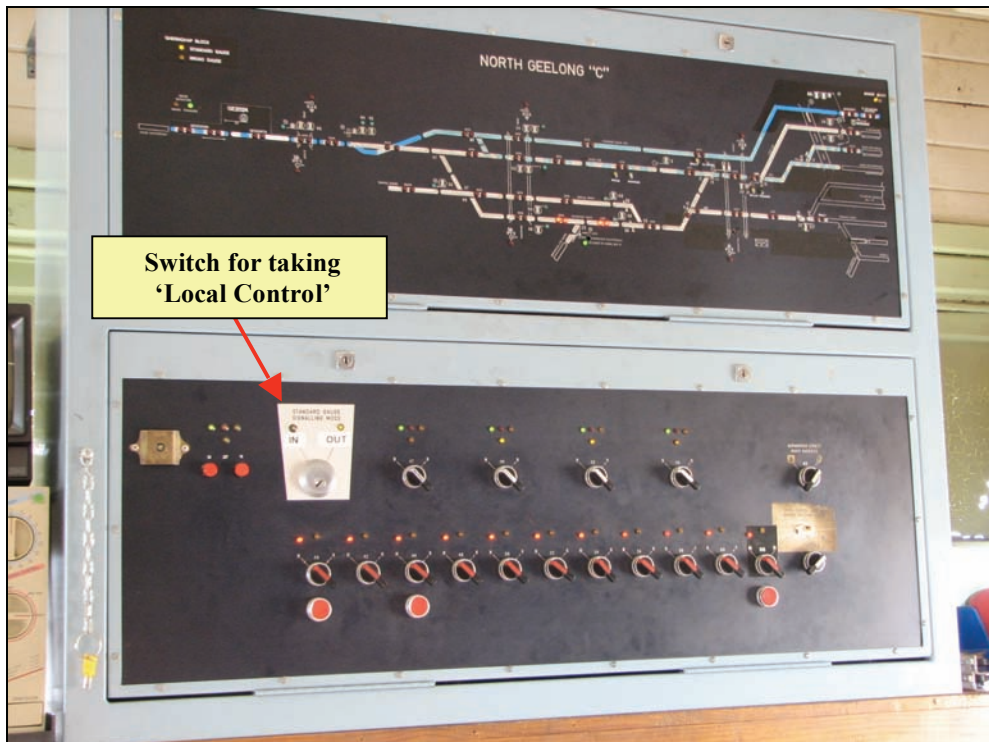


Figure 8: View of 'Local Control Panel', North Geelong 'C'



During the periods that North Geelong 'C' is switched-out the ARTC train controller is fully responsible for the safeworking of personnel and trains operating along the DIRN. The network rules also prescribe the safeworking procedures to be applied when switched-out, ie when in remote (CTC) control.

Signaller - information

The signaller on duty at the time of the collision started his employment as a signalman class 1 on 2 January 1985. He was last re-certified in safeworking on 13 July 2004 and was reclassified as a train controller class 4 on 27 June 2005.

During the six days preceding the collision he worked on five occasions starting at 0500 and ending duty no later than 1320. During this rostered period, four days before the collision he had one day off duty.

At the time of collision the signaller was considered to be appropriately trained, qualified, and fit for duty.

1.5 Train information

Pacific National¹² was providing the train crew, rollingstock and locomotives for train 4AM3 on a contracted basis for Patrick Corporation Ltd. Pacific National is the largest accredited and privately owned rail operator in Australia.

Train 4AM3 consisted of three locomotives (NR86 leading, second in line XRB560 and NR64 trailing) hauling 60 wagons with a total length of 1286 metres and a gross mass of 4019 tonnes.

There were no dangerous goods on board the train at the time of the collision.

Train crew information

The two train drivers operating 4AM3 were certified to drive the Adelaide to Melbourne route including the section of track where the collision occurred. A review of the rosters established that the driver had not worked the six days before the collision, the second driver had not worked the two days prior.

The drivers were appropriately trained, qualified, and fit for duty at the time of the collision.

1.6 The occurrence

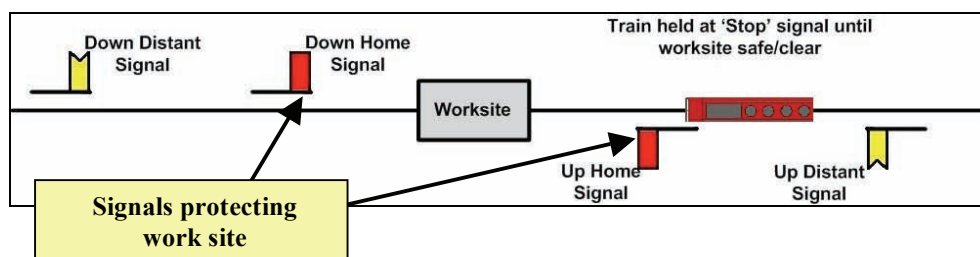
On Thursday 19 October 2006, the week before the collision, the WI compliance officer provided level one/basic 'track awareness' training for all contractors who would be working at the Separation Street site. While undertaking this training he stated that he spoke to the signaller (signaller on duty at the time of the collision) on duty at the North Geelong 'C' signalbox and briefed him regarding the works and safeworking arrangements, ie using 'track warrant' access. During the ensuing discussion the compliance officer further stated that he and signaller agreed¹³ that it

12 On the 6 July 2007 Asciano became the 100% owner of Pacific National and Patrick container ports as well as the combined port operations and stevedoring businesses of Toll and Patrick. Pacific National continues to operate under the brand name of Pacific National.

13 Investigators were unable to resolve whether this discussion actually took place and if so who made the actual decision to change the method of safeworking/site protection. The compliance officer asserts that the signaller made the suggestion and the signaller claims that the compliance officer made the suggestion; however, it is the signaller who has the ultimate operational responsibility for protecting the site.

would be more productive to use an alternative method of safeworking for protecting the site instead of ‘track warrant’ access. This alternative method of safeworking (section 15, rule 5 of the network rules) required that the North Geelong ‘C’ signal box was switched-in. Under section 15, rule 5 the two men understood that only verbal authority (that of the track protector to the signaller) was required before clearing the protecting signals (see Figure 9) either side of the work site. Once the protecting signals had been cleared, a train had authority to proceed through the work site.

Figure 9: Diagrammatic representation of ‘section 15, rule 5’



From 20 October 2006, the day work started at Separation Street, through to 26 October 2006, the day of collision, there were various signallers and track protectors rostered on duty at the North Geelong ‘C’ signalbox and the Separation Street overpass respectively. All of these individuals were aware of the alternative method of safeworking, including the signaller and track protector who were on duty at the time of the collision.

On the morning of 26 October 2006, train 4AM3 was en route from Port Flat, Port Adelaide to Appleton Dock, Melbourne. The drivers operating the train had booked on duty at their home depot of Dimboola in Victoria at 0400 and departed from Dimboola at 0425. The train arrived at the Gheringhap loop (11 km from the North Geelong site) at 0815 to cross train 5108. Train 4AM3 departed the crossing loop at 0822, the train was now approximately 10 minutes from the North Geelong ‘C’ site.

At 0500 on the same day, the rostered signaller started duty at the North Geelong ‘C’ signalbox. For the first part of the morning the ARTC train controller was in charge of train movements along the DIRN at the North Geelong ‘C’ site. At 0625 the North Geelong ‘C’ signalbox was ‘switched-in’ in order to route train 9126 into the Geelong Grain Terminal. Having assumed control, the signaller was now primarily responsible for the site including all safeworking of personnel and trains along the DIRN within the limits of the North Geelong site.

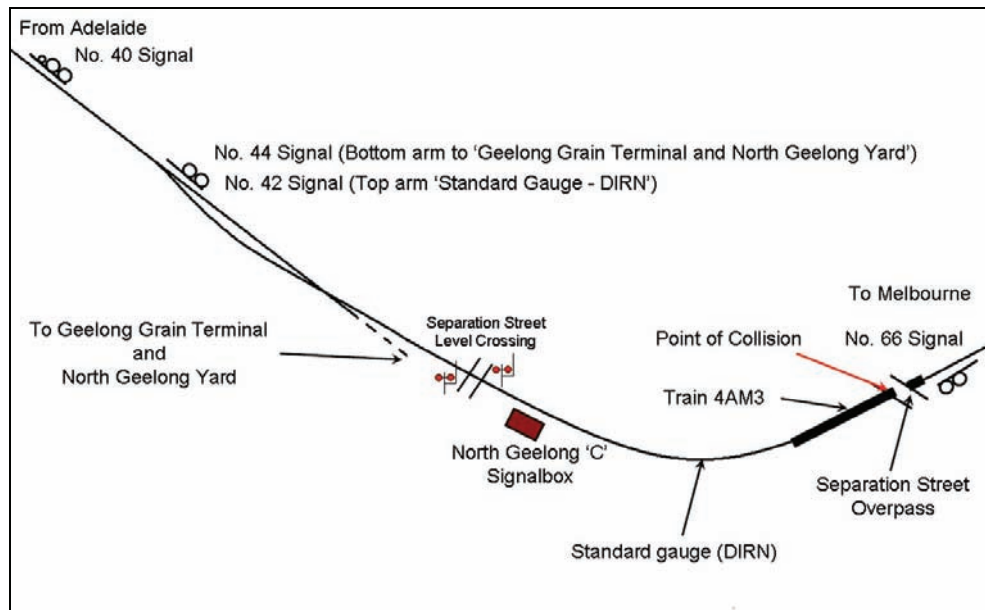
Train 9126 was routed into the Geelong Grain Terminal, clearing No. 44 Signal (Figure 10) at 0650.

The signaller retained local control after this movement, routing a second and close following train 4AM6 along the standard gauge line (DIRN) through to Melbourne, this train cleared No. 42¹⁴ Signal at 0709.

14 In the North Geelong ‘C’ signalbox, the control for activating No. 44 Signal top arm (DIRN) is by means of a switch called No. 42 and the control for activating No. 44 Signal lower arm (DIRN) is by means of a switch called No. 44, (See Figure 8). However the signal in the field is called No. 44 Signal. Throughout this report, the top arm is referred to as No. 42 Signal and the lower arm is referred to as No. 44 Signal.

At about this time the Works Infrastructure track protector on duty at the Separation Street overpass reported to the North Geelong 'C' signalbox and spoke to the signaller. He provided the signaller with his mobile telephone number and contact details and told him that contractors would be working at the Separation Street site. The track protector returned to the work site, briefed the contractor's employees and waited for an EM80, a rail mounted track inspection vehicle, to pass through the work site before allowing work to commence on the overpass structural beams.

Figure 10: Approaches to Nth Geelong 'C' Signalbox. Work site at Separation Street overpass located on the DIRN



The EM80 was recorded as passing the Nth Geelong 'C' signalbox at about 0802. Phone records show that the track protector then rang and spoke to the signaller at 0801:54. Following this telephone call the track protector authorised work to commence on the overpass structure. The employee who was later injured in the collision with 4AM3, climbed into the basket of the elevated platform vehicle and manoeuvred it until it was directly beneath the bridge structure. He started cleaning the support beams using a high speed grinder. The basket of the elevated platform vehicle, with the worker in it, was now foul of the standard gauge main line.

At this time train 4AM3 was approaching the North Geelong 'C' signalbox with No. 40 Signal displaying a proceed indication and No. 42 Signal, the signal in advance of the work site, also displaying a proceed signal (having been previously cleared by the North Geelong 'C' signaller). The train driver observed the signals to be at clear signifying authority to pass through North Geelong unhindered. He slowed the train to a speed of approximately 17 km/hr for a temporary speed restriction and then increased the train speed to about 30 km/h in advance of a curve speed restriction of 50 km/h near the North Geelong 'C' signalbox. A short time later train 4AM3 passed over the Separation Street level crossing. The train was now entering the sweeping left hand curve leading to the Separation Street overpass, with buildings and vegetation obscuring the driver's view of the work site ahead. When the locomotive cleared the buildings and vegetation the train was travelling at a speed of 32 km/h. At this point the train driver saw the elevated platform vehicle at the overpass and realised that it was fouling the track. He made an immediate emergency brake application and sounded the locomotive horn.

The train, now slowing under an emergency brake application, continued towards the work site. The worker in the basket of the elevated platform vehicle saw the approaching train and desperately attempted to release his safety harness and escape onto the steel support beams of the overpass, however, his efforts were unsuccessful. The train struck the elevated platform vehicle before he could climb to the safety of the steel beams. However, having now released his safety harness, the worker was no longer secured to the elevated platform vehicle and was violently ejected from the basket by the force of the collision and onto the roof of the train's leading locomotive before falling to the ground beside the train.

The train stopped approximately 75 m past the point of impact following which the driver activated the emergency radio button and contacted the emergency services using his mobile telephone.

The maintenance worker was now lying beside the track, seriously injured with several work colleagues coming to his assistance. The locomotive crew were shaken, but otherwise unhurt.

1.7 Post occurrence

Response

The response by emergency services was quick and appropriately resourced with police in attendance within minutes of the collision. Police took control of the site until evidence was gathered and the site suitably cleared.

The injured maintenance worker was transferred to hospital by ambulance where he was treated for a combination of head, chest and serious leg injuries.

The train drivers, track protector and signaller were breath tested after the incident and all returned zero readings.

Site recovery

There was only minor damage to the lead locomotive of the train. It departed for Appleton Dock, Melbourne, at 1209.

1.7.1 Loss and damage

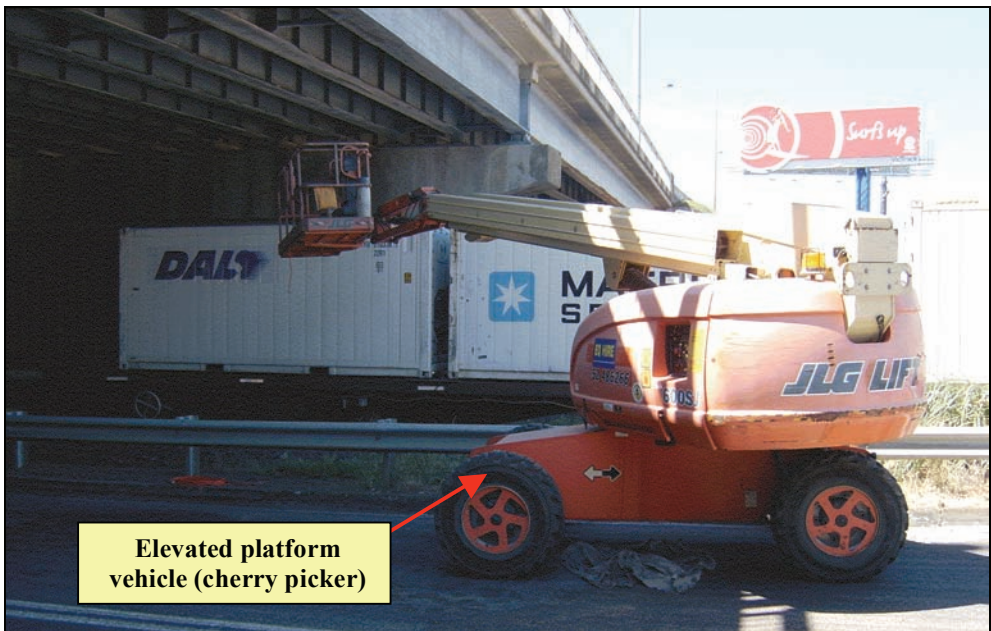
Locomotive NR86 sustained only minor damage to the cowling and horn cluster above the driver's cab (Figure 11), there was no damage to the trailing locomotives and wagons. There was no observed damage to the elevated platform vehicle (Figure 12).

Figure 11: View of damage to cowling on locomotive NR86



Photograph – Department of Infrastructure, Public Transport Safety Victoria©.

Figure 12: View of elevated platform vehicle and train 4AM3 in background



Photograph – Department of Infrastructure, Public Transport Safety Victoria©.

On 26 October 2006, an investigation team from the Australian Transport Safety Bureau (ATSB) was despatched to examine a collision involving Pacific National freight train (4AM3) and an elevated platform vehicle containing a worker performing maintenance on the Separation Street overpass near the North Geelong 'C' signalbox in Victoria.

Evidence was sourced from witnesses, the Victoria Police, Victorian Department of Infrastructure, WorkSafe Victoria, VicRoads, the ARTC, McElligott Partners Pty Ltd, Works Infrastructure (WI), and Pacific National (PN). Evidence included train control graphs, train control voice and data logs, locomotive data logs, site drawings and statements from the WI compliance officer, WI track protector(s), PN signaller(s) and the train drivers. The investigators photographed and examined the collision site, including the approaches to the work site and observed first hand signalling operations and sighting constraints at Separation Street.

Analysis of the evidence indicated that:

- There were no deficiencies that related to the mechanical condition of the locomotive. The lead locomotive (NR86) was fitted with a Wabtec data recorder used for capturing data such as time and train speed. A review of the information from the data recorder established that 4AM3 had been driven within posted speed limits. Braking, headlight illumination and the sounding of the whistle were appropriate.
- There were no factors identified that related to the performance of the train crew in their handling of the train. The train crew were unable to take any avoiding action other than sounding the locomotive horn and braking.

2.1 Sequence of events analysis

Based on available evidence and interviews with the signaller and track protector who were on duty at the time of the collision, it was established that:

- The track protector reported to the duty signaller at the North Geelong 'C' signalbox on the morning of the collision.
- The track protector requested train running information from the signaller.
- The track protector provided the signaller with a mobile telephone and contact number. This was so the signaller could communicate with him and provide updated train running information.
- In his statement the signaller asserted that the track protector did not tell him that the contractor would foul the running line and therefore did not protect the work site in the period preceding the collision. In his mind there was no requirement to set the protecting signals to 'stop' and no requirement to sleeve¹⁵ any signal levers. Data from the ARTC Centralised Train Control system

15 Lever sleeve/collar/blocking jack, etc. In circumstances where a signaller is required to prevent a train from entering a section, the signaller places and maintains the entrance signal leading into the section at 'stop'. The signaller then secures the signal lever by means of a physical device, a 'lever sleeve'. This device is a mental and physical reminder for the signaller not to clear the signal.

established that No. 42 Signal, the signal protecting the work site, was cleared 15 minutes before and well in advance of train 4AM3 entering the work site.

- The signaller retained local control of the North Geelong 'C' signalbox as agreed with the ARTC train controller. However, this is not consistent with standing instructions that require the signaller should relinquish operational control of the North Geelong site to the ARTC train controller for the routing of standard gauge movements. This could have occurred as soon as train movement 9126 had been routed into the Geelong Grain Terminal.
- The track protector maintained that he requested that the signaller protect the work site by holding signals No. 42 and No. 66 at 'stop'. In his mind and based on instructions from the compliance officer he believed that he was only required to:
 - Inform the signaller that work was being done at the Separation Street site.
 - Obtain train running information from the signaller.
 - Request that the signaller maintain communications regarding train running information.
 - Brief McElligott's employees regarding safeworking and train running information.
 - Remain at the work site with the contractors and make sure that the track was 'not obstructed' before authorising the signaller clear the protecting signal(s).

Summary

Following a review of the evidence it has not been possible to determine whether a single person error by the signaller in the pre-clearing of No. 42 Signal or a misunderstanding between the signaller and track protector regarding the need to protect the work site was the decisive factor leading to the collision.

What is evident, however, is that the deviation from the documented and agreed safety plan, which provided for 'track warrant' access (with the consequent need to go through the more formal communication process to obtain a written track access authority), combined with a subsequent misinterpretation and miscommunication of the network rules and procedures were primary factors contributing to the accident.

The variation in safeworking arrangements was not formally communicated to McElligott's, VicRoads or the ARTC. No opportunity was afforded to these agencies to review/challenge the alternate safeworking arrangement and to determine whether it was safe and fit for purpose.

2.2 Safeworking implemented

From 20 October 2006 (the day work started) through to 26 October 2006 (day of collision) there were various signallers and track protectors rostered on duty at the North Geelong 'C' signalbox and Separation Street overpass respectively. All of these individuals were briefed on at least one occasion regarding the variation in safeworking. During interviews with signallers and track protectors it was evident that they understood what was required ie fixed signals protecting the work site were to be held at 'stop' until the track protector requested the signaller to clear them.

All persons interviewed (including the signaller and track protector on duty at the time of the collision) had applied section 15, rule 5, on at least one of the days preceding the collision. All train movements had been safely routed through the work site using section 15, rule 5. None of the individuals (signallers or track protectors) had reported any concerns regarding the method of safeworking before the collision occurred.

2.2.1 Interpretation of network rule - section 15, rule 5

The change in safeworking arrangements put in place at North Geelong 'C' was a deviation from the formally approved safety plan and contravened the safeworking arrangements endorsed by McElligott's, VicRoads and the ARTC. Although the final mistake before the collision involved miscommunication and/or a single person error, an examination of the network rules, in particular section 15, rule 5 (Appendix A) is appropriate to determine whether there was an unacceptable risk in the interpretation/application of this rule.

The intent of section 15, rule 5, (Figure 9) on first examination appears straight forward and should have been effective in protecting the work site, provided that the home/protecting signals on either side of the work site were kept at 'stop' ie the signaller did not inadvertently clear the signal(s) until authorised by the track protector to do so.

However, a closer examination establishes that the level of protection put in place at the Separation Street site was inconsistent with the intent of similar network rules in particular section 15, rule 3 and section 15, rule 4 (Appendix A). Both of these rules prescribe the use of inner and outer track protectors, hand signals, audible track warners and a strict communication/interface protocol where opportunities exist to co-locate a signaller and track protector.

In principle, had the higher level of protection afforded by these rules been in place, a fall back safety net would have existed to guard against circumstances where a signal might be inadvertently cleared which is what happened on this occasion. The use of inner and outer track protectors, hand signals and audible track warners and a strict communication/interface protocol as mandated in section 15, rule 3 and section 15, rule 4, would have substantially reduced the risk of a collision.

Similarly, an examination of the 'track warrant' access system of safeworking shows that a strict communication protocol is in place to safe guard against a miscommunication error.

It is evident that section 15, rule 3, section 15 rule 4 and the 'track warrant' access systems acknowledge the underlying importance of protecting the safety of a work site from the risk of miscommunication and/or single person error, a mechanism that was missing in the procedure put in place at the Separation Street overpass.

Operational rules should be relatively easy to understand and apply, however, the subtleties of some rules can be less than clear to all but the most experienced of employees¹⁶. In fact, it is sometimes necessary to refer to a rule book committee, in

¹⁶ Both the compliance officer and signaller were considered to be very experienced employees and were required to regularly interpret and apply the network rules.

this case the Victorian Network Rules Consultative Committee¹⁷ (VNRCC) for a determination regarding the exact intent and/or meaning of a rule.

The final sentence of section 15, rule 5 states:

The Ganger in charge must arrange for the obstruction to be protected.

The intent of this sentence is not clear and open to individual interpretation as no form of ‘protection’ is actually prescribed.

Discussions with representatives from the VNRCC and an examination of the network rules established that:

- Although not specified, the level of protection afforded by section 15, rule 5 is intended to be comparable to that prescribed by section 15, rule 3 and section 15, rule 4, ie the use of inner and outer track protectors, hand signals, audible track warners and a strict communication/interface protocol.
- Further, section 15, rule 5 was only ever intended to be applicable for signalling areas having ‘Two Position Lower Quadrant Signalling’. The rule should not be applied for areas having ‘Three Position Signalling’ as was installed along the section of track where the collision occurred,

Neither of these important qualifications are apparent when reading the network rules and they were evidently not understood by either the WI compliance officer or the signaller in applying section 15, rule 5 at the Separation Street overpass work site.

Summary

Had the network rules been appropriately applied and/or section 15, rule 5 been used with the additional protections intended to guard against single person error, it is probable that the collision would not have occurred.

Similarly, had the site been under CTC control and afforded protection using ‘track warrant’ access, it is also most likely that the collision would not have occurred.

Based on available evidence:

- Section 15, rule 5 of the network rules were misconstrued by the compliance officer and signaller and should not have been used. Section 15, rule 5 is only applicable to ‘Two Position Lower Quadrant Signalling’ areas. This is not evident when reading the rule and should be re-examined to avoid possible ambiguity.
- The final sentence of section 15, rule 5:

The Ganger in charge must arrange for the obstruction to be protected.

This is an open ended statement and therefore subject to individual interpretation. The intent of the rule is that site protection should be consistent

¹⁷ Victorian Network Rules Consultative Committee – A committee specifically established in Victoria to manage, maintain and establish the safeworking rules, addenda and supplements for trains operating over the Victorian Rail Network. The Victorian Network Rules Consultative Committee (VNRCC) has been established to facilitate this process and achieve a consistent application of the rules across the four networks.

with section 15, rule 3 and section 15, rule 4 and this intent also needs to be more clearly articulated within the network rules.

- The underlying safety principle of protecting the safety of a work site from the risk of miscommunication and/or single person error, were not recognised by the compliance officer or the signaller in using section 15, rule 5 at the Separation Street work site. Similarly, none of the other track protectors or signallers who were on duty in the days leading up to the collision had raised any concerns about the method of safeworking used at the site.

Employees should be given an understanding of underlying safety principles and encouraged to challenge procedures where they appear inconsistent with safety doctrine, ie the application of section 15, rule 5 by the compliance officer and signaller provided a lower level of protection than what was normal/good practice and could have been challenged by PN and ARTC operational managers if formally communicated as required.

3.1 Context

At approximately 0832 on 26 October 2006 an Adelaide to Melbourne bound Pacific National freight train (4AM3) collided with an elevated platform vehicle containing a worker performing maintenance on the Separation Street overpass at North Geelong in Victoria. The injured worker was working from within the basket of the elevated platform vehicle underneath the overpass and directly above the standard gauge track of the Defined Interstate Rail Network (DIRN) when struck by the train.

From the evidence available, the following findings are made with respect to the collision and should not be read as apportioning blame or liability to any particular individual or organisation.

3.2 Contributing safety factors

1. The signaller in the North Geelong 'C' signalbox either inadvertently pre-cleared No. 42 Signal (which was protecting the work site at the overpass) or a misunderstanding between the signaller and the Works Infrastructure track protector (at the work site) caused the signaller to believe that site protection was not required. In any event, the signaller cleared No. 42 Signal for the impending passage of train 4AM3 which led to the train entering the work site where the elevated platform vehicle was fouling the rail line.
2. The Works Infrastructure compliance officer (with overall planning responsibility for ensuring that the overpass work site was appropriately protected from train movements) and the North Geelong 'C' signalbox signaller implemented a method of safeworking based on section 15, rule 5 of the network rules. The variation in safeworking arrangements was not formally communicated to McElligott's, VicRoads or the ARTC. No opportunity was afforded these agencies to review/challenge the safeworking arrangement and to determine whether it was safe and fit for purpose. The revised safeworking arrangements were clearly in contravention of the safety plan that had been agreed between McElligott's, VicRoads and the ARTC. *[Safety Issue]*
3. The intent of section 15, rule 5 of the network rules was misconstrued by the Works Infrastructure compliance officer and the North Geelong 'C' signalbox signaller in protecting the Separation Street overpass work site. Their interpretation of section 15, rule 5 introduced the risk of a miscommunication and single person error. It relied totally on the signaller holding the protecting signals at 'stop'. No additional protection was afforded to the work site. *[Safety Issue]*

4. Section 15, rule 5 of the network rules is only applicable for ‘Two Position Lower Quadrant Signalling’ areas and should not have been used at the Separation Street overpass work site which had ‘Three Position Signalling’. Further, section 15, rule 5 stipulates additional but unspecified levels of site protection by the ‘Ganger’. The level of protection needs to be qualified to ensure the correct intent of the rule is observed. Neither of these important qualifications is apparent when reading section 15, rule 5 of the network rules.
[Safety Issue]

3.3 Other key findings

1. There were no deficiencies in the mechanical condition of the train. Braking, headlight illumination and the sounding of the locomotive horn were appropriate. Train speed was below the required track speed of 50 km/h.
2. The train crew were appropriately trained, qualified, and medically fit at the time of the collision.
3. The Works Infrastructure compliance officer was appropriately trained and qualified.
4. The Pacific National signaller on duty at the time of collision was appropriately trained, qualified, and medically fit. Fatigue was not an issue.
5. The Works Infrastructure track protector on duty at the time of collision was appropriately trained, qualified, and medically fit. Fatigue was not an issue.

The safety issues identified during this investigation are listed in the Findings and Safety Actions sections of this report. The Australian Transport Safety Bureau (ATSB) expects that all safety issues identified by the investigation should be addressed by the relevant organisation(s). In addressing those issues, the ATSB prefers to encourage relevant organisation(s) to proactively initiate safety actions, rather than to issue formal safety recommendations or safety advisory notices.

All of the responsible organisations for the safety issues identified during this investigation were given a draft report and invited to provide submissions. As part of that process, each organisation was asked to communicate what safety actions, if any, they had carried out or were planning to carry out in relation to each safety issue relevant to their organisation.

Depending on the level of risk of the safety issue, the extent of corrective action taken by the relevant organisation, or the desirability of directing a broad safety message to the rail industry, the ATSB may issue safety recommendations or safety advisory notices as part of the final report.

4.1 V/Line Regional Network and Access¹⁸

4.1.1 Communication of changes made to safeworking arrangements

Safety Issue

The Works Infrastructure compliance officer (with overall planning responsibility for ensuring that the overpass work site was appropriately protected from train movements) and the North Geelong 'C' signalbox signaller implemented a method of safeworking based on section 15, rule 5 of the network rules. The variation in safeworking arrangements was not formally communicated to McElligott's, VicRoads or the ARTC. No opportunity was afforded these agencies to review/challenge the safeworking arrangement and to determine whether it was safe and fit for purpose. The revised safeworking arrangements were clearly in contravention of the safety plan that had been agreed between McElligott's, VicRoads and the ARTC.

ATSB safety recommendation RR20080021

The Australian Transport Safety Bureau recommends that V/Line Regional Network and Access take action to address this safety issue.

¹⁸ At the time of the collision Pacific National was the accredited track manager for the Geelong Grain Terminal and the North Geelong Yard (part of the regional broad gauge network). On 4 May 2007 the Victorian Government resumed control of the regional rail network, previously operated by Pacific National Network & Access.

4.1.2 Interpretation of network rules

Safety Issue

The intent of section 15, rule 5 of the network rules was misconstrued by the Works Infrastructure compliance officer and the North Geelong 'C' signalbox signaller in protecting the Separation Street overpass work site. Their interpretation of section 15, rule 5 introduced the risk of a miscommunication and single person error. It relied totally on the signaller holding the protecting signals at 'stop'. No additional protection was afforded to the work site.

ATSB safety recommendation RR20080022

The Australian Transport Safety Bureau recommends that V/Line Regional Network and Access take action to address this safety issue.

4.2 Works Infrastructure

4.2.1 Communication of changes made to safeworking arrangements

Safety Issue

The Works Infrastructure compliance officer (with overall planning responsibility for ensuring that the overpass work site was appropriately protected from train movements) and the North Geelong 'C' signalbox signaller implemented a method of safeworking based on section 15, rule 5 of the network rules. The variation in safeworking arrangements was not formally communicated to McElligott's, VicRoads or the ARTC. No opportunity was afforded these agencies to review/challenge the safeworking arrangement and to determine whether it was safe and fit for purpose. The revised safeworking arrangements were clearly in contravention of the safety plan that had been agreed between McElligott's, VicRoads and the ARTC.

ATSB safety recommendation RR20080023

The Australian Transport Safety Bureau recommends that Works Infrastructure take action to address this safety issue.

4.2.2 Interpretation of network rules

Safety Issue

The intent of section 15, rule 5 of the network rules was misconstrued by the Works Infrastructure compliance officer and the North Geelong 'C' signalbox signaller in protecting the Separation Street overpass work site. Their interpretation of section 15, rule 5 introduced the risk of a miscommunication and single person error. It relied totally on the signaller holding the protecting signals at 'stop'. No additional protection was afforded to the work site.

ATSB safety recommendation RR20080024

The Australian Transport Safety Bureau recommends that Works Infrastructure take action to address this safety issue.

4.3 Victorian Network Rules Consultative Committee (VNRCC)

4.3.1 Meaning of network rules

Safety Issue

Section 15, rule 5 of the network rules is only applicable for ‘Two Position Lower Quadrant Signalling’ areas and should not have been used at the Separation Street overpass work site which had ‘Three Position Signalling’. Further, section 15, rule 5 stipulates additional but unspecified levels of site protection by the ‘Ganger’. The level of protection needs to be qualified to ensure the correct intent of the rule is observed. Neither of these important qualifications is apparent when reading section 15, rule 5 of the network rules.

ATSB safety recommendation RR20080025

The Australian Transport Safety Bureau recommends that the Victorian Network Rules Consultative Committee take action to address this safety issue.

APPENDIX A : NETWORK RULES – SECTION 15

Extract from *TA 20 – Victorian Network Operations*, incorporating the applicable sections of the *1994 Public Transport Corporation (PTC) Book of Rules*.

15. INFRASTRUCTURE WORKS

Rules 3, 4, 5 and 21

3. TRACK FORCE PROTECTION - COUNTRY REGIONS

(a) Occasions when Protection must be Provided

Protection must be provided prior to:

- (1) any on-track machine carrying work persons and/or material,
- (2) any other obstruction being placed upon a running line,
- (3) any ballast or other maintenance train remaining stationary or moving slowly along the line,
- (4) any rail being taken out or relaying operations commencing, or
- (5) the line being unsafe due to landslip or other such cause.

(b) How Protection is Provided

Protection must be provided as follows:

- (1) an outer flagman must place three Audible Track Warners (ATWs) on the line, 10 metres apart, not less than 2000 metres and not more than 4000 metres beyond the obstruction. The 'Warning' hand signal (yellow flag or light) must be plainly exhibited to any approaching train even if a train is not expected.
- (2) an inner flagman must plainly exhibit the 'Stop' hand signal (red flag or light) not less than 200 metres from the obstruction.
- (3) this protection can only be withdrawn when instructions are received from the person in charge that the obstruction has been removed. The inner flagman then must plainly exhibit a green flag or light, held steadily in the hand, to the Driver of the train or light locomotive.

(c) Approaching Train

The Driver of an approaching train must reduce speed on observing the 'Warning' hand signal or exploding ATWs. The driver must be prepared to stop the train and await further guidance from the inner flagman.

(d) Reduced Speed

When the train or light locomotive is required to reduce speed:

- (1) the person in charge must instruct the inner flagman to exhibit the 'Caution' hand signal,
- (2) the Inner Flagman must stop the train for speeds required of less than 25 km/h. The Driver must be verbally informed of the speed at which the train can proceed and then display the 'Caution' hand signal,
- (3) when the train is clear of the work point, the inner flagman must exhibit a steady green flag or light and normal speed may be resumed.

(e) Restricted Terrain

Should restricted terrain not allow a good and distant view of the 'Warning' hand signal, then the hand signal and three ATWs must be placed so that there is a good and distant view.

Restricted terrain includes:

- (1) within a tunnel,
- (2) close to the mouth of a tunnel nearest to obstruction,
- (3) steep descending gradient, and
- (4) curvature of the line.

(f) Special Case of a Tunnel

In the case of a tunnel the outer flagman must:

- (1) place three ATWs 10 metres apart at the end of the tunnel nearest to the obstruction,
- (2) proceed through the tunnel to a position where the Driver can obtain a good and distant view of the 'Warning' hand signal, and
- (3) place on one rail three ATWs 10 metres apart at this position.

(g) Signalbox with a Signaller on Duty

Should a signalbox be located within 2000 metres of an obstruction, and except as provided in para (e) above, the outer flagman must act as follows:

- (1) remain at the signalbox or signalling complex,
- (2) place three ATWs ten metres apart and display the 'Warning' hand signal,
- (3) instruct the Signaller to keep the fixed signals at the 'Stop' position, and
- (4) not allow any train to pass the signalbox until the obstruction has been removed.

(h) Obstruction within 400 metres in Advance of the Home Signal

Where an obstruction is located within 400 metres in advance of the home signal, the outer flagman must:

- (1) instruct the Signaller to keep the fixed signals at the 'Stop' position, and
- (2) go back the required distance of 2000 metres, unless there is a signalbox within that distance when the flagman will stop at the signalbox, and act as directed above.

(i) Automatic Signalling

Where automatic signalling is in force, the flagman need not go beyond the third fixed signal in the rear of the obstruction if within the 2000 metres, but must:

- (1) fix three ATWs on the line adjacent to the third signal beyond the obstruction, and
- (2) exhibit the 'Warning' hand signal until otherwise directed.

(j) Responsibilities of Ganger

The Ganger, or person in charge, is personally responsible for ensuring that flagmen are:

- (1) positioned correctly, and
- (2) certified as competent.

The Ganger must also ensure that:

- (1) additional Flagmen are employed where a Driver's view is restricted,
- (2) an additional rail is available to replace a rail which has been removed, and
- (3) work is not carried out during inclement weather or when a clear view of the hand signal may not be obtained.

4. TRACK FORCE PROTECTION - SUBURBAN AREA

(a) Clearly Defined Suburban Area

Is the area embraced by Lilydale, Belgrave, Alamein, Glen Waverley, from up home signals of the Eastern and South Eastern lines at Dandenong, from up home signals at:

- (1) Frankston, Sandringham, Williamstown,
- (2) Laverton Crossing Loop via Westona (but not the east and west lines between Altona Junction and Laverton),
- (3) St. Albans, and
- (4) Broadmeadows (via Essendon), Upfield, Epping, Hurstbridge, and the up end of Richmond, Jolimont (MCG) and North Melbourne.

(b) Occasions when Protection must be Provided

Protection must be provided prior to:

- (1) any on-track machine carrying work persons and/or material,
- (2) any other obstruction being placed upon a running line,
- (3) any ballast or other maintenance train remaining stationary or moving slowly along the line,
- (4) any rail being taken out or relaying operations commencing, or
- (5) the line being unsafe due to landslip or other such cause.

(c) How Protection is Provided

- (1) An outer flagman must place three Audible Track Warners (ATWs) on the line, 10 metres apart, not less than 1200 metres from the obstruction. The 'Warning' hand signal (yellow flag or light) must be plainly exhibited to any approaching train.
- (2) An inner flagman must plainly exhibit the 'Stop' hand signal (red flag or light) not less than 200 metres from the obstruction.
- (3) This protection can only be withdrawn when instructions are received from the person in charge that the obstruction has been removed. The inner flagman then must plainly exhibit a green flag or light, held steadily in the hand, to the Driver of the train or light locomotive.

(d) Responsibilities of Ganger

The Ganger, or person in charge, is personally responsible for ensuring that flagman are:

- (1) positioned correctly, and
- (2) certified as competent.

The Ganger must also ensure that:

- (1) additional flagmen are employed where a Driver's view is restricted, and
- (2) an additional rail is available to replace a rail which has been removed.

(e) Approaching Train

The Driver of an approaching train must reduce speed on observing the 'Warning' hand signal or exploding ATWs. The Driver must be prepared to stop the train and await further guidance from the inner flagman.

(f) Reduced Speed

When the train or light locomotive is required to reduce speed:

- (1) the person in charge must instruct the inner flagman to exhibit the 'Caution' hand signal,

- (2) the Inner Flagman must stop the train for speeds of less than 25 km/h. Verbally inform the Driver of the speed at which the train can proceed. The inner flagman must then display the 'Caution' hand signal,
- (3) when the train is clear the inner flagman must exhibit a steady green flag or light and normal speed may be resumed, and
- (4) the speed of the train must not be increased until the steady green flag or light is exhibited.

(g) Restricted Terrain

Should restricted terrain not allow a good and distant view of the 'Warning' hand signal, then the hand signal and three ATWs must be placed so that there is a good and distant view (at least 1200 metres). Restricted terrain includes:

- (1) within a tunnel,
- (2) close to the mouth of a tunnel nearest to obstruction,
- (3) steep descending gradient, and
- (4) curvature of the line.

(h) Special Case of a Tunnel

In the case of a tunnel the outer flagman must:

- (1) place three ATWs 10 metres apart at the end of the tunnel nearest to the obstruction,
- (2) proceed through the tunnel to a position where the Driver can obtain a good and distant view of the 'Warning' hand signal, and
- (3) place on one rail three ATWs 10 metres apart at this position.

(i) Signalbox with a Signaller on Duty

Should a signalbox be located within 1200 metres of an obstruction, and except as provided in para (e) above, the outer flagman must act as follows:

- (1) remain at the signalbox or signalling complex,
- (2) place three ATWs ten metres apart and display the 'Warning' hand signal,
- (3) instruct the Signaller to keep the fixed signals at the 'Stop' position, and
- (4) not allow any train to pass the signalbox until the obstruction has been removed.

(j) Obstruction within 400 metres in Advance of the Home Signal

Where an obstruction is located within 400 metres in advance of a signalbox, the outer flagman must act as follows:

- (1) instruct the Signaller to keep the fixed signals at the 'Stop' position, and

- (2) go back the required distance of 1200 metres, unless there is a signalbox within that distance when the flagman will stop at the signalbox, and act as directed above.

(k) Automatic Signalling

Except in the Clearly Defined Inner Suburban Area, where automatic signalling is in force, the flagman need not go beyond the third fixed signal in the rear of the obstruction if within the 1200 metres, but must:

- (1) fix three ATWs on the line adjacent to the third signal beyond the obstruction, and
- (2) exhibit the 'Warning' hand signal until otherwise directed

5. OBSTRUCTION OF THE LINE SPECIAL CIRCUMSTANCE

If it is necessary to obstruct the line between the up and down distant signals, verbal permission must be obtained from the Signaller. The Signaller must keep the relevant fixed signals at the 'Stop' position until the Ganger in charge advises the Signaller that the line is clear for the passage of trains.

This Rule also applies at a terminal station when the line inside the distant signal is to be obstructed, or inside the home signal where a distant signal is not provided.

The Ganger in charge must arrange for the obstruction to be protected.

21 TRACK WARRANT WORKING

A Track Warrant is the authority for unplanned infrastructure work activities and is issued by either a Train Controller or a Signaller (dependant on the Safeworking System) to the Track Supervisor of the work site as authority to foul the Main Running Line.

The revised Track Warrant format (**Form TW 1 August 2001**) showing the details required to issue (**Part 1**) and return (**Part 2**) a Track Warrant is illustrated after Clause (**h**) of this Rule.

The issue of a Track Warrant will only apply on Main Running Lines.

(a) GENERAL CONDITIONS

Track Warrants may be issued for:

- Infrastructure maintenance activities where the track may be broken or otherwise obstructed whilst the work is being carried out.
- Infrastructure maintenance activities where one or more Track Vehicles or Track Machines are to be used.
- Infrastructure maintenance activities involving mechanical plant or machinery that is to be used within **two metres** of a Main Running Line.

A Track Warrant **must not be issued in the same section** where:

- Permission has been given for the issue of an Absolute Occupation,
- The line is Booked Out of Service, or
- Track Permission has been granted for a Road Rail journey, unless the Road Rail vehicle operator is advised and agrees to the issue of the Track Warrant.

A Track Warrant must not be used:

- If a plant train is to operate within the section of track.
- To cover works on the obstructed line where Single Line Working is in force.
- For major planned works that would necessitate the rescheduling of timetabled traffic.

Protection Under Track Warrants

The work performed under a Track Warrant will not be protected by Audible Track Warning Signals or Hand Signals. A Train is not permitted to enter a section of line covered by a Track Warrant until the Track Supervisor returns the Track Warrant to the Train Controller or Signaller.

Issue of One or More Track Warrants in the Same Section

With the exception of the **Section Authority** system, two or more Track Warrants may be issued for the one section, provided the work areas do not overlap.

Numbering of Track Warrants

Track Warrant forms are numbered consecutively by the issuing Train Controller or Signaller, commencing with number 1 at 0001 hours each day.

Track Warrant to be Returned in Sufficient Time

All work performed under a Track Warrant must be arranged so that the Track Warrant has been returned to the Train Controller or Signaller and the track is clear and safe for traffic **at least 20 minutes** prior to the scheduled arrival of a train at either end of the affected section.

Issue and Receipt of Track Warrants

A Track Warrant may be issued to the Track Supervisor either:

- ***verbally by radio or phone*** - a Train Controller or Signaller dictates the details in **Part 1** of the Track Warrant form to the Track Supervisor requesting the Track Warrant, or
- ***in person*** - a Signaller completes all the details in **Part 1** of the Track Warrant form and hands it to the Track Supervisor requesting the Track Warrant.

A Track Warrant may only be received by a person (the Track Supervisor) who has been qualified to **Level 3 - Train Track Protection Coordinator**.

Infrastructure Service Providers must ensure that staff who are required to apply for a Track Warrant are in possession of a valid Train Track Protection Coordinator's ticket.

Once a Track Warrant is Issued

Once a Track Warrant has been issued authorising the Main Running Line to be fouled, a movement must not be authorised to enter the applicable section until the Track Warrant is returned and advice has been received that the track is clear and safe for normal traffic.

Return of Track Warrants

The Track Supervisor must return the Track Warrant either:

- ***verbally by radio or phone*** by dictating the details in **Part 2** of the Track Warrant form to the Train Controller or Signaller that issued the Track Warrant, or
- ***in person*** by returning the Track Warrant form with **Part 2** completed to the Signaller who issued it.

Protection of Parallel Lines

Where a parallel line(s) passes the work site and the works will or could foul that line(s), the parallel line(s) must be protected by:

- (1) the issue of an additional Track Warrant for the line, or
- (2) implementing Track Force Protection in accordance with Rule 3 or 4 (Section 15), as applicable, of the 1994 Book of Rules and Operating Procedures, or
- (3) Booking Out the track in accordance with Rule 22 (Section 15) of the 1994 Book of Rules and Operating Procedures.

The Train Controller responsible for any parallel line(s) that pass the work site must be advised of any infrastructure work activities on the adjacent line, even if the line(s) passing the work site will not be fouled or obstructed.

(b) ISSUE OF A TRACK WARRANT

The issue of a Track Warrant will be effected as follows:

- On the **Train Order, Section Authority, Automatic Electric Staff and Centralised Traffic Control** systems, the Train Controller is considered to be the Signaller and will be responsible for the issue of the Track Warrant.
- On the **Electric Staff, Train Staff and Ticket, Track Block, Automatic Block Signalling and Automatic and Track Control** systems, the Signaller may issue a Track Warrant, after conferring with and obtaining the permission of the Train Controller.

The Track Supervisor must:

- Request permission from the Train Controller or Signaller ***before*** commencing any work which will obstruct the line, stating the line section, location and distance in kilometres covered by the proposed work.
- Give the Train Controller or Signaller detailed advice of the likely duration of the proposed work.
- Advise the Train Controller or Signaller of an appropriate contact mode, should the need arise, (eg. a mobile telephone number or radio channel and frequency details).
- Where Track Maintenance Machines/Vehicles are working in the area covered by the Track Warrant, advise the Train Controller or Signaller of the number of vehicles involved in the work area.
- Not allow the line to be fouled until the Train Controller or Signaller has given permission for the work either by transmitting the details in **Part 1** of the Track Warrant form by radio or phone, or by personally issuing the form with **Part 1** completed.

When Part 1 details have been received by radio or phone, the Track Supervisor must verify correct receipt by repeating them back to the Train Controller or Signaller.

- Ensure that the details of scheduled and running trains are entered in the Train Information and Permission Book (Form 2481) or equivalent record, showing the time that trains are due or expected at the applicable section(s) covered by the Track Warrant.
- Complete the work in time to clear the line and make it safe for traffic ***at least 20 minutes prior to the arrival of a train*** at either end of the affected section and advise the Train Controller or Signaller.
- Immediately advise the Train Controller or Signaller if the line is unable to be cleared at the time specified on the Track Warrant.
- At the completion of the work authorised by the Track Warrant, ensure that the line is clear and safe for the passage of trains.
- Complete the details in **Part 2** of the form and transmit them to the Train Controller or Signaller, or return the completed form in person to the Signaller.
- If permission has been granted by the Track Supervisor for a Road Rail Vehicle to pass through the work area, the Track Supervisor must ensure the vehicle has cleared the work area prior to returning the Track Warrant.
- Report to the Train Controller or Signaller after the passage of each train, and if required, obtain a fresh Track Warrant to reoccupy the track.

The Track Supervisor must conduct a Roll-by inspection of each passing train to ensure train integrity is maintained.

Where a Train Controller is responsible for Issuing the Track Warrant, the Train Controller must:

- Ensure that no train not yet in the section has been authorised to enter the section and that any train already within the section has passed the intended work site.
- Ensure that all relevant Train Running information is provided to the Track Supervisor.
- Graph the details on the Train Graph, ensuring no conflict exists, *prior* to issuing or authorising the issue of the Track Warrant,
- In the **Centralised Traffic Control** system, apply a Blocking Command over the Single Line section.
- In the **Section Authority** system, apply a work gang permission “Under Absolute Occupation” with details of the Track Warrant and contact number of the Track Supervisor.
- Complete **Part 1** of a Track Warrant form, ensuring all the details are correct. Transmit the details by radio or phone to the Track Supervisor and record the correct read back of those details.
- Not authorise any train movement to enter the section until the Track Supervisor has returned the Track Warrant and reported that the line is clear and safe for the passage of traffic.

The Track Warrant is returned when the Track Supervisor has completed Part 2 of the Track Warrant form and dictated the details to the Train Controller.

Where necessary, another Track Warrant may be issued once the train has passed the work site.

- Give the Signaller(s) in attendance at one or both ends of the section(s) affected by the Track Warrant full details of the issue of the Track Warrant. This information must be endorsed by the Signaller(s) across the figure line of the Train Register Book.
- Where a Signaller is absent or not on duty at either end of the section at the time a Track Warrant is issued, the Signaller must be advised of the issue of the Track Warrant upon commencing duty. When so advised, the Signaller must enter the appropriate details in the Train Register Book.

This is only to be carried out where the Track Supervisor has not already returned the Track Warrant.

- Should a Road Rail vehicle require to enter or pass the work area, the Train Controller must ensure that both the operator of the Road Rail vehicle and the Track Supervisor holding the Track Warrant have been advised of the working and movement of the other party.

The Track Warrant must not be returned until the Track Supervisor has confirmed that the Road Rail vehicle is clear of the Track Warrant work area.

- Complete **Part 2** of the Track Warrant form as dictated by the Track Supervisor when the Track Supervisor reports that the work is complete and the track is clear and safe for traffic.
- Suitably endorse the Train Graph to reflect the return of the Track Warrant.
- Notify the Signaller(s) at one or both ends of the section of the return of the Track Warrant. The Signaller(s) must record this information across the figure line of the Train Register Book.

Where a Signaller is responsible/or Issuing the Track Warrant, the Signaller must:

- Ensure that no train not yet in the section has been authorised to enter the section and that any train already within the section has passed the intended work site. The Train Register Book must be referenced in this instance.
- Ensure that all relevant Train Running information is provided to the Track Supervisor.
- Confer with the Train Controller and advise the period of time requested for the issue of the Track Warrant. Obtain authority from the Train Controller for the issue of the Track Warrant.

Note: The Train Controller must record details of the authority on the Train Graph.

- Complete **Part 1** of a Track Warrant form, ensuring all the details are correct. Either transmit the details by radio or phone to the Track Supervisor and record the correct read back of those details, or obtain the Track Supervisor's signature in the Train Register Book when issuing the Track Warrant form in person.
- Enter full details of the issue of the Track Warrant in the Train Register Book.
- On the **Electric Staff** or **Train Staff and Ticket** systems, issue the Track Supervisor with the Staff for the section and record the issue of the Staff in the Train Register Book (for more details, refer Clause **(d)** and **(e)** of this Rule).
- Where there is an opposing Signaller at the other end of the section, advise that Signaller of the issue of the Track Warrant and confirm that the Fixed Signals governing the entrance to the affected section are sleeved at the 'Stop' position.

When so advised, the opposing Signaller must include full details of the issue of the Track Warrant in the Train Register Book.

- Where the opposing Signaller at the other end of the section is absent or not on duty at the time a Track Warrant is issued, advise that Signaller of the issue of the Track Warrant, and confirm that the Fixed Signals governing the entrance to the affected section are sleeved at the 'Stop' position as soon as that person commences duty.

When so advised, the opposing Signaller must include full details of the issue of the Track Warrant in the Train Register Book.

This is only to be carried out where the Track Supervisor has not already returned the Track Warrant.

- Not authorise any train movement to enter the section until the Track Supervisor has returned the Track Warrant and reported that the line is clear and safe for the passage of traffic.

The Track Warrant is returned when the Track Supervisor has completed **Part 2** of the Track Warrant form and dictated the details to the Signaller or has handed the completed form back to the Signaller in person.

Where necessary, another Track Warrant may be issued once the train has passed the work site.

- Should a Road Rail vehicle require to enter or pass the work area, the Signaller must ensure that both the operator of the Road Rail vehicle and the Track Supervisor holding the Track Warrant have been advised of the working and movement of the other party.

The Track Warrant must not be returned until the Track Supervisor has confirmed that the Road Rail vehicle is clear of the Track Warrant work area.

- On the **Electric Staff** or **Train Staff and Ticket** systems, receive the Staff back from the Track Supervisor and obtain the Supervisor's signature in the Train Register Book (for more details, refer Clause **(d)** and **(e)** of this Rule).
- Advise the opposing Signaller at the other end of the section that the Track Warrant has been returned. The opposing Signaller must endorse the Train Register Book accordingly.
- Advise the Train Controller when the Track Warrant has been returned.

Note: The Train Controller must record details of the return on the Train Graph.

(c) EXTENT OF TRACK WARRANT BOUNDARIES

With the exception of the **Section Authority** system, a Track Warrant may be issued for the entire single line section or part of the single line section, depending on the extent of the work area.

In the case of the **Section Authority** system, the Track Warrant shall apply over the entire Single Line or Track Section.

In granting permission for the issue of a Track Warrant, the following conditions must exist on the corridor:

(i) Train Order Territory

Where a Track Warrant is issued for the **entire single line section** or an **intermediate location**, the permission to occupy the line will extend between the Up and Down Location Boards or Repeating Signals of the adjoining locations.

An approaching train may be permitted to approach the Crossing Station, Loop or Block Point at the boundary of the area where the Track Warrant is in force, provided the work point is at or beyond a point of **2500 metres** from the Crossing Station, Loop or Block Point.

If the proposed boundary of the Track Warrant boundary is **less than 2500 metres** from the Crossing Station, Loop or Block Point, the adjoining section must also be included in the Track Warrant area.

Where a Track Warrant is issued for the **Up or Down Track** at an **Unattended Crossing Loop**, an approaching train is not permitted to be given permission to proceed beyond the adjoining Crossing Station, Loop or Block Point location.

Where there is a Signaller in attendance, the Fixed Signals governing entrance to the section must be secured at the 'Stop' position until the Track Warrant is returned. The Train Register Book must be endorsed to this effect.

(ii) Electric Staff, Automatic Electric Staff, Intermediate Electric Staff and Train Staff and Ticket Systems

Permission to occupy the line will extend over the entire single line section. Additionally, the Track Supervisor must be issued with the Electric Staff or Train Staff for the section. Where a Signaller is in attendance, the Fixed Signals governing entrance to the section must be secured at the 'Stop' position until the Track Warrant is returned. The Train Register Book must be endorsed to this effect.

(iii) Automatic and Track Control System

Permission to occupy the line will extend over the entire single line section between the Home Departure Signals of adjoining Crossing Stations/Loops. The Signallers at both ends of the section must ensure that the Fixed Signals governing entrance to the section are secured at the 'Stop' position until the Track Warrant is returned. The Train Register Books must be endorsed to this effect.

(iv) Automatic Block Signalling System

On Double lines, permission to occupy the line will extend from the Departure Signal at the Signalbox in the rear to the arriving Home Signal at the Signalbox in advance.

On Single lines, permission to occupy the line will extend between adjacent arriving Home Signals.

The Signaller must ensure that the Fixed Signals governing entrance to the section are secured at the 'Stop' position until the Track Warrant is returned. The Train Register Book must be endorsed to this effect.

(v) Section Authority System

A Track Warrant must be issued for the entire single line or track section.

Where a Track Warrant is issued between Crossing Loops and/or Block Points, the permission to occupy the line will extend up to the arriving Home Signal at that Crossing Loop or the Block Point boards at a Block Point location.

An approaching train may be permitted to approach the Crossing Station, Crossing Loop or Block Point at the boundary of the area where the Track Warrant is in force.

Where a Track Warrant is issued for the Main or Loop Track at an Unattended Crossing Loop or Remote Control Crossing Loop, an approaching train is not permitted to be given permission to proceed beyond the adjoining Crossing Station, Loop or Block Point location.

Prior to issuing a Track Warrant at an Unattended Crossing Loop, the Train Controller must ensure that appropriate Track Blocking commands have been applied over both the Main and Loop tracks at that location.

The Track Warrant shall only be applicable between the Up and Down end Clearance Point (CP) boards at that location.

Where there is a Signaller in attendance at an attended location, the Fixed Signals governing entrance to the section must be secured at the 'Stop' position until advised by the Train Controller that the Track Warrant has been returned. The Train Register Book must be endorsed to this effect.

In the case of Remote Control locations, Blocking Commands must be applied on the applicable signals controlling entrance of trains into the affected section(s) and not removed until advised by the Train Controller that the Track Warrant has been returned and the track is clear and safe for normal traffic.

Should a Track Warrant be issued on the Main or Loop Track of a Remote Control location within the Section Authority system, the Train Controller must apply Blocking Commands on the Arrival Signals at that location to protect the work operations. A Section Authority must not be issued for a movement to depart the Crossing Loop or Block Point either side of the Remote Control location until the Track Warrant is returned and the track is certified as clear and safe for normal traffic.

(vi) Centralised Traffic Control System

Permission to occupy the line will extend over the single line section between the Home Departure Signals at adjoining Crossing Loops or Junctions. The Train Controller must ensure that the Fixed Signals governing entrance to the section are secured at the 'Stop' position by means of a Blocking Command over the applicable section until the Track Warrant is returned.

Should the Track Warrant apply to either the Main or Loop Track at a Crossing Loop, the Train Controller must ensure that the appropriate Blocking Commands have been applied to protect the line over which the Track Warrant applies. The Drivers of any movements proceeding through the Crossing Loop must be advised of the issue of the Track Warrant.

Should a Switch In/Out Location be switched In, or an Attended Location is within the area where the Track Warrant applies, the Train Controller must instruct the Signaller at that location to secure the applicable Home Signals governing the entrance of trains into the area at the 'Stop' position by means of Lever Sleeves. This advice must be given prior to the issue of the Track Warrant.

The Lever Sleeves must not be removed until advised by the Train Controller that the Track Warrant has been returned and the line is clear and safe for normal traffic.

(d) LINES WORKED UNDER TOKEN SYSTEMS

The Signaller should give the Track Supervisor the Train Staff or Electric Staff for the section, after conferring with and obtaining agreement from the Train Controller that the time required can be granted without delaying a train.

Where an **Electric Staff** is not available due to Instrument failure, or a **Train Staff** has been lost, a Track Warrant *may* be issued whilst Train Authority Working is instituted, *provided* the section is clear and the authority of the Train Controller has been obtained.

Where the **Train Staff** is at the opposite end of the section when a Track Warrant is requested, the Train Staff must be transferred to the end of the section where the Track Warrant is required *before* the Track warrant is issued, provided train delays will not thereby be incurred.

Where the **Train Staff** or an **Electric Staff** is on a train proceeding away from the proposed Track Warrant work point, a Track Warrant *must not be issued* until the **Train Staff** or **Electric Staff** has been returned or is available to be issued to the Track Supervisor, in conjunction with a Track Warrant.

It may be necessary for the **Train Staff** to be transferred to the opposite end of the section for this purpose.

(e) AUTOMATIC ELECTRIC STAFF SYSTEM

On lines where the **Automatic Electric Staff** system is in force:

- At an Attended Staff Station, the Track Supervisor must obtain an Electric Staff from the Signaller.
- At an Unattended Staff Station, the Track Supervisor must obtain permission from the Train Controller to withdraw an Electric Staff.

This is provided that the Track Supervisor holds a current certificate of competency for operation of the Automatic Electric Staff system.

(1) LOCATIONS PROVIDED WITH SWITCHING FACILITIES

If it is necessary to alter the status of a section in:

- Section Authority,
- Centralised Traffic Control,
- Automatic and Track Control,
- Track Block, or
- Automatic Block Signalling

territory, and a Track Warrant has been issued for the section concerned, the status of the section must not be altered until arrangements have first been made for the Track Warrant to be returned. Once the status of the section has been altered, the Track Warrant may then be reissued indicating the new boundaries of the work point.

(g) ATTENDANCE OF SIGNALLING STAFF

Where a Signaller is in attendance, the Fixed Signals must be held at the 'Stop' position for the protection of the section in which the Track Warrant has been issued. Where authorized by the responsible Rail Safety Department, the Signaller may cease duty once a Track Warrant has been issued, provided no trains are scheduled to approach the location during the period the Track Warrant remains in force. A Signaller must recommence duty either:

- ten minutes prior to the Track Warrant being returned, or
- on **Block Signalling** systems, be in attendance to give permission for a train to approach from the signalbox in the rear.

APPENDIX B : SOURCES AND SUBMISSIONS

Sources of information

Australian Rail Track Corporation
Department of Infrastructure (Victoria)
McElligott Partners Pty Ltd
Pacific National
VicRoads
V/Line Regional Network and Access
WorkSafe Victoria
Works Infrastructure

References

TA 20 – Victorian Network Operations, which incorporates the applicable sections of the 1994 Public Transport Corporation (PTC) Book of Rules

Submissions

Under Part 4, Division 2 (Investigation Reports), section 26 of the Transport Safety Investigation Act 2003, the Executive Director may provide a draft report, on a confidential basis, to any person whom the Executive Director considers appropriate. Section 26 (1) (a) of the Act allows a person receiving a draft report to make submissions to the Executive Director about the draft report.

A draft of this report was provided to:

- a) Australian Rail Track Corporation
- b) Department of Infrastructure (Victoria)
- c) McElligott Partners Pty Ltd
- d) Pacific National (PN)
- e) PN signaller
- f) VicRoads
- g) V/Line Regional Network and Access
- h) WorkSafe Victoria
- i) Works Infrastructure (WI)
- j) WI infrastructure compliance officer
- j) WI Track Protector

Submissions were received from:

The Australian Rail Track Corporation, Department of Infrastructure (Victoria), Pacific National (PN), VicRoads, V/Line Regional Network & Access, Works Infrastructure (WI) and the train driver have made a number of comments and observations on the draft report issued to directly involved parties.

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

Collision between freight train 4AM3 and an elevated platform vehicle at
North Geelong in Victoria 26 October 2006