Australian Government

Australian Transport Safety Bureau

ATSB TRANSPORT SAFETY INVESTIGATION REPORT
Rail Occurrence Investigation 2005001
Final

Collision Between Freight Wagons (for train 4MP5) and Passenger Train 8622

Moonee Ponds Creek Junction, South Dynon, Victoria

19 January 2005

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

Published by: Australian Transport Safety Bureau
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ISBN and formal report title: see 'Document retrieval information' on page vi.

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DOCUMENT RETRIEVAL INFORMATION

Report No.	Publication date	No. of pages	ISBN	ISSN
2005/001	May 2006	54	1 921092 51 3	

Publication title

Collision Between Freight Wagons (for Train 4MP5) and Passenger Train 8622

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Acknowledgements

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Abstract

Pacific National train 4MP5 was in the process of being marshalled towards the South Dynon yard's exit points in the Melbourne Freight Terminal when the leading end of train collided with the XPT Sydney to Melbourne passenger service. The XPT was minutes away from journey's end at Spencer Street Station. The investigation team determined that because of poor communications to and task understanding by a trainee, the shunting movement passed the yard exit signal 214U at stop and open catch-points resulting in the last wagon fully derailing and the 2nd last wagon derailing one bogie. The two derailed wagons collided with the XPT before coming to a stop. There were no reported injuries.

MEDIA RELEASE

SHUNTING COLLISION WITH XPT ON 19 JANUARY 2005

An ATSB investigation has found that nobody was assigned to guide the leading end of a shunting movement of a Pacific National freight train which collided with the side of the Sydney to Melbourne XPT on the evening of 19 January 2005 at South Dynon. The ATSB investigation found that factors including the lack of procedures, poor communications, erroneous assumptions and a depleted team of terminal operators all contributed to the collision. The investigation also found that the catch-points were ineffective in deflecting the wagons away from the main line.

The final investigation report by the Australian Transport Safety Bureau states that three employees were directly involved in the shunting operation, a qualified terminal operator, a trainee and a locomotive driver. The terminal operator stayed with the locomotive to disconnect it from the wagons and allow the front portion of the train to connect. He incorrectly thought that the trainee understood that he was to guide the leading wagon and stop the train short of a signal guarding the main line.

However, the trainee however thought he had to go to a position only half way down the yard, remove a derailing device (a 'scotch-block') from the rail and wait there until the locomotive reached him, when he would disconnect the locomotive from the wagons. He had done this job on previous shunting movements and he was not qualified to guide the leading wagon.

The locomotive driver was not aware of the exact position of the leading wagon and was receiving 'distance-to-go' information over the radio from the trainee. He continued pushing the wagons until he saw the trainee and then realised that nobody was at the leading end of the shunt and that the distances given by the trainee related to the distance that the locomotive had to go to his position. The driver immediately brought the shunt to a stop. In the mean time the leading two wagons had derailed on catch-points guarding the main line and continued at a speed of about 9 km/h into the side of the XPT train passing at the time at a speed of about 13 km/h.

Nobody was hurt and relatively light damage was sustained by the XPT.

The ATSB issued two safety recommendations in the course of the investigation and is releasing a further seven recommendations today with the final report.

AUSTRALIAN TRANSPORT SAFETY BUREAU

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

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. Accordingly, the ATSB also conducts investigations and studies of the transport system to identify underlying factors and trends that have the potential to adversely affect safety.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and, where applicable, relevant international agreements. The object of a safety investigation is to determine the circumstances to prevent other similar events. The results of these determinations form the basis for safety action, including recommendations where necessary. As with equivalent overseas organisations, the ATSB has no power to implement its recommendations.

It is not the object of an investigation to determine blame or liability. However, it should be recognised that an investigation report must include factual material of sufficient weight to support the analysis and findings. That material will at times contain information reflecting on the performance of individuals and organisations, and how their actions may have contributed to the outcomes of the matter under investigation. 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.

Central to the ATSB's investigation of transport safety matters is the early identification of safety issues in the transport environment. While the Bureau issues recommendations to regulatory authorities, industry, or other agencies in order to address safety issues, its preference is for organisations to make safety enhancements during the course of an investigation. The Bureau is pleased to report positive safety action in its final reports rather than make formal recommendations. Recommendations may be issued in conjunction with ATSB reports or independently. A safety issue may lead to a number of similar recommendations, each issued to a different agency.

The ATSB does not have the resources to carry out a full cost-benefit analysis of each safety recommendation. The cost of a recommendation must be balanced against its benefits to safety, and transport safety involves the whole community. Such analysis is a matter for the body to which the recommendation is addressed (for example, the relevant regulatory authority in aviation, marine or rail in consultation with the industry).

EXECUTIVE SUMMARY

At approximately 1956 Eastern Summer Time on Wednesday 19 January 2005, wagons of a Pacific National (PN) operated freight train collided with a RailCorp operated eXpress Passenger Train (XPT) passenger train at South Dynon, Melbourne, about 2.3 km from Spencer Street Station. The wagons were being marshalled to form train 4MP5 on sidings in the South Dynon yard when the two leading wagons were propelled at a speed of 9 km/h into the side of the passenger train running on the main line at a speed of about 13 km/h.

There was damage to three XPT cars and minor damage to two freight wagons but no reports of injury to the 220 passengers, the crew on board the XPT or to the PN crew.

The wagons were being marshalled to form a train of 1415.4 metres in length. This involved joining two separate strings of wagons from two adjacent sidings. The rear portion of 697 metres was being propelled by a PN yard locomotive (pilot locomotive) from one siding to another at the eastern end of the yard. The front portion of the train was then to be drawn forward from an adjacent siding and attached to the rear portion.

There were three employees engaged in the propelling movement: a locomotive driver, a terminal operator riding on the pilot locomotive and a trainee terminal operator (trainee), located at the eastern end of the rear portion. Other employees were working elsewhere but were not required for the propelling movement.

With the pilot locomotive propelling the rear portion, the intention was for the trainee to guide the shunting movement and to stop the wagons short of a signal protecting the main line. The trainee did not fully understand his role. He went to the rear of the train before the movement started and remained there instead of guiding the leading wagon. As a result the leading wagon passed the signal and although catch-points derailed three bogies on the two leading wagons, the wagons were propelled into the side of the passing XPT.

The investigation found that the trainee's task had not been clearly specified. The accident sequence had developed because of a lack of defined procedures covering the marshalling of long trains, the breakdown in communication between terminal operations employees and the lack of structure in the task. In addition, although the catch-points derailed the leading wagons, they were not effective in deflecting the wagons away from the main line.

As a result of the investigation, the ATSB has issued recommendations with particular focus on:

- revision of the safety management system particular to the marshalling of trains in South Dynon yard
- revision of the safety management system to incorporate the need for a supervisory structure in relation to trainees in terminal operator teams
- consideration of the level of performance of the catch-points
- a revision of the safety management system to include a documented standard or policy to define the requirements and function of catch-points
- consideration of the development of specifications for catch-points and similar devices for inclusion in the Code of Practice for the Defined Interstate Rail Network.

1 INTRODUCTION

At approximately 1956 Eastern Summer Time on Wednesday 19 January 2005, Melbourne, Victoria, the rear portion of a Pacific National (PN) operated freight train, being propelled during a shunting movement inside the South Dynon yard, passed signal 214U displaying a stop indication. The shunting movement continued and derailed the two leading wagons on a set of catch-points which came into contact with the scheduled Melbourne bound RailCorp operated XPT (eXpress Passenger Train), numbered 8622, running on the main line.

As a result of this accidental incursion onto the interstate main line and its subsequent collision with a passenger service, the Executive Director of the Australian Transport Safety Bureau (ATSB) authorised an independent investigation into the causal factors contributing to the accident with a view to encouraging safety action and to prevent future accidents.

The ATSB conducted an on-site investigation where an examination of rollingstock and track infrastructure related evidence took place. Subsequent off-site investigation and analysis by the ATSB examined issues related to the electronic data recorders, safety management systems, records, personnel and organisational actions and responsibilities.

This final report is the result of the investigation into the collision.

2 OVERVIEW

2.1 Location

The collision between the wagons for freight train 4MP5 and the XPT passenger train occurred on the Sydney – Melbourne section of the standard gauge Defined Interstate Rail Network (DIRN) at the connection between the main line to Spencer Street Station and the South Dynon *Pacific National Yard* and *Coke Road*.

The main line section and yard connection are operated by the Australian Rail Track Corporation (ARTC) with the yard being operated by PN. The connection is known as Moonee Ponds Creek Junction and is 2.288 km from the 0 km mark on the approach to Spencer Street Station.

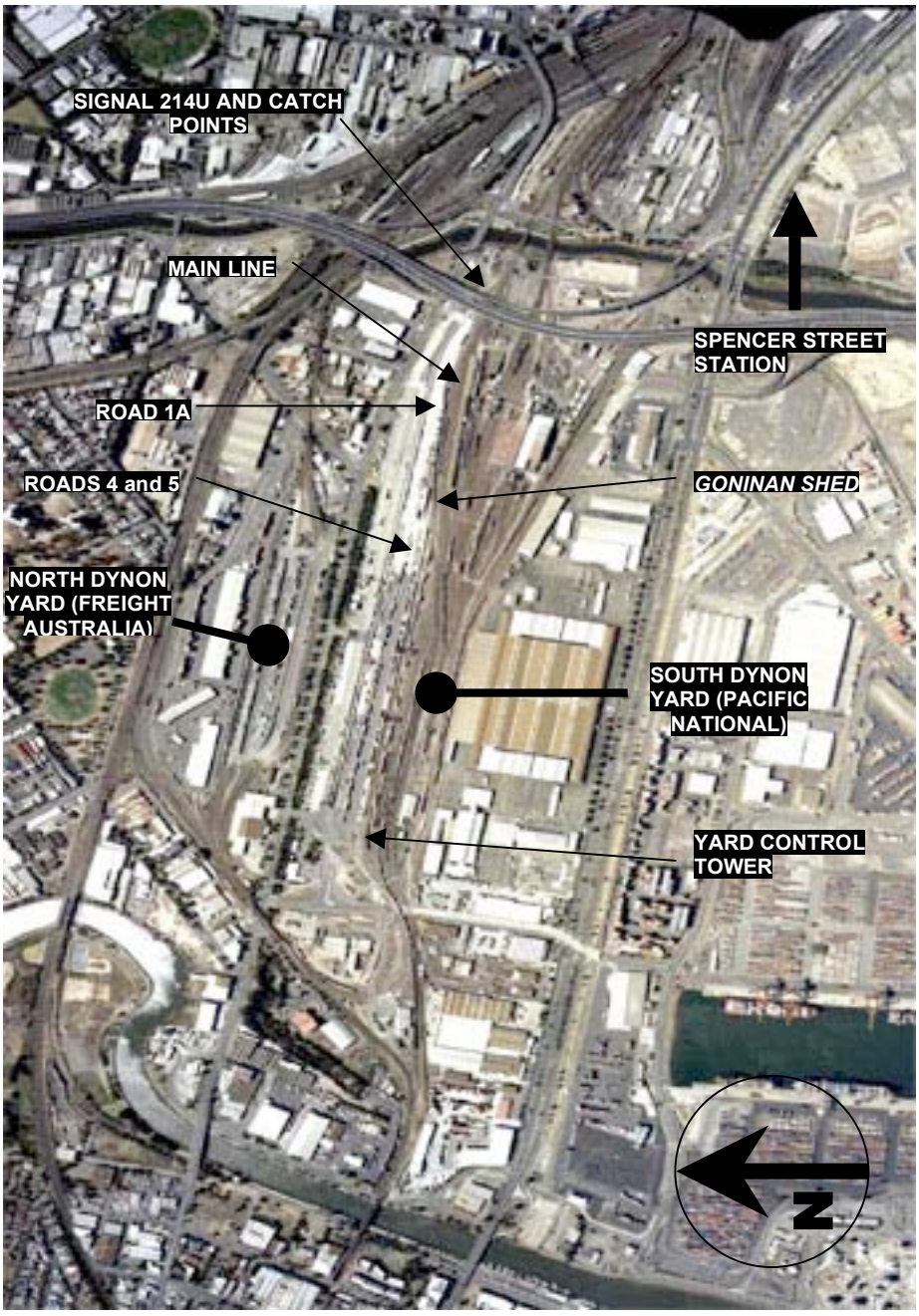
The operation of the line is bi-directional and is regulated by Victorian speed indication colour light signalling. The track is standard gauge with dual gauge (standard gauge and broad gauge)[1] capability from the PN yard to the *Loco Flyover Track* entering Spencer Street Station.

Figure 1: Moonee Ponds Creek Junction. The operational interface between the main line to Spencer Street Station and the *Pacific National Yard* and *Coke Road* is marked by 'dwarf' signal 214U.

1 Broad gauge – a measurement of 1600 mm between the inside rail faces. Standard gauge – a measurement of 1435 mm between the inside rail faces.

The connection from the PN yard to the main line is protected by signal 214U and dual gauge double blade catch-points[2].

Figure 2: Aerial photograph of Melbourne's Dynon complex. The occurrence site is S37°48.286' E144° 56 102' at signal 214U.



2 Catch-points – A single or double blade switch placed on a siding to protect the main line by derailing rail traffic that may enter or foul an adjacent running line. Alternate device: Derail. (Australian Railway Association's "Glossary for National Code of Practice and dictionary of railway terminology").

2.2 The Occurrence

The marshalling of trains is a regular PN operation within South Dynon yard. The sidings in the yard are generally not long enough for a train length of around 1500 metres to be contained wholly within any one siding. The wagons were being marshalled to form a length of 1415.4 metres[3] for the departure of train 4MP5 and involved a process of joining two separate strings of wagons (front and rear portions) from the adjacent sidings. This required the rear portion of the train to be moved towards the Spencer Street Station or eastern end of the yard onto a common extension road (1A) and the front portion then moved onto the rear portion to form the complete train. The process results in some sidings not being accessible from the eastern end until the train departs from the yard.

The marshalling of train 4MP5 involved the 697.2 metre long rear portion, positioned in '5' road, being propelled by a PN yard locomotive (pilot locomotive) into '1A' road. Here it was to be held on the approach side of departure signal 214U, at the eastern end of the yard. The 674.2 metre front portion of train 4MP5 was then to be moved from the adjacent '4' road by the 4MP5 main line locomotives and attached to the rear portion. Finally, train 4MP5 was to be prepared and despatched from this location via the western end of the yard onto the interstate main line for Perth.

There were four PN employees (team) engaged in the overall marshalling of train 4MP5 on the day: a driver of the pilot locomotive, two terminal operators, and one trainee terminal operator (trainee).

A yard coordinator was located in a 'control tower' to direct marshalling operations but did not have any supervisory role and was not immediately responsible, nor was he required to be, for the shunting movements to form train 4MP5.

At 1947:14, the yard coordinator contacted the team by radio with instructions to propel the rear portion of train 4MP5 into '1A' road, to uncouple, and then attend to some defective wagons[4] elsewhere. The trainee answered the yard coordinator and verified the instructions.

The yard coordinator at this time asked if anyone was available to set the road for the 4MP5 locomotives to arrive onto '4' road from the western end. The second terminal operator, who had previously been with the team at '9' road, replied that he would carry out this task. He set the road and then remained at the western end of the yard anticipating the return of the pilot locomotive on the completion of the '5' road shunting movement.

3 Includes the two wagon strings plus two NR class locomotives of 22 metres each.

4 Referred to as 'red cards'

After the pilot locomotive had been attached to the rear portion in '5' road, the first terminal operator indicated to the trainee to go to 'the Melbourne end', meaning to go to the eastern end of the yard. The terminal operator added that he would 'stay on the loco'. The intention was for the trainee to firstly remove a scotch-block[5] then guide the shunting movement along '1A' road towards signal 214U and indicate to the driver when to stop. The terminal operator then rode on the leading end of the pilot locomotive to uncouple it when the shunting movement had been completed.

The trainee drove a utility vehicle to the eastern end of the rear portion in '5' road. The trainee was also asked by the yard coordinator if the scotch-block had been removed from the rail on road '1A' at the eastern end. The trainee understood that what he had to do was to remove the scotch-block and remain where he was, close to the points connecting '5' road and '4' road on road '1A' and to uncouple the rear portion from the pilot locomotive. The trainee went to the end of the train and when the shunting movement started he remained where he was rather than guiding the leading wagon.

For the first part of the shunting movement, the terminal operator queried if the western end of the rear portion was to be positioned just past the '4' / '5' road points. Although the trainee answered that he would position them at the scotch-block, it was still not apparent to both the terminal operator and the driver that the trainee was not at the leading end and guiding the train towards 214U signal. As the shunting movement progressed, neither the driver nor the terminal operator could see the trainee. The trainee was also communicating regularly[6] by radio with the driver, however the directions he was providing related to the progress of the propelling movement on '5' road and not the progress of the leading wagons towards signal 214U.

As the shunting movement was underway, the Melbourne bound XPT was approaching along the main line at 59 km/h approximately three kms from the point of collision. The terminal operator and the driver noticed the XPT running opposite South Dynon yard and commented on its lateness[7].

The trainee did not realise that nobody was positioned at the leading end of the shunting movement until the terminal operator riding on the pilot locomotive came

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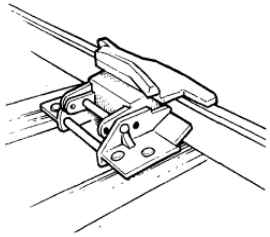
5 A PN Shunting Handbook refers to a derail block as a hinged ramp which is placed across one rail of a siding. It protects traffic from any runaway wagons or unauthorised moves and derails any locomotive or wagon that comes in contact with it. PN staff at South Dynon refer to the derail block as a scotch-block. (Diagram courtesy of Pacific National)



6 Pacific National Operations Manual OMP_34-R02 (20 September 2004) requires that instructions must be transmitted to the driver at intervals not exceeding 10 seconds or, until the shunting movement is complete.

7 Time was 1953:32.

into view. Correspondingly, it was not until the pilot locomotive neared the end of '5' road that the driver and terminal operator realised the situation. The driver first saw the utility vehicle to one side and then saw the trainee standing beside the *Goninan Shed* opposite to the '4' / '5' road points. Realising that there was nobody at the leading end of the shunting movement, the driver stopped the train[8].

The collision with the XPT was not immediately apparent and the yard coordinator questioned the terminal operator as to whether the rear portion was on the 'straight'[9]. The yard coordinator then asked how far the eastern end of the shunting movement was from signal 214U and how far the western end was from clearing the '4' / '5' road points.

The trainee was also asked to check the eastern end to make sure that it was still safely inside signal 214U. He replied that it had passed the signal and had collided with the XPT.

The rear portion of train 4MP5 was moving at 9 km/h when it passed signal 214U at 1956:05. At the same time, the leading end of the XPT was 53 metres beyond the point of collision and travelling at 13 km/h.

An on-board passenger attendant of the XPT was alerted to the collision and notified the driver to stop in compliance with RailCorp emergency procedures.

The leading wagon of the shunting movement, numbered RQSY 34384B, had collided with the fifth car (Car D) [10] from the leading end of the XPT and deflected to the left. The next wagon, numbered RQPW 60077T, then brushed against the sixth car (Car C) before contacting the seventh car (Car B) as the trains came to a stop at 1956:28. These contacts between the two trains extended over a distance of 51.2 metres.

The two leading container carrying wagons of the shunting movement, RQSY 34384B and RQPW 60077T, had become derailed and a third container carrying wagon, RQWW 22003J, had passed signal 214U but had not reached the catch-points. The leading end of RQPW 60077T had come to rest against the side of XPT Car B.

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8 Pacific National Operations Manual OMP_34-R02 (20 September 2004) requires that if there is any doubt about the safety of a shunting movement, the driver must immediately stop and check the situation.

9 As the rear portion had been stopped the yard coordinator made enquiries as to the reason with the terminal operator.

10 The XPT had been configured as cars H to A in the direction of travel.

Figure 3: The development of the occurrence. (Relevant details shown only).

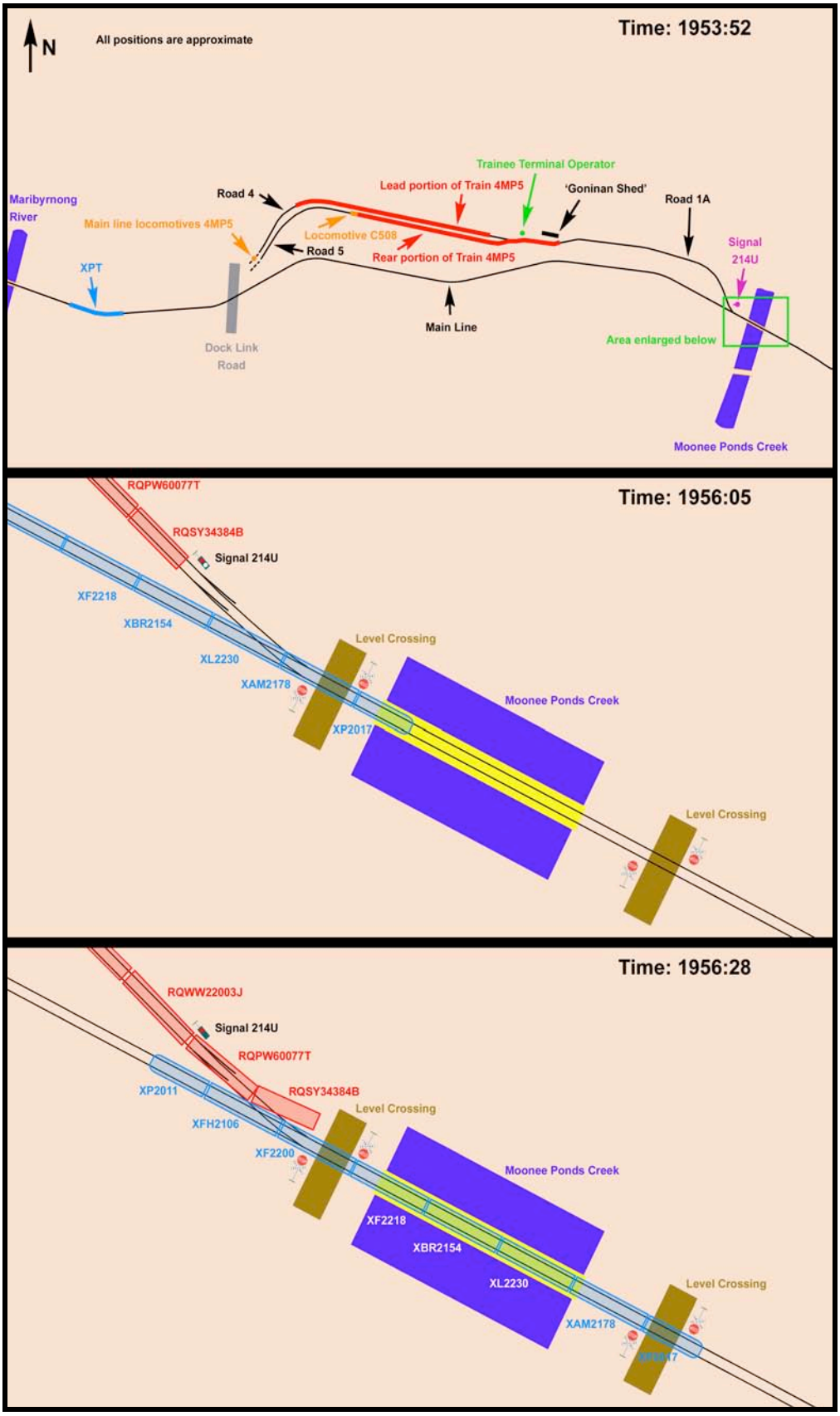


Figure 4: The occurrence scene at South Dynon. The photograph shows the trailing power car (Car A) and coach (Car B) of the XPT and the second freight wagon from the leading end of the shunting movement resting against Car B of the XPT. Part of the third freight wagon is on the left and the first freight wagon to derail is hidden behind the second freight wagon in the photograph.

2.3 Injuries

There were no reports of injury to the 220 passengers, the crew on board the XPT or to the PN crew.

No report of post-incident stress or related conditions to train crew or other personnel was indicated.

2.4 Train Information

2.4.1 Train 4MP5

PN train 4MP5 is a scheduled freight service between Melbourne, Victoria and Perth, Western Australia. The planned length of the train was 1415.4 metres made up of 39 container wagons. After the collision but before departure, the three leading wagons of the propelling movement were detached and the final length of the train was 1343 metres. Locomotives NR103 and NR109 were assigned to haul the train's weight of 2991.4 tonnes (departed as 2827 tonnes).

The marshalling of the train was being carried out by a PN 'Yard Pilot' locomotive registered C508. The pilot locomotive was fitted with an operating Hasler chart type speed recorder. The chart was removed for examination and it was determined

that the pilot locomotive's speed during the movement was in compliance with the maximum allowed in South Dynon yard of 15 km/h.

There were no conditions apparent on the pilot locomotive or the wagons that passed signal 214U that may have contributed to the occurrence.

Table 1: Details of three rear-most container carrying wagons of train 4MP5 that passed signal 214U.

NUMBER	TYPE	POSITION	LENGTH	GROSS WEIGHT
RQSY 34384B	Container flat	Rear of train	20.1 metres	31.97 tonnes
RQPW 60077T	Container flat	2nd from rear	25.8 metres	62.74 tonnes
RQWW 22003J	Container flat	3rd from rear	25.6 metres	70.06 tonnes

Figure 5: South Dynon Pilot Locomotive C508 engaged in recovery of the rear three wagons of 4MP5 following the occurrence

2.4.2 Train 8622

The XPT, operated by New South Wales based RailCorp, carried train number ST23 from Sydney to Albury and then train number 8622 to Melbourne. The train had departed Central Station, Sydney earlier that day for Melbourne's Spencer Street Station and was running approximately one hour late at the time of the occurrence.

The XPT consisted of eight vehicles with a train length of 179 metres and a weight of 266 tonnes. An XPT has a permitted maximum speed of 160 km/h.

Table 2: Details of Train ST23/8622

NUMBER	POSITION	CAR	CAR TYPE	LENGTH	MASS
XP2017	Leading	H	Driving/power	17.335 metres	76 tonnes
XAM2178	2nd	G	Sleeping with attendant's station	24.2 metres	48.3 tonnes
XL2230	3rd	F	First class seating and luggage	24.2 metres	39.6 tonnes
XBR2154	4th	E	Economy class seating & buffet	23.254 metres	43.6 tonnes
XF2218	5th	D	Economy seating	24.2 metres	41.6 tonnes
XF2200	6th	C	Economy seating	24.2 metres	41.6 tonnes
XFH2106	7th	B	Economy seating, supervisor's station & luggage	24.2 metres	40.1 tonnes
XP2011	Trailing	A	Driving/power	17.335 metres	76 tonnes

Figure 6: RailCorp XPT Driving/Power Car (Car A) standing in the Great Northern Siding (now Southern Short Haul Railroad Siding) following the occurrence

The train is crewed by one driver, a passenger services supervisor, and on-board staff for passenger and catering requirements. The speed recorder charts[11] from the XPT were also examined. The speed of the train at the time of the accident was

11 An operating Hasler chart type speed recorder was in place in the leading and trailing cabs of the train

found to be in compliance with a temporary speed restriction of 15 km/h which had been in place from 26 May 2004 for a distance of 100 metres between 2.2 km and 2.3 km (from 0 km near Spencer Street Station). The usual speed for this section of line is 55 km/h.

The operation of the XPT or the actions of its crew did not contribute to the occurrence.

2.5 PN Team Details[12]

The first terminal operator had been employed at South Dynon by PN for nine years and had experience in customer service, driving forklifts and inter-modal terminal vehicles, gantry crane operation, train examination and shunting.

The second terminal operator employed on the shift, who had left the team to set the points to '4' road, was an experienced shunter with other rail operators. He had been with PN for three months as a part-time terminal operator on permanent afternoon shifts.

The trainee had been employed by PN for three years and in this time he had been a South Dynon terminal operator driving forklifts and inter-modal terminal vehicles, before becoming a trainee (shunting). The trainee had been engaged in on-the-job training since September 2004 following a five day theory shunting training course.

The driver of the pilot locomotive had been with PN for 12 years and operated main line freight trains as well as yard pilot locomotives.

The terminal operators and trainee started their shift on the day at 1400 and were due to finish at 2200. The driver was rostered from 1330 to 2230. The team took a meal break between 1830 and 1900 just before attending to the marshalling of 4MP5.

The yard coordinator had been employed by PN for 11 years. This included five to six years as a terminal operator before becoming yard coordinator. On the day of the occurrence he started his shift at 1345 and was due to finish work at 2215.

The rosters for the terminal operators, trainee, driver and yard coordinator were analysed using software designed by the Centre for Sleep Research. This software estimates likely levels of fatigue based on the timing and duration of work periods for a particular work schedule. Results indicated that roster induced fatigue was unlikely to have contributed to the incident.

The first terminal operator and the trainee were also asked about sleeping patterns and tasks outside of work hours. Analysis indicated that any outside work activities were unlikely to have contributed towards the incident.

2.6 Medical and Toxicology Information

The PN driver of the pilot locomotive, the two terminal operators, and the trainee

12 Staff may have previously been employed by Freight Australia before this organisation was purchased by Pacific National.

were breath tested following the occurrence[13]. All employees returned 0.00% test results.

Records indicate that these PN employees were medically 'fit for duty' at the time of the occurrence.

2.7 Loss or Damage

The collision resulted in damage to the XPT. The damage included car body fibreglass fractures, skidded brakes, bogies, skirting, and inter-car diaphragm damage. The damage was confined to cars XF2218 (Car D), XF2200 (Car C), and XFH2106 (Car B). Car XF2218 sustained most of the damage and was withdrawn for repairs with car XFH2106. The cars remained out of service for a number of weeks following the collision.

There was minimal damage to the wagons of the freight train with the rear-most two wagons, RQSY 34384B and RQPW 60077T, sustaining bogie and minor body damage. Some post-occurrence damage also came about as a result of oxy-acetylene cutting during recovery.

There was no damage and only minimal disruption to track infrastructure following the derailment.

Figure 7: Example of fibreglass and door step damage to XPT cars C and B.

13 Tests were conducted no later than 2250 hours.

2.8 Dangerous Goods

Five wagons on the freight train were loaded with dangerous goods however none were involved in the derailment and subsequent collision with the XPT.

There were no releases of dangerous goods or toxic spillage of any kind.

2.9 Environmental Factors

Bureau of Meteorology records indicate that at the time of the occurrence, the weather was fine with an overnight minimum temperature of about 12 to 15 degrees Celsius and no rainfall.

Sunset was at 2042. There was adequate light for the locomotive driver to see the trainee during the shunting movement. The area at the leading end of the shunting movement in the vicinity of signal 214U was well out of view from the locomotive driver and had a relatively lower level of illumination due to the shadow cast by the CityLink road overpass.

There was no evidence of fog or dust at the time.

Apart from the inherent 'clutter' of wagons, equipment and buildings in the yard, there was no evidence that the working environment or the weather conditions were a contributing factor in the occurrence.

2.10 Post Occurrence Arrangements

The 'accident site' was secured and emergency procedures of each of the organisations involved were initiated following the occurrence.

Although the XPT was comparatively lightly damaged and had not derailed, there was some running gear damage and a derailed freight wagon was pressed up against Car B. This limited the scope of the immediate recovery and movement to a more suitable location where passengers could be assisted.

Table 3: Details of Consequential Delays and Altered Arrangements.

TRAIN NUMBER	CONSEQUENCES OR ALTERED ARRANGEMENTS
ST22	The Wednesday night return XPT service from Melbourne to Sydney (formed by ST23) was cancelled as a result of the occurrence with approximately 190 intending passengers being transferred to road coach for the journey. The coaches left Melbourne between 0015 and 0050 Thursday 20 January 2005.
ST21	The Wednesday overnight XPT service from Sydney to Melbourne was terminated at Albury with road coaches used between Albury and Melbourne.
ST24	The 0830 Thursday 20 January 2005 XPT service from Melbourne to Sydney was replaced by road coaches between Melbourne and Albury.
NT35	The 1135 Thursday 20 January 2005, Sydney to Grafton XPT service departed with an altered consist of spare cars. The usual ST22 set should have made this service.

WT27	The Sydney to Dubbo XPT departing at 0710 on Thursday 20 January 2005 operated with one power car only as the other power car was used in the make up of NT35.
4MP5	Departed Melbourne later on the Wednesday night without the three rear most wagons involved in the occurrence.

In compliance with RailCorp procedures, the Passenger Service Supervisor coordinated the evacuation of the 220 passengers. Ladders, supplied by Victorian passenger train operator V/Line, were used in this evacuation ensuring a safe exit for all passengers and on-board staff. Alternative transport was arranged by RailCorp for the passengers to complete their journey to Spencer Street Station. The transport however did not arrive until around midnight due to the absence of available road coaches on account of the Australian Open Tennis tournament in Melbourne at the time.

Repairs to the track infrastructure started on the day of the occurrence and were sufficiently completed by 1540 on Thursday 20 January 2005 to permit reopening of the line.

Figure 8: Recovery of rear-most wagon RQSY 34384B, in its final stopping position, being carried out following the removal of the XPT on Thursday 20 January 2005.

3 KEY ISSUES

3.1 Introduction

Rail safety management in Australia is based on a system of co-regulation. Train operators and track managers are required to have in place a safety management plan that is consistent with Australian Standard 4292.1. However, equivalent or superior standards may be nominated by the track manager or train operator for their safety management system. The overall objective is to make sure that a robust process for effective rail safety is in place.[14] The investigation focused on the relevant areas of the safety management systems applying to yard operations and the relevant infrastructure.

There are generally 17 trains a week made up to '1500 metres' in South Dynon yard. Normally three such trains are marshalled each day except Tuesdays and Thursdays when one is marshalled. As these long trains block access to other sidings at the Spencer Street Station end of the yard, the trains are formed as two shorter portions until a time closer to departure.

There are two general methods used to amalgamate the front portion with the rear portion of a '1500 metre' train. The particular method used is determined by the initial positioning of the rear portion in '1A' road and if it is able to clear '4' / '5' road points[15]. The front portion is either propelled directly onto the rear portion or alternatively, pulled forward to the western end and then propelled onto an adjacent road where the rear portion is standing. Each method requires a different approach to the task by the yard coordinator and the terminal operators. What is common between the two methods used in the marshalling of '1500 metre' trains is the initial positioning of the rear portion in '1A' road.

There were a number of factors that contributed to the passing of signal 214U at stop and subsequent collision of 19 January 2005. These included: role assignment, procedures, formal briefings, miscommunication, non-standard terminology, expectation, team resources, trainee supervision and catch-point protection. Consideration has also been given to training.

3.2 South Dynon Personnel

3.2.1 Role assignment and procedures

Yard coordinators, terminal operators, and drivers work as a team to carry out tasks based on procedures, their experience, understanding of what is to be done and training. While the yard coordinator generally arranged for each operation and assigned them to the terminal operators, the team took responsibility and carried out

14 Rail Safety Co-Regulation, Accreditation Authorities Group, Australia 2001.

15 Signal 214U can be cleared to allow a rear portion, which is longer than 1A road, to be propelled further to clear '4' / '5' road points. Evidence has indicated that this practice may not be recommended as the main line is blocked at the eastern end until the front portion can be attached and the whole train moved in clear of signal 214U.

the task as they saw fit. Train drivers largely followed instructions given by the terminal operators and were not always included in the planning of the marshalling task.

Procedures did not require the yard coordinator or any one terminal operator to take charge of the team or coordinate each shunting movement. With no set leader, some terminal operators assumed the role of 'lead terminal operator'. Historically this yard had two levels of shunters (i.e., terminal operators): Class one and Class two. Class two shunters had greater experience, obtained higher qualifications, assumed a greater level of responsibility than Class one shunters and had a higher pay scale. During restructuring these levels were flattened out so that irrespective of training and experience, all shunters in the yard were at the same level.

Generic shunting procedures were in place for the marshalling of trains in South Dynon yard and included the requirement that a qualified employee guide the leading wagon of a shunting movement. There were not, however, any specific set and practiced procedure or formalised structure on role allocation to follow.

3.2.2 Formal briefings

Terminal operators

There was no group briefing conducted by radio or face-to-face on what was expected during the shunting movement. This would have provided details of the upcoming task and to make sure that all members of the team had a common understanding of what would be done.

PN procedures do not require terminal operators to carry out briefings before undertaking each new marshalling movement.[16] Although the first terminal operator had a clear concept of what the movement involved, he did not explain to the trainee what he would be doing nor what the trainee needed to do, other than an undefined instruction to go to 'the Melbourne end'.

One strategy to promote coordination is the use of short briefings prior to work being carried out. This provides team members with a clear understanding of what the task is to be achieved, mitigation of risk and strategies to achieve this, and their own and others roles and responsibilities. Information sharing enables a shared mental model to be developed. Not only does this provide team members with a common plan, but also means in which to monitor the progress of a particular task and to determine whether it is going to plan.

In this case, the awareness by each employee of the responsibilities and roles of others during the shunting movement was therefore not adequate for the safe completion of the task. This misunderstanding led to a reduction in situational awareness. Situational awareness, through a team's shared understanding, provides a predictive element in that each member of the team will be aware of how a situation is likely to develop.

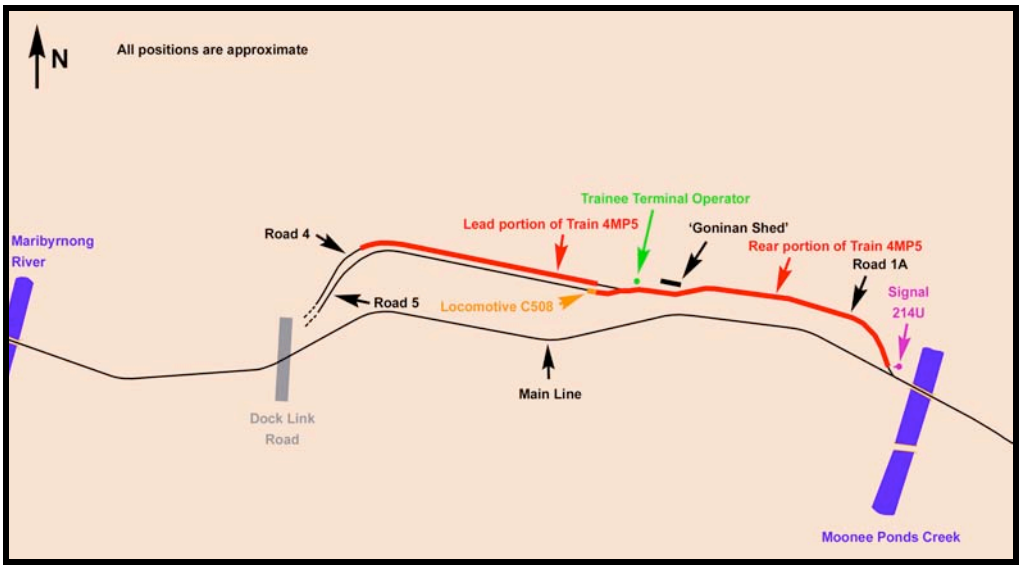
16 PN procedures suggest that planning should be carried out before a movement is started. This however only goes as far as checks such as releasing hand brakes and setting points, that need to be made and not an allocation of terminal operator positions in the overall task.

Yard coordinator

The yard coordinator was aware that the 697.2 metre rear portion of the train would not completely fit inside road '1A' without either clearing signal 214U and extending to the main line or having some wagons remaining in '5' road. Of the two methods used to amalgamate '1500 metre' trains, the yard coordinator figured that the front portion be pulled forward to the western end and then propelled onto the rear portion previously left in '5' and '1A' roads.

The locomotive driver, terminal operator and trainee on the other hand did not know the length of the rear portion of the train. They were not aware that the shunting movement would be required to stop with part of the string of wagons remaining in '5' road. Consequently this additional level of protection wasn't available to the team which may have unintentionally increased the potential for overrunning signal 214U.

Figure 9: With the 697.2 metres rear portion in '1A' road and up against signal 214U, approximately three wagons would have remained in '5' road. The front portion would then have been required to move towards the western end of the yard and then propel into '5' road to amalgamate with the rear portion.



3.2.3 Miscommunication and non-standard terminology

Terms used

The shunting movement involved various personnel, working in a team, that were periodically out of sight of each other. The operation largely relied on effective radio communications as the locomotive driver needed to be provided with distance-to-go information.

The trainee misunderstood what his task was. Quite possibly this was because his initial position at the leading end coincided with the position at which he expected to uncouple the locomotive. This may have provided a cue to complete a similar task he had undertaken previously.

The instruction to the trainee was to go to 'the Melbourne end'. The term 'Melbourne end' was one adopted by custom and practice within the South Dynon yard but had no defined meaning. Before the movement started the 'Melbourne end' was where the scotch-block was located. The trainee knew that it was his job to remove it. Thereafter the trainee received no other instruction as to what he was to do nor was the communication sufficient to challenge his mental model of how the task was to be carried out and his role in it. He remained where he was at the Melbourne end of '5' road.

The PN *Shunting Participants Handbook* notes that, 'Shunting instructions may contain special shunting commands, or they may be messages, which help to clarify shunting activities.' These instructions are intended to reduce the likelihood of potential communication errors. The Handbook also states that, 'Standard instructions are essential to ensure that there is no possibility of confusion between the locomotive driver and the radio operator giving shunting instructions.' The handbook however contains no detailed or specific communication requirements that could have been used by members of the team.

The radio exchanges did not communicate to the trainee specific instructions for guiding the leading end or stopping before reaching signal 214U. The terminal operator and the locomotive driver both assumed that sufficient information had been passed on to the trainee on his role and where he was to be positioned. Essentially the structure and words used to convey the instructions were those that might be used between experienced terminal operators. The trainee lacked the experience to interpret the implicit assumptions contained in the exchanges. There was a lack of explicit instructions to the trainee and no check on his understanding of the task.

3.2.4 Experience

The trainee understood his role as removing the scotch-block and later uncoupling the pilot locomotive. This understanding was largely based on previous experience. He had fulfilled this task before. It did not include him undertaking the safety critical role of guiding the shunting movement as he had only ever done this under the supervision of a terminal operator. Although the trainee understood the task that was to be carried out, the content and structure of the message did not challenge his understanding and expectation of what he was specifically required to do.

It is possible that the experience of the trainee contributed to the incident as a qualified terminal operator, being an equal member of the team with greater years of experience, may have automatically assumed the safety critical role. Furthermore, an individual more familiar with how the yard was run and the ambiguous communication protocols used, may have understood what was meant.

3.2.5 Team resources

There were usually four or five terminal operators rostered to a team on each shift. In the team on the occurrence shift, two were on personal leave and one was on sick leave. The trainee was deemed to be an extra person on the team. Replacements were unavailable and this left two terminal operators and one trainee to complete the shift.

Before the shunting movement the yard coordinator asked if the road could be set for the 4MP5 locomotives to arrive onto '4' road from the western end. As the second terminal operator was close-by, he chose to do this task. This left only one terminal operator and the trainee. There was possibly no necessity for the second terminal operator to undertake this task as the 4MP5 locomotive crew could have set the road themselves. Consequently two separate tasks were occurring in parallel, unnecessarily separating the two experienced terminal operators.

The impact on the trainee was that he was now required to assume a safety critical position in the propelling of the rear portion of the train. Had another terminal operator been available, it is unlikely that the trainee would have been asked to fulfil that position unsupervised.

3.2.6 Trainee supervision

The trainee had not been assigned a supervisor or mentor. Although trainees are required to undertake on-the-job experience, it is not usual for them to be assigned a specific individual to guide this learning. Neither of the terminal operators had received any direction or training in the supervision of trainees engaged in on-the-job experience acquisition. It is also apparent that there was no understanding as to who was responsible for the trainee terminal operator. Analysis of procedures indicated that terminal operators who work with trainees were not required to obtain formal training qualifications to promote trainee learning.

According to the PN *Safety, Health and Environment Manual* the trainee at the time of the incident, although qualified in theory components, had not been certified on the job as 'competent'[17]. The PN *Operations Manual* requires that all propelling movements must be preceded by a 'competent' employee. Hence the trainee should not have been required to execute a safety critical role such as guiding a shunting movement unsupervised towards a signal[18].

3.3 Infrastructure

The ARTC is the accredited Railway Manager for this section of the DIRN and the associated main line connection at Moonee Ponds Creek Junction. The train control centre overseeing this installation is located in Adelaide, South Australia. The operational interface between ARTC and PN is signal 214U with PN being

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17 The Pacific National Safety, Health and Environment (SHE) Management Manual SHE-001-R02 (24 June 2003) defines the following:

'4.7 Non-Certified Persons Conducting Safeworking Duties. Any safeworking incident involving a person who has not been training (sic), assessed, and certified as competent in the safeworking procedures applicable to the tasks being undertaken. Examples (in part)

Where a person performs shunting without being certified in the applicable safeworking procedures.'

18 The Pacific National Operations Manual OMP_34 – R02 (20 September 2004) states the following:

'A competent employee who is to be in constant communication with the Locomotive Driver must precede all propelling movements.'

responsible for the movement of trains within South Dynon yard including the observance of this signal.

PN and ARTC each have maintenance responsibilities for their respective sections of track.

3.3.1 Signal 214U

Signal number 214U is described as a 'dwarf' and displays a single light red for stop or a yellow low speed caution. The yellow aspect is also qualified by an illuminated letter 'S' or 'V' to indicate the route's gauge setting[19]. The signal is appropriately positioned to the left of the track at the exit from the yard, immediately in front of catch-points 215D, with the red aspect 3.4 metres above the rail level and 3.2 metres from the track centre.

Controlled movement of trains and observance of signal 214U by PN in South Dynon yard were the principal safeguards employed in protecting against accidents such as the collision between the wagons and the XPT.

Signal 214U could not be seen from the locomotive almost 700 metres from the leading wagon.

Signal 214U operated correctly less than five minutes before the occurrence when another PN train (PW), enroute to the steel terminal hauled by locomotive NR22, departed without incident. There were no reports of faults or unusual operation at this time. The signal was also found to be operational and displaying a red indication after the occurrence.

There was no evidence that the operation of signal 214U contributed to the occurrence.

3.3.2 Catch-points 215D

Catch-point functions

Once the leading wagon had passed signal 214U, a final line of defence to prevent an incursion onto the main line was 215D catch-points. There are two requirements of catch-points. Firstly they should prevent 'unsafe movements' of trains, and secondly, ensure that the derailed vehicle does not foul the running line.

The propelling movement passed signal 214U at stop and engaged catch-points 215D set to divert moves away from the main line. The effective length of the catch-points was 12.8 metres, or 13.75 metres beyond signal 214U. The catch-points had initially deflected the wagon away from the main line, but only for a limited distance. Had the leading wagon stopped at this time, an 'unsafe movement' would have been prevented.

The locomotive driver, being unaware that the lead wagon had passed signal 214U, continued propelling the string of wagons until he realised that there was nobody guiding the shunting movement. By this time the two leading wagons had fouled the main line and impacted the side of the passing XPT. Because the movement of

19 'V' refers to 'Victorian broad gauge' and 'S' refers to 'Standard gauge'.

the wagons continued for 46.25 metres from the time it entered the catch-points and until it stopped, the second requirement was not achieved as the derailed vehicles fouled the running line.

Catch-point standards

No documented standards covering catch-points on the DIRN in Victoria are in place. There was therefore no defined policy governing the function and location of catch-points and their relationship between a running line and a siding.

The Australian Standards (AS 4292.2, Track, civil and electrical infrastructure) and the *Code of Practice for the Defined Interstate Rail Network* are silent on the functions of catch-points. The Australian Standards however are not necessarily required to specify such requirements. The Australian Standards in its application, '…sets requirements and provides guidelines for preparing or adopting engineering and operating systems safety standards and procedures to comply with the relevant requirements of AS 4292.1 (General and interstate requirements)' [20].

Volume 4, Part 2, Section 3, *Points and Crossings* of the *Code of Practice for the Defined Interstate Rail Network* provides design specifications for points and crossings. In dealing with catch-points, the standard only notes that their function is 'to prevent unsafe movements of trains'.

The PN *Shunting Course Participants Handbook* goes further in its description of the function of catch-points as, '…being used to deflect and derail any train or wagon, which is in danger of fouling an adjacent running line.'

The lack of defining requirements for catch-points is generally common amongst most Australian railway managers. There are two known exceptions:

- RailCorp, standard TS3504 *Catch Point Design & Clearance Beyond Catch-points* states, '5.1 Clearance Requirements, The catch-points are to be located to provide a minimum of 450 mm between the side of the vehicle on the running line and the vehicle being derailed on the catch point. The throw off rail is to be located so as to ensure the wheels of the derailing vehicle travel the correct path, thus ensuring the end of the vehicle does not foul the running line structure gauge.'
- QR, *Civil Engineering Track Standards* 0077/TEC states, 'Catch-points or choke blocks shall be provided to prevent unauthorised train movements fouling the main line…The risks associated with where the derailed vehicle would be directed shall be considered when determining the location of the catch point and the need for a throw off rail…The throw off rail is to be located so as to ensure the wheels of the derailing vehicle travel the correct path, thus ensuring the derailed vehicle does not foul the running line structure gauge.'

In comparison, the defining requirements for derails and trap points are provided in relevant American and British standards:

- The U.S. Federal Railroad Administration, Department of Transport, *Code of Federal Regulations* (October 2004) states in Part 213 *Track Safety Standards*, Section 213.357 *Derails*, '(a) Each track, other than the main track, which connects with a Class 7, 8 or 9 main track shall be equipped with a functioning

20 AS4292.1 – 1997, Section 1 Scope and General, 1.2 Application.

derail of the correct size and type, unless the railroad equipment on the track, because of grade characteristics cannot move or foul the main track. (b) For the purposes of this section, a derail is a device which will physically stop or divert movement of the railroad rolling stock or other railroad on-track equipment past the location of the device.'

- The British Railway Group Standard GK/RT0064 (December 2000), defines Trap Points as, 'Facing points provided at an exit from a siding or converging line to derail an unauthorised movement, thus protecting movements on the adjacent running line.' Section 6.2 Design and location of trap points states in 6.2.1, 'Trap points shall be located so as to: a) guide derailed vehicles away from other lines, structures and any other hazards.' Section 6.4 states, 'Where vehicles derailed at trap points could foul lines other than the one to which the track circuit interrupter applies, operation of the track circuit interrupter shall place or maintain protecting signals to danger on those lines and provide an indication to the signaller.'

Catch-point effectiveness

Catch-points such as 215D at South Dynon are most effective in low speed and low kinetic energy derailments where rollingstock, after one or more wheel sets derail, comes to a stop in a relatively short distance. Where there is greater momentum or the propelling movement is not arrested the main line stands a greater risk of being fouled.

In the occurrence, the wheel-sets of the leading wagon of the shunting movement derailed to the track sleepers. The wagon being propelled by the force of a locomotive, continued in a more or less straight line in the direction of the main line after passing beyond the short closure rail of the catch-point. Had the XPT not been present at the time of the wagons passing signal 214U, the leading wagon would have continued further along a path towards the main line. The inside of the leading right-hand wheel would have come up against the inside of the left-hand rail and effectively guided the wagon well beyond the point of clearance between the main line and the South Dynon yard leg.

There have been efforts to avoid this problem by enhancing catch-points with a throw-off rail or by using a cross-over style catch point at the exit from a siding[21]. There is no question that rollingstock would derail and eventually come to a stop at catch-points 215D, but it would not always be the case that fouling of the main line is prevented. In their basic state, the arrangement of 215D catch-points, although apparently believed to be satisfactory in their protection of the main line when installed, had proved otherwise by the occurrence at South Dynon.

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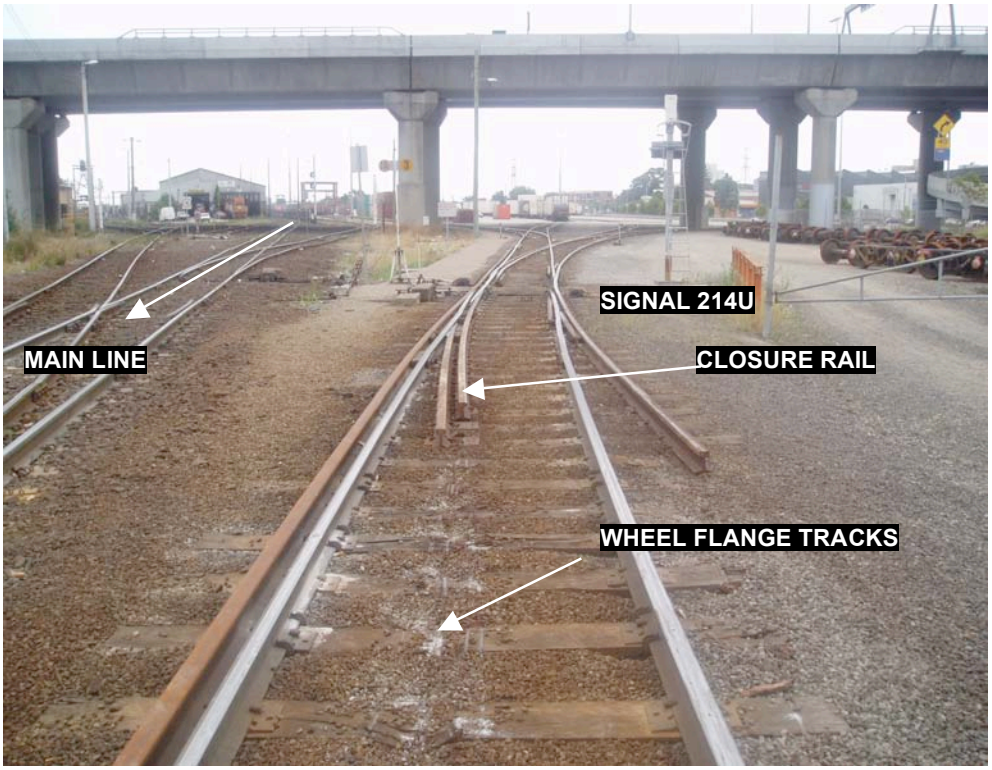
21 Catch points fitted with so called 'throw off rails' provide an improved level of protection reducing the likelihood of the move fouling the main line by deflecting the inside wheels away from the main or running line. Refer to Appendix 7.3.

Figure 10: Looking from the east, wheel flange tracks indicate the path of the derailed wagons and their reversion towards the main line once leaving the closure rails of the catch-points (flange marks on the opposite side had been erased during recovery work)



The British Railway Group Standard mentions the provision of track circuit interrupters and their use where vehicles derailed at catch-points could foul other lines. Although the fouling of the main line at South Dynon was immediately known by the crew of the XPT, it had been some minutes before either Adelaide train control or the PN team had become aware of the occurrence.

Generally, there would be no immediate indication of a derailment at catch-points unless a pair of wheels remained on the rails to operate track circuits, or a level of damage occurred to the fail-safe track-side signalling wiring or apparatus. The replacement or maintenance of protecting main line signals to stop and the provision of an indication to the train controller in these circumstances cannot be guaranteed. One pair of wheel-sets of each of the second and third leading 4MP5 wagons did however remain on the rails during the occurrence.

Leading wagon RQSY 34384 had passed signal 214U by 47.25 metres before being brought to a stop. Catch-points 215D had not been effective in diverting this and the following wagon, RQPW 60077T, away from contact with the main line. The fouling of the main line would have been less likely had the design of 215D catch-points been of the cross-over style or possibly, included a throw-off rail. Refer to Appendix 7.3 for details of general catch-point types.

4 CONCLUSIONS

4.1 Derailment Causal Factors

Based on the available evidence, it is concluded that the collision at South Dynon had developed primarily through the breakdown in communication and the lack of defined structure in the marshalling task. Assumptions were made leading to misunderstanding as a result of which there was a reduction in awareness in the PN team.

Personal leave and sick leave reduced the strength of the shunting team and was further undermined when one terminal operator attended to another task. This was a factor that led to the absence of a competent person to guide the leading wagon of the shunting movement and stop it short of signal 214U.

The lack of supervision and associated procedures had a direct effect and resulted in a lack of a standardised approach and common understanding of the marshalling task.

The design of Moonee Ponds Creek Junction catch-points 215D was not effective in preventing the two leading wagons of train 4MP5 fouling the main line at the time occupied by the XPT.

4.2 Findings

1. The marshalling of '1500 metre' trains is a regular operation by PN at South Dynon yard and involved a process of joining two separate strings of wagons (front and rear portions) from adjacent sidings.
2. The operation of the XPT or the actions of its crew did not contribute to the occurrence.
3. There were no reports of injury to the 220 passengers, the crew on board the XPT or to the PN team.
4. The driver, terminal operators, and trainee were 'medically fit' at the time of the occurrence.
5. Fatigue was not a causal factor in the occurrence.
6. Damage to the XPT and wagons of train 4MP5 was minor although three XPT cars remained out of service for a number of weeks. Damage to the track infrastructure was also minimal.
7. There were no conditions apparent on the pilot locomotive or the wagons that passed signal 214U that may have contributed to the occurrence.
8. The scope of the immediate recovery and movement of the XPT to a more suitable location where passengers could be assisted was limited. The crew of the XPT responded appropriately to the collision and the evacuation of the XPT was coordinated in compliance with RailCorp Emergency Procedures.

4.3 Contributing Factors

1. The propelling move of the 4MP5 wagons towards signal 214U was carried out without a competent member of the team at the leading wagon to provide guidance to the driver and to stop the shunting movement short of the signal, as required by PN procedures.
2. A lack of any guidance at the leading wagon during the propelling movement was not apparent to the available terminal operator, the pilot locomotive driver or the yard coordinator.
3. There was no common understanding by the PN team of the method in which the two portions of train 4MP5 were to be marshalled.
4. Ambiguity in the direction to the trainee to go to 'the Melbourne end' by the first terminal operator led to the trainee assuming that his role was to detach the rear portion from the pilot locomotive, rather than guide the leading wagon.
5. The awareness by each team member of the responsibilities and roles of others during the shunting movement was not adequate for the safe completion of the task.
6. Of a rostered strength of five qualified terminal operators in the team, three were off duty and had not been replaced on the shift by PN.
7. The ability of the team to undertake the propelling move effectively had been diminished when one of the terminal operators responded to a request from the yard coordinator to set the road for the 4MP5 locomotives to arrive to '4' road.
8. At the start of the shunting movement towards signal 214U, the assumption that the trainee would guide the leading wagon was contrary to procedures as he was not qualified to do so.
9. It was likely that the trainee had not developed the extensive understanding required of the various roles applied in the marshalling of trains.
10. PN did not have an established and tested plan that considered the hazards peculiar to '1500 metre' trains. This meant that there was little formalised structure for terminal operators to work with to safely and efficiently complete their work.
11. PN procedures did not require, and terminal operators did not carry out, briefings to comprehend the hazards and risks before undertaking the task of marshalling the train.
12. PN had not assigned a supervisor or mentor to the trainee. Neither of the terminal operators had received any direction or training in the supervision of trainees engaged in on-the-job experience acquisition. There was no understanding as to who was responsible for the trainee.
13. PN procedures did not adequately cover the supervision of a trainee when receiving on-the-job training or consolidation of training.
14. When displaying a stop aspect, signal 214U was passed by the rear portion of train 4MP5.
15. There was no documented standard or policy for the DIRN in Victoria to define the requirements and function of catch-points.
16. There were no specifications for catch-points in the Code of Practice for the Defined Interstate Rail Network.

5 SAFETY ACTIONS

5.1 Actions Taken

As a result of the occurrence, the ATSB consulted with Pacific National and the Australian Rail Track Corporation in relation to safety issues that had became apparent during the initial stages of the investigation and issued interim recommendations. The interim recommendations are contained in 5.1.1 and 5.1.2.

The ATSB also published on 20 May 2005, an Interim Factual Rail Safety Investigation Report in relation to this occurrence.

5.1.1 Pacific National

RR20060010

The ATSB recommends that Pacific National review their procedures for the marshalling of trains at South Dynon to ensure that:

- Communication protocols and phrases are clarified to ensure understanding and compliance.
- Terminal operator teams do not diminish their effectiveness by attending to multiple requirements.
- The terminal operator training program be reviewed to ensure a structured learning experience is achieved and suitable mentoring is provided for on-the-job training.

5.1.2 Australian Rail Track Corporation

RR20060011

The ATSB recommends that the Australian Rail Track Corporation review the existing protection arrangements between signal 214U and the main line at Moonee Ponds Creek Junction, South Dynon to ensure that the intended function of catch-points 215D is adequate.

5.2 Recommendations

As a result of its finalisation of the investigation, the ATSB makes the following recommendations with the intention of improving railway operational safety and associated safety management systems by overcoming shortfalls identified.

Rather than provide prescriptive solutions, these recommendations are designed to guide the interested parties on what situations need to be considered. Recommendations should not be seen as a mechanism to apportion blame or liability. Recommendations are directed to those agencies that should be best able to give effect to the safety enhancement intent of the recommendations, and are not, therefore, necessarily reflective of deficiencies within those agencies.

The recommendations are in addition to the interim recommendations above.

5.2.1 Pacific National

RR20060012

The ATSB recommends that Pacific National undertake a revision of their safety management system particular to the marshalling of trains in South Dynon yard and take into consideration the contributing factors to the 19 January 2005 occurrence.

RR20060013

The ATSB recommends that Pacific National consider a revision of their safety management system to incorporate the need for a supervisory structure in relation to trainees in terminal operator teams.

RR20060014

The ATSB recommends that Pacific National consider improvements to make sure that the rostered strength of terminal operator teams are adequately covered with contingencies for terminal operator sick leave and recreation leave or work is redesigned to provide safety assurance for smaller teams.

5.2.2 Victorian Railway Safety Regulator, Department of Infrastructure

RR20060015

The ATSB recommends that the Victorian Department of Infrastructure consider the level of performance and implement improvements to the Moonee Ponds Creek Junction, South Dynon catch-points number 215D. The development of improvements should be based on the outcomes of a risk assessment and control measures may include but not be limited to the use of a throw-off rail or cross-over 'natural trap' style catch point or equivalent.

RR20060016

The ATSB recommends that the Victorian Department of Infrastructure monitor Pacific National's revision of their safety management system particular to the marshalling of trains in South Dynon yard and their consideration of the contributing factors to the 19 January 2005 occurrence.

RR20060017

The ATSB recommends that the Victorian Department of Infrastructure monitor Pacific National's consideration of their safety management system to incorporate the need for a supervisory structure in relation to trainees in terminal operator teams.

5.2.3 Australasian Railway Association, Code Management Company

RR20060018

The ATSB recommends that the Australasian Railway Association consider the development of specifications for catch-points and similar devices for inclusion to the Code of Practice for the Defined Interstate Rail Network.

6 SUBMISSIONS

Section 26, Division 2, and Part 4 of the *Transport Safety Investigation Act 2003*, requires that the Executive Director may provide a draft report, on a confidential basis, to any person whom the Executive Director considers appropriate, for the purposes of:

a) Allowing the person to make submissions to the Executive Director about the draft: or

b) Giving the person advance notice of the likely form of the published report.

The final draft of this report was provided for comment to the following directly involved parties:

a) Pacific National

b) The Australian Rail Track Corporation

c) RailCorp

d) Department of Infrastructure, Victoria

e) Australasian Railway Association.

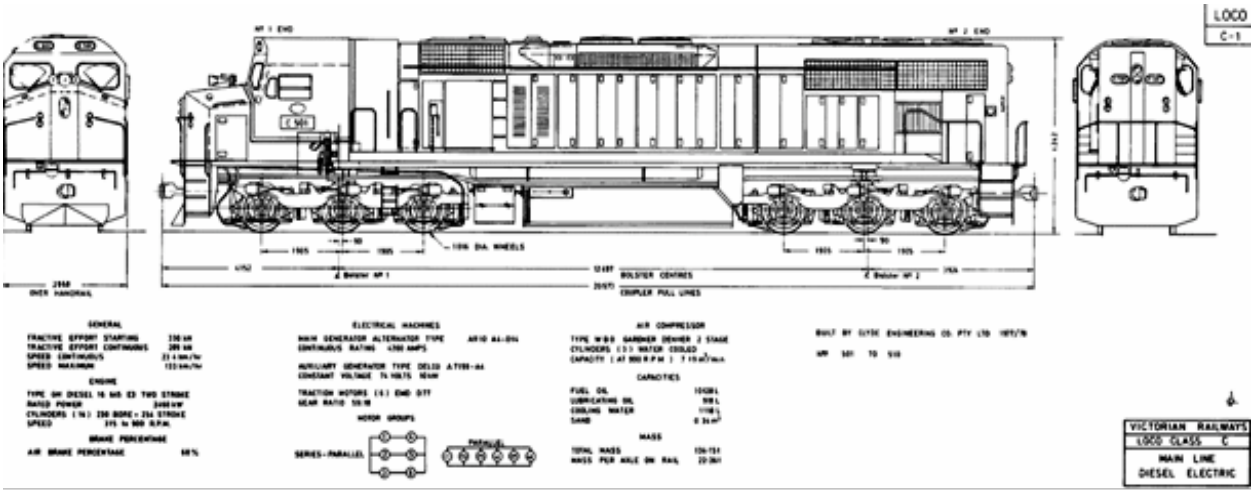
7 APPENDICES

7.1 List of acronyms used in report

ARTC	Australian Rail Track Corporation
ATSB	Australian Transport Safety Bureau
DIRN	Defined Interstate Rail Network
DOI	Department of Infrastructure, Victoria
HP	Horse Power
km/h	kilometres per hour
kW	Kilo Watt
mm	Millimetre
SHE	Safety, Health and Environment Management Manual
TSI Act	Transport Safety Investigation Act 2003
TSR	Temporary Speed Restriction
UHF	Ultra High Frequency
WI	Works Infrastructure
XPT	eXpress Passenger Train

7.2 Details: yard pilot locomotive – class C

(Source: http://www.victorianrailways.net reproduced with permission of owner).



Owned by	Silverton Rail and leased to PN
Entered service	1977 with Victorian Railways
Built	Clyde Engineering South Australia
Number built	10
Model Number	GT26C
Length over couplers	20.573 metres
Width over side handrails	2.968 metres
Transmission	Diesel electric
Engine	General Motors V16 cylinders 645, 230 bore x 254 stroke
Main alternator	AR10 A4-D14
Traction Motors (x6)	Model D77
Power	2461 kW (3340 HP)
Wheel arrangement	Co-Co
Fuel capacity	10138 litres (2228 gallons)
Mass	134.15 tonnes

7.3 Examples of catch-point types

Figure 11: Common single blade catch point arrangement at Tottenham

Figure 12: Catch point fitted with throw off rail and wheel ramp at Sydney Central

Figure 13: Double blade catch-points at South Dynon

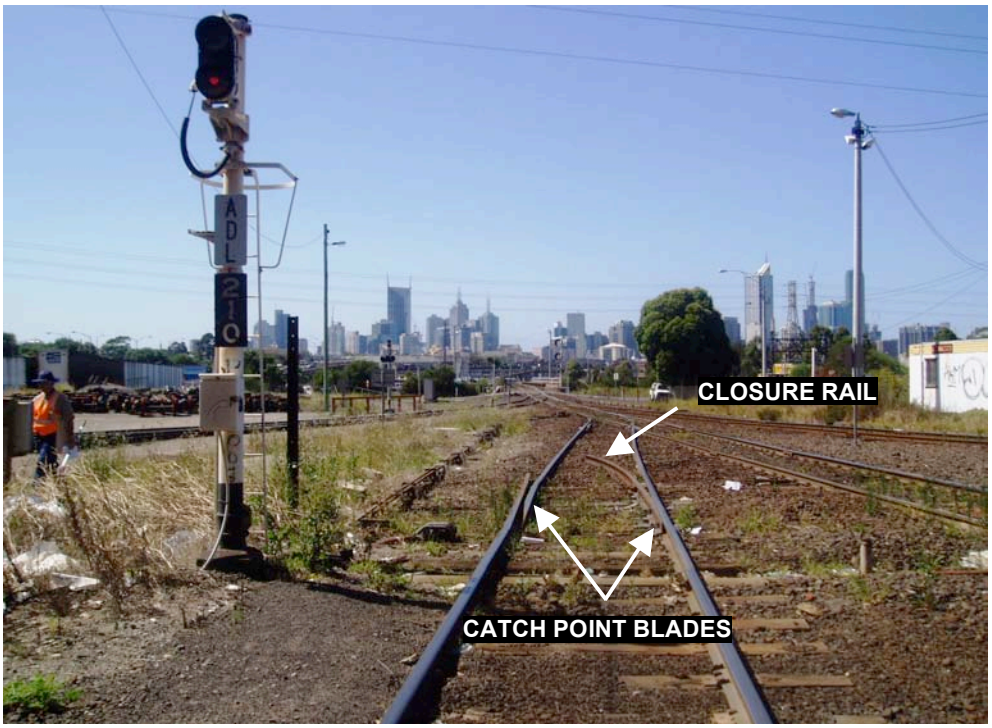


Figure 14: 'Natural trap' cross-over style protection at McIntyre Loop

7.4 Transcript Of Recorded Communications – PN Channel 1 – Melbourne Freight Terminal

Audio recorded on Arunta Comsec Pty Ltd Total Recall Voice Logger Recorder

Symbol decode:	?	Unidentified source
	(----)	Unintelligible word(s)
	// //	Explanatory
	( )	Words open to other interpretation
	……	Significant Pause (one dot per second)

Time	Duration	Medium	Speaker	Dialogue
1947:14	00:00:46	Radio	Tower	(----) just push down in line with the back of M, of '4' road, so push down 1A, and um, come back up light engine put the pilot on to that two red cards on nine push in and that'll do ya's
			Trainee	but, so you don't want us to um, couple up with '4' road down if we push down to one-A?
			Tower	no just push '5' road down into one-A and line it up on the straight at the back of '4' road, and um I'll do the rest with the main liners, OK
			Trainee	roger and we'll come back up '5' on, then onto nine?
			Tower	roger
1948:02	00:00:24	Radio	terminal operator 1	(----) the yard and back onto '5' road here *driver*
			Driver	yeah, I'm ready if you are
			terminal operator 1	right *tower* (----) '5', here it comes there ah *trainee*
			Trainee	roger that, you have about three wagons to couple there ah *driver*, maybe four
1948:32	00:00:07	Radio	Trainee	two wagons to couple
1948:40	00:00:28	Radio	Trainee	two wagons to couple, forty feet to couple, twenty feet to couple, five feet, three feet, red light, red light

1949:25	00:00:34	Radio	terminal operator 1	go down the Melbourne end and I'll stay on the loco
			Trainee	roger that, its all coupled ah *terminal operator 1*
			terminal operator 1	right you go to Melbourne end and then I'll push in clear OK
			?	OK just make sure its layin' (----)
			Tower	if there's anyone available up the top, ah leave it layin' '4' road and the block off while were pushin' this down
1950:01	00:00:22	Radio	Trainee	(----) where are you *terminal operator 2*?
			terminal operator 2	I'm coming around now you want the block off of '4' road was that right?
			Tower	yeah roger, lay it for '4' and the block off '4' thanks ah *terminal operator 2*
			terminal operator 2	I'm on my way
1950:27	00:00:26	Radio	Driver	as soon as you get down there we are right to push we've got enough air
			Trainee	(----) a minute their *driver,* so you could start
			Driver	I'll ah start coming down slowly
1950:57	00:00:15	Radio	Trainee	I can see ya *driver* it's all clear mate
			Tower	that blocks off the Melbourne end is it *trainee*?
			Trainee	roger that
1951:41	00:00:07	Radio	Trainee	clear *driver* keep coming mate
1952:10	00:00:38	Radio	Trainee	yeah you're all clear *driver*, block's off
			Driver	roger *trainee* thanks mate
			terminal operator 1	you just want this past the catch-points um past those um points don't ya yeah?
			Trainee	yeah I'll put em down were the block is on um '4' road *terminal operator 1*
			terminal operator 1	yeah OK
			Trainee	yeah it's all clear *driver* keep coming mate
1953:03	00:00:09	Radio	Trainee	I still can't see yet *driver* keep comin'
1953:32	00:00:30	Radio	terminal operator 1	to beat them bastards over there!

			Driver	geez they're late aren't they!
			terminal operator 1	oh yeah that ah good half an hour maybe more!
			Driver	about two and a half hours I think!
			terminal operator 1	bloody hell at least we beat them!
			Trainee	yeah its all clear *driver*
1955:03	00:00:10	Radio	?	(----)
			Trainee	yeah keep coming almost there
1955:33	00:00:12	Radio	Trainee	yeah one platform to go there *driver*
			Driver	yeah who's down the back there?
1955:47	00:00:06	Radio	Trainee	(----) for a sec
1956:02	00:00:15	Radio	Tower	straight *terminal operator 1*?
			terminal operator 1	yeah, yeah we are just a bit of a conversation for sec there eh *tower* (----)
1956:18	00:00:44	Radio	Tower	yeah how far are we off the light and how far are we from clearing the points on '4' and '5' road just out of curiosity?
			terminal operator 1	um I'm about a wagon away from it and back there probably just a bit under the scotch block
			Tower	*trainee* how far do we got to two-one-four before we ah go out?
			terminal operator 1	wow I will need *trainee* to find out, *trainee* let me know please
			Trainee	roger
1957:16	00:00:36	Radio	Trainee	gone too far!
			terminal operator 1	how far have we gone?
			Trainee	oh it's hit the XPT
			Tower	*Trainee,* were you ah watching this?
			Trainee	I thought I had to watch where the um scotch block, at the other end
1959:45	00:00:19	Radio	?	I'm out
			Tower	I'm sending *name* down I just got to make some phone calls *terminal operator 1* so eh, everyone just stay where they are
			terminal operator 1	yeah it is really bad up here mate two wagons are off the track

2000:53	00:00:07	Radio	?	*terminal operator 1* it's pretty bad
2001:02	00:00:06	Radio	?	// short duration click//
2006:36	00:00:22	Radio	Driver	down there *terminal operator 1*?
			terminal operator 1	I have had a look there boys and girls and have a have a good look at this there it is pretty bad there *driver* come off the ute
			Driver	I'll come down mate
			terminal operator 1	get you or get *trainee* to pick you up?
			Driver	yeah roger mate
2035:55	00:00:07	Radio	terminal operator 1	*trainee* you on channel?
2036:05	00:00:07	Radio	Trainee	*trainee* to *terminal operator 1*

7.5 Transcript Of Recorded Communications – Channel 3 – Melbourne Freight Terminal Administration

Audio recorded on Arunta Comsec Pty Ltd Total Recall Voice Logger Recorder

Symbol decode:

?	Unidentified source
(----)	Unintelligible word(s)
// //	Explanatory
( )	Words open to other interpretation
……	Significant Pause (one dot per second)

Time	Duration	Medium	Speaker	Dialogue
1949:21	00:00:29	Radio	driver MP4	MP-four locos calls the tower over
			Tower	yeah MP-four go ahead
			driver MP4	yeah um up at one-one-four ready to go into the yard when you can take us
			Tower	right I'll just see where the XPT is ah might be able to get you in 'cause got ah PW loco and ah wagon that want to come out but you'll be going up '4' road
			driver MP4	roger
1952:46	00:00:12	Radio	Tower	receiving
			terminal operator 2	yeah it's lyin' for '4'
			Tower	right MP-five you receive that?
1952:59	00:00:28	Radio	Tower	MP-five *driver MP5* you on channel?
			driver MP5	yeah receiving
			Tower	Ah its layin' for '4' when you get one-one-four come on in and I need to get this other one out thanks
			driver MP5	yeah on our way
			Tower	*Driver PW* PW you are aright to move up to two-one ah four mate get you going soon as these get clear
			driver PW	yeah roger *tower*
1955:06	00:00:24	Radio	driver PW	*tower* NR-twenty-two we're leaving the channel

			Tower	no worries mate you should have the rest of ‘em
			driver PW	roger thanks *tower*
			driver MP5	yeah *tower* ah MP-five we right to couple up?
			Tower	roger *driver MP5* permission to couple onto ‘4’
			driver MP5	rightee-oh *tower*
2000:38	00:00:17	Radio	Tower	yeah there *driver MP5*
			driver MP5	yeah *tower*
			Tower	ah we’re gona have a fair wait mate // sound of telephone ringing in background //
2001:39	00:00:08	Radio	?	this is *name* I’ll talk to you on channel seven

7.6 Transcript of Recorded Communications – ARTC Channel 4 – West Tower Telephone Extension 4233

Audio recorded on digital tape deck

Only audio applicable to this incident has been transcribed

Symbol decode:

?	Unidentified source
(----)	Unintelligible word(s)
// //	Explanatory
( )	Words open to other interpretation
……	Significant Pause (one dot per second)

Time	Duration	Conversation Type	Speaker	Dialogue
1950:01	00:01:00	Phone call from PN Yard Tower (tower) to Adelaide Control (control)	control	hello, control
			tower	yeah its *tower*, where's that XPT?
			control	he's ah, he's on the double *tower*, so
			tower	double, coming past
			control	yeah
			tower	alright, I might get some locos in but I'll give you this PW loco that come in to me with one wagon
			control	okay, rightee-oh
			tower	shortly, and he'll go over one-twenty-six over the steel terminal
			control	rightee-oh no worries
			tower	alright
			control	okay yeah give us a yell once this guys gone through, probably another four, five minutes
			tower	yep no problems
			control	thanks *tower*
			tower	oright, see ya

1955:01	00:00:55	Phone call from PN Yard Tower (tower) to Adelaide Control (control)	control	control
		PN Yard Tower breaking phone call to converse with driver PW	tower	no worries mate you should have the rest of 'em
			tower	one-twenty-six for the PW loco
			control	yeah I got him through there *tower*, now what this number sorry, that was?
			tower	NR-twenty-two
			control	NR-twenty-two again, rightee-oh
		PN Yard Tower breaking phone call to converse with driver MP5	tower	roger *driver MP5*, permission to couple onto '4'
			control	okee-dokee
			tower	now, I'll give you a yell, I'll be doin' the Perth make up in about ten minutes, maybe five or ten, so if there's anything out there, is there?
			control	ah no, not, not at the moment, until the, probably mainly the X' to come back and just something to go down to ah, ah, Swanson Dock, nine double seven two
			tower	yeah no worries, alright well ah, I'll chase you up when I ah got him pumped up and ready to go
			control	okay
			tower	pushed him right back, so I need just to come out or lights I'll sneak back in no prob's I got a clear road there
			control	okay *tower* I'll hear from ya when your ready for that one
			control	no worries, thanks, cheers
			tower	See ya
1956:58	00:01:17	Phone call from Adelaide Control (control) to PN Yard Tower (tower)	tower	*tower* speakin'
			control	*tower* we've had a run away hit the XPT on the um, out of the new there, do you know anything about it?
			tower	out of the new!
			control	out of the new, its run through apparently the XPT driver reckons

			tower	…. for fuck sake
			control	(----) he reckons he's been struck by a run away, its yours
			tower	hang on a minute
				(----) // 8 second pause //
			tower	yeah, looks like he hasn't fucken watched it goin' back
			control	sorry?
			tower	hasn't watched it goin' back
			control	okay, um, can you find out and give us details and um, see how serious it is whether anyone needs 'n ambulance or anything
			tower	yeah, no worries
			control	okay
			tower	fucken Jesus
			control	okay mate ta
			tower	right-oh