Australian Government

Australian Transport Safety Bureau

ATSB TRANSPORT SAFETY INVESTIGATION REPORT
Rail Occurrence Investigation 2006006
Final

Level crossing collision between

XPT Passenger Train ST24 and Passenger Car

Thurgoona Road, Albury, NSW

5 June 2006

Australian Government

Australian Transport Safety Bureau

ATSB TRANSPORT SAFETY INVESTIGATION REPORT

Rail Occurrence Investigation
2006/006

Final

Level Crossing Collision between XPT Passenger Train ST24 and Passenger Car

Thurgoona Road, Albury, NSW

5 June 2006

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

Published by: Australian Transport Safety Bureau
Postal address: PO Box 967, Civic Square ACT 2608
Office location: 15 Mort Street, Canberra City, Australian Capital Territory
Telephone: 1800 621 372; from overseas + 61 2 6274 6590
Accident and serious incident notification: 1800 011 034 (24 hours)
Facsimile: 02 6274 6474; from overseas + 61 2 6274 6474
E-mail: atsbinfo@atsb.gov.au
Internet: www.atsb.gov.au

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

CONTENTS

DOCUMENT RETRIEVAL INFORMATION

Report No.	Publication date	No. of pages	ISBN
2006/006	June 2007	39	978-1-921164-88-0

Publication title

Level Crossing Collision between XPT Passenger Train ST24 and Passenger Car

Thurgoona Road, Albury, NSW, 5 June 2006

Prepared by

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

Reference No.

Jun2007/DOTARS 50306

Acknowledgements

The map section identified in this publication is reproduced by permission of Geoscience Australia, Canberra. Crown Copyright ©. All rights reserved. www.ga.gov.au

The cover photo (right) and photos appropriately captioned in this publication are reproduced by permission of The Border Mail, Albury. Copyright ©. All rights reserved.

Abstract

At approximately 1322 on 5 June 2006, a passenger car (a 1986 Holden Commodore sedan) drove into the path of XPT passenger train (ST24) at the Thurgoona Road level crossing, on the northern edge of Albury, New South Wales (NSW).

The driver of the passenger car was fatally injured during the collision.

The investigation concluded that the effect of non-prescription drugs on driver performance and driver distraction due to mobile phone operation were safety factors which contributed 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 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.

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 THIS REPORT

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: the occurrence would probably not have occurred; or 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 1322[1] on 5 June 2006, a passenger car (a 1986 Holden Commodore sedan) drove into the path of CountryLink XPT passenger train ST24 at the actively[2] protected level crossing of Thurgoona Road, NSW. Thurgoona Road is located on the northern outskirts of Albury and links the Hume Highway[3] to the smaller township of Thurgoona.

At the time of the accident, a major upgrade and realignment of the Hume Highway was underway which included the replacement of six rail level crossings with road bridges. A major freeway interchange, including a road bridge over the railway line, was under construction at Thurgoona Road.

Train ST24 was approaching Thurgoona Road level crossing from the south at the same time that the passenger car was approaching from the east. The car had entered the crossing just before the arrival of the train which then collided with the passenger side of the car, slightly in front of the rear wheels. The car was broken in half by the collision, with the front section pushed approximately 20 m into the retaining wall of the adjacent road bridge construction. Both sections of the car ignited and the subsequent fire destroyed the entire vehicle.

The only occupant (driver) of the passenger car was thrown from the vehicle during the collision and fatally injured, coming to rest approximately 50 m from the initial impact. There were no physical injuries to witnesses, crew or passengers of train ST24, however, a few did suffer some post-incident stress.

Toxicology results from the fatally injured driver were positive to both the active and inactive metabolite of cannabis, delta-9-tetrahydrocannabinol (THC). The concentration of active metabolite in the driver's blood exceeded levels where studies have indicated performance impairment becomes "truly prominent" across all driving-related performance measures[4].

The investigation also found that the passenger car driver's mobile telephone probably rang at or around the time that the car was approaching Thurgoona Road level crossing. Evidence suggested that the telephone was in close proximity to the driver at the time of the accident and, while records indicate that the driver did not answer the call, the ringing telephone could have distracted him from the driving task.

---

1 The 24-hour clock is used in this report to describe the local time of day, Eastern Standard Time (EST), as particular events occurred.

2 The crossing was fitted with flashing lights and bell to warn motorists of approaching trains.

3 Main highway between Melbourne and Sydney.

4 Ramaekers, J. G., Moeller, M. R., van Ruitenbeek, P., Theunissen, E. L., Schneider, E., & Kauert, G. (2006). Cognition and motor control as a function of delta-9-THC concentration in serum and oral fluid: Limits of impairment. *Drug and Alcohol Dependence, 85, 114-122.*

The investigation concluded:

- It is likely that the presence of the psychoactive metabolite of cannabis (Delta-9-THC) in the car driver's blood contributed to a reduced capacity to respond appropriately to complex or unexpected driving conditions.
- It is likely that a ringing mobile telephone and/or driver examination of the telephone information was a distraction that increased the car driver's workload and the demand on his cognitive resources.

It is probable that combined, these two factors contributed to the car driver not responding appropriately to the level crossing flashing lights and bell, and subsequently driving into the path of XPT passenger train ST24 at the Thurgoona Road level crossing.

The investigation recommended safety actions that related to reinforcing public awareness of the risks associated with cannabis use and the resultant impairment of driving performance, and driver distraction in relation to mobile telephone usage.

The investigation also noted that at the completion of the 'Albury Wodonga Hume Freeway Project' (scheduled for mid 2007), the road bridge would result in the closure of the level crossing, achieve grade separation and eliminate the risk of level crossing accidents at Thurgoona Road.

1 FACTUAL INFORMATION

1.1 Overview

At approximately 1322 on 5 June 2006, a passenger car drove into the path of XPT passenger train (ST24) at the Thurgoona Road level crossing on the northern outskirts of Albury, (NSW).

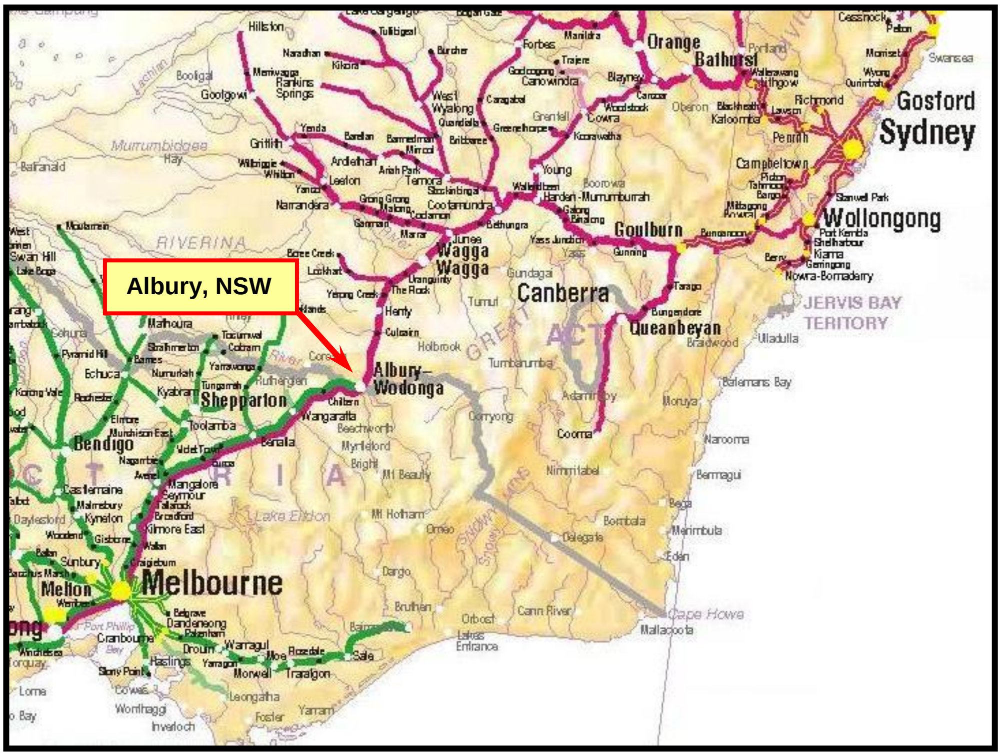
The driver of the car was fatally injured during the collision.

As a result of the collision, the Australian Transport Safety Bureau (ATSB) initiated an investigation under the *Transport Safety Investigation Act 2003* (TSI Act).

1.1.1 Location

Albury is a regional city in NSW, on the banks of the Murray River. The Murray River defines the state border between NSW and Victoria. The regional city of Wodonga is located immediately across the border on the Victorian side of the river. Albury and Wodonga are also located on the Hume Highway, the major inland road transport corridor between Sydney and Melbourne. The cities service a regional population of around 100,000 people with approximately 46,000 people living in Albury.

Figure 1: Location of Albury, NSW

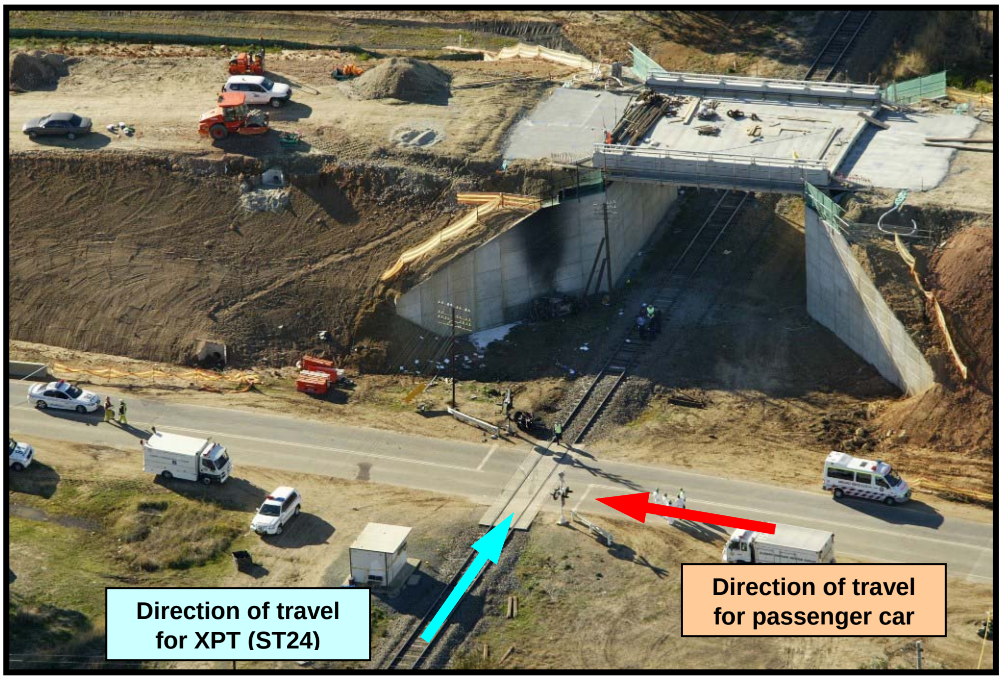


Geoscience Australia. Crown Copyright ©.

At the time of the accident, the Hume Highway through the district was undergoing a major upgrade and realignment. The $524 million 'Albury Wodonga Hume Freeway Project'[5] was initiated to improve the road transport corridor between Sydney and Melbourne and also improve road safety and utility for the regional population. The new alignment of the Hume Highway generally follows the alignment of the Defined Interstate Rail Network (DIRN) and the upgrade program included the replacement of six rail level crossings with road bridges in the Albury area. At the time of the accident, construction works were significantly advanced and the entire project was scheduled for completion by mid 2007.

Thurgoona Road is located on the northern outskirts of Albury and links the Hume Highway to the smaller township of Thurgoona. At the time of the accident, Thurgoona was considered a growth front, projected to service a sub-regional population of up to 30,000 people. Consequently, the road junction between the new Hume Highway and Thurgoona Road was to become a major freeway interchange, incorporate a road bridge over the DIRN and the subsequent closure of the 'at-grade' level crossing.

Figure 2: Thurgoona Road level crossing and road bridge construction



The Border Mail. Copyright ©.

Responsibility for safety at railway level crossings in NSW is shared by a number of agencies. For strategic co-ordination and oversight of railway level crossing safety, responsibility resides with the NSW Level Crossing Strategy Council (LCSC).

The level crossing at Thurgoona Road comprised a single track crossed at right-angles by the roadway and used active traffic control devices (flashing lights, road surface markings and roadside signage) for both road approaches. Responsibility

5 The Roads and Traffic Authority, NSW (RTA) was responsible for managing the NSW component of the Australian Government funded project with construction works contracted to Abigroup Contractors Pty Ltd.

for upkeep and maintenance of the level crossing, within the rail corridor, resided with the Australian Rail Track Corporation (ARTC). Responsibility for installation and maintenance of road markings and approach warning signage, resided with the NSW Roads and Traffic Authority (RTA).

1.1.2 Train and passenger car information

XPT passenger train

The XPT was introduced into service in 1982 and operates between Melbourne, Sydney and Brisbane. The train is operated by CountryLink, an independent business under the NSW Government agency, Rail Corporation, New South Wales (RailCorp)[6].

Train ST24 consisted of a lead and trailing power car with five passenger cars in between. The train length was approximately 156 m for an unladen train weight of approximately 365tonnes[7]. The XPT had a maximum permitted speed of 160 km/h depending on track condition and posted speed limits.

Figure 3: CountryLink XPT power car similar to train ST24

6 The body of this report refers to CountryLink in relation to the operation of XPT passenger train ST24. However, recommendations are directed to the accredited owner/operator, RailCorp.

7 The ARTC load sheet indicated a gross weight of 376t.

Train ST24 was crewed by a single driver plus on-board staff for passenger and catering requirements. The driver had 42 years experience in the rail industry including 20 years as a train driver and had driven XPT passenger trains on the Sydney to Melbourne service since starting his employment with CountryLink in February 2000.

Training records indicate that the driver had been assessed as competent with periodic re-training conducted as required by CountryLink. Similarly, records indicate that the driver had been medically examined and at the time of the accident was fit for duty as prescribed by the national standard[8]. An examination of the hours worked by the driver established that fatigue was unlikely to have contributed to the accident.

Consistent with CountryLink procedures, the driver of train ST24 was requested to undertake screening for drugs and alcohol following the incident. The breath test for alcohol was administered by an officer of the NSW Police and returned a negative result. The test for drugs was administered at the Albury Wodonga Private Hospital and returned a negative result.

Motor vehicle

The passenger vehicle was a NSW registered 1986 Holden VL Commodore sedan, a large four door family sedan. By contemporary standards, the vehicle had limited safety features although it was fitted with three point retractable seat belts.

The driver of the passenger car was a male aged 19. There was no evidence of any illness or other medical condition that would suggest reduced ability to concentrate while performing routine driving tasks.

1.2 The occurrence

On the morning of 5 June 2006, CountryLink XPT passenger train ST24 departed Melbourne for its journey to Sydney. Train ST24 travelled through Victoria on the DIRN before crossing the border into NSW and stopping at Albury station at approximately 1312. After a short stop to drop off and pick up passengers, train ST24 departed Albury station and continued its journey towards Sydney at approximately 1317.

At about 1322, train ST24 travelled around a slight left hand curve while approaching the Thurgoona Road level crossing from the south. At the same time, a passenger car was approaching the level crossing from the east. The car then entered the crossing immediately in front of the train.

Train ST24 collided with the passenger side of the car slightly in front of the rear wheels. The impact was distributed across the front of the train's leading power car and primarily absorbed by the steel cowcatcher. The car was pushed and rotated such that the rear of the vehicle impacted and became entangled with a metal road barrier and the mast supporting the level crossing flashing light assembly and signage. As the train continued through the crossing, the car continued to rotate

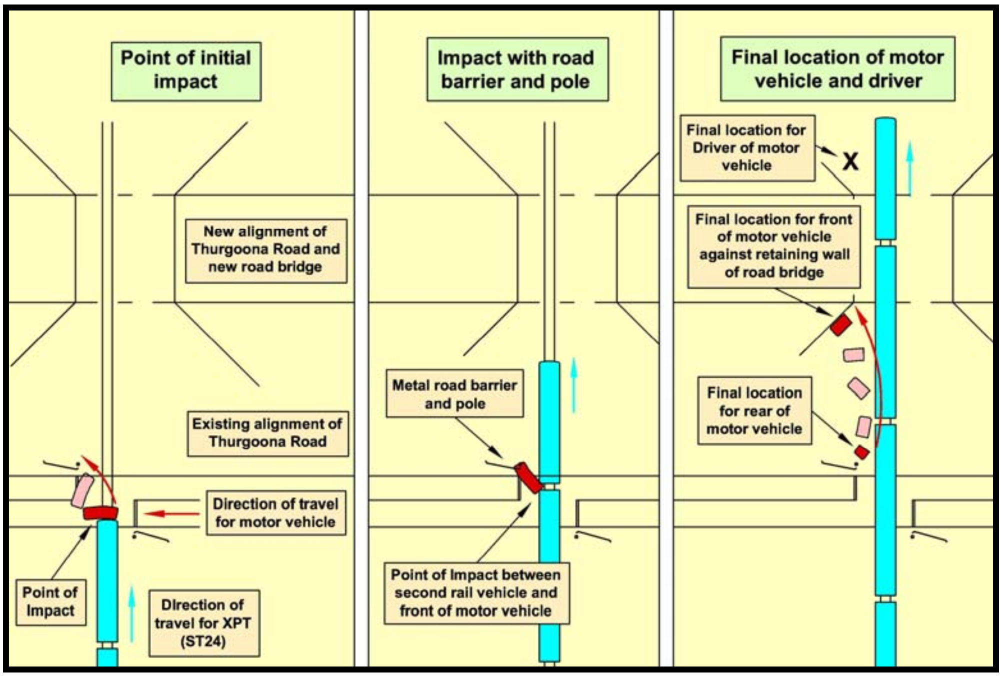
---

8 National Transport Commission (NTC) *National Standard for Health Assessment of Rail Safety Workers, June 2004.*

which resulted in the front of the vehicle impacting with the side of the train towards the rear of the leading rail vehicle and the leading end of the second rail vehicle.

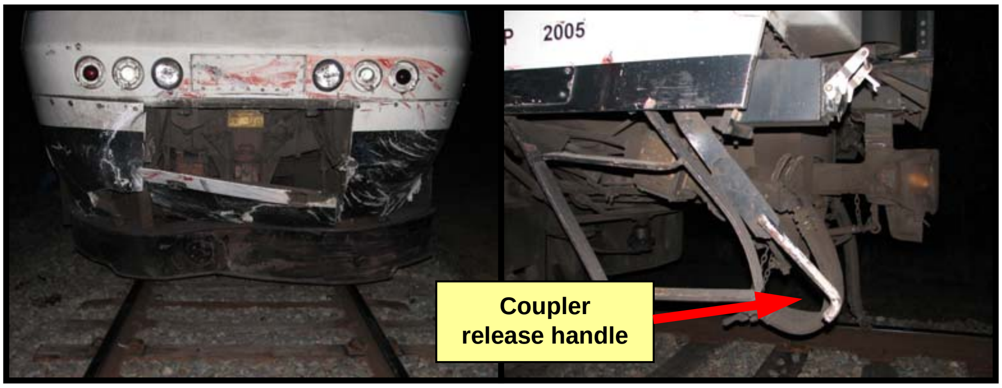
During the collision, the passenger car was broken into two main sections. The rear of the car remained adjacent the road barrier and mast, with the front section pushed approximately 20 m into the retaining wall of the adjacent road bridge. Both sections of the car ignited with the subsequent fire destroying the entire vehicle. The only occupant (driver) of the passenger car was thrown from the vehicle during the collision, coming to rest approximately 50 m from the initial impact. The driver was fatally injured.

Figure 4: Collision Sequence



When all of the rail vehicles had come to a stop, the lead power car had uncoupled and was approximately 300 m in front of the remaining train, a total distance of 864 metres past the level crossing. Examination of the coupler and associated equipment indicated that the passenger car had impacted with the ladder and the support bar for the coupler release handle at the rear of the lead power car. The release handle was pushed to an angle which allowed the coupler to open, which in turn resulted in the lead power car separating from the rest of the train.

Figure 5: Front and rear of lead power car



There were no physical injuries to passengers or the crew of train ST24, however, a few did suffer some post-incident stress. CountryLink offered the crew access to counselling, which was accepted with all personnel returning to work over the following few days.

The level crossing traffic control equipment was largely undamaged except for the mast and flashing light assembly on the north-western side of the level crossing. The impact of the road vehicle slightly deformed the mast supporting the flashing light assembly and broke one of the flashing light support arms. The mast was found to be suitable for continued service until the crossing was closed and the adjacent road bridge opened. The flashing light support arm was replaced and the lights aligned in the required direction.

Witness accounts

The driver of train ST24 advised that the trip from Melbourne had been uneventful until the approach to Thurgoona road. When the train was approximately 100 m (three seconds) away from the crossing, he saw a car approaching from the right. He then sounded the horn continuously but the car driver made no attempt to stop. The train driver realised that a collision was imminent and placed the brake handle into the emergency position. The train driver said that the car driver was looking straight ahead, did not turn to look at the train and did not appear to alter speed.

Observations from other witnesses are consistent with the train driver’s account. Specifically, that train ST24 sounded its horn almost continuously as it approached Thurgoona Road level crossing and that the vehicle did not appear to slow down. In addition, it was said that the level crossing warning equipment was operating as train ST24 approached the level crossing. The most reliable account of the event was that of a car driver who was approaching the level crossing from the west. This witness observed the flashing lights and bells, slowed the vehicle and stopped at the crossing before the arrival of train ST24. The driver observed a vehicle approaching from the east, which entered the crossing as train ST24 approached from the south. Train ST24 collided with the passenger car only a few metres in front of her vehicle.

Witness estimates of the car’s speed as it approached the crossing varied slightly, however, all were below 60 km/h.

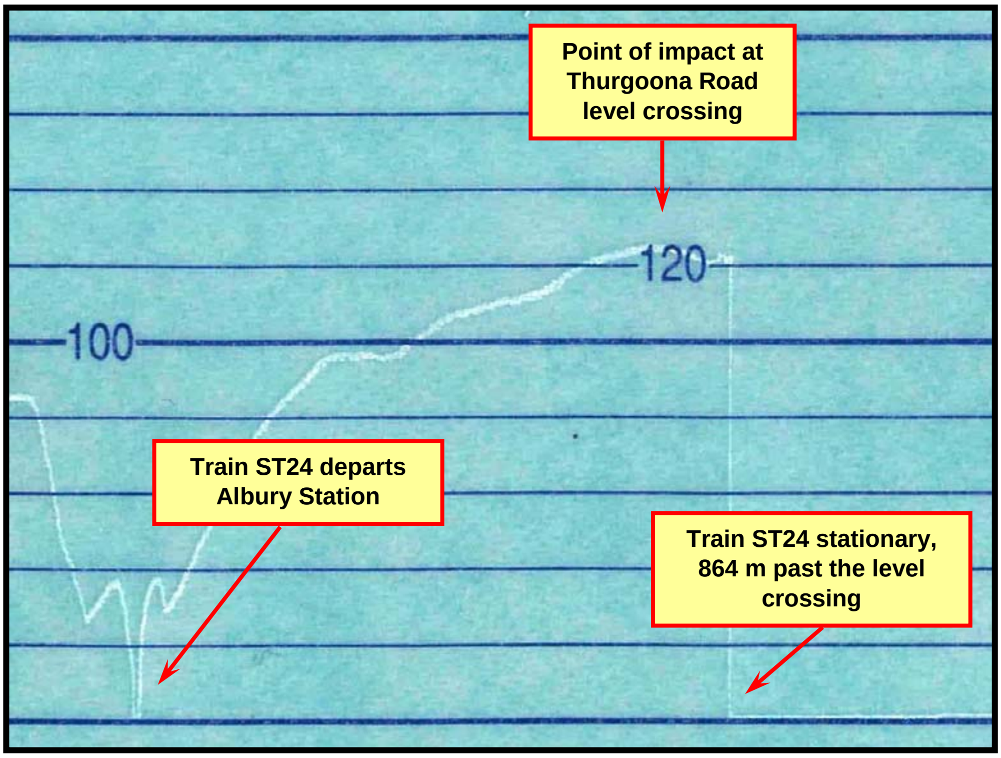
There were no physical injuries to any witness, however a few did suffer some level of post-incident stress.

Train data logger

Train ST24 was fitted with a Hasler data logger. This is an electro-mechanical strip chart recorder used for capturing train speed, throttle position, vigilance activation and brake cylinder pressure on the XPT class train. Examination of the data log shows that ST24 had been consistently driven within posted track speeds. Similarly, the data log shows that management of throttle, brake and vigilance activation was consistent with normal driving practices.

The data log showed that train ST24 had departed Albury station approximately five minutes before the collision at Thurgoona Road. Train ST24 had gradually accelerated and was running at between 120 km/h and 130 km/h as it approached Thurgoona Road level crossing. The posted track speed was 160 km/h.

Figure 6: Train speed for lead power car of train ST24



Note: Illustrated data chart not adjusted for mechanical system tolerances

1.3 Post occurrence

1.3.1 Emergency response

Immediately after the collision, witnesses at the Thurgoona Road level crossing contacted emergency services using the '000' emergency telephone number. These calls were received at 1324. Within 12 minutes, NSW Police, fire and ambulance services were all in attendance.

The driver of train ST24 contacted the Junee based train controller and advised him of the collision, with a request for attendance by the emergency services. The train controller also contacted emergency services and was advised that units had already been tasked to respond at Thurgoona Road.

CountryLink staff liaised with the passengers of train ST24, firstly ensuring there were no injuries, and then attending to passenger comfort until evacuation processes could begin. With the assistance of emergency services personnel and CountryLink staff, passengers were safely transferred to alternative transport for completion of their journey.

Figure 7: Emergency Services

The Border Mail. Copyright ©.

In general, the emergency response was conducted in an efficient and professional manner, including the actions of train crew, train control staff, witnesses and emergency services personnel.

1.3.2 Site recovery

The section of line in which the accident occurred is part of the DIRN and is an essential corridor for interstate rail traffic. It was therefore important that collection of perishable evidence and restoration works was carried out quickly and efficiently.

Examination of train ST24 was completed by 2225, allowing CountryLink staff to prepare the train for travel back to Albury. The level crossing traffic control equipment was fully checked for correct operation and the track opened to rail traffic at approximately 0100. ARTC staff provided protection for road traffic until the level crossing equipment could be fully repaired later on Tuesday 6 June 2006.

Site recovery and repairs were conducted in a safe, efficient, coordinated and professional manner. All parties cooperated in a manner that allowed examination and collection of evidence for future analysis while minimising disruption to rail operations.

2 ANALYSIS

Safe driving and proper observance of relevant rules by motor vehicle drivers and train drivers is essential for both road and rail safety. At level crossings, these rules together with the design of the crossing, road signs, road markings, signalling, warning systems and physical barriers form the defences that prevent the road and rail systems coming into conflict. The combined systems of defence aim to provide a safe environment for train drivers, motor vehicle drivers, passengers and pedestrians.

Active level crossing traffic control reduces the requirement for a driver of a motor vehicle to sight an approaching train. The critical issue at crossings with active traffic control is a motor vehicle driver's ability to sight the flashing lights and stop in accordance with the road rules.

The Australian Road Rules, incorporated into the law of New South Wales, state:

> A driver must not enter a level crossing if:
>
> (a) warning lights (for example, twin red lights or rotating red lights) are operating or warning bells are ringing

Examination of the evidence identified that:

- The level crossing traffic control equipment was operating correctly at the time of the collision.
- The car driver did not stop as required by the Australian Road Rules, and entered the crossing while the warning lights were operating.
- There was no evidence to suggest any deficiencies existed in the mechanical condition of the passenger car that could have contributed to the accident.
- There were no deficiencies in the mechanical condition of train ST24 that contributed to the accident.
- There were no issues associated with the performance of the train crew that contributed to the accident.

Thus the majority of the analysis of the accident focused on the factors which may have influenced the actions of the car driver and the effectiveness of the level crossing traffic control system.

2.1 Level crossing traffic control system

There are three main methods for providing traffic control at interfaces between the road and rail networks, passive or active control at level crossings or grade separation. The Thurgoona Road level crossing comprised one standard gauge track crossed at right-angles by the roadway and was protected by flashing lights, bells, approach warning signs and road markings (Active traffic control – refer to Appendix 5.1). It was also noted that upon completion of the road bridge over the railway line, grade separation would be achieved which would eliminate the risk of level crossing accidents at Thurgoona Road.

2.1.1 Level crossing compliance

At the time of the accident, Australian Standard AS1742.7-1993 *Manual of uniform traffic control devices Part 7: Railway crossings*, prescribed the standard for road markings, road-side signs and active traffic control that is to be used throughout Australia[9]. An examination of road markings and signage at Thurgoona Road identified slight variations from the requirements specified in the standard. The points of non-compliance, detailed in Figure 8 and associated notes, are minor and generally limited to signage design. While the sign design did not conform to AS1742.7 – 1993, they did conform to an earlier standard for traffic control devices at level crossings. The crossing at Thurgoona Road was probably installed before 1993[10] and migration to the new standard was not retrospective.

The placement of the advance warning sign 170 m before the crossing and associated road markings (RAIL X) at 152 m and 139 m respectively was consistent with a level crossing approach design based on 85% of road vehicles travelling between 75 km/h and 90 km/h (V_{85}). However, due to major road construction, the speed limit had been reduced to a maximum of 60 km/h and subject to construction conditions was occasionally reduced further to 40 km/h. Consequently, an advance warning sign (W7-4) had been positioned 120 m before the crossing in accordance with the requirements of AS1742.7-1993. It was noted that the advance warning sign was slightly turned away from the road, however, the sign was still clearly visible and its angle was not considered to have contributed to the accident.

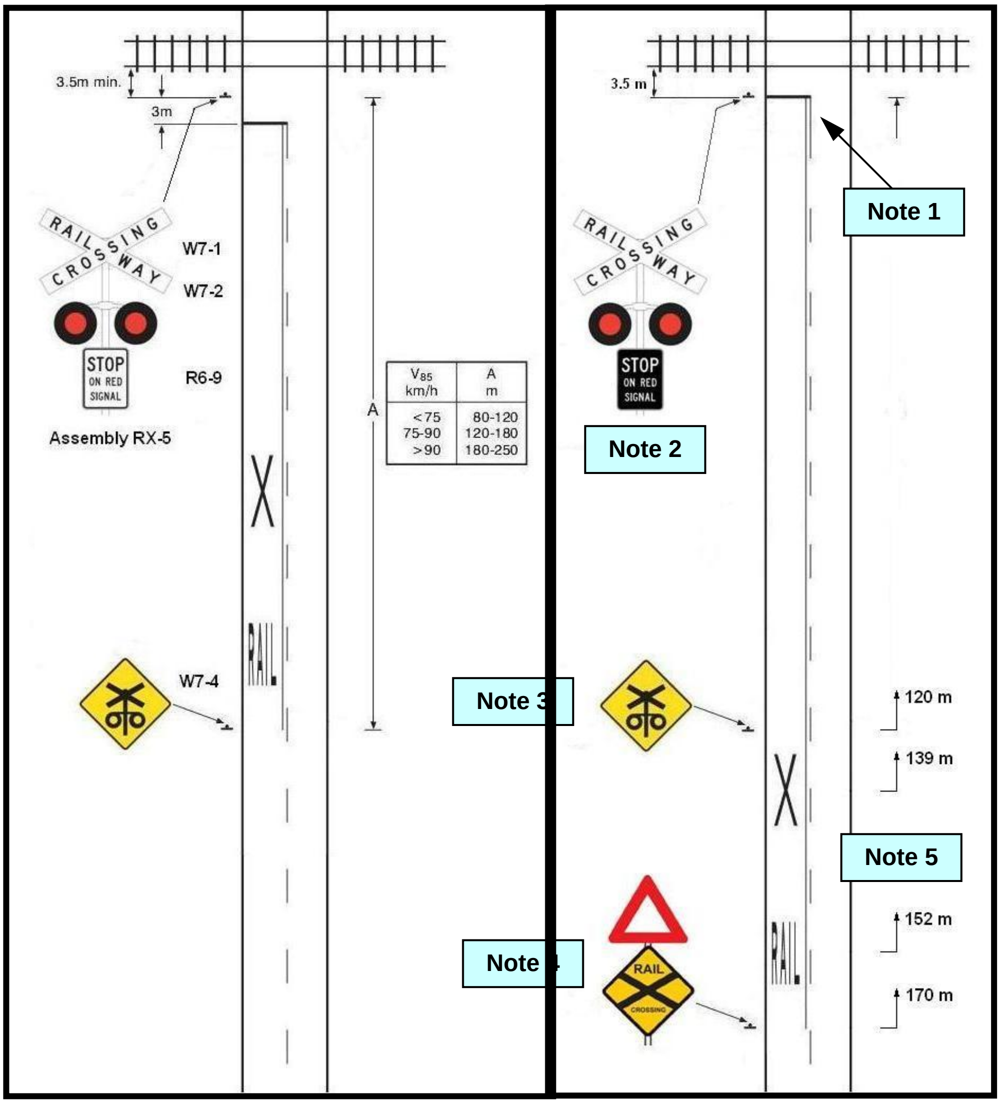
The investigation concluded that there was no deficiency in road markings or signage that could be considered as contributing either directly or indirectly to the collision at Thurgoona Road level crossing.

---

9 During the course of the investigation, a revised version of the Australian Standard was published, AS1742(7) - 2007 *Manual of uniform traffic control devices Part 7: Railway crossings*.

10 The actual installation date could not be provided to the ATSB.

Figure 8: Signage as required by AS1742.7-1993 (left)
Signage as installed at Thurgoona Road on 5 June 2006 (right)



V_{85} km/h	A m
<75	80-120
75-90	120-180
>90	180-250

Note 1: The position of the 'Stop Line' did not conform to the current standard which specifies the 'Stop Line' to be marked 3 m before the flashing light assembly RX-5.

Note 2: The flashing light assembly conformed to the current standard except for the 'Stop on Red Signal' sign (R6-9). AS1742.7 – 1993 specifies white background with black lettering for the 'Stop on Red Signal' sign (R6-9); however, the sign at Thurgoona road conformed to an earlier standard using black background with white lettering.

Note 3: The position of the advance warning sign (W7-4), 120 m from the flashing light assembly, conformed to the current standard for roads with a speed limit of less than 75 km/h.

Note 4: A second advance warning sign, the design of which conformed to an earlier standard, was positioned 170 m from the flashing light assembly.

Note 5: The pavement marking (RAIL X) was positioned at a point consistent with the advance warning sign at 170 m.

Level crossing – control circuits, test and maintenance data

Active level crossing traffic control systems are complex pieces of safety equipment that require regular inspection and maintenance to ensure reliability of operation and to guard against any unwanted operation. It is normal practice to fully validate the operation of level crossing control circuits and associated warning devices following any reported crossing incident/accident. This involves an examination of historic records, maintenance standards and a series of engineering tests, the outcomes of which are appropriately documented.

Records confirm that level crossing maintenance was regularly conducted in accordance with documented procedures. Maintenance at Thurgoona Road level crossing was last performed on 6 April 2006 with a maintenance inspection conducted on 16 May 2006. No system anomalies were recorded.

In addition to scheduled maintenance, operational testing of the level crossing was normally conducted each day. Witnesses working on the adjacent road construction observed maintenance personnel test the level crossing traffic control equipment at Thurgoona Road earlier on the day of the accident.

Following the passenger car collision on 5 June 2006, the level crossing was fully tested with all test parameters verified as within specified limits. A physical inspection of the site established that there was no evidence of vandalism or graffiti that may have rendered any part of the warning system ineffective.

Level crossing – event and data logging

A Remote Terminal Unit (RTU) was installed at Thurgoona Road to assist with offsite testing and monitoring of the level crossing equipment. The RTU had not been fully commissioned at the time of the accident, however, its capacity to capture and record data events locally was functioning correctly.

Examination of the RTU event log indicated that the level crossing traffic control system was tested at approximately 0745 on the day of the accident, consistent with witness observations. At approximately 1230, the RTU recorded a train travelling through the crossing towards Albury. Both events indicate that the level crossing traffic control system was operating correctly before train ST24 approached Thurgoona Road.

The RTU recorded the operation of the level crossing equipment as train ST24 approached Thurgoona Road from Albury on Monday 5 June 2006. The start of operation was recorded at 13:21:25.3 and the train recorded arriving at the road crossing at 13:21:51.5. This equates to 26.2 seconds of operation for the approaching XPT. The RTU also recorded confirmation that all lamps were flashing 3.2 seconds after the crossing began to operate[11]. Examination of the RTU event log indicated that the level crossing traffic control equipment operated correctly and all lamps continued to flash for the entire period as train ST24 approached the level crossing.

11 A characteristic of the lamp detection feature on the RTU is a delay between actual lamp operation and the recorded confirmation. The delay can be up to 4 seconds.

Level crossing warning time

Warning time is a critical design consideration for active level crossing traffic control. The intent is to provide sufficient warning to allow vehicles and pedestrians to clear the protected area before the arrival of the train. This includes vehicles and pedestrians that have already entered the crossing and approaching vehicles that cannot safely stop before entering the crossing.

Minimum warning time (MWT) refers to the minimum time that the warning devices shall operate before a train enters the crossing. It is important to note that allowances for equipment response, boom barrier operation and crossing configuration (width, angle etc.) should be considered in addition to MWT. At the time of the accident, there was no mandatory requirement for MWT in Australia. However, it was generally recognised in Australia, and worldwide[12], that a MWT of 20 seconds was the minimum acceptable limit. A MWT of 20 seconds has since been documented in the revised Australian Standard AS1742.7-2007.

As mentioned in the previous section, a warning time of about 26 seconds was provided as train ST24 approached Thurgoona Road, exceeding the minimum acceptable warning time of 20 seconds. Had the train been travelling at the maximum permissible track speed of 160 km/h, the calculated warning time would have been about 21 seconds over the 943 m approach distance (with no allowance for equipment response).

2.1.2 Traffic control system effectiveness

Road perspective

As mentioned previously, at level crossings with active traffic control, it is critical that motor vehicle drivers are able to sight the flashing lights in sufficient time to allow the driver to stop safely before entering the crossing.

The flashing lights installed at the Thurgoona Road level crossing consisted of a combination of main-lights and back-lights, utilising LED[13] fittings. The main-lights were aligned towards the 'RAIL X' road markings, while the back-lights were aligned to a point slightly in front of the opposite 'Stop Line' road markings. An on site inspection of the crossing established that the flashing lights provided good coverage, were clearly visible from the first advance warning sign and provided consistent coverage for both road approaches along Thurgoona Road.

At 1322, when the accident occurred, the sun was approximately 20° west of north and at an elevation of approximately 28°. Reflection and ghosting on the flashing light lens surfaces was unlikely to have been problematic for the driver approaching from the east. Similarly, the elevation and angle are unlikely to have contributed to any significant level of glare. The level crossing was observed on the following

---

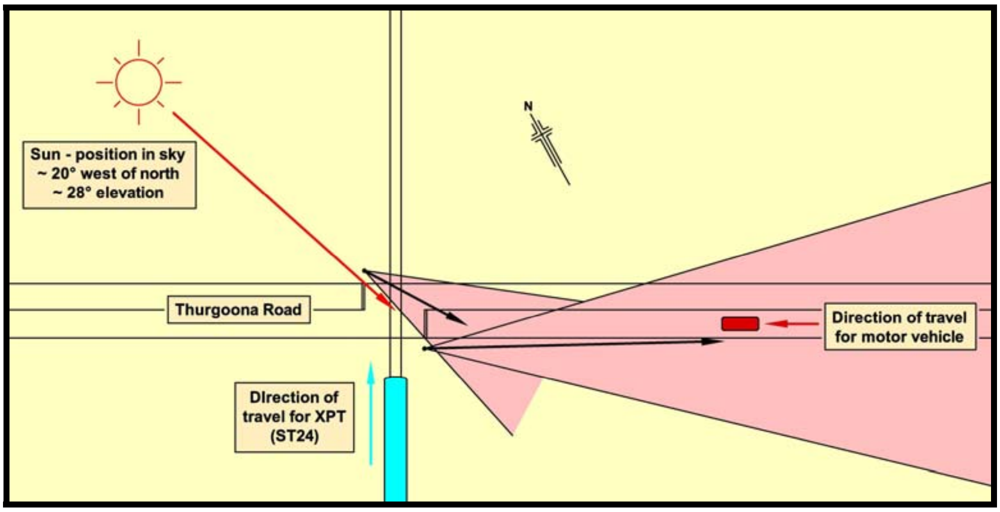
12 For example, the Code of Federal Regulations (USA), Title 49: Transportation states;

> *A highway-rail grade crossing warning system shall be maintained to activate in accordance with the design of the warning system, but in no event shall it provide less than 20 seconds warning time for the normal operation of through trains before the grade crossing is occupied by rail traffic.*

13 LED – Light Emitting Diode

day, at the same time of day. The environmental conditions were considered similar to the day of the accident and verified that the effects of the sun were unlikely to have contributed to a reduction in sighting at the Thurgoona Road level crossing.

Figure 9: Sun position and alignment of flashing lights (Eastern approach only)



The flashing lights started to operate 23 seconds before the train crossed the roadway. The estimated speed for the passenger car was less than 60 km/h. At this speed, the car would have been approximately 380 m away when the flashing lights started to operate. Even if the car was travelling at half this speed (30 km/h), there would have been at least 190 m of warning. The investigation concluded that the LED flashing lights would have been operating and clearly visible to the driver of the passenger car well before the vehicle passed the first advance warning sign positioned 170 m from the crossing.

The ATSB was advised that no record of any previous accidents could be found relating to the Thurgoona Road level crossing. The investigation concluded that the level crossing traffic control system at Thurgoona Road was normally effective at providing motorists with sufficient warning of an approaching train such that they could stop safely before entering the crossing.

Rail perspective

Given the size and weight of most trains it is not possible to brake at anywhere near the rate of a road vehicle, nor is it possible to rapidly accelerate or decelerate a train. Heavy freight and locomotive hauled passenger trains can take many kilometres to slow from track speed. Even intercity passenger trains such as the XPT can exceed a kilometre to stop under moderate braking. Therefore, trains are driven several kilometres 'in advance' such that a train driver will plan a stop, and start a brake application several kilometres before the required stopping point.

At many level crossings, the train driver's ability to sight an approaching motor vehicle is likely to be restricted. Where sighting an approaching motor vehicle is possible, it is not until the motor vehicle is relatively close to the crossing that the train driver can make a reasonable determination whether its intention is to stop. The train driver is unlikely to sight the approaching motor vehicle, or determine its intent not to stop, until both vehicles are relatively close to the crossing and a collision is imminent. By this time, the train driver would be unable to take any avoiding action to prevent the collision other than sounding the horn and (if time permits) make a brake application. Even if the train driver initiated emergency braking, the train is likely to traverse the crossing well before the braking effort became effective.

It is for this reason that, regardless of passive or active traffic control, it is essential that a motorist stop and give way to any train approaching or entering a level crossing in accordance with the road rules.

2.1.3 Summary of level crossing traffic control system

Analysis verified that at Thurgoona Road:

- The level crossing design and installation largely complied with the Australian Standard AS1742.7-1993. The minor non-compliances were not considered to have contributed to the accident.
- The level crossing traffic control equipment was operating correctly at the time of the collision with no defect or deficiency that contributed to the accident.
- The level crossing traffic control system was effective at providing motorists with sufficient warning of an approaching train such that they could stop safely before entering the crossing.
- The train driver would have been unable to take any avoiding action to prevent the collision.

2.2 Motor vehicle driver behaviour

Individual actions that can increase safety risk can be broadly categorised as violations (intentional deviations from rules or procedures) and errors (actions which are not consistent with the individual’s plan or where the plan is not adequate to achieve their goal).

Driver violations in relation to level crossings are usually characterised by a variation in the vehicle’s speed. A motor vehicle will usually increase speed if a driver attempts to race the train and cross the tracks in front of the train. Alternatively, a vehicle will usually decrease speed or possibly stop if the driver attempts to deliberately place their vehicle in the path of an approaching train with the intention of suicide.

Driver errors are usually characterised by either a constant vehicle speed indicating no awareness of impending danger, or a sudden deceleration and/or change of direction indicating late awareness and an attempt to stop and/or avoid a collision with the train.

In the case of the accident at Thurgoona Road, the witnesses indicated that the passenger car approached the crossing at a constant speed (estimated at less than 60 km/h) and made no attempt to slow or stop at the crossing. It would appear that the driver did not notice the flashing lights, was oblivious to the approaching train and did not attempt to avoid the collision.

The actions of the driver, as observed by witnesses, are inconsistent with the characteristics of a violation (deliberate) and are more likely to be the result of an error (unintentional). Some common factors contributing to driver errors at level crossings are inappropriate road signage, poor sighting of the crossing traffic control system, and reduced visibility due to environmental conditions, all of which are considered to be unlikely in this case. The remaining factors that may have contributed to the accident at Thurgoona Road are impairment due to drugs/alcohol, driver distraction, driver fatigue, expectation or a combination of these factors.

2.2.1 Drugs and alcohol

Analysis was conducted on blood samples obtained from the fatally injured driver. The analysis did not detect any concentration of alcohol, however, the samples did indicate evidence of cannabis use. The ATSB sought expert opinion from the Monash University Accident Research Centre on the effect of cannabis on driver performance.

The major psychoactive component of cannabis is delta-9-tetrahydrocannabinol (THC). After cannabis use, the active metabolite is rapidly converted to an inactive metabolite commonly referred to as THC-acid. The toxicology results from the fatally injured driver were positive to both delta-9-THC and delta-9-THC-acid. Delta-9-THC is the psychoactive metabolite that several studies have linked to performance impairment.

The predominant form of impairment is a driver's ability to react to complex or unexpected scenarios. Studies have concluded that affected drivers appear to be aware of their impairment and where possible compensate by slowing down, focussing attention and not taking risks (like overtaking)[14]. However, this compensation is not possible when the driver encounters unexpected events and/or when the driver is placed in situations requiring increased mental load or continuous attention[15].

An Australian study indicated that the crash risk for drivers with THC concentrations >5.0 ng/ml was similar to the crash risk associated with drivers showing a Blood Alcohol Concentration (BAC) >0.15%[16]. A recent overseas study also indicated that performance impairment became "truly prominent" across all driving related performance measures at THC concentrations equivalent to 2.5-5.0 ng/ml in whole blood[17]. Toxicology results from the fatally injured driver showed the active metabolite (delta-9-THC) in whole blood, at a concentration of 8.0 ng/ml.

It is therefore considered likely that the presence of the psychoactive metabolite of cannabis (Delta-9-THC) in the driver's blood contributed to a reduced capacity to respond appropriately in complex or unexpected driving conditions such as those

---

14 Smiley, A. (1986). Marijuana: On-road and driving simulator studies. *Alcohol, Drugs and Driving, 2(3-4), 121-134.*

15 Robbe, H. W. J. (1994). Influence of marijuana on driving. Unpublished PhD, Univeristy of Limburg, Maastricht.

16 Drummer, O. H., Gerostamoulos, J., Batziris, H., Chu, M., Caplehorn, J., Robertson, M. D., & Swann, P.(2004). The involvement of drugs in drivers of motor vehicles killed in Australian road traffic crashes. *Accident Analysis & Prevention, 36, 239-248.*

17 Ramaekers, J. G., Moeller, M. R., van Ruitenbeek, P., Theunissen, E. L., Schneider, E., & Kauert, G. (2006). Cognition and motor control as a function of delta-9-THC concentration in serum and oral fluid: Limits of impairment. *Drug and Alcohol Dependence, 85, 114-122.*

involving the possible distractions and the flashing lights at Thurgoona Road level crossing.

2.2.2 Driver distraction

Driver distraction has been defined by the American Automobile Association Foundation as occurring:

> …when a driver is delayed in the recognition of information needed to safely accomplish the driving task because some event, activity, object or person within or outside the vehicle compelled or tended to induce the driver's shifting attention away from the driving task.[18]

Driver distraction can include a range of factors either inside or outside a vehicle that draws on the limited physical, visual and cognitive resources, resulting in a degradation of the driver's performance. Eating, drinking, operating a mobile telephone, operating other devices integral or brought into the vehicle, smoking, and conversing with another occupant are all interior factors that can distract from the driving task. Exterior factors such as a person, object or event can also distract a driver. It has been estimated that driver inattention contributes to 25% of road accidents, and that distraction is a contributing factor in over half of these inattention accidents.[19]

Onsite observations and examination of evidential material identified two possible sources of distraction: the driver's mobile telephone and the construction work in the area near the crossing.

Mobile phone

A commonly known contributor to driver distraction is the operation of mobile telephones.[20] A mobile telephone was recovered from a location within a few metres of the fatally injured driver. Both the information stored on the telephone handset, and the records of the service provider were examined. While a mobile telephone is switched on it records dialled numbers, received calls and missed calls. These records indicated that the driver had not initiated any calls on the day of the accident, had only one received call earlier in the day, and had missed one call.

Of the calls recorded on the telephone, the single missed call (time stamped 1.23pm) is of interest as this was the approximate time of the accident. When cross referenced with the service provider's records, it indicates the unanswered call was diverted (probably to voicemail). The service provider records also show a second diversion occurred 29 seconds later. However, the second missed call was not recorded on the telephone, suggesting that the phone was off or inoperable by that time.

---

18 Young, K., Regan, M., & Hammer, M. (2003). *Driver distraction: A review of the literature*. Monash University Accident Research Centre. Report No. 206.

19 Young et al. (2003).

20 Young et al. (2003). See also: Horrey, W.J., & Wickens, C.D. (2006). *Examining the impact of cell phone conversations on driving using meta-analytical techniques*. Human Factors, 48, pp. 196-205.

The telephone data suggests that the mobile phone rang at or around the time that the car was approaching Thurgoona Road level crossing. The second diverted call, 29 seconds later and not recorded on the telephone, probably occurred immediately after the accident when the telephone handset was de-energised as a result of the battery becoming dislodged during the accident.

While the records indicate that the driver did not answer the call, the ringing telephone could still have been a significant distraction from the driving task. It is also a natural reaction for many people to examine a telephone to identify who may have called. The proximity of the telephone to the driver's body suggests that it may have been in close proximity to the driver at the time of the accident.

On balance, it is concluded that a ringing mobile telephone and/or the driver's examination of the telephone information were a likely distraction that shifted the car driver's attention away from the driving task as he approached the Thurgoona Road level crossing.

Distraction due to construction works

Originally from Albury, the passenger car driver had been working in a number of jobs in Melbourne over the previous two years and had only recently returned to live at Albury. Information obtained during the investigation suggested that the driver may not have travelled Thurgoona Road for some time. Consequently, it is unlikely that he would have been familiar with the adjacent roadway and bridge construction works which may have increased the opportunity for visual distraction.

However, witnesses stated that the car driver's attention appeared to be focussed straight ahead, suggesting that he was not looking at, or distracted by the construction works.

2.2.3 Driver fatigue

Fatigue can have a profound effect on human performance. It can reduce attention, increase reaction times and affect memory. When fatigued, it can take longer for a person to perceive and interpret information and longer for them to decide on and carry out an appropriate course of action. Fatigue can also affect a person's ability to judge distance, speed and time. Often individuals will be unaware of the effects of fatigue on their performance.

Fatigue can arise from a number of sources, including the nature and duration of work, insufficient rest or sleep, and the time of day (with performance generally most affected during the period 0300 to 0500, and a smaller decrement occurring in the period 1500-1700).

The driver had returned to Albury two days before the accident and little is known of his sleep-work patterns before this time. However, statements from witnesses indicated that the day before the accident he remained at home and had had a significant amount of sleep throughout the day. Also, the night before the accident he visited friends, returned home in the early hours of the morning and slept soundly.

While the driver's sleep-wake pattern may not have been ideal in a fatigue management sense, it is not entirely uncommon in many younger/teenage people. The accident occurred in the early afternoon when a person would normally be awake and alert. Overall, while it cannot be totally ruled out, there is insufficient evidence to conclude that the driver was experiencing fatigue or that fatigue was involved in the accident at Thurgoona Road.

2.2.4 Driver expectation

A person's perception of the probability of a given event is strongly influenced by past experience (Schoppert and Hoyt, 1968 cited in NTSB, 1998[21]). Similarly, the frequency with which they encounter a train at a level crossing that they use regularly will influence the likelihood of the motorist stopping (NTSB, 1998).

For example, a road user's perception that a train is unlikely to be at the crossing is reinforced every time that road user traverses the crossing without seeing a train. Under these conditions, crossing familiarity combined with the expectation that a train won't be present has the potential to lull motorists into becoming complacent or develop poor looking habits. Conversely, if a train is encountered on a regular basis, it is more likely that they would develop an expectation of encountering a train and be more vigilant when approaching the crossing.

Given his recent return to the local area, it is unlikely that the driver had travelled Thurgoona Road for some time. Consequently, the lack of recent past experience at the Thurgoona Road level crossing would suggest that the driver would not have developed any expectation with respect to encountering, or not encountering, a train on the crossing.

2.2.5 Summary of motor vehicle driver behaviour

It is likely that the presence of a significant amount of the psychoactive metabolite of cannabis (Delta-9-THC) in the car driver's blood contributed to a reduced capacity to respond appropriately to complex or unexpected driving conditions. It is also likely that a ringing mobile telephone and/or the driver's examination of the telephone information were a distraction that increased his workload and the demand on his cognitive resources.

It is probable that combined, these two factors contributed to the car driver not responding appropriately to the level crossing flashing lights and bell, and subsequently driving into the path of XPT passenger train ST24.

It is unlikely, or there is insufficient evidence to conclude, that driver fatigue, expectation or other sources of distraction contributed to the collision at Thurgoona Road level crossing.

2.3 Aids to redirect driver attention

In much the same way that an external influence can distract a driver, an external influence can also focus a driver's attention back on the driving task and a possible hazard. This will usually be an audible or visual signal. For example, a motor vehicle horn, screeching of tyres under heavy braking, or flashing lights.

---

21 National Transportation Safety Board (1998). Safety at passive grade crossing. Volume 1: Analysis. Safety study NTSB/SS-98/02. Washington DC.

Visual devices

At level crossings, visual devices remain the primary method used to warn motorists of an approaching train. Depending on a risk assessment for each specific location, visual level crossing traffic control is provided by passive signage or a combination of passive signage and active visual devices such as flashing lights and boom barriers.

Signage provides limited ability to refocus the attention of a distracted driver whereas signal lights are more likely to demand attention. Flashing lights provide some improvement over steadily lit lights by giving a changing visual cue to draw the attention of a motorist. Boom barriers add a further visual cue and a physical barrier and as such may provide further protection for drivers who make an error however, they have proved more effective at deterring violations.

An enhancement not commonly used at this time on level crossings is active advance warning[22]. In some circumstances, signage and flashing lights are positioned to provide road users with advance warning of a requirement to stop due to an impending activation of the level crossing traffic control system. However, installation costs are usually high and installations are generally intended for locations where the crossing is the first active road signal control encountered by a motorist after a long distance of unencumbered travel and/or the road has a high speed limit.

Audible devices

Historically, audible devices have been considered an important component in the systems used to warn motorists of an approaching train. However, soundproofing, air conditioning and entertainment systems in modern vehicles raise questions as to how effective level crossing bells and train whistles are in the current environment.

Considering the sound excluding performance of most modern passenger cars, a suitable sound pressure level inside the vehicle requires a significantly higher sound pressure level at the source of the sound. Achieving this sound pressure level at the source would possibly exceed the pain threshold for human hearing and would not generally be acceptable on health and environmental grounds. While a 1986 Holden Commodore may not be considered modern, its sound excluding performance would still make audible devices ineffective at warning a driver of an approaching train.

Consequently, it would appear that audible warnings are more effective at warning bicycle riders and pedestrians, and a substantial increase in the loudness of train whistles is possibly not a viable option. It should also be noted that portable entertainment systems (iPods etc.) are reducing the effectiveness of audible warning devices for bicycle riders and pedestrians.

Other devices

Audio-tactile road markings are a series of closely spaced small raised bumps in the road surface. This type of road marking is designed to generate noise and steering

22 During the course of the investigation, a revised version of the Australian Standard 1742(7) was published. AS1742(7) - 2007 includes the requirements for active advance warning.

wheel vibration when traversed by a road vehicle. Audio-tactile line marking is commonly used to indicate the road edge and is recognised as an effective tool to combat driver fatigue. However, the use of audio-tactile road marking in other applications such as railway level crossings is not so common.

Vision is the principal sense used while driving, whereas hearing and especially touch are used to a much lesser degree, suggesting that audio-tactile road marking could be an effective attention-capturing means. Audio-tactile road markings are potentially a relatively low cost enhancement to level crossing traffic control systems that could assist with refocusing the attention of distracted drivers.

Intelligent Transport Systems (ITS) is a generic term used to describe active in-vehicle warning systems. In the railway level crossing context, these systems are generally activated through a wireless communication link between the rail/train system and the motor vehicle to provide a warning to the driver of an approaching train. However, until ITS becomes part of the standard control system in motor vehicles, these systems are unlikely to be the solution for improving level crossing traffic control.

3 FINDINGS

3.1 Context

From the evidence available, the following findings are made with respect to the fatality of a passenger car driver on 5 June 2006 when their vehicle drove into the path of a Sydney bound CountryLink XPT passenger train at the Thurgoona Road level crossing, Albury (NSW).

The findings detail the factors that most likely contributed to the collision, and any other safety factors or findings identified through analysis. The findings should not be read as apportioning blame or liability to any particular organisation or individual.

3.2 Contributing factors

These findings identify the various events and conditions that increased safety risk and contributed to the occurrence.

1. It is likely that the presence of a significant concentration of the psychoactive metabolite of cannabis (Delta-9-THC) in the car driver's blood contributed to a reduced capacity to respond appropriately to complex or unexpected driving conditions.
2. It is likely that a ringing mobile telephone and/or examination of the telephone information were a distraction that increased the car driver's workload and the demand on his cognitive resources.

It is probable that combined, these two factors contributed to the car driver not responding appropriately to the level crossing flashing lights and bell, and subsequently driving into the path of XPT passenger train ST24 at the Thurgoona Road level crossing.

3.3 Other key findings

These are findings that are not defined as safety factors or may be positive events and conditions that reduced the risks associated with the occurrence.

1. The level crossing design and installation largely complied with the Australian Standard AS1742.7-1993. The minor non-compliances were not considered to have contributed to the accident.
2. There were no deficiencies in the mechanical condition of train ST24, nor any issues associated with the performance of the train crew that contributed to the accident.
3. The level crossing traffic control equipment was operating correctly at the time of the collision with no defect or deficiency in track or signalling infrastructure that contributed to the accident.
4. Completion of the road bridge would achieve grade separation and eliminate the risk of level crossing accidents at Thurgoona Road

4 SAFETY ACTIONS

At the time of the accident, a major upgrade and realignment of the Hume Highway was underway and incorporated the replacement of six rail level crossings with road bridges. A major freeway interchange, incorporate a road bridge over the railway line was under construction, which when completed would achieve grade separation and eliminate the risk of level crossing accidents at Thurgoona Road.

As a result of its investigation, the ATSB makes the following recommendation with the intention of improving railway operational safety. Rather than provide prescriptive solutions, ATSB recommendations are designed to highlight safety issues that need to be considered. Recommendations are directed to those agencies that should be best placed to action the safety enhancements intended by the recommendations, and are not necessarily reflective of deficiencies within those agencies.

RR20070003

The ATSB recommends that the NSW Level Crossing Strategy Council consider strategies to reinforce public awareness of the risks associated with cannabis use and the resultant impairment of driving performance, and driver distraction in relation to mobile telephone ringing and usage.

5 APPENDIXES

5.1 Level crossing traffic control systems

Historically, there has been no common national method for evaluating the level of traffic control required at a specific level crossing. Each state developed their own process through local standards and assessment committees. However, in 2003, the Australian Transport Council (ATC)[23] agreed to adopt the Australian Level Crossing Assessment Model (ALCAM) as the national model for assessing safety risk at level crossings. ALCAM is a process that objectively assesses, evaluates and prioritises the safety risks at railway crossings and can also be used to test treatment strategies aimed at improving safety risk at specific sites.

Traffic control treatments at the road-rail interface can be placed into three main categories, passive traffic controls, active traffic controls or grade separation.

Passive level crossing traffic control systems

Passive level crossing traffic control uses signs which are not activated during the approach or passage of a train. Passive traffic control is usually provided by 'Give Way Signs' or 'Stop Signs' and used where the volume of road traffic is relatively low. If the driver of a passenger car approaching a crossing has sufficient visibility to sight an approaching train and make an informed decision whether to stop or proceed across the level crossing, 'Give Way Signs' may be appropriate. If visibility is restricted such that a passenger car could only sight an approaching train from the stopped position before making an informed decision whether to proceed, 'Stop Signs' may be more appropriate.

The system relies on the road user detecting the approach or presence of a train through direct observation.

Active level crossing traffic control systems

Active level crossing traffic control uses devices such as flashing lights, audible devices, barriers, or a combination of these where the devices are actuated before and during the passage of a train. Active traffic control is commonly used when passive traffic control is not sufficient and/or the speed and volume of road or rail traffic is relatively high. Flashing lights and bells remove the need for a passenger car driver to sight an approaching train before deciding whether to proceed across the level crossing. Boom barriers provide an additional visual and physical barrier between road vehicles and trains.

The system relies on the road user obeying the activated signals and removes the requirement for direct observation of an approaching train.

---

23 The Australian Transport Council comprises Commonwealth, State, Territory and New Zealand Ministers responsible for transport and road issues.

Grade separation

The most costly type of traffic control involves the building of a bridge or tunnel to separate the two modes of transport. Grade separation is commonly used where the speed and volume of road or rail traffic is high and road closure due to train movements would cause unacceptable delays to road traffic.

The system removes the road rail interface at this location, eliminating the requirement for road traffic to consider an approaching train.

5.2 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) Australian Rail Track Corporation

b) RailCorp

c) NSW Level Crossing Strategy Council

d) NSW Independent Transport Safety and Reliability Regulator.

A number of comments and observations on the draft report were received from directly involved parties. Their remarks have been considered by the ATSB investigation team and have been incorporated into the body of the report where appropriate.

5.3 References

Australian Standard AS1742.7-1993 *Manual of uniform traffic control devices Part 7: Railway crossings*

Australian Transport Safety Bureau (2004), Dr D.G. Newman, *Cannabis and its Effects on Pilot Performance and Flight Safety: A Review*

Baan Baa, 4 May 2004: *Road Motor Vehicle Struck by Countrylink Xplorer Passenger Service NP23a on Baranbah Street Level Crossing (530.780kms)*. Investigation by Office of Transport Safety Investigations, NSW

Code of Federal Regulations (USA), Title 49: Transportation

Drummer, O. H., Gerostamoulos, J., Batziris, H., Chu, M., Caplehorn, J., Robertson, M. D., & Swann, P.(2004). The involvement of drugs in drivers of motor vehicles killed in Australian road traffic crashes. *Accident Analysis & Prevention*, 36, 239-248.

National Transport Commission (NTC) *National Standard for Health Assessment of Rail Safety Workers, June 2004.*

National Transportation Safety Board (1998). *Safety at passive grade crossing. Volume 1: Analysis*. Safety study NTSB/SS-98/02. Washington DC.

Ramaekers, J. G., Moeller, M. R., van Ruitenbeek, P., Theunissen, E. L., Schneider, E., & Kauert, G. (2006). Cognition and motor control as a function of delta-9-THC concentration in serum and oral fluid: Limits of impairment. *Drug and Alcohol Dependence*, 85, 114-122.

Robbe, H. W. J. (1994). Influence of marijuana on driving. Unpublished PhD, Univeristy of Limburg, Maastricht.

Smiley, A. (1986). Marijuana: On-road and driving simulator studies. *Alcohol, Drugs and Driving*, 2(3-4), 121-134.

Young, K., Regan, M., & Hammer, M. (2003). *Driver distraction: A review of the literature.* Monash University Accident Research Centre. Report No. 206.

Young et al. (2003). See also: Horrey, W.J., & Wickens, C.D. (2006). *Examining the impact of cell phone conversations on driving using meta-analytical techniques.* Human Factors, 48, pp. 196-205.

5.4 Media release

Cannabis and mobile telephone probably contributed to fatal level crossing collision

The ATSB has found that the driver of a motor vehicle fatally injured in a collision with a train on 5 June 2006, was under the influence of cannabis and probably distracted by his mobile telephone at about the time of the accident.

The Australian Transport Safety Bureau has released its report into the accident which occurred at a level crossing on Thurgoona Road on the northern outskirts of Albury at approximately 1:22 pm on 5 June 2006. The 1986 Holden Commodore drove at a steady speed of less than 60 km/h into the path of a Sydney bound CountryLink XPT passenger train which was travelling at between 120 and 130 km/h at the point of collision.

The Commodore was destroyed by the collision and the 19 year old male driver was thrown from the car and fatally injured. There were no physical injuries to witnesses, crew or passengers of the train.

The investigation found that the level crossing's flashing lights and warning bells were operating at the time of the collision and that the train driver had sounded the train's horn when he realised the car was not going to stop at the lights.

Toxicology results from the fatally injured driver were positive for cannabis. The concentration of the drug in the driver's blood exceeded levels where studies have indicated performance impairment becomes 'truly prominent' across all driving-related performance measures.

The investigation also found that the motor vehicle driver's mobile telephone probably rang at or around the time that the car was approaching Thurgoona Road level crossing. While the driver did not answer the call, the ringing telephone probably distracted him from the driving task.

The ATSB concluded it was likely that combined, these two factors contributed to the motor vehicle driver not responding appropriately to the level crossing flashing lights and bell, and subsequently driving into the path of the train.

The ATSB has recommended raising public awareness of the risks associated with cannabis use and mobile telephones with respect to driving performance.

The investigation also noted that at the completion of the 'Albury Wodonga Hume Freeway Project' (scheduled for mid 2007), the road bridge would result in the closure of the level crossing, achieve grade separation and eliminate the risk of future level crossing accidents at Thurgoona Road.

Copies of the report can be downloaded from the ATSB's internet site at www.atsb.gov.au, or obtained from the ATSB by telephoning 1800 020 616.

Level crossing collision between XPT Passenger Train ST24 and Passenger Car Thurgoona Road, Albury, NSW, 5 June 2006