RAIL SAFETY INVESTIGATION REPORT

LEVEL CROSSING COLLISION

MOREE

21 MAY 2013
THE OFFICE OF TRANSPORT SAFETY INVESTIGATIONS

The Office of Transport Safety Investigations (OTSI) is an independent NSW agency whose purpose is to improve transport safety through the investigation of accidents and incidents in the rail, bus and ferry industries. OTSI investigations are independent of regulatory, operator or other external entities.

Established on 1 January 2004 by the Transport Administration Act 1988, and confirmed by amending legislation as an independent statutory office on 1 July 2005, OTSI is responsible for determining the causes and contributing factors of accidents and to make recommendations for the implementation of remedial safety action to prevent recurrence. Importantly, however, OTSI does not confine itself to the consideration of just those matters that caused or contributed to a particular accident; it also seeks to identify any transport safety matters which, if left unaddressed, might contribute to other accidents.

This OTSI investigation was conducted under powers conferred by the Passenger Transport Act 1990. OTSI investigators normally seek to obtain information cooperatively when conducting an accident investigation. However, where it is necessary to do so, OTSI investigators may exercise statutory powers to interview persons, enter premises and examine and retain physical and documentary evidence.

It is not within OTSI’s jurisdiction, nor an object of its investigations, to apportion blame or determine liability. At all times, OTSI’s investigation reports strive to reflect a “Just Culture” approach to the investigative process by balancing the presentation of potentially judgemental material in a manner that properly explains what happened, and why, in a fair and unbiased manner.

Once OTSI has completed an investigation, its report is provided to the NSW Minister for Transport for tabling in Parliament. The Minister is required to table the report in both Houses of the NSW Parliament within seven days of receiving it. Following tabling, the report is published on OTSI’s website at www.otsi.nsw.gov.au.

OTSI cannot compel any party to implement its recommendations and its investigative responsibilities do not extend to overseeing the implementation of recommendations it makes in its investigation reports. However, OTSI takes a close interest in the extent to which its recommendations have been accepted and acted upon.
# CONTENTS

| TABLE OF PHOTOGRAPHS                      | ii |
| TABLE OF FIGURES                         | ii |
| EXECUTIVE SUMMARY                        | iii |
| PART 1 Factual Information               | 1  |
| Overview                                 | 1  |
| Location                                 | 1  |
| The track                                | 3  |
| The train                                | 3  |
| The train crew                           | 4  |
| The utility driver                       | 4  |
| The utility                              | 5  |
| Environmental conditions                 | 5  |
| The crossing                             | 6  |
| The collision                            | 13 |
| Emergency response                       | 15 |
| PART 2 Findings                          | 16 |
| Immediate cause                          | 16 |
| Contributing factor                      | 16 |
| PART 3 Recommendations                   | 17 |
| Moree Plains Shire Council together with ARTC | 17 |
| PART 4 Appendices                        | 18 |
| Appendix 1: Sources and submissions      | 18 |
**TABLE OF PHOTOGRAPHS**

<table>
<thead>
<tr>
<th>Photograph</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Damage to the utility</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>View looking west towards crossing</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>Pavement marking and stop sign warning</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>Sign assembly</td>
<td>9</td>
</tr>
<tr>
<td>5</td>
<td>Width marker assembly</td>
<td>10</td>
</tr>
<tr>
<td>6</td>
<td>Box marking</td>
<td>10</td>
</tr>
<tr>
<td>7</td>
<td>View to north from Stop Sign</td>
<td>12</td>
</tr>
<tr>
<td>8</td>
<td>View to south from Stop Sign</td>
<td>12</td>
</tr>
</tbody>
</table>

**TABLE OF FIGURES**

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Incident location</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>Location of crossing</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Sun position relative to utility and train</td>
<td>6</td>
</tr>
</tbody>
</table>
EXECUTIVE SUMMARY

At 0720\(^1\) on Tuesday 21 May 2013, track measuring and recording train NK81 travelling north from Narrabri towards Moree collided with the rear left corner of a utility travelling west across a railway crossing on Tapscott Road, known locally as Dunavant’s Crossing. The driver of the utility was uninjured in the collision and drove from the scene after speaking to the train crew.

The train, operated by Pacific National (PN) for the Australian Rail Track Corporation (ARTC), consisted of three specially equipped carriages instrumented to record a range of track geometry parameters. It was hauled by PN locomotives 48138 and 48104, and was travelling at approximately 96 km/h.

The railway crossing was passively protected by stop signs and associated roadside signs.

The driver of the utility stopped at the stop sign on the eastern side of the crossing before proceeding across the crossing into the path of the approaching train. Although he believes he did look out for trains, he could not explain why he did not see the train. The most likely explanation is that it was a case of inattentional blindness, the phenomenon of ‘look but did not see’.

There were no matters directly associated with the incident that warranted a recommendation to any party involved. However, in the course of the investigation, it was noted that the required interface agreement for the crossing had not been finalised between the Moree Plains Shire Council and the Australian Rail Track Corporation. It is recommended this be completed by the two parties.

---

\(^1\) Times in this report are in 24-hour clock form, and are in Eastern Standard Time, 10 hours ahead of Coordinated Universal Time.
PART 1 FACTUAL INFORMATION

Overview

1.1 At 0620 on Tuesday 21 May 2013, track measuring and recording train NK81 left Narrabri to travel north through Moree to North Star. The train, operated for ARTC by PN, comprised two 48 Class locomotives and three carriages instrumented for track geometry measurement.

1.2 At approximately 0720 a utility was travelling west along Tapscott Road which crossed the railway line 7.6 km south of Moree. The railway crossing, known locally as Dunavant’s Crossing, was protected by stop signs and associated road signs and markings.

1.3 On reaching the crossing the driver of the utility brought it to a stop at or just past the stop sign before proceeding across the railway line, having failed to notice the train approaching the crossing from his left. The left front corner of the train’s lead locomotive struck the left rear corner of the utility, pushing the utility clear of the railway line and causing significant localised damage to the utility and minor damage to the locomotive.

1.4 The driver of the utility was uninjured in the collision and drove from the scene after speaking to the train crew. Neither the two crew members nor the four other persons on the train were injured.

Location

1.5 Moree, located on the Mehi River in the north of NSW, is a large agricultural town with a population of around 10,000. It is known primarily for cotton growing and its hot artesian springs, and is surrounded by rich black soil plains. Its location is shown in Figure 1.

---

2 ARTC reported that CCTV records from the lead locomotive of NK81 indicated that the utility appeared to have stopped past the stop sign.
1.6 The railway crossing on which the collision occurred was 7.6 km south of Moree on Tapscott Road, which is a side road running east from the Newell Highway and providing access to a cotton gin, a waste management facility and livestock saleyards, as depicted in Figure 2. The speed limit on the Newell Highway was 100 km/h. The absence of any signs to the contrary on Tapscott Road implies that it was also subject to a 100 km/h speed limit, although the road configuration was such that much lower speeds were more likely.

1.7 Traffic volumes on Tapscott Road are generally low, comprising predominantly light and heavy commercial vehicles travelling to and from the waste management facility. On livestock sale days the volume increased, but rarely enough for any significant queuing to occur at the Newell Highway.

1.8 Train movements across the crossing are also low, the only regular scheduled services being daily passenger services into Moree from the south at 1840, and out of Moree to the south at 0825. Other trains are predominantly seasonal services carrying agricultural products south from Moree, and were infrequent at the time of the collision.
The track

1.9 The incident occurred on a single line bi-directional track running to Moree through Werris Creek from the south. The track is leased from the NSW Government by the Australian Rail Track Corporation (ARTC) and, under the terms of the lease, ARTC is responsible for track maintenance and train control functions. It is a Class 2 track with maximum permitted speeds in both directions at the incident location of 130 km/h for passenger services and 100 km/h for other trains.

The train

1.10 The train involved in the incident was designated NK81 and comprised three ARTC Track Recording Cars hauled by PN locomotives 48138 and 48104. It had left Narrabri at 0620 to travel to the end of the line at North Star.
1.11 The speed of the train as it approached the crossing was recorded on the train’s Hasler recorder as being an uncorrected 96 km/h.  

The train crew

1.12 The driver of the train was a 33 year old male who had been employed by PN for seven years, had five years experience as a train driver, was certified as medically fit, and had been re-certified as a driver in 2012. On the day of the incident he had commenced work at 0500 to prepare train NK81 for departure. He had not been rostered to work on the three days preceding the incident.

1.13 The assistant driver was a 58 year old male who had been employed by PN for 11 years with seven years experience as a train driver, was certified as medically fit, and had been re-certified as a driver in 2012. He also had commenced work at 0500 on the day of the incident, after two days on which he was not rostered to work.

1.14 Both crew members were tested after the collision for the presence of drugs and alcohol, with negative results.

The utility driver

1.15 The driver of the utility was healthy and fit, took no medications, and was well rested prior to commencing work at 0700 on the day of the incident.

1.16 The driver was breath tested by the police following the incident, with a negative result. A subsequent test for the presence of drugs was also negative.

1.17 The driver was very familiar with the crossing, using it on a daily basis to travel to and from work.

1.18 At the times at which he usually used the crossing, the driver would have very rarely encountered a train.

---

3 Hasler speed records are based on the rotational speed of one locomotive wheel. As the wheel wears and is machined, the relationship of wheel rotational speed to track speed changes. The maximum deviation from true speed is ±3.5%. In this case no correction was applied to account for wheel wear.
The utility

1.19 The utility was a near-new Mitsubishi Triton utility, white in colour. It sustained moderate damage to the left rear corner in the collision but remained drivable. The damage is shown in *Photograph 1.*

![Photograph 1: Damage to the utility](image)

Environmental conditions

1.20 It was a cool, dry morning at Moree on the day of the collision, with a temperature at 0730 of 6.7°C and significant cloud cover.\(^4\) The sun was at an azimuth of 62° and an altitude of 7°.\(^5\) The alignment of the road and track at the crossing and the relative position of the sun were as shown in *Figure 3.*

1.21 The sun was shining from behind and to the right of the utility driver and would have clearly illuminated the approaching train. From the train driver’s position,

---

\(^4\) Source: Bureau of Meteorology.

\(^5\) Source: Geoscience Australia; rounded to nearest whole degree.
the white utility stopped at the crossing would have been in clear view, with the sun well to the right.

Figure 3: Sun position relative to utility and train

The crossing

1.22 The crossing is located 7.6 km south of Moree and 658.027 km from a reference point at Sydney’s Central Station. Tapscott Road, the road leading to the crossing, is sealed with a paved width of approximately 6.6 metres. The road is divided centrally by an unbroken double line extending from its intersection with the Newell Highway and continuing for a further 6 metres past the railway line. The crossing is 115 metres east of the junction of Tapscott Road and the Newell Highway.

1.23 The crossing is subject to legislation requiring the rail infrastructure manager (in this case the ARTC) to conduct a safety risk assessment and to seek to enter into an interface agreement with the manager of the road (in this case the Moree Plains Shire Council). The ARTC had commenced this process in December 2009 and had provided a draft agreement in May 2010. Despite
repeated efforts by ARTC to progress negotiations, the agreement had not yet been finalised at the time of the incident.

1.24 The crossing is protected by a passive control system comprising stop signs, associated warning signs and pavement markings. This type of protection relies on the driver of a road vehicle stopping before reaching the crossing and not proceeding across the crossing unless it is safe to do so.6

1.25 There are also warning signs on the Newell Highway, on both approaches to its intersection with Tapscott Road.

1.26 The requirements for traffic control devices at level crossings are set out in Australian Standard 1742.7—2007.7 When the crossing was examined two months after the incident, a number of minor inconsistencies with the requirements of the Standard were observed. None of these, if in existence at the time of the incident, are considered to have been contributing factors.

1.27 The approach to the crossing, as viewed by the driver of the utility who was travelling west on Tapscott Road, would have been as shown in Photograph 2. The road seen on the right is the entrance to the saleyards, 100 metres from the crossing.

---

6 New South Wales Road Rules 2008, paragraph 121.

---

Photograph 2: View looking west towards crossing
1.28 The access road to the waste management facility was a further 180 metres from the crossing. The paved surface of Tapscott Road stopped 310 metres east of the crossing, with an unsealed road for a further 60 metres to the cotton gin gate.

1.29 The first sign seen when approaching from the east was the black steam train visible on the right of Photograph 2. This sign was in fact incorrectly used, as it should be on the left side of the road with its mirror image on the right side. There was no sign on the left side, although a post to which a sign appeared to have once been attached was present.

1.30 Directly opposite the saleyard entrance was the pavement marking shown in Photograph 3, as required by the Standard. This was followed by a Stop Sign Ahead warning 83 metres from the nearest rail which is consistent with the distance set out in the Standard for roads with an 85th percentile road speed of less than 75 km/h, a figure that is reasonable for this location.

Photograph 3: Pavement marking and stop sign warning
1.31 The main sign assembly at the crossing, seen in Photograph 4, comprises a Railway Crossing sign, a Stop sign and a Look for Trains sign. This is located on the left side of the road 5 metres from the nearest rail and is accompanied by a Stop line on the pavement. This is in keeping with the requirements of the Standard. Although not required by the Standard, an identical sign assembly is repeated on the right side of the road.

Photograph 4: Sign assembly

1.32 A Railway Crossing Width Marker assembly, specified by the Standard for use where conspicuity of the crossing needs to be enhanced, and seen in Photograph 5, was installed 13 metres from the nearest rail.
Photograph 5: Width marker assembly

Photograph 6: Box marking
1.33 The crossing itself was painted with a yellow hatch marking, seen in Photograph 6, and described in the Standard as a box marking, for use where a traffic constriction downstream from the crossing could cause traffic to queue back to the crossing. The Standard also requires a KEEP TRACKS CLEAR sign to be used in conjunction with the box marking but this sign was not present.

1.34 The road configuration, with multiple entry points to Tapscott Road within the area covered by the Standard’s warning sign requirements, meant that not all road users would see all the warning signs. For example, those who exited the saleyards would not see the first warning sign or the pavement marking. However, the configuration also made high speeds impractical and the flat terrain rendered the crossing readily visible to approaching motorists.

1.35 In summary, although there were minor deviations from the strict requirements of the Standard, the crossing and its signage were highly conspicuous when approached from the east. Neither the deviations from the Standard nor the previously mentioned lack of a finalised interface agreement are considered to have contributed to the occurrence of the collision as they did not affect the conspicuity of the crossing.

1.36 For a driver stopped at the crossing’s eastern stop sign, visibility of approaching trains is unrestricted both to the north and the south as can be seen in Photographs 7 and 8.

1.37 The height of the approaching 48 Class locomotive and its contrasting blue and yellow livery would have made it conspicuous against the light background of dry grass and cloudy sky.

1.38 An examination of rail incident records since the opening of the Waste Management Centre in 2009 indicated that there had been no significant incidents at the Tapscott Road crossing prior to this collision.
Photograph 7: View to north from Stop Sign

Photograph 8: View to south from Stop Sign
The collision

1.39 On the day of the incident the driver of the utility had been at his workplace on the eastern side of the crossing for a short time when it became necessary for him to leave work to attend to a private matter, requiring him to travel across the crossing.

1.40 At the same time, train NK81 was approaching the crossing from the south. When approximately 400 metres from the crossing the assistant driver sounded the horn. Shortly afterwards, at a distance of approximately 300 metres, the assistant driver saw the utility stopped at the crossing. The assistant driver sounded the horn again, told the driver there was a car at the crossing, and then saw the utility start to move forward. The assistant driver immediately told the driver that the car was moving.

1.41 On being told that the car was moving, the train driver immediately made an emergency brake application. He stated that he ‘then felt and heard the impact of the locomotive striking the vehicle and saw the vehicle come across the front of the locomotive’. The train stopped approximately 700 metres past the crossing, and the crew immediately contacted the ARTC North Network Controller.

1.42 The utility driver stated that on stopping at the crossing he looked but didn’t see the train. He then proceeded across the crossing and was hit by the train. He stopped after the impact and, after recovering from the shock and realising he was not injured, saw that the train had stopped a distance away that he estimated at 800 metres. He drove down to the train driver who was walking towards him. After speaking to the train driver, he drove home and then returned to the crossing.

1.43 After the utility driver returned to the crossing, police and ambulance officers arrived. The utility driver spoke to the police and was breath tested, but declined medical attention. He then returned to his workplace where a drug test was performed.

1.44 Rule 121 of the NSW Road Rules requires the following:

A driver at a level crossing with a stop sign must:
(a) stop as near as practicable to, but before reaching, the stop line or, if there is no stop line, as near as practicable to, but before reaching, the stop sign, and  
(b) give way to any train or tram on, approaching or entering the crossing.

1.45 The utility driver stopped at the crossing, probably just past the stop sign. He stated at interview that he then proceeded across the crossing without seeing the train. His evidence, corroborated by the evidence of the train crew, does not support any suggestion that he did in fact see the train and try to cross before it reached the crossing. He had no explanation for how he had missed seeing the train. In this regard, two possible explanations are considered:  

a. **He did not look.** As pointed out by Yeh & Multzer (2008), “drivers who are familiar with a crossing will be less likely to look for a train at a crossing … than drivers who are unfamiliar with the crossing”. The driver was very familiar with the crossing, driving over it on a daily basis.

b. **He looked, but did not see.** Chabris & Simons (2009) speak of “the illusion of attention”, pointing out that, particularly when distracted, people can fail to see the unexpected even when looking directly at it. This is supported by the research of Mack & Rock (1998) who conducted a series of experiments on the relationship between perception and attention. They showed that a person can fail to see something unexpected even when looking directly at it, when they are concentrating on something else. This phenomenon has been called *Inattentional Blindness*. In this case the driver’s familiarity with the crossing, combined with the extremely low probability of a train being present, and the distraction of the event that had caused him to have to travel home at that time, could explain his failure to see an unexpected train even after stopping at the crossing and looking both ways.

---


Emergency response

1.46 The ARTC’s Train Controller was contacted at 0722, within two minutes of the time recorded for the collision. Police and Ambulance notifications were at approximately 0730, and they were on scene by 0750. Police were able to interview the utility driver and train crew at the scene, and conduct breath tests, within an hour of the incident.
PART 2 FINDINGS

Immediate cause

2.1 The collision occurred as a result of the utility driver, after stopping at the crossing, proceeding across without first giving way to the approaching train.

Contributing factor

2.2 It is possible that the utility driver either did not look in the direction of the train or, due to inattentional blindness, looked but failed to see the train.
PART 3  RECOMMENDATIONS

The following recommendation is made in relation to matters identified in the course of this investigation.

Moree Plains Shire Council together with ARTC

3.1 Finalise the interface agreement for the Tapscott Road crossing.
PART 4 APPENDICES

Appendix 1: Sources and submissions

Sources of information

- Australian Rail Track Corporation
- Bureau of Meteorology
- Geoscience Australia
- Moree Plains Shire Council
- NSW Branch Office of the National Rail Safety Regulator
- Pacific National Pty Ltd
- The driver of the utility

Submissions

The Chief investigator forwarded a copy of the Draft Report to the Directly Involved Parties (DIPs) to provide them with the opportunity to contribute to the compilation of the Final Report by verifying the factual information, scrutinising the analysis, findings and recommendations, and to submit recommendations for amendments to the Draft Report that they believed would enhance the accuracy, logic, integrity and resilience of the Investigation Report. The following DIPs were invited to make submissions on the Draft Report:

- Australian Rail Track Corporation
- Moree Plains Shire Council
- NSW Branch Office of the National Rail Safety Regulator
- Pacific National
- The driver of the utility

Responses were received from the Australian Rail Track Corporation and the NSW Branch Office of the National Rail Safety Regulator and these were taken into consideration in finalising the Report.