



The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory Agency. The Bureau is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers. The ATSB's function is to improve safety and public confidence in the aviation, marine and rail modes of transport through excellence in:

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

The ATSB does not investigate for the purpose of apportioning blame or to provide a means for determining liability.

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

When the ATSB issues a safety recommendation, the person, organisation or agency must provide a written response within 90 days. That response must indicate whether the person, organisation or agency accepts the recommendation, any reasons for not accepting part or all of the recommendation, and details of any proposed safety action to give effect to the recommendation.

© Commonwealth of Australia 2011

This work is copyright. In the interests of enhancing the value of the information contained in this publication you may copy, download, display, print, reproduce and distribute this material in unaltered form (retaining this notice). However, copyright in the material obtained from non-Commonwealth agencies, private individuals or organisations, belongs to those agencies, individuals or organisations. Where you want to use their material you will need to contact them directly.

Australian Transport Safety Bureau
 PO Box 967, Civic Square ACT 2608
 Australia

1800 020 616
 +61 2 6257 4150 from overseas
 www.atsb.gov.au

ISBN 978-1-74251-184-9
 Publication Date: June 2011
 ATSB-June11/ATSB57

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

Collision between freight train 7SP3 and a track mounted excavator near Jaurdi, WA

28 March 2011

Figure 1: Train 7SP3 and track mounted excavator following the collision



Abstract

At about 1308¹ on 28 March 2011 a collision involving freight train 7SP3 and a track mounted excavator² occurred near Jaurdi, Western Australia.

The train driver sustained a minor injury. There was moderate damage to the lead locomotive and the excavator, and minor damage to the track as a result of the incident.

The investigation is continuing.

FACTUAL INFORMATION

The information contained in this preliminary report is derived from the initial investigation of the occurrence. Readers are cautioned that it is possible that new evidence may become available that alters the circumstances as depicted in the report.

Location and track structure

Jaurdi crossing loop is located about 135 km west of Kalgoorlie (Western Australia), on the Defined Interstate Rail Network (DIRN) between Adelaide and Perth. The track is managed by WestNet Rail, with maintenance contracted to John Holland Rail.

1 The 24-hour clock is used in this report. Australian Western Standard Time (WST), UTC + 8 hours.

2 An excavator capable of travelling on road or rail.

The collision occurred on a straight section of track near the 511.600 km³ track mark between the Jaurdi (525 km) and Darrine (491 km) crossing loops. The track at this location was elevated about 1.2 m above the natural ground level with a 1.6 km section of downward gradient at 1 in 150 reducing to about 1 in 413 at the point of impact.

The maximum permitted track speed for freight train 7SP3 through the Jaurdi - Darrine section was 110 km/h.

Freight train 7SP3

Freight train 7SP3 was an intermodal freight service owned and operated by Pacific National. It consisted of two locomotives (NR38 leading and NR22 trailing) with 53 freight wagons (six of which were multiple platform vehicles⁴). The train was about 1443 m long with a total weight of about 3632 t. For the journey between Parkeston (near Kalgoorlie) and Perth, train 7SP3 was under the control of a single driver.

Rail track works

The track works between Darrine and Jaurdi were part of the Eastern Goldfields Re-railing Project. The works involved two teams of track workers carrying out boxing-up⁵ of ballast and other corrective works. One team was operating two track mounted excavators, while the second team was operating a ballast regulator (track machine TM-032) and a tamper (track machine TM-734).

At the time of the incident, the two excavators had 'put-on' track at a level crossing (505.860 km) about half way between Jaurdi and Darrine. They were intending to work near the 510 and 512 km marks before progressively working east towards Jaurdi. The track machines were at Jaurdi and were intending to work back towards Darrine (and the excavators) doing track surfacing operations.

Track safeworking and signalling

The track between Darrine and Jaurdi is a bi-directional single line equipped with automatic signalling. Half pilot staff keys⁶ were provided for track occupancy authority. When the half pilot keys are removed the signals display a stop aspect thereby preventing train movements into a specific track section. On the day of the collision these arrangements were used to protect the workers within the worksite. Additional safety protections included detonators set on the track east of Jaurdi and west of the Darrine work section in accordance with WestNet Rail safeworking rules.

The John Holland Supervisor (Track Machines) was the person in charge of safeworking in relation to the track works between Jaurdi and Darrine. His role included communicating with the WestNet Rail train controller in Northam and directing when work on track would commence and cease between scheduled train movements. When working on the track, all workers in the section, including the excavator operators and a second Supervisor (Excavators) located at Darrine, were under the direction of the Supervisor (Track Machines) located at Jaurdi.

Prior to track works commencing on the 28 March 2011, the Supervisor (Excavators) received a copy of the WestNet Rail train running information for that day and later conducted a pre-work briefing to advise the excavator drivers and a WestNet Rail Perway Inspector of work to be carried out. The briefing included details of safeworking process, hazards at the worksite and the three scheduled track possession times that would allow them to place their excavators on the track. The track possession times, between scheduled freight and passenger train services, specified by WestNet Rail train control were 0830 to 1030, 1110 to 1230 and 1300 to 1600.

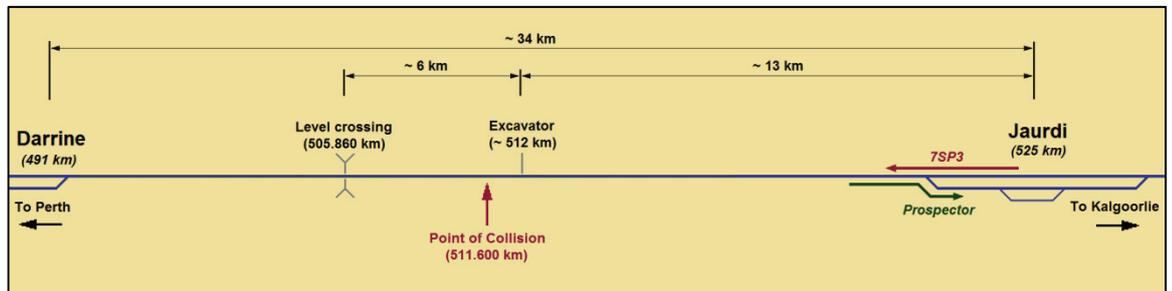
3 Distance in rail kilometres from a track reference point located at the East Perth Terminal, Western Australia.

4 Multiple platform vehicles on train 7SP3 were 5 pack wagons; an articulated wagon comprising five platforms with common bogies between platforms.

5 The process of filling the track with ballast to the specified ballast profile including the shoulder.

6 A metal staff located at the ends of a section, and interlocked with signal circuits. Two half staffs can be joined to provide a pilot staff for the section.

Figure 2: Incident site between Darrine and Jaurdi



The occurrence

Freight train 7SP3 originated in Sydney and its destination was Forrestfield near Perth. The train departed Parkeston (near Kalgoorlie) at 1000 on 28 March 2011. As was common practice, the driver carried out a running brake test near Bonnie Vale (about 110 km before the collision), where he subsequently concluded the train's brakes were operating very well.

At 1105, WestNet Rail train control contacted the Supervisor (Track Machines) at Jaurdi and advised him that after an iron ore train (number 2415) heading east had cleared the departure signal at Jaurdi, the half pilot keys could be removed at Jaurdi and Darrine thereby protecting the section for track works. From 1108, the track machines and excavators worked on track within the protected section.

As train 7SP3 travelled west, it crossed a rail work train (number 2865) that was standing in the passing loop at Stewart (587km) and was then diverted into the passing loop at Wallaroo (562km) to allow the iron ore train (number 2415) to cross. Train 7SP3 departed the Wallaroo loop at 1219 and the driver was aware that ahead of his train, track work was being carried out between the Jaurdi to Darrine section.

At about the same time, the track machines were preparing to clear the track for the arrival of an east bound *Prospector* passenger train. By 1225 both track machines had been positioned in the siding at Jaurdi and the half pilot staff key (at Jaurdi) had been reinserted. At 1227 the train controller contacted the Supervisor (Track Machines) enquiring when the Supervisor (Excavators) was going to restore his half pilot staff key to enable the signal to clear at Darrine, as the *Prospector* was approaching the Darrine to Jaurdi section. The Supervisor (Track Machines)

replied that the Supervisor (Excavators) was in the process of restoring the half pilot staff key at Darrine and the section was about to clear for the passage of the *Prospector*. Soon after 1230, the *Prospector* entered the Darrine to Jaurdi section and proceeded towards Jaurdi.

After the *Prospector* had entered the section, the Supervisor (Excavators) contacted the two excavator drivers by mobile telephone to tell them to wait 5 to 10 minutes after the *Prospector* had passed their location before putting their excavators back on track to travel east to the worksite. At this time the excavator drivers were located at the 505.860km mark; a level crossing about 15 km east of Darrine.

At about 1250, the *Prospector* was approaching Jaurdi and was instructed to enter the passing loop to allow freight train 7SP3 to take the mainline for its journey to Perth. Shortly after, at 1252, the driver of the *Prospector* confirmed with train control that he was clear of the mainline and train 7SP3 was authorised to pass through Jaurdi and continue towards Perth.

Meanwhile, the excavator operators had positioned their excavators back on the track and were proceeding towards Jaurdi at about 25 km/h. The trailing excavator stopped at the 510 km mark and commenced boxing up ballast, while the leading excavator continued east to the 512 km mark.

At about 1302 train 7SP3 was travelling at about 105 km/h when it exited a right-hand curve leading onto a straight section of track with a sighting distance ahead of about 4 km. The driver of the excavator had looked to the east and could see a light in the distance, but was not sure of its source, or if it was moving towards him. His initial thought was that the light was from a track machine working from the Jaurdi end.

At about the same time, the driver of train 7SP3 was focussing his attention on sighting signal 512 in the distance (located at 512.936 km) when he observed an unrecognisable object ahead of him. He soon realised that the object was on the track and immediately reacted by sounding the horn continuously for 7 seconds before making an emergency brake application.

The excavator driver realised that the vehicle approaching him was travelling too fast and that the light was too bright to be one of the track machines from Jaurdi. He immediately stopped and reversed his machine away from the train which was quickly closing in on him. The excavator driver used the UHF radio to alert the driver of the other excavator about the train that was heading towards them by saying 'train on – get off track'. The other excavator driver acknowledged the message and both excavators headed back towards Darrine at a maximum speed of about 25km/h.

After making the emergency brake application, the train driver continuously sounded the horn for 31 seconds. Six seconds before impact, the train driver retreated to the locomotive vestibule and braced himself expecting a violent collision and possible derailment of his train.

About 3 seconds before the collision the excavator driver jumped clear of his machine, landing at the base of the track formation, rolling on the ground as the train impacted his excavator. Fearing the train would derail around him, the excavator driver got to his feet and quickly ran into the scrub about 20 m from the track.

Train 7SP3 was travelling at 67 km/h when it collided with the excavator. The front of the locomotive rode up onto, and became wedged on, the trailing components of the excavator. The now interlocked excavator and locomotive continued along the track finally coming to a stop 290 m and 34 seconds after the point of impact.

Around the same time as the collision, the Supervisor (Excavators) at Darrine had telephoned the Supervisor (Track Machines) enquiring if he brought his track machines back into the section. When the Supervisor (Track Machines) mentioned that the west bound freight train had entered the section, the Supervisor (Excavators) told the Supervisor (Track Machines) to 'stop the freighter' before immediately attempting to contact the

excavator operators by mobile telephone. When he could not establish contact with them, he started to drive along the railway access road towards their work area.

The Supervisor (Track Machines) then made a radio call telling the driver of 7SP3 to stop his train. The train controller overheard this transmission and also radioed the driver of 7SP3 asking to him to 'please pull up' and stop his train. Neither call received a response. The train controller contacted the WestNet Rail Track Liaison Officer (TLO) who also attempted to contact the driver of train 7SP3, again without success.

Post occurrence

After train 7SP3 came to stop, the driver contacted the train controller advising him that he had collided with an excavator. While the train driver sustained a minor injury, the excavator operator who had evacuated the machine was uninjured. The WestNet Rail train controller closed the section of track between Jaurdi and Darrine to protect the incident scene.

Investigators from the Australian Transport Safety Bureau (ATSB) were dispatched from Adelaide on 29 March 2011, flying to Kalgoorlie then travelling by road vehicle to Southern Cross. On arrival the investigators were briefed on the occurrence by rail safety managers from WestNet Rail and John Holland Rail. Subsequently, interviews were conducted with the excavator and track machine operators and supervisors directly involved in the occurrence. Photographic and preliminary written evidence from the collision site was also collected and examined.

The investigation

The investigation is continuing and will include examination of the following:

- The protection of the work site.
- The adequacy and effectiveness of safeworking rules for working within closed sections of track.
- Communication systems and procedures.