

Australian Government Australian Transport Safety Bureau

# **Derailment of train 4DA8**

# Katherine, Northern Territory | 30 January 2013





ATSB Transport Safety Report Rail Occurrence Investigation RO-2013-004 Final – 26 June 2013 Released in accordance with section 25 of the Transport Safety Investigation Act 2003

#### **Publishing information**

Published by:	Australian Transport Safety Bureau			
Postal address:	PO Box 967, Civic Square ACT 2608			
Office:	62 Northbourne Avenue Canberra, Australian Capital Territory 2601			
Telephone:	1800 020 616, from overseas +61 2 6257 4150 (24 hours)			
	Accident and incident notification: 1800 011 034 (24 hours)			
Facsimile:	02 6247 3117, from overseas +61 2 6247 3117			
Email:	atsbinfo@atsb.gov.au			
Internet:	www.atsb.gov.au			

© Commonwealth of Australia 2013



#### Ownership of intellectual property rights in this publication

Unless otherwise noted, copyright (and any other intellectual property rights, if any) in this publication is owned by the Commonwealth of Australia.

#### Creative Commons licence

With the exception of the Coat of Arms, ATSB logo, and photos and graphics in which a third party holds copyright, this publication is licensed under a Creative Commons Attribution 3.0 Australia licence.

Creative Commons Attribution 3.0 Australia Licence is a standard form license agreement that allows you to copy, distribute, transmit and adapt this publication provided that you attribute the work.

The ATSB's preference is that you attribute this publication (and any material sourced from it) using the following wording: *Source:* Australian Transport Safety Bureau

Copyright in material obtained from other 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.

# **Derailment of The Ghan, 4DA8**

# Background information

## **Derailment location**

The derailment occurred at the 2446.100 km point<sup>1</sup> of the Tarcoola to Darwin railway line at Katherine, Northern Territory on the No.219 points that provides access from the crossing loop to the north end of the goods loop.

### Track

The railway line between Alice Springs and Darwin, Northern Territory was owned, operated and maintained by Genesee & Wyoming Australia Pty Ltd (GWA).

The rail yard at Katherine consisted of a bi-directional main line, crossing loop and goods loop (west side of the crossing

#### Location of derailment



Source: Geoscience Australia. Crown Copyright ©.

loop). There was a small siding off the crossing loop at the southern end of the yard.

No. 219 points is a right hand turnout, hand operated and comprised of 47 kg/m rail fastened to steel sleepers using resilient clips and a ballast bed with a minimum depth of 150 mm.

## Train information

*The Ghan* passenger train was operated by Great Southern Rail Limited<sup>2</sup> (GSR) between Darwin and Adelaide, South Australia twice a week. GSR contracted the responsibility for train operations to Pacific National (PN), who provided locomotives and drivers under a 'hook and pull' agreement. At the time of the derailment, *The Ghan* consisted of two locomotives (NR 106 leading and NR109 dead attached), 29 coaches (including power vans) and one motorail wagon.<sup>3</sup> There were 194 passengers, 31 hospitality staff and 4 train drivers<sup>4</sup> on board. The train was 758 m long (including locomotives) and weighed 1585 tonnes.

# What happened

On Wednesday 30 January 2013 at 1014 Central Standard Time,<sup>5</sup> *The Ghan*, train 4DA8 departed Berrimah Passenger Terminal in Darwin.

At 1217, 4DA8 was issued a train authority to proceed to Katherine and take the crossing loop to cross train 2AD1. At 1415, 4DA8 entered the Katherine crossing loop at 29 km/h<sup>6</sup> with 2AD1 standing on the mainline. The crew sighted and cross-called the point indicator for No.219 points, which was correctly set (yellow circle) for 4DA8 to continue heading south on the crossing loop.

<sup>&</sup>lt;sup>1</sup> Rail distance measured from the track kilometre zero point located at Coonamia, near Port Pirie, South Australia.

<sup>&</sup>lt;sup>2</sup> Great Southern Rail Limited (GSR) is an accredited rail organisation providing interstate passenger rail transport between Sydney, Melbourne, Adelaide, Perth and Darwin.

<sup>&</sup>lt;sup>3</sup> A rail based trailer for the movements of cars. Source: RISSB National Guideline Glossary of Rail Terminology 3 December 2010

<sup>&</sup>lt;sup>4</sup> *The Ghan* operates in a relay crew configuration where two crews are rostered to work the train. The crews work on a rotational basis completing 8 hour shifts of consecutive work and rest over a given number of days until the train reaches its destination.

<sup>&</sup>lt;sup>5</sup> Central Standard Time (CST) was Coordinated Universal Time (UTC) +9.5 hours.

<sup>&</sup>lt;sup>6</sup> Maximum permitted speed over the points from the mainline into the crossing loop is 30 km/h. Source: FreightLink, Network Operating Guide Tarcoola to Darwin, Route Operating Protocols, FL-PR0-06-005

Approximately 50 m from No. 219 points, the co-driver noticed that the right hand point blade did not look quite right and alerted the driver. About 20 m from the points, the driver applied the brake to slow the train in response to the co-driver's concern. When the co-driver confirmed that the two locomotives and first coach had traversed No. 219 points without incident, the driver released the brake. The co-driver continued to monitor the progress of the train over No. 219 points via the side, rear-view mirror and advised the driver that a passenger coach had derailed. The driver immediately reapplied the brake and 4DA8 stopped about 15 seconds later.

When 4DA8 stopped, the front portion of the train was standing on the crossing loop while the rear portion was standing on the mainline (Figure 1). There were no reported injuries to passengers or train crew.

The two locomotives, the first coach and the leading bogie of the second coach had passed through the points correctly following along the crossing loop. The trailing bogie of the second coach and the leading bogie of the third coach derailed into the goods loop. The trailing bogie of the third coach, the fourth and fifth coaches took the crossing loop and remained on track. The leading wheelset of the sixth coach had also commenced to track incorrectly towards the goods loop (figure 2). All vehicles remained upright and coupled.



#### Figure 1: Site map

Source: Genesee & Wyoming Australia P/L ©.

# **GWA Investigation**

The GWA investigation established that the right hand wheel of the trailing bogie of the second coach climbed the points blade of No. 219 points and dropped into the goods loop. It was followed by the leading bogie of the third coach. The leading wheelset of the sixth coach came to a stand on No. 219 points and had also commenced to track incorrectly towards the goods loop (Figure 2).

The investigation looked at the track geometry and maintenance / inspection history of No.219 points and considered the points to be in a serviceable condition with the blades having minimal

wear. The damage to the heel block,<sup>7</sup> heavy battering to the closure rail<sup>8</sup> (Figure 3), the crippling and disconnection of the point blade (and subsequent gap at the point) were considered to be a consequence of the derailment.

No. 219 points had received appropriate annual and quarterly inspections with no issues being identified. A crack through the nose the of the "V" had been reported 18 months previously, but was not considered to be unsafe.

While the GWA investigation noted a slightly tight gauge<sup>9</sup> (< 5mm) on the track preceding No. 219 points and a slightly sharper flange on leading wheelset of the trailing bogie of the second coach, it concluded that the evidence was inconclusive and that the cause could not be determined. No recommendations were made.

Figure 2: Wheelset tracking into goods loop



Figure 3: Heavy battering to end of the closure rail



Source: ONRSR

Source: GSR

# **PN** investigation

The PN investigation focused mainly on the sequence of events as reported by the crew and event recorder information.

The report found that:

- the crew were medically fit and certified to operate trains on this route;
- the crew confirmed No. 219 points;
- 4DA8 was travelling at 29 km/h when it entered the crossing loop and it was travelling at 13 km/h at the time of the derailment;
- the co-driver noticed an anomaly with No. 219 points as the train approached;
- No. 219 points were correctly set and padlocked for the crossing loop;
- analysis of the event recorder did not identify any train handling issues; and
- the cause of the derailment appeared to be an infrastrucure defect.

<sup>&</sup>lt;sup>7</sup> The block at the heel end of points about which the switch pivots. Source: RISSB National Guideline Glossary of Rail Terminology 3 December 2010

<sup>&</sup>lt;sup>8</sup> A rail located between switch and crossing components, cut to a length to fit the requirements of the turnout. Source: RISSB National Guideline Glossary of Rail Terminology 3 December 2010.

<sup>&</sup>lt;sup>9</sup> The distance between the inside running (or gauge) faces of the two rails, measured between points 16 mm below the top of the rail heads. Source: RISSB National Guideline Glossary of Rail Terminology 3 December 2010. No action required for gauge tightening of <17mm on track with maximum speed of up to 40 km/h. Source: RISSB Australian Standard Rail Networks Track, Code of Practice, Volume 4, Civil and Electrical Infrastructure Part 3: Infrastructure Guidelines, Version 1.00, July 2009.</p>

# **GSR Investigation**

The GSR investigation consisted of three components:

- an infrastructure report provided by Duncan McLeod Consulting Pty Ltd;
- an on-site rolling stock recovery report provided by UGL Ltd<sup>10</sup>; and
- a detailed inspection report of rolling stock recovered from the derailment provided by UGL Ltd.

The infrastructure report considered the track and point geometry post-derailment. It noted cross level variation<sup>11</sup> on approach to No. 219 points, evidence of wheels bearing against the left hand rail on approach to the points and against the right hand point blade within the points area and a slight arris<sup>12</sup> on the right hand wheel of the second coach's trailing bogie. The report suggested that flange climb<sup>13</sup> or split points<sup>14</sup> were the likely cause of the derailment, but it was unable to conclusively identify a derailment mechanism.

The rolling stock report concluded that the derailed coaches, bogies and wheels were within specified operating limits and tolerances.

# **ATSB comment**

Given that there were no train handling issues identified, the coaches were within tolerance, track damage appeared to be consequential and the PN, GWA, and GSR reports were inconclusive, the cause of the derailment could not be determined.

Date and time:	30 January 2013 – 1415 CST				
Occurrence category:	Serious incident				
Primary occurrence type:	Derailment				
Location:	Katherine, Northern Territory				
Train operator:	Pacific National / Great Southern Rail				
Train number:	4DA8	4DA8			
Type of operation:	Rail passenger				
Persons on board:	Passengers - 194	On-train staff - 31	Crew – 2	Relay crew – 2	
Injuries:	Passengers - 0	On-train staff - 0	Crew – 0	Relay crew – 0	
Damage:	Minor				
Locomotives	NR 106 (leading) and NR 109 (dead attached)				
Number of vehicles	30 (excluding the two locomotives)				
Length	758 metres				
Mass of trailing load	1,585 tonnes				

# **General details**

<sup>&</sup>lt;sup>10</sup> UGL Ltd is GSR's contracted rolling stock maintenance provider.

<sup>&</sup>lt;sup>11</sup> The variation of the actual cross-level at one track position from the design cross-level at that position

<sup>&</sup>lt;sup>12</sup> An arris is a sharp metal flow formed on the flange tip of the wheel.

<sup>&</sup>lt;sup>13</sup> A derailment in which a wheel of an item of Rolling stock mounts the rail on which it is running so that the flange runs on the rail head before dropping off on the outside of the rail. Source: RISSB Investigation Derailment and Analysis Guideline, version 0.02, 30 August 2012

<sup>&</sup>lt;sup>14</sup> A derailment which occurs when a wheel flange runs between the "closed" switch blade and the stock rail such that the wheelset derails off the diverging stock rails. Source: RISSB Investigation Derailment and Analysis Guideline, version 0.02, 30 August 2012

# About the ATSB

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; and fostering safety awareness, knowledge and action.

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.

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

It is not a function of the ATSB to apportion blame or determine liability. At the same time, 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.

# About this report

Decisions regarding whether to conduct an investigation, and the scope of an investigation, are based on many factors, including the level of safety benefit likely to be obtained from an investigation. For this occurrence, a limited-scope, fact-gathering investigation was conducted in order to produce a short summary report, and allow for greater industry awareness of potential safety issues and possible safety actions.

#### Australian Transport Safety Bureau

24 Hours 1800 020 616 Web www.atsb.gov.au Twitter @ATSBinfo Email atsbinfo@atsb.gov.au

# **ATSB Transport Safety Report**

Rail Occurrence Investigation Derailment of train 4DA8, Katherine, Northern Territory, 30 January 2013

RO-2013-004 Final - 26 June 2013