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Addendum

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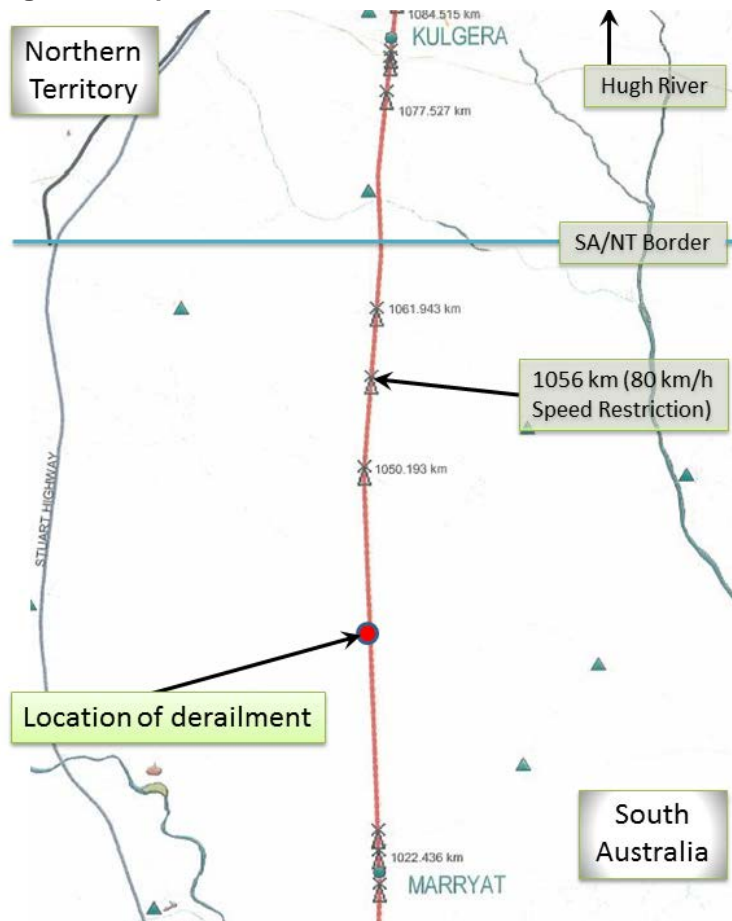
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The occurrence

The information contained in this Preliminary report is released in accordance with section 25 of the Transport Safety Investigation Act 2003 and is derived from the ongoing investigation of the occurrence. Readers are cautioned that new evidence will become available as the investigation progresses that will enhance the ATSB's understanding of the accident as outlined in this Preliminary report. As such, no analysis or findings are included in this report.

At about 0800¹ on 26 July 2014, the crew of Genesee & Wyoming Australia (GWA) freight train 6DA2 carried out a crew change near Hugh River, Northern Territory. The train then continued its journey south before crossing the South Australia – Northern Territory border. At about the 1056 km mark² the train entered a section of track that had a permanent speed restriction of 80 km/h.

Figure 1: Map of derailment location



Source: FreightLink (annotated by ATSB)

The crew reported that train had been handling well when the driver reduced the speed with throttle and dynamic brake applications to enter the 80 km/h section (Figure 1). At about the 1036.530 km mark, the driver had just acknowledged the vigilance indication and was verifying the train's speed when a 'large bang' was heard and the crew felt the lead locomotive jar. The crew

¹ The 24-hour clock is used in this report and is referenced from Central Standard Time (CST), UTC + 9.5 hours.

² Distance in kilometres from the reference point located at Coonamia, South Australia.

commented that the 'bang' may have been their passage across a broken rail. The crew looked in the rear view mirrors and could see large volumes of dust rising from derailed wagons about 200 m behind the driver's cab. At this time, the locomotives started shuddering and the driver made an emergency brake application and moved the throttle back to idle. The lead locomotive stopped about 360 m from the point of derailment.

Events after the derailment

The second driver alighted from the locomotive to check that the crew resting in the crew van were uninjured. When walking back to the crew van, the second driver observed that the wheelsets of the leading bogie on the trailing locomotive and the wheelsets of the trailing bogie on the crew van had also derailed.

Further inspection of the train found that it had separated into two portions, with the locomotives, locomotive refuelling wagon, crew van and one loaded container flat wagon remaining coupled. There was a gap of about 108 m between the front portion of train and the first of the derailed wagons. Various wagon types, freight and containers were scattered either laterally or vertically, for about 250 m along the rail corridor. The rear 930 m of the train, extending north beyond the point of derailment, remained on rail.

The train crew was uninjured during the event, however a number of rail vehicles, containers, freight goods and track infrastructure had sustained significant damage.

Context

The location

The derailment occurred near Marrayat (1036.530 km) on the Tarcoola to Darwin railway, about 28 km south of the Northern Territory - South Australia border (Figure 1).

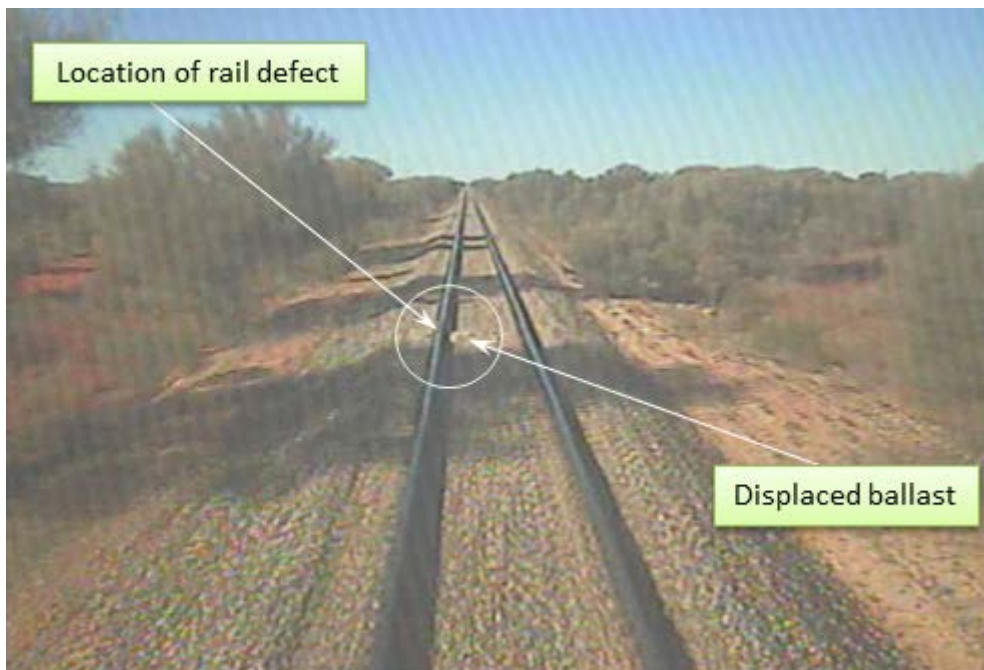
Train and train crew information

Train 6DA2 was a freight service operated by GWA between Darwin and Adelaide. The train consisted of two locomotives (GWU 006 leading and ALF 23 trailing), hauling an in-line fuel wagon, a crew van and 42 freight wagons (including 14 multi-platform wagons). The train was 1543.3 m long and had a trailing mass of 2540.9 t.

Train 6DA2 departed from the Berrimah Freight Terminal, Northern Territory at about 0920 on 25 July with a crew of four drivers. The drivers worked the train in pairs, operating in rotating relay shifts. The drivers operating the train at the time of derailment had about 2.5 and 7 years rail industry experience respectively.

Preliminary examination of the train and locomotive data indicated that there were no anomalies with the train handling or mechanical condition before the derailment. A review of video and audio recordings extracted from leading locomotive GWU 006 supported the drivers report of a 'large bang' when they travelled over what they thought was a broken rail (Figure 2).

Figure 2: Location of rail defect & minor ballast displacement near 1036.530 km mark.



Source: Genesee & Wyoming – Locomotive GWU 006 video camera

Environmental conditions

The Bureau of Meteorology weather stations nearest the derailment were located at Kulgera (47 km NNW) and Ernabella (120 km E). On the morning of 26 July, overnight minimum temperatures at these stations were 10.4 °C and 9.4 °C respectively. No rainfall was recorded and winds were light, generally from a northerly direction. On this basis, it was considered unlikely that environmental conditions had contributed to the derailment.

Track information

The track infrastructure is owned and maintained by GWA, with the movement of rail traffic controlled from the GWA's Transport Control Centre located at Dry Creek in South Australia.

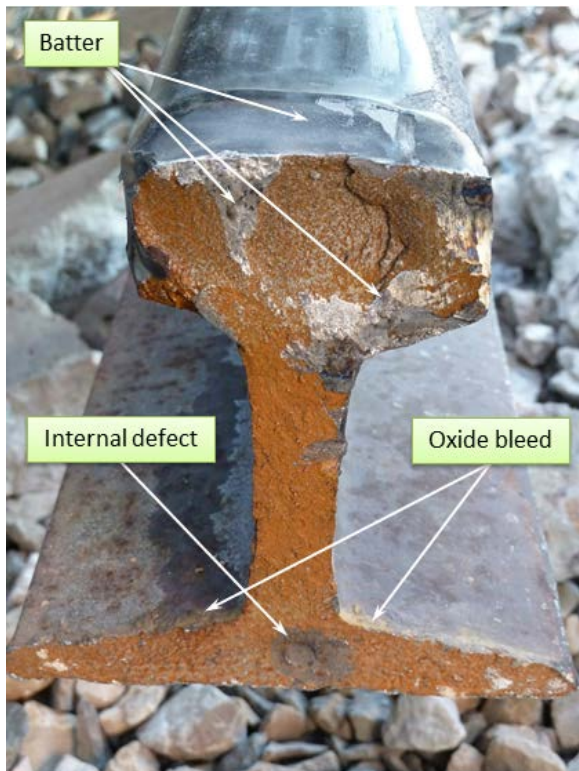
The standard gauge (1435 mm) track at the derailment location consisted of 80 lb/yd rail fastened to concrete sleepers by resilient clips. The track formation comprised sand/clay based soil, topped with a capping layer and overlaid with ballast to a nominal design depth of 250 mm. The track bed supported prestressed concrete sleepers spaced at 667 mm centres.

Approaching the derailment site from Kulgera, the track was tangent³ and the terrain slightly undulating. The derailment occurred within a 68 km section of track where the maximum track speed was 80 km/h.

Rail examination

The ATSB's examination of the track leading into the derailment site determined the most likely contributor to the derailment was a break in the east rail near the 1036.530 km mark. An inspection of the mating ends from two broken rail sections strewn near the point of derailment identified variable oxidisation levels across the fracture surfaces and a localised feature that was characteristic of an internal material defect (Figure 3).

Figure 3: Broken rail fracture surface



Source: ATSB

The oxidisation that extended across the rail foot and through the web was noticeably greater than on the fracture surfaces through the rail head. This was consistent with the rail break originating in the rail foot and propagating vertically through the rail web.

Evidence of iron oxide bleed on the top surface of the foot suggested that the fracture had propagated slowly and been in existence for some period – potentially remaining undetected during track inspections and the passage of previous trains.

³ Straight track with no applied cant.

The rail head at the point of initial fracture showed light battering from train wheels that had traversed the break, before the rail breakup extended into multiple other sections - each about 700 mm long.

The ATSB quarantined four pieces of the broken rail for the purposes of laboratory metallurgical examination and analysis, including:

- Magnetic particle testing to identify and characterise any surface features of relevance to the failure
- Ultrasonic testing to assess internal quality (steel cleanliness) to the relevant standards
- Residual stress measurements on the failed rail section/s (including a like-sample section of rail taken from store stock)
- Examination and characterisation of the fracture surfaces
- Chemical analysis and mechanical testing to assess material properties.

Ongoing investigation activities

The ATSB's investigation is continuing and will focus on:

- The inspection and maintenance practices for rail and track infrastructure between North Gate, South Australia and Alice Springs, Northern Territory
- The findings from laboratory tests of the quarantined and sample rail sections
- A review of rail and track defects reported by train operators and track inspection staff before the derailment of 6DA2.

General details

Occurrence details

Date and time:	26 July 2014 – 0936 CST	
Occurrence category:	Accident	
Primary occurrence type:	Derailment	
Location:	1036.530 km near Marryat, South Australia	
	Latitude: 26° 15' 39.7" S	Longitude: 133° 24' 05.4" E

Train details

Train operator:	Genesee & Wyoming Australia
Registration:	6DA2
Type of operation:	Mixed Freight
Persons on board:	Crew – 4
Injuries:	Nil
Damage:	Substantial

Sources and submissions

Sources of information

The sources of information during the investigation included:

Genesee & Wyoming Australia

References

Bureau of Meteorology – Weather Observations, Ernabella/Pukatja (Station ID 16097)

Bureau of Meteorology – Weather Observations, Kulgera (Station ID 15603)

RISSB Glossary of Railway Terminology - Guideline

Australian Transport Safety Bureau

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The ATSB 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 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 identify and reduce safety-related risk. ATSB investigations determine and communicate the 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.

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 initiate proactive safety action that addresses safety issues. Nevertheless, the ATSB may use its power to make a formal safety recommendation either during or at the end of an investigation, depending on the level of risk associated with a safety issue and the extent of corrective action undertaken by the relevant organisation.

When safety recommendations are issued, they focus on clearly describing the safety issue of concern, rather than providing instructions or opinions on a preferred method of corrective action. As with equivalent overseas organisations, the ATSB has no power to enforce the implementation of its recommendations. It is a matter for the body to which an ATSB recommendation is directed to assess the costs and benefits of any particular means of addressing a safety issue.

When the ATSB issues a safety recommendation to a person, organisation or agency, they must provide a written response within 90 days. That response must indicate whether they accept 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.

The ATSB can also issue safety advisory notices suggesting that an organisation or an industry sector consider a safety issue and take action where it believes it appropriate. There is no requirement for a formal response to an advisory notice, although the ATSB will publish any response it receives.

Australian Transport Safety Bureau

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Investigation

ATSB Transport Safety Report Rail Occurrence Investigation

Derailment of freight train 6DA2 near Marrayat, South Australia
26 July 2014

RO-2014-014

Preliminary – 23 September 2014