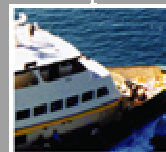


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RAIL SAFETY INVESTIGATION REPORT

DERAILMENT OF PACIFIC NATIONAL WHEAT SERVICE 5424 OLD BURREN 6 APRIL 2005



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5424

OLD BURREN

6 APRIL 2005

OTSI File Ref: 03724

17 November 2005

**Office of Transport Safety Investigations
Level 21, 201 Elizabeth Street
Sydney NSW 2000**

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Established on 1 January 2004 by the *Transport Administration Act 1988*, the Office 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.

OTSI investigations are conducted under powers conferred by the *Rail Safety Act 2002* and 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. Where OTSI investigators exercise their powers of compulsion, information so obtained cannot be used by other agencies in any subsequent civil or criminal action against those persons providing information.

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Information about OTSI is available on its website or from its offices at

Level 21, 201 Elizabeth Street
Sydney NSW 2000
Tel: (02) 8263 7100

PO Box A2616
Sydney South NSW 1235

The Office of Transport Safety Investigations also provides a Confidential Safety Information Reporting facility for rail, bus and ferry industry employees. The CSIRS reporting telephone number is 1800 180 828

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EXECUTIVE SUMMARY

The Accident

At approximately 5.45PM on 6 April 2005, a fully loaded wheat train operated by Pacific National Limited, designated as wheat service 5424, derailed on a Class 5¹ single grain line North West of Narrabri. As a result of the derailment, which occurred at a location known as Old Burren in the section of track between Merrywinebone and Burren Junction, six of 37 wheat hopper wagons came off the rails and were damaged, 87 metres of track was damaged and 17 tonnes of wheat was lost. Neither members of the train crew were physically injured in the derailment.

Findings

The derailment was caused by misaligned and unstable track which spread under the load of train 5424.

In addition, the following systemic deficiencies became apparent during the course of the investigation:

- a. sections of the Class 5 track system in NSW are not being maintained in accordance with specified standards;
- b. the Australian Rail Track Corporation's (ARTC) track inspection and defect management systems are not sufficiently robust or integrated to provide adequate managerial oversight of the asset and its condition, and
- c. there is a lack of priority being accorded to the fitting, inspection, servicing and calibration of Hasler-type event recorders by freight rail operators in NSW.

Recommendations

The following recommended safety actions are directed to the Directly Involved Party (DIP) listed, as a means of mitigating the factors which gave rise to the derailment at Old Burren, and to redress the underlying systemic deficiencies which have been identified:

- a. **Rail Infrastructure Corporation, Country Rail Division (RICCRD) and Australian Rail Track Corporation (ARTC)**
 - i. Review the condition of the Class 5 lines they respectively own and/or manage against the required standards;
 - ii. Review their track management systems to ensure that track inspections are appropriate and conducted at the required intervals;

¹ See Sections 2.12 and 3.5 for description of Class 5 lines.

- iii. Provide the Independent Transport Safety and Reliability Regulator (ITSRR) with an asset condition report which identifies those track sections that do not meet the required standard and which specifies the actual restrictions that are in place within those sections, and
 - iv. Provide ITSRR with a maintenance program which specifies the timetable for the repair and upgrade of those sections of track that do not currently meet the required standards.
- b. **Pacific National Limited (PN)**
 - i. Ensure that event recorders are properly fitted to its locomotives and that they are regularly inspected, maintained and calibrated.
- c. **Independent Transport Safety and Reliability Regulator (ITSRR)**
 - i. Ensure that both RICCRD's and ARTC's track management systems and maintenance plans are appropriate and are implemented in accordance with their advised timetables;
 - ii. Require both RICCRD and ARTC to describe fully and disclose any variations to maintenance standards and procedures that they may have implemented, and
 - iii. Reinforce the requirement for rolling stock operators in NSW to have properly fitted event recorders in their locomotives which are regularly inspected, serviced and calibrated.

PART 1 INTRODUCTION

Notification and Response

- 1.1 At 6.32PM on Wednesday 6 April 2005, the Office of Transport Safety Investigations (OTSI) Duty Officer was notified by the Australian Rail Track Corporation's (ARTC) North Coast Operations Manager that a loaded Pacific National wheat train had derailed at a location North West of Narrabri known as Old Burren, in the section of track between Merrywinebone and Burren Junction, at approximately 5.45PM.
- 1.2 Based on the information provided by the reporter, the Chief Investigator directed the deployment of two OTSI Investigating Officers to the incident site. The Investigating Officers deployed by air to Narrabri and by road to the incident site on the morning of 7 April and commenced the inspection, assessment and evidence collection process.
- 1.3 The incident site was released for recovery and repair by the OTSI Investigating Officers on their departure on the evening of 8 April.

Initiation of Investigation

- 1.4 As a result of the primary evidence collected by the OTSI Investigating Officers at the incident site, the Chief Investigator determined that the incident constituted a Category 2 accident and initiated a Rail Safety Investigation in accordance with s67 of the *Rail Safety Act 2002*.

Interim Factual Statement

- 1.5 An Interim Factual Statement notifying OTSI's investigation and describing the incident in terms of what had happened was published on the OTSI website on 10 April 2005.
- 1.6 On 13 April, the Chief Investigator notified all Directly Involved Parties (DIP) that OTSI was investigating the Old Burren Derailment and requested that an officer be nominated in each organisation to act as the point of contact for all inquiries made by the appointed OTSI Investigator in Charge. The Terms of Reference for the Investigation were provided to the DIPs with this notification.

Terms of Reference

- 1.7 The Chief Investigator established the following Terms of Reference to determine why the accident had occurred and what to do to prevent recurrence:
 - a. identify the factors, both primary and contributory, which caused the accident;

- b. identify whether the accident might have been anticipated and assess the effectiveness of any strategies that were in place to manage the related risk/s;
- c. assess the effectiveness of emergency actions in response to the accident, and
- d. advise on any matters arising from the investigation that would enhance the safety of rail operations.

Methodology

- 1.8 The methodology adopted for this investigation is based on the Incident Cause Analysis Method (ICAM) and involves the process of:
- a. Collection of primary physical evidence at incident site;
 - b. Collection of witness evidence;
 - c. Collection of documentary evidence;
 - d. Collection of other relevant and/or corroborating evidence, including results of technical inspections and/or test results;
 - e. Analysis and interpretation of evidence;
 - f. Determination of those factors which:
 - i. contributed directly to accident causation;
 - ii. contributed indirectly to accident causation, and
 - iii. are relevant safety issues but did not contribute to accident causation;
 - g. Establishing the cause of the accident, and
 - h. Determining recommendations to improve safety and prevent recurrence.
- 1.9 The underlying feature of the methodology is the Just Culture principle with its focus on safety outcomes rather than the attribution of blame or liability.

Consultation

- 1.10 On 17 August, a copy of the investigation Draft Report was forwarded to the Australian Rail Track Corporation (ARTC), Pacific National Limited (PN), Rail Infrastructure Corporation (RIC) and the Independent Transport Safety and Reliability Regulator (ITSRR). The purpose was to provide all DIPs with the opportunity to contribute to the compilation of this Final Report by verifying the factual information, scrutinising the analysis, findings and recommendations, and providing any commentary that would enhance the structure, substance, integrity and resilience of the Investigation Report. DIPs were requested to submit their comments by 16 September. Submissions were received from ARTC, PN and ITSRR.
- 1.11 The Chief Investigator considered all representations made by DIPs and where appropriate, reflected their advice in this Final Report. On 15 November, the Chief Investigator informed DIPs which matters from their submissions had been

incorporated in this Final Report and where any proposal was not included, the reasons for not doing so.

Investigation Report

- 1.12 This report describes the derailment which occurred at Old Burren on 6 April 2005 and explains why it occurred. The recommendations that are made are designed to contribute to the maintenance of a safe operating environment for rolling stock operators on Class 5 track and to minimise the potential for a recurrence of this type of accident.

PART 2 FACTUAL INFORMATION

Accident Synopsis

- 2.1 At approximately 5.45PM on 6 April 2005, a fully loaded wheat train operated by Pacific National Limited, designated as wheat service 5424, derailed on a Class 5² single grain line North West of Narrabri. As a result of the derailment, which occurred at a location known as Old Burren in the section of track between Merrywinebone and Burren Junction, six of 37 wheat hopper wagons came off the rails and were damaged, 87 metres of track was damaged and 17 tonnes of wheat was lost. Neither crew members from the train were physically injured in the derailment.

Before the Derailment

- 2.2 Pacific National wheat service 4523 arrived at Merrywinebone at 9.00AM on 6 April 2005 and was loaded throughout the day. 4523 consisted of three 48 Class branch line locomotives and 37 wheat hopper wagons. 4523's crew was changed at approximately 2.10PM and, at the completion of loading, the new crew marshalled the rakes back together to reform the train, now designated as 5424. As required by Network Rules and Procedures, the crew then conducted a safety inspection of the train, and after certifying the braking system, departed Merrywinebone for Burren Junction at 4.15PM.

The Derailment

- 2.3 The journey from Merrywinebone was uneventful until 5424 exited a curve near 666.000kms³ where the crew recalled noting a small "kick"⁴ in the rails to their front. The driver was not concerned about the misalignment; indeed, he indicated that such occurrences were not uncommon and did not consider it necessary to adjust the train's speed of 28km/h, which was below the speed limit of 30km/h, further. However, he did maintain observation of the rest of 5424 in his rear vision mirrors.
- 2.4 Both crew members recall that their locomotive "wobbled" slightly as it passed over the "kick". The driver observed the train ride over the "kick" and then noticed the leading wagons begin to rock from side to side, progressively more violently. He immediately shut off the throttle and applied the emergency brakes. As the train came to a stand, the driver recalls seeing and feeling some of the wagons "kick out" sideways off the track before 5424 came to rest. While the three locomotives and the

² See Sections 2.12 and 3.5 for description of Class 5 lines.

³ This is the measurement of distance from Central Station in Sydney.

⁴ Misalignment.

leading wagon remained on the track, the following six wagons derailed and came to rest at various angles on the northern, or up, side of the track. Two of the derailed wagons tipped onto their sides and approximately four tonnes of wheat was spilled through opened loading hatches and damaged bottom dump doors. The results of the derailment are depicted in Photos 1 and 2.



Photo 1: View of derailed wagons from the front of the train on the Driver's, or Northern, side

Emergency Response

- 2.5 Immediately after 5424 came to a stand, the crew notified Train Control in Newcastle of the incident using the CountryNet⁵ radio equipment fitted in the locomotive. Train Control then commenced notifying relevant organisations and response officers of the incident.
- 2.6 As required by Network Rules, the assistant driver acted to protect 5424 by fitting audible warning devices to the track approximately 500m ahead of the train⁶. While the assistant driver was engaged on this task, the driver inspected the train to establish the extent of the damage and having done so, reported his findings to Train Control. Thereafter, the driver and his assistant secured the train and waited for the arrival of first response officers.

⁵ CountryNet is the satellite based radio system currently installed on trains operating in the country regions of NSW.

⁶ These devices, carried in the train emergency kit, are placed on track to warn other approaching trains of impending danger.

- 2.7 The first response personnel to arrive at the incident site were NSW Police Officers from Burren Junction, some 17 kilometres away. These officers were advised of the incident at 6.25PM and arrived on site at approximately 6.45PM. ARTC's Regional Safety Officer was notified by Train Control at 5.51PM and arrived on site at 8.58PM having travelled 250 kilometres from Moree. Having satisfied himself that proper protection arrangements were in place, he closed the line and secured the site pending the arrival of OTSI Investigating Officers and recovery gangs.



Photo 2: North side of incident. Derailed wagons (2 – 7) showing extent of wheat spillage.

Injuries

- 2.8 There were no injuries as a result of the incident.

Site Description

2.9 The derailment occurred at a location known as Old Burren (Lat 29° 56', Long 148° 55'), 17 kilometres North of the township of Burren Junction, on the line between Burren Junction and Merrywinebone. Burren Junction is located in the North West Slopes and Plains Region of NSW, in an area bounded by Narrabri, Collarenebri and Walgett. The location of the derailment is shown in Figure 1.

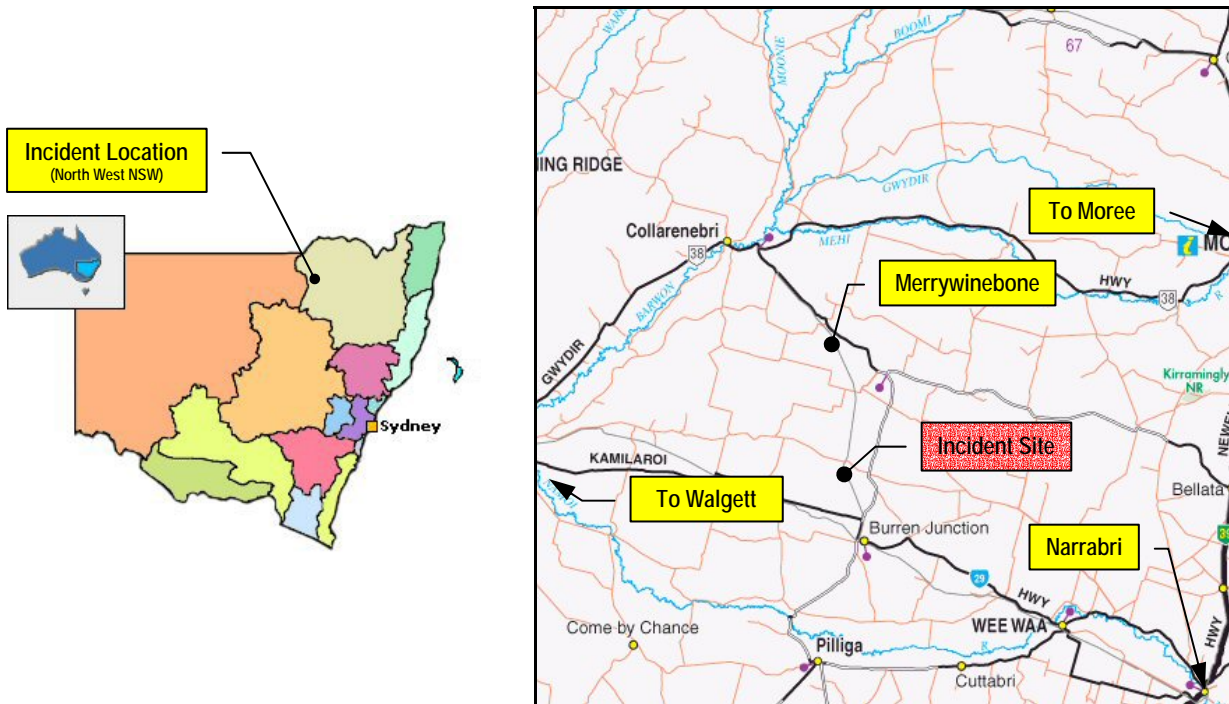


Figure 1: Incident Location and Region

Crew Information

2.10 5424 was operated by an experienced crew, based out of Narrabri, who were both familiar with, and qualified for, the route. Both crew members were within their respective medical and competency assessment periods. In addition to his rostered driving duties, the driver of 5424 was also the driver trainer for the Narrabri depot.

Train Information

2.11 5424, consisting of three 48 Class branch line locomotives and 37 loaded wheat hopper wagons, measured 587 metres in length and was hauling a 2,812 tonne load.

Track Information

- 2.12 The line is standard gauge, single line, with a ruling gradient of 1:456. The immediate area around the incident was level (see Figure 2). The track consisted of 30kg/m (60lb/yd) rail fixed to timber sleepers by dog spikes, and interspersed with irregularly placed steel sleepers. A 40 metre section within the area of the damaged track was fixed to consecutive steel sleepers. These steel sleepers had been installed as part of track repairs from a previous derailment in 2002.
- 2.13 The track is classified as a Class 5 grain line under Rail Infrastructure Corporation's (RIC) Engineering Standard TS 3101 and Australian Rail Track Corporation's (ARTC) Engineering Standard TDS 11⁷. Class 5 grain lines generally carry only seasonal bulk commodity traffic. While the line is owned by the Rail Infrastructure Corporation's Country Rail Division (RICCRD)⁸, track maintenance and the train control function is managed by ARTC under contractual arrangements. The actual standards to which such track must be maintained are determined and specified by the Rail Infrastructure Corporation (RIC).

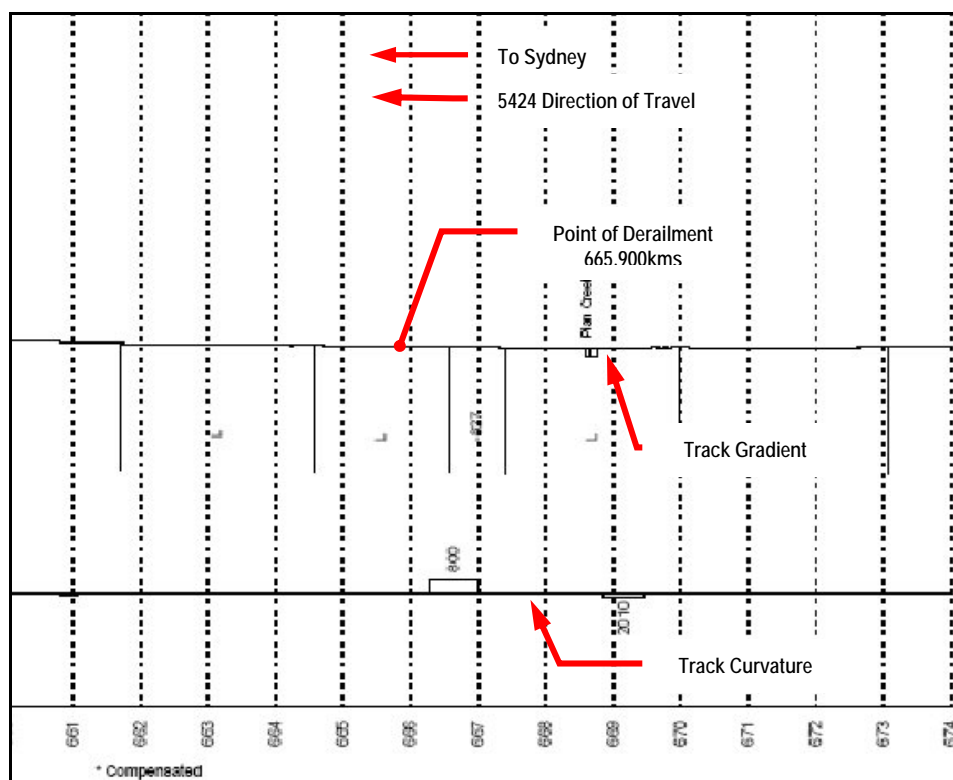


Figure 2: Curve and Gradient Diagram.

⁷ The content of both standards is identical. Rail track throughout NSW is divided into five classes. Class 5 is the lowest classification in terms of rail size and track structure.

⁸ In July 2004, ARTC leased lines on the NSW rail network covering the Defined Interstate Rail Network and parts of the Hunter Valley with the residual of the country network coming under the control of Rail Infrastructure Corporation, Country Rail Division. RailCorp, formed by the amalgamation of State Rail and the Rail Infrastructure Corporation in 2004, has responsibility for the Sydney metropolitan rail network.

Operations Information

- 2.14 The safeworking system for the section is Staff and Ticket⁹. 5424 had been given authority by Train Control to traverse the section and had been in possession of the train staff for the section at the time of the incident.

Meteorological Information

- 2.15 The train crew described the weather conditions at the time of the derailment (5.45PM) as dry and clear, in a fading light. Sunset was due at 5.56PM on the day.
- 2.16 Bureau of Meteorology (BOM) readings recorded maximum and minimum temperatures at Narrabri on the day of the incident as 29.7 degrees Celsius and 14.6 degrees Celsius respectively. BOM information from Moree and Narrabri Airports at 3.00PM on the day further described the weather conditions as follows:

	<i>Moree</i>	<i>Narrabri</i>
<i>Temperature</i>	29.5°C	29.0°C
<i>Relative Humidity</i>	28%	29%
<i>Air Pressure</i>	1017.7 HPa	1018.3 HPa
<i>Wind</i>	15km/h	19km/h
<i>Cloud Cover</i>	3/8	Not recorded
<i>Rain in previous 24hrs</i>	0.4mm	3.4mm

Medical and Toxicological Information

- 2.17 Both crew members were breath tested at 6.58PM by NSW Police and returned negative results.

Damage

- 2.18 Six wagons were damaged to varying degrees. However, three were subsequently re-railed and certified fit to travel, at reduced speed, to Werris Creek. Those wagons not fit for service were recovered to Werris Creek by road transport. The re-railing and recovery operations required the affected wagons to be unloaded and approximately 17 tonnes of wheat could not be recovered. In addition, 87 metres of track had to be replaced before the track was re-opened on 12 April 2005.

⁹ The Staff and Ticket system is used in bi-directional single line territory, in lieu of rail vehicle detection systems, to give a train sole occupancy of the section and prevent other trains from entering the same section.

PART 3 ANALYSIS

Locomotive Event Recorder Data

- 3.1 Event recorder data tapes (Hasler tapes) were recovered from 5424's three locomotives by OTSI. The data from the three recorders did not correlate as there was a difference of three minutes across the three sets of data. This difference was primarily a consequence of discrepancies in the setting and winding of the clocks as 5424's locomotives were readied for operations. Data taken from the leading locomotive (48136) also indicated that the styli for the speed and vigilance traces on its recording device had not been functioning since replacement of the recorder tape during the servicing of the locomotive on 5 April 2005, the day before the derailment. Data taken from the two other locomotives established that 5424 had been travelling at approximately 28km/h, 2km/h under the authorised track speed of 30km/h, prior to an emergency brake application being made at 5.45PM. 5424 came to a stand almost immediately after this braking application.

Train Condition & Train Management

- 3.2 An examination of load documentation indicated that 5424 was operating within allowable load limits at the time of the incident and this was subsequently confirmed when the wagons were re-weighed at Port Waratah the following day. A series of inspections and measurements of the locomotives, wagons and bogies post-incident indicated that the mechanical condition of the train did not contribute to the cause of the derailment¹⁰.
- 3.3 Data from the event recorders corroborated information provided by the crew of 5424 in relation to train management. OTSI noted that the driver saw the misalignment and had sufficient time to reduce train speed. However, he elected not to do so, on the basis of his experience and the fact that such track conditions were not uncommon to him. However, it is possible that if the driver had reduced the train's speed, the misalignment may have been safely negotiated. OTSI emphasises that the operative word is "may" because the state of the track was such that it may have spread even if the train had been operated at a lower speed.
- 3.4 Given that the locomotive was serviced only the day before, OTSI notes with concern that the defective event recorder was not repaired or replaced. The lack of

¹⁰ The assessment of the rolling stock condition was made on the basis of detailed inspection and measurement of the wheels, bogies and wagon bodies of those derailed in the incident as well careful examination on the day of 5424's locomotives and wagons that remained on the rails.

serviceability or poor calibration of event recorders is a recurring issue that OTSI has encountered in the course of its investigations into other rail incidents in NSW.

Factors Affecting Track Condition

- 3.5 Class 5 tracks should generally conform to, and be maintained and operated in accordance with, the following standards:

Rail Section	30kg/m (60lb/yd)	Rail Type	Loose rail/short length
Nominal Ballast Depth	150mm	Sleeper Type	Timber/Steel
Ballast Grade	Standard/Fine	Maximum Axle Load	19 tonnes
Maximum Train Speed (Freight)	40km/h	Sleeper Spacing	610mm
Sleeper Spacing/Skew Tolerance	20mm	Number of sleepers per Km	1639
Spacing Of Sleepers at Rail Joints	510mm	Anchor Pattern (Timber Sleeper)	Not applicable unless required

The maintenance standard for timber sleepers is detailed in RIC Standard TS22000 201SP which further stipulates the following in respect of Class 5 tracks:

- a. that there should be no more than three consecutive ineffectual sleepers on sharp curves;
- b. that there should be no more than four consecutive ineffectual sleepers on moderate curves, and
- c. that there should be no more than five consecutive ineffectual sleepers on wide curves and tangent track.

- 3.6 Over time, there has been a reduction in the degree of maintenance activity on Class 5 lines, largely due to financial considerations. This has resulted in a decline in the condition of the Class 5 lines. RICCRD and ARTC have both had reservations about the viability of these lines but have been reluctant to close lines, or have met opposition when they have sought to do so. OTSI noted that the Principal Engineer, Track, RIC, issued an engineering waiver (See Appendix 1) effective from 1 April 2004 to sections C2009, C2010 and C2011 of RIC's Engineering standards; these sections form what is considered to be the 'base operating conditions' for Class 5 lines. This waiver was intended to reconcile the fact that track did not meet the base conditions, with the need to continue to operate it, albeit under revised operating conditions. The waiver extended to a number of Class 5 Lines in the North West Region, including the line between Merrywinebone and Burren Junction. The waiver had the effect of accepting a range of track 'exceedances', or instances where the engineering standards were not being met, by limiting the maximum speed on these lines to 30km/h. The times by which exceedances had to be rectified was also relaxed. The waiver was, in effect, recognition of the fact that the standards were not

being met and that the track could not be closed. OTSI noted that the waiver was due to expire on 1 October 2004, but was never rescinded. Rather, additional restrictions were placed on operations during the summer period. These included restricting the length of trains to 40 wagons and curtailing operations between the hours of 10:00AM and 8:00PM.

- 3.7 OTSI also notes with concern that neither RIC nor RICCRD notified ITSRR before the waiver was issued. OTSI is of the opinion that, quite apart from the potential consequences of the waiver, the waiver constituted a “material change” and as such, RIC should have sought a variation to its then provisional accreditation, to allow for the operation of substandard infrastructure for an extended period, albeit under special conditions.

Track Inspection and Maintenance Regimes

- 3.8 Track inspection requirements are contained in RailCorp’s Standard C2435 and ARTC’s Engineering Standard TEP 13 “*Track Examination Handbook: System Overview*”. These standards stipulate that inspections of Class 5 lines must be conducted at the following intervals:

Inspection Type	Frequency	Inspection Requirements
Track Patrol	15 Days (Maximum)	Conducted by track vehicle to ensure: <ul style="list-style-type: none"> There are no obstructions to train movements or signalling equipment within (or potentially within) the structure gauge. There is continuity of rails (i.e. no broken rails or joints, or loose or foul joints) There are no imminent failures of track fastenings There are no major geometry exceedents (of derailment potential) without suitable protection There are no major deficiencies in supporting track structure (resulting from earthworks, bridges, structures, culverts, etc.) That permanent & temporary speed signs are visible to train/track vehicle operators (are present, facing the right direction, not obscured by vegetation, graffiti, etc) & that temporary speed boards have been placed correctly, are accurate (have the right plates in the right order & working lights) & are standing securely.
Front of Engine	Monthly (Dependent on train running)	Non specific examination to assist in the assessment of track by enabling the reaction of trains to the track structure to be observed (preferably at maximum allowable speed)
Detailed Walking	Yearly	Thorough examination of the components of the track structure & the right of way to ensure that the components are satisfactory & contribute to a safe railway. Items examined include, but are not limited to: <ul style="list-style-type: none"> Track geometry and adjustment Track components, including rails, fastenings, ties, joints, insulated joints, ballast profile and condition, lubricators Turnouts and special track work Bridge and structure conditions effecting track integrity Earthworks & drainage including geotechnical hazards Right of Way including: <ul style="list-style-type: none"> Fencing & gates Weed & vermin control Firebreak condition, fire hazard control, access roads Vegetation fouling, or with the potential to foul the track Drainage including waterways & flooding Check of any undermining of track or structures Visibility, security & clearances of Permanent & Temporary Speed signs & other trackside safety signs.

- 3.9 In addition, a number of other track inspections are also conducted on an annual basis. These inspections include:
- a. *Track geometry recording by a track recording train.* This type of inspection (1) graphs the condition of the track, (2) identifies any locations where track geometry parameters are exceeded, (3) categorises the severity of the exceedents and (4) recommends the extent of the temporary speed limit to be placed on the track.
 - b. *Sleeper inspection and marking.* This type of inspection examines the condition of the timber sleepers in the section and identifies those requiring renewal in the immediate future.

Any immediate repairs resulting from the above inspections are generally recorded locally. Major defects, outstanding repairs or the imposition of temporary speed restrictions are reported to a Team Leader and subsequently a Team Manager for prioritisation. The prioritisation of tasks across a region is determined by a Delivery Manager who, in conjunction with the Team Manager and Team Leaders, reviews the results of inspections. OTSI noted that continuing budgetary constraints and the cumulative effect of delayed maintenance, in concert with the waiver system, are placing considerable pressures on local staff to prioritise defects and work.

- 3.10 OTSI noted that the cycle of scheduled periodic track inspections was based on the premise of a Class 5 network that was generally sound and intact. OTSI considers that a thorough risk assessment of the process that allows continuing operations under waived conditions would have identified the need for an increased frequency of track inspections.

Track Maintenance Records

- 3.11 Track maintenance records supplied by ARTC indicated that:
- a. While track patrols were generally conducted at the required intervals, inspection reports contained little, if any, information or detail regarding track condition, and in particular, any comment on defects located or repairs carried out during the inspection.
 - b. The different types of inspections had last been conducted in the Merrywinebone to Burren Junction section on the dates shown in the table overleaf.

Inspection Type	Date Conducted	OTSI's Observations of Inspection Comments
Track Patrol	02/04/2005	<ul style="list-style-type: none"> There was a complete absence of comment made of track condition on inspection sheet. Emergency & Category 1 exceedents, as defined in RIC Standard C2011, as recorded from the Track Inspection vehicle in section 663.829kms to 667.538kms on 28/09/2004, were "Assessed OK" with no further amplification.
Front of Engine	-	<ul style="list-style-type: none"> This was not conducted
Detailed Walking	21/12/2004	<ul style="list-style-type: none"> There was a complete absence of comment made in relation to track condition on the inspection sheet.
Track Geometry Recording	28/09/2004	<ul style="list-style-type: none"> Noted a total of 11 emergency & 12 Category 1 exceedents between 665.500kms & 666.500kms during track recording.

- c. Track maintenance staff had inspected and assessed the Emergency and Category 1 exceedents detected in the section between 665.500kms and 666.500kms (the derailment site) during September 2004 and on 2 April 2005, four days prior to the derailment. The records in respect of the latter inspection are significant in that they conclude that, upon revisiting areas identified in September 2004 as exhibiting Category 1 exceedences, all of the areas were "OK". Even under the more relaxed conditions allowed by the waiver, areas exhibiting Category 1 exceedences were required to be the subject of temporary speed restrictions; yet no such restrictions were recommended or imposed.
 - d. There was no record of the Civil Engineering representative having carried out a detailed assessment and given written authority for departure from the standard repair requirements as per Standard C2011 or the waiver; nor had the waiver been rescinded after it had expired.
 - e. There was no record of any recent reports regarding track condition made by any train crew operating over the route.
 - f. Ballast tamping in the section had been conducted between October and November 2004.
 - g. There had been a previous derailment in close proximity to the current derailment site in 2002.
- 3.12 OTSI noted that ARTC's *"Defect Work Logging Report"* should have provided a significant amount of information regarding the track condition, planned maintenance activities for the section and the history of maintenance conducted in the section. However, the report did not contain any of the following information:
- a. recent information regarding the degraded condition of the asset in the area of the derailment, even though it was obvious to OTSI investigators during their on-site inspections that the degraded condition of the track in the vicinity of the derailment was not a recent phenomenon;
 - b. the history of planned maintenance or out of course repairs carried out on the track;

- c. details regarding any defects or exceedences identified in the measurement of track geometry during September 2004;
 - d. provision within the system to schedule planned maintenance activities, or
 - e. details to indicate that an upgrade program was in prospect.
- 3.13 OTSI formed the view that the inspection and defect management system for track maintenance in this region was fragmented and disjointed, and that there was little or no correlation between the track condition, outstanding defects, repairs carried out and planned maintenance activity. As such, managers were making operational decisions without the benefit of proper visibility of the condition of the track.

Actual Track Condition

- 3.14 OTSI spent considerable time examining the 900m track section between 666.400kms and 665.500kms, i.e., either side of the derailment site, to establish the condition of the track in proximity to the derailment site. It observed:
- a. A track misalignment measuring 60mm, to the up side and stretching for 9.5 metres, at 665.900kms. Heavy flange marks made by the wagon wheels on the gauge face¹¹ of the rails at that point, were also consistent with track misalignment (see Photo 3). There was no evidence of extreme oscillation or “hunting” of the bogies prior to the misalignment.
 - b. Evidence that the track had spread immediately beyond the area of heavy flanging and immediately before the point of derailment, with the up rail displaced outwards (see Photo 4). Flange marks on the rail web and top sleeper faces on the inside of the up rail immediately after the point of dismount, were also consistent with the track having spread and the wheels dropping inside the rail.
 - c. The condition of the timber sleepers in the section generally varied from **poor** to **fair**, as defined in RIC standard TS22000 201SP, with the occasional **good** sleeper.
 - d. Most dog spikes examined were loose within the sleeper and able to be easily moved by hand. Additionally, a number of dog spikes had rotated, preventing any clamping of the rail to the sleeper. This indicated that only lateral movement of the rails was restrained, but only where the timber sleepers were in good condition, or steel sleepers were in place.
 - e. The ballast was clean and sharp and there was no evidence of sleepers pumping¹² or bog holes. However, the shape of the ballast profile was uneven,

¹¹ The inside of the rails from which the width or gauge of the track is measured.

¹² The term used when a sleeper is not supported against vertical movement.

with little evidence of recent maintenance. As a consequence, the ballast did not provide a stable foundation for the track.

- f. All of the mechanical (plated) joints inspected exhibited varying degrees of tightness (see Photo 5) and the distance between sleeper centres under the joints often exceeded the nominal 510mm for Class 5 lines. This meant that, there was little support, if any, beneath the joints, especially when they were under load.
- g. The fishplates at a number of mechanical (plated) joints had fractured through the bolt holes (see Photo 6).
- h. The expansion gap between rail ends at the mechanical (plated) rail joints varied between nil and 25mm (see Photo 7), whereas the standard indicates that such gaps are normally set between zero and 12mm. It was also noted that there was either little or no gap between some consecutive sections of rail, whilst others had wide gaps between the rail ends. This variation in gapping indicated significant longitudinal movement of the rails which could reasonably be attributed to the fishplate¹³ bolts and poor fastening of the rail to the sleepers. The closing of gaps on some consecutive rail ends and the excessive gap and longitudinal movement in other rail lengths in the area, prior to the derailment, may also have been an indication of 'bunching'. It is likely that such bunching existed in the vicinity of a section of steel sleepers used in repairs following a derailment in 2002. However, the extent of the damage to the track on 6 April 2005 prevented OTSI from definitively establishing this to be the case.
- i. The horizontal alignment of the track and rail top was poor (see Photo 8).
- j. Significant vertical lift and bowing was apparent at the centre of various rail lengths in the vicinity of those wagons that remained on the track at the derailment site, and especially so where wheels were in close proximity to, or over the rail joints (see Photo 9).
- k. The distance between sleeper centres varied and often exceeded the nominated standard of 610mm, with some points measuring up to 900mm. Significant skewing and bunching of sleepers was also noted at various points during the inspection (see Photos 10 and 11). This skewing often exceeded the limit of 20mm which would have further reduced support under the rail and increased the risk of wheels imparting excessive vertical force on the rail.
- l. Limited sleeper marking and renewal was observed to have occurred in the section.
- m. The rail anchor pattern within the timber sleepers section was irregular.

¹³ Terminology describing the plates that are used to join lengths or sections of rail together.



Photo 3: Evidence of heavy flanging on gauge face.

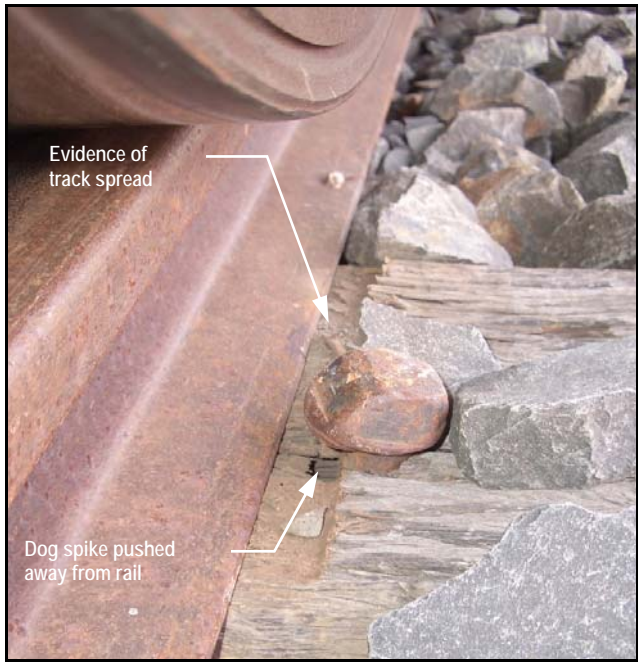


Photo 4: Evidence of track spread at point of derailment.



Photo 5: Typical condition of fishplate bolts

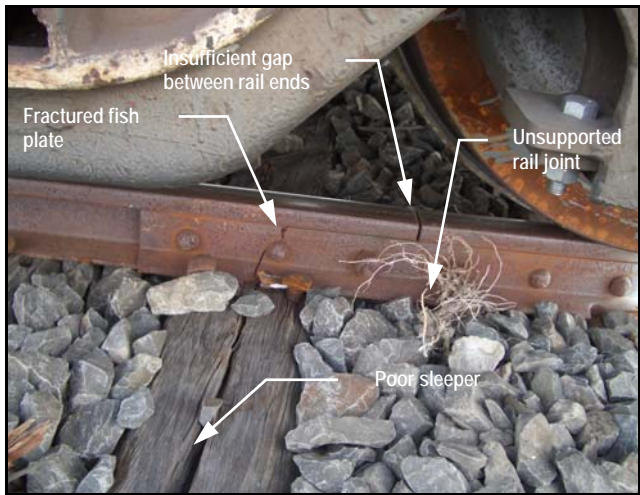


Photo 6: Fractured fish plate.

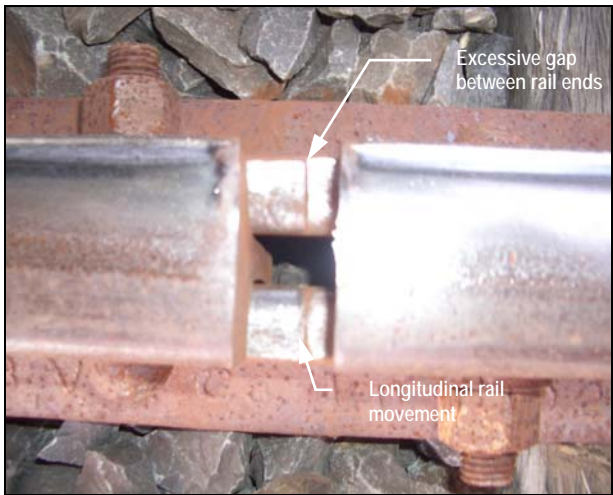


Photo 7: Typical condition of open rail joint



Photo 8: Alignment of track top just prior to the point of derailment.

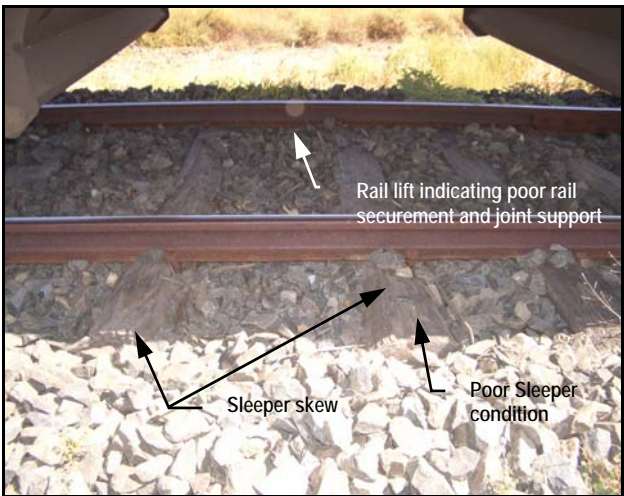


Photo 9: Rail lift or bow.

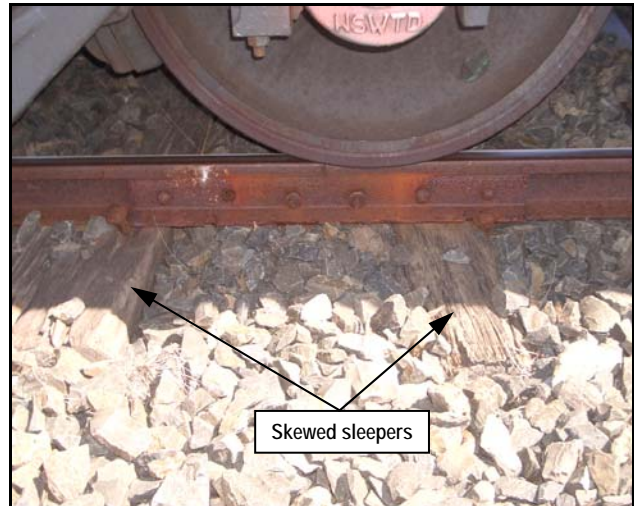


Photo 10: Track condition under 5424.

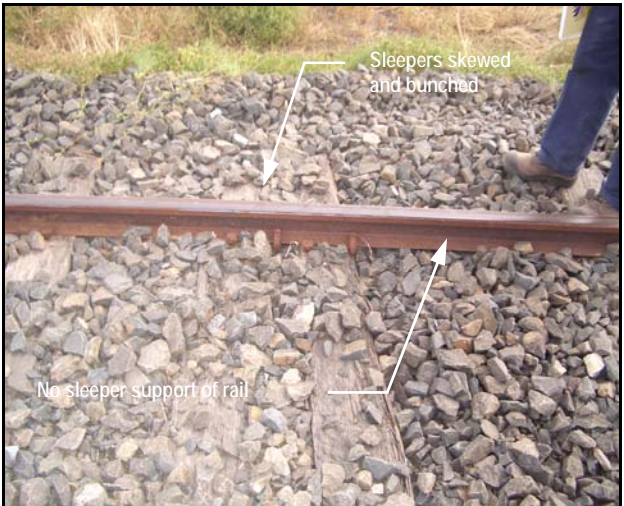


Photo 11: Track condition in front of 5424.

Funding of Grain Lines

- 3.15 In order to have a better appreciation of what appeared to significant limitations in the management of the Class 5 line, OTSI visited a number of other derailment sites in a selection of sections across two of ARTC's regions and held meetings with senior ARTC managers, track workers and with specialist staff within ITSRR. OTSI found that there is widespread understanding in the rail industry in NSW that Class 5 lines do not meet the Class 5 standards, and that operations are heavily dependent upon the application of waivers. OTSI notes that, in response to industry concerns regarding the condition of grain lines throughout NSW, the NSW Government announced on 19 April 2005 that it was committing an additional \$21M towards the maintenance and repair of the Western NSW restricted rail lines¹⁴. Although the Merrywinebone to Burren Junction Line is in the North West Region of NSW, it was allocated sufficient funding in the Government's announcement for the renewal of 10,000 sleepers and the upgrading of 25kms of ballast. Notwithstanding this investment, and the utility of the waiver, much of the Class 5 track is likely to continue to present ongoing risk in the absence of detailed risk management decisions that are informed by good visibility of actual track conditions.

Emergency Response

- 3.16 OTSI considers the emergency response to the Old Burren derailment was timely and effective.

¹⁴ The "Restricted Rail Lines" are Class 5 lines in which the track condition has deteriorated due to the factors described in Section 3.6. The Merrywinebone to Burren Junction Line was one of the lines categorised as a "Restricted" or "R" line.

PART 4 FINDINGS

- 4.1 **In respect of causation, OTSI finds that:** 5424 derailed when misaligned and unstable track spread under load.
- 4.2 **OTSI also finds that:**
 - 4.2.1 The condition of the track was not a recent phenomenon and could be attributed to progressive and unremediated degradation.
 - 4.2.2 Inspection, defect recording and maintenance systems in the region were less than sufficiently robust or integrated to provide adequate managerial oversight of the asset and its condition.
 - 4.2.3 The driver had sufficient time to bring 5424 to a stand but that his continued exposure to degraded condition led him to believe that the misalignment was not significant or unusual.
- 4.3 **In respect of whether the accident might have been anticipated and the effectiveness of the risk management strategies of the respective organisations involved, OTSI finds that:**
 - 4.3.1 There is continued utilisation of Class 5 lines that do not meet the required standards under the provisions of a waiver system that was introduced by RIC, embraced by ARTC, but which was never countenanced by the ITSRR and which expired on 1 October 2004.
 - 4.3.2 Adherence to track engineering standards appears to have assumed less significance and risk management appears to have been increasingly devolved to a local level. Such practises might be acceptable were they informed by a detailed understanding of track conditions and deliberate decision-making.
- 4.4 **In respect of the effectiveness of the emergency response to the accident, OTSI finds that** despite the remoteness of the incident, the emergency response to this incident was timely, effective, and appropriate.
- 4.5 **In relation to other matters that would enhance the safety of rail operations, OTSI finds that** rail vehicle operators in NSW are paying insufficient regard to the requirement to ensure event recorders on board their locomotives are properly fitted; and are regularly inspected, serviced and calibrated.

PART 5 RECOMMENDATIONS

5.1 The following recommended safety actions are directed to the Directly Involved Party (DIP) listed, as a means of mitigating the factors which gave rise to the derailment at Old Burren, and to redress the underlying systemic deficiencies which have been identified.

5.1.1 Rail Infrastructure Corporation, Country Rail Division (RICCRD) and Australian Rail Track Corporation (ARTC)

- a. Review the condition of the Class 5 lines they respectively own and/or manage against the required standards;
- b. Review their track management systems to ensure that track inspections are appropriate and conducted at the required intervals;
- c. Provide the Independent Transport Safety and Reliability Regulator (ITSRR) with an asset condition report which identifies those track sections that do not meet the required standard and which specifies the actual restrictions that are in place within those sections, and
- d. Provide ITSRR with a maintenance program which specifies the timetable for the repair and upgrade of those sections of track that do not currently meet the required standards.

5.1.2 Pacific National Limited (PN)

- a. Ensure that event recorders are properly fitted to its locomotives and that they are regularly inspected, maintained and calibrated.

5.1.3 Independent Transport Safety and Reliability Regulator (ITSRR)

- a. Ensure that both RICCRD's and ARTC's track management systems and maintenance plans are appropriate and are implemented in accordance with their advised timetables;
- b. Require both RICCRD and ARTC to describe fully and disclose any variations to maintenance standards and procedures that they may have implemented, and
- c. Reinforce the requirement for rolling stock operators in NSW to have properly fitted event recorders in their locomotives which are regularly inspected, serviced and calibrated.

Priority rank With Incident value	Exceedent type	Size to be rectified	Response time
	R.V.X.		See attachment a
1	Wide gauge	>35 >30 >25	10km/hr and repair ASAP Repair ASAP Inspect within 14 trains respond accordingly
2	Top	>45 >35	10km/hr and repair ASAP Repair within 14 trains
3	Tight gauge	>22 >20 >16	10km/hr & repair ASAP Repair within 7 trains Repair within 28 trains
4	Long twist	>60 >55 >45	10km/hr & repair ASAP Repair asap Repair within 28 trains
5	Short twist	>35 >30 >27	10km/hr and repair ASAP Repair within 7 trains Repair within 40 trains
6	Line	>75	Ride & or visual assessment should be used as guide for appropriate speed restriction
7	Super	See section 10.0	Planned maintenance
	Track patrol		
1	Locations due to bunching	High risk	Before next train

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004/01

ATTACHMENT 2**UPGRADED TABLE FOR**

- **BURREN JUNCTION TO WALGETT**
- **BURREN JUNCTION TO MERRYWINEBONE**
- **CAMURRA TO WEEMELAH**

Priority rank With Incident value	Exceedent Type	Size to be rectified	Response time
	R.v.x.		See attachment a
1	Long twist	>60 >55 >45	10km/hr and repair ASAP 20km/hr and repair ASAP Repair within 28 trains
2	Top	>45 >35 <35	10km/hr and repair ASAP 20km/hr and repair within 28 trains Planned maintenance
3	Wide gauge	>35 >30 >25	10km/hr and repair ASAP 20km/hr and repair ASAP Inspect within 14 trains Respond accordingly
4	Tight gauge	>22 >20 >16	10km/hr and repair ASAP 20km/hr and repair within 14 trains Repair within 56 trains
5	Short twist	>35 >30 >27	10km/hr and repair ASAP 20km/hr and repair within 14 trains Repair within 42 trains
6	Line	>75	Ride & or visual assessment should be used as guide for appropriate speed restriction
7	Super	See section 10.0	Programmed maintenance
	Track patrol		
1	Locations due to bunching	High risk	Before next train

~~PN Derailment Old Burren 6 April 2005~~

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005/010


RailCorp
Engineering Services

Engineering Waiver Approval	
Approval number:	RIC 04/227
Background details	
<p>The operation of rollingstock on the nominated lines has taken place under "dpwck11rev 6.1," for the previous 3 years under the standards authority of the maintainers civil engineer originally with supporting waiver from the Principal Track Engineer. This operation has proceeded satisfactorily during that time. The rollingstock operating on the line is "accommodating" to the track conditions. Version 6.1 has been modified to tighten the requirements for the Gwabegar line to bring these in line with the other lines. The limits in "dpwck11rev 6.2" have restrictions on speed that align with track defects permitted and considering the seasonal nature of the lines.</p> <p>The original review and this review have been carried out in consultation with the Principal Engineer Rollingstock and Mechanical Assurance. The limits selected are based on the capacity of the rollingstock using line.</p> <p>It is noted that the track geometry on these lines has not improved or deteriorated significantly over the last three years. The exception being the Gwabegar line where selective upgrading work was carried out to improve the condition. It is not intended that this waiver permit deterioration of the lines. A more detailed review is required on the current defect regimes on the lines and consideration of the longer term strategies for these lines. It is also not clear whether the end of drought conditions will affect the tonnages on the lines. The current levels have been fairly consistent for the years.</p> <p>In past years problems have occurred on these lines primarily due to heat buckles. Special measures have been put in place to control the operation of trains during hot weather to moderate this risk. The operations on these lines need to be carefully assessed before the wheat season.</p>	
Justification	
<ul style="list-style-type: none"> • The operations on the line from a geometry perspective has been satisfactory for the last 3 years. • The rollingstock using the line is accommodating to the track conditions. • The history of the class 5 lines shows that derailments due to track geometry are rare. • Operations of other types of rollingstock which would not be as suitable do not use the line and are not likely to use the line. As an additional precaution it is proposed to specify this in the Train Operating Conditions Manual. • The waiver conditions are to be reviewed each six months or whenever operating conditions are proposed to be changed. – Additional restrictions have been imposed under controls 	

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REVIEW FACTORS		
Gwabegar	Not available	.03 and .06MGT last two years 00-01 and 01-02
Walgett	Approx 60 over last 3 yrs	about 0.4MGT last two years 00-01 and 01-02
Merrywinebo ne	Approx 56 over last 3 yrs	about 0.3MGT last two years 00-01 and 01-02
Weemeloh	Approx 58 over last 3 yrs	about 0.3MGT last two years 00-01 and 01-02
Narrabri to Burren Jct	Approx 32 over last 3 yrs	about 1.1MGT last two years 00-01 and 01-02

Deraillments over last 3 years possibly related to track geometry

- Walgett line, 1 shown as track train dynamics (no specific track cause found)
- Weemeloh line, 1 shown as irregular alignment (more details to be obtained)

Note 1: Another 3 deraillments on these lines due to heat buckles.

Note 2: Two deraillments on North Star Line which is not covered by waiver (one due to heat buckle and one due to washaway).

No additional deraillments have occurred since July 03.

Further Investigation Required prior to Wheat Season:-

1. Rollingstock – any special requirements, carry out twist test on vehicles. Review performance of vehicles wrt top and line by observation of selected locations.
2. Review current track defects from latest Track Geometry car runs. Arrange run for Gwabegar line (being organised).
3. Review loading arrangements for vehicles and affects performance.
4. Consider benefits of vehicle simulations.

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