Inquiry RO-2012-104: Train 723 overran limit of track warrant
Parikawa, Main North line, 1 August 2012

The Transport Accident Investigation Commission is an independent Crown entity established to determine the circumstances and causes of accidents and incidents with a view to avoiding similar occurrences in the future. Accordingly it is inappropriate that reports should be used to assign fault or blame or determine liability, since neither the investigation nor the reporting process has been undertaken for that purpose.

The Commission may make recommendations to improve transport safety. The cost of implementing any recommendation must always be balanced against its benefits. Such analysis is a matter for the regulator and the industry.

Final Report

Rail inquiry RO-2012-104
Train 723 overran limit of track warrant
Parikawa, Main North line
1 August 2012

Approved for publication: August 2015

Transport Accident Investigation Commission

About the Transport Accident Investigation Commission

The Transport Accident Investigation Commission (Commission) is a standing commission of inquiry and an independent Crown entity responsible for inquiring into maritime, aviation and rail accidents and incidents for New Zealand, and co-ordinating and co-operating with other accident investigation organisations overseas. The principal purpose of its inquiries is to determine the circumstances and causes of the occurrences with a view to avoiding similar occurrences in the future. Its purpose is not to ascribe blame to any person or agency or to pursue (or to assist an agency to pursue) criminal, civil or regulatory action against a person or agency. The Commission carries out its purpose by informing members of the transport sector and the public, both domestically and internationally, of the lessons that can be learnt from transport accidents and incidents.

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Important notes

Nature of the final report

This final report has not been prepared for the purpose of supporting any criminal, civil or regulatory action against any person or agency. The Transport Accident Investigation Commission Act 1990 makes this final report inadmissible as evidence in any proceedings with the exception of a Coroner's inquest.

Ownership of report

Citations and referencing

Information derived from interviews during the Commission's inquiry into the occurrence is not cited in this final report. Documents that would normally be accessible to industry participants only and not discoverable under the Official Information Act 1980 have been referenced as footnotes only. Other documents referred to during the Commission's inquiry that are publicly available are cited.

Photographs, diagrams, pictures

Unless otherwise specified, photographs, diagrams and pictures included in this final report are provided by, and owned by, the Commission.

Source: mapsof.net

Location of accident

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Abbreviations

ACC	Accident Compensation Corporation
Commission	Transport Accident Investigation Commission
EAP	Employee Assistance Programme
GPS	global positioning system
mg	milligram(s)
northbound train	express freight Train 726, travelling from Christchurch to Picton
southbound train	express freight Train 723, travelling from Picton to Christchurch
Standard	National Rail System Standard 3: Health Assessment of Rail Safety Workers
TWACS	track warrant assisted computer system

Data summary

Vehicle particulars

Train type and number:	express freight Train 723
Origin – destination:	Picton to Christchurch
Train weight:	1167 tonnes
Train length:	514 metres
Maximum train speed:	80 kilometres per hour
Operator:	KiwiRail Limited
Date and time	1 August 2012 at about 0737[1]
Location	Parikawa, 236[2] kilometres Main North line
Persons involved	the driver of Train 723
	the driver of Train 726
	three train controllers
Injuries	nil
Damage	nil

[1] Times in this report are New Zealand Standard Times (universal co-ordinated time + 12 hours) and are expressed in the 24-hour mode.
[2] The distance from a marker post located at Christchurch.

1. Executive summary

1.1. On Wednesday 1 August 2012, a southbound freight train was travelling from Picton to Christchurch. At the same time a northbound freight train was travelling from Christchurch to Picton. The train controller had planned to cross the trains at the Pines track warrant station.

1.2. The train controller had issued a track warrant to the driver of the southbound train to proceed to Parikawa only, the track warrant station before Pines. The track warrant terminated at Parikawa because the train controller had authorised a hi-rail vehicle associated with a track maintenance work group to occupy the track between Parikawa and Pines.

1.3. The driver of the southbound train correctly wrote Parikawa as the terminating track warrant station, but subsequently formed the belief that his track warrant terminated at Pines instead. The southbound train passed through Parikawa and stopped at Pines. Fortunately, the driver of the hi-rail vehicle had completed his task and removed his vehicle from the track; otherwise there would have been a high risk of collision between the train and his vehicle.

1.4. The Transport Accident Investigation Commission (Commission) was not able to determine conclusively at what point and why the train driver formed the belief that his train had authority to proceed through Parikawa to Pines.

1.5. The Commission found that the train driver's roster alone was unlikely to have caused the driver to be fatigued. However, there were other factors that could have been affecting the quality of sleep obtained.

1.6. The Commission found that the train driver's performance was likely to have been affected by a number of medications that he had been prescribed in response to work- and non-work-related injuries.

1.7. The Commission identified the following safety issues:

- the train driver, who was performing a safety-critical role, had been prescribed a number of potentially performance-impairing medications without the knowledge of the industry health professionals
- there was no requirement for private medical practitioners to inform the rail industry medical professionals when they became aware that a person who performed a safety-critical role had medical conditions or had been prescribed performance-impairing medications that could render that person unfit for normal duty
- there was no requirement for the driver to complete the safety-critical worker health questionnaire before he presented for a special 'triggered' health assessment
- there was little or no warning system built in to KiwiRail's procedures to mitigate the risk of the track warrant control operating system failing due to human error.

1.8. The Commission made one recommendation to the Chief Executive of the NZ Transport Agency, one recommendation to the Secretary for Transport and one recommendation to the Chief Executive of KiwiRail to address these safety issues.

1.9. The Commission identified that the key lessons learnt from the inquiry into this occurrence were:

- over-the-counter and prescribed medications have the potential to affect the performance of train drivers and other persons working in safety-critical roles. Any person working in a safety-critical role should notify an industry health professional of any such medication before presenting for further duty
- drivers of trains operating under track warrant authority who do not follow the correct procedures are more likely to endanger lives by causing accidents
- train controllers who do not follow the correct procedures for controlling trains in track warrant territory are more likely to endanger lives by causing accidents

- this report gives an example of KiwiRail not following or enforcing a procedure in its safety system relating to periodic health assessments. A rail operator that does not strictly enforce its own standards will risk engendering a culture of non-compliance among its employees.

2. Conduct of the inquiry

2.1. The incident occurred at 0737 on 1 August 2012. The NZ Transport Agency notified the Transport Accident Investigation Commission (Commission) of the incident by email on 2 August 2012. After making preliminary enquiries the Commission opened an inquiry that day under section 13(1) of the Transport Accident Investigation Commission Act 1990 to determine the circumstances and causes of the occurrence. An investigator in charge was appointed, who began the investigation that same day.

2.2. The Commission's investigator obtained and reviewed a number of records and documents from KiwiRail Limited, including:

- the training records of the driver of express freight Train 723, travelling from Picton to Christchurch (the southbound train), including the findings from recent performance assessments
- train control voice tape recordings, track warrant assisted computer system (TWACS) output and the train control diagram
- the original track warrants as issued by train control and recorded by the driver of the southbound train
- the rosters and hours worked for both the train controller and the driver of the southbound train
- the event recorder downloaded data from the southbound train.

2.3. On 22 and 23 August 2012 the investigator travelled to the location where the incident had occurred and interviewed the drivers of both the trains involved.

2.4. On 28 August 2012 two of the train controllers who had been involved in the incident were interviewed.

2.5. The southbound driver's medical records were obtained from KiwiRail, his general practitioner and the Burwood Pain Centre, Christchurch.

2.6. The Commission's consultant medical specialist[3] also assisted the Commission during its inquiry, particularly in terms of reviewing the effects of medication that had been prescribed to the driver of the southbound train.

2.7. On 11 March 2015 the Commissioners finalised a draft final report regarding the incident and approved it for distribution to interested parties for comment.

2.8. On 28 May 2015 the Commission considered written submissions received from the driver of the southbound train, the train controller who issued the track warrant authority to the driver, KiwiRail, the NZ Transport Agency and the Ministry of Transport and made changes to the report where appropriate. The Commission approved the report for publication on 28 May 2015.

2.9. On 7 July 2015 the Commission received additional written submissions from KiwiRail. The Commission withheld publication while it considered further submissions, and made several changes to the report.

2.10. On 26 August 2015 the Commission approved the revised report for publication.

[3] Dr Rob Griffiths is the Director of the Occupational and Aviation Medicine Unit at the University of Otago, Wellington. His qualifications include MBChB (Hons) (Bristol) 1978, FAFPHM (RACP, Sydney) 1985, FFOM (RCP, London) 1986, FAFOEM (RACP, Sydney) 1987, FFOM(I) (RACPI, Dublin) 2009, FACOEM (ACOEM,) 2009, FACASM 2011, MPP (VUW) 1994, DipAvMed (Univ London) 1983, and DIH (Soc. Apoth, London) 1984.

3. Factual information

3.1. Narrative

3.1.1. On Wednesday 1 August 2012, express freight Train 726 (the northbound train) was scheduled to travel northbound from Christchurch to Picton. Express freight Train 723 was scheduled to travel southbound from Picton to Christchurch. The track between Christchurch and Picton was single line with crossing loops at various locations. The train controller was to select the most suitable crossing station for the trains to cross, which depended on the progress that each train was making along the route. When the trains crossed, the drivers were to swap trains and drive them back to where they had begun their shifts. The running authority for the trains was by track warrant issued by the train controller to the train drivers.

3.1.2. The Picton-based train driver started work at 0230 to drive Train 723 southbound and return with northbound Train 726 from the crossing point. The southbound train departed from Picton at 0430, one hour later than scheduled.

3.1.3. Meanwhile, the northbound train had departed Christchurch and was making its way towards Picton. At 0521 the train controller issued track warrant[4] number 16 to the driver of the northbound train at Tormore to proceed from Tormore to the loop at Pines to cross the southbound train (see Figure 1). The driver of the northbound train was also instructed to make a clause 10 radio base-call as his train passed through Oaro so that the train controller could record the train's progress on the train control diagram and verify the limit of the track warrant authority.

3.1.4. Meanwhile, the southbound train had reached Seddon. At 0558 the train controller issued track warrant number 18 to the driver of the southbound train to proceed from the loop at Seddon to the main line at Parikawa. The southbound train was to stop en route at Wharanui for shunting operations. The driver was instructed to make a Clause 10[5] radio base-call to train control after he had cleared Wharanui, so that the train controller could record the train's progress on the train control diagram and verify the limit of the track warrant authority. The train controller did not issue the southbound train's track warrant all the way to Pines (where the crossing with the northbound train was planned to take place) because there was track maintenance work scheduled to take place that morning between Parikawa and Pines.

3.1.5. At 0617 the train controller issued track warrant number 19 to the driver of a hi-rail vehicle to work between Pines and Parikawa so that he could erect "Compulsory Stop Protection" boards associated with the planned work activity[6].

3.1.6. At 0628 the driver of the southbound train overheard the driver of the northbound train make his clause 10 radio base-call to the train controller confirming that he had cleared Oaro at 0626. The train controller acknowledged the call and concluded by saying, "You have a warrant to the loop at Pines".

[4] A track warrant is an authority issued by train control defining limits and other instructions for the occupation of the main line.
[5] A clause 10 radio call is used when it is necessary for drivers to confirm their whereabouts with train control.
[6] Information Bulletin dated 1 August 2012 showed seawall protection work and earthworks between Pines and Parikawa from 0630 to 1830. An information bulletin is an unnumbered instruction issued the day before it is effective containing information that may include general track maintenance planned work, maintenance equipment travelling as a train, work train or additional passenger train arrangements or any special instructions for the day. It is issued to all train drivers.

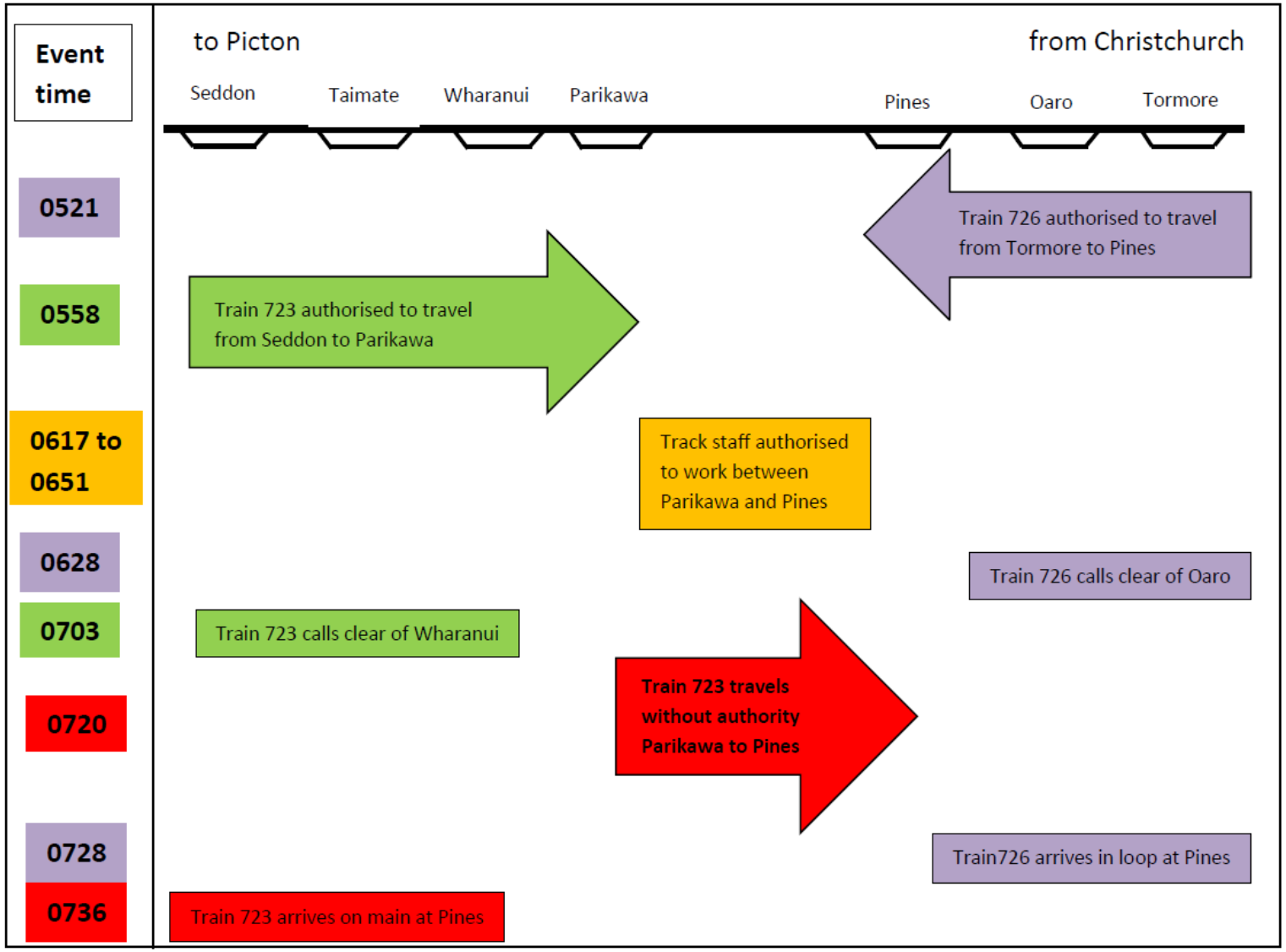

Figure 1
Event log (not to scale)

3.1.7. At about 0650 there was a change of shift hand-over on the Main North line train control desk. The incoming train controller (train controller B) was only scheduled to manage the Main North line desk for 40 minutes, after which he would be relieved by another train controller. The train controller informed train controller B of the progress of all current rail movements, the terminating limits of all active track warrants and the current track occupation for the maintenance work between Parikawa and Pines. He explained that the driver of the southbound train had a track warrant to the main line at Parikawa, but he had some shunt work to perform at Wharanui. The train controller also confirmed that the driver of the southbound train had been instructed to base-call train control after he was clear of Wharanui, but as yet that base-call had not been received.

3.1.8. The train controller also told train controller B that he had prepared, in TWACS, a new track warrant for the southbound train to proceed from Parikawa to Pines. The prepared warrant was ready to issue once the southbound train arrived at Parikawa and the work gang between Parikawa and Pines had reported clear of the section. The train controller also confirmed that the driver of the northbound train had reported clear of Oaro and held an active track warrant to the loop at Pines to cross the southbound train.

3.1.9. During the desk hand-over the driver of the hi-rail vehicle made a radio base-call to train control cancelling track warrant number 19. He confirmed that the "Stop boards" for the planned work had been erected and that he was now clear of the track. The train controller cancelled the hi-rail vehicle driver's track warrant number 19 at 0651 and told him that the southbound train would be the first train to approach the [Stop] boards, but that the driver had yet to report that he was clear of Wharanui. The train controller then left the train control desk to train controller B.

3.1.10. At 0703 the driver of the southbound train radioed train controller B and said, in relation to his track warrant:

> "Through Wharanui a couple of minutes earlier, right to the main [line] at Pines – arrived at 0633 – over".

Train controller B's response was:

> "Got there at 0633 – just away from Wharanui – roger thanks".

Train controller B had not picked up the driver's error that he understood his train was cleared through to Pines, rather than Parikawa.

3.1.11. It is mandatory for drivers to make radio transmissions on the short-range local channel one stating their train numbers, their locations and the terminating limits of their track warrants when their trains are passing through track warrant stations. This procedure was introduced to force drivers to check regularly the limits of their track warrants. Such calls were not recorded and could only be heard by other users in the local area. The train event recorder showed that the driver of the southbound train made a channel one call as his train was passing through Parikawa. The driver said that as his train approached Parikawa he glanced at the track warrant clipboard before making this call. He said that at the time he was certain that his terminating limit was Pines and that is what he called. He drove his train through Parikawa towards Pines, and in doing so exceeded the limit of his track warrant.

3.1.12. Meanwhile, in train control at about 0725, train controller B conducted a hand-over to a trainee train controller who was undergoing on-the-job training. The trainee was supervised by a senior train controller.

3.1.13. At about 0728 the driver of the northbound train berthed his train on the loop at Pines and one minute later called train control and reported that his train was now "on the loop at Pines – clear of the main line". The trainee train controller acknowledged the call and cancelled the track warrant number 16 for his train.

3.1.14. At about 0734, as the southbound train was approaching Pines, the driver of the southbound train called the driver of the northbound train (now stationary at Pines) on channel one to

confirm the route setting and driver change-over arrangements. The southbound train stopped on the main line at about 0736 with its locomotive a few metres short of the northbound train occupying the loop. The drivers then changed trains.

3.1.15. The new driver of the southbound train then made a radio base-call to train control seeking a track warrant to begin his trip back to Christchurch. After several minutes the trainee train controller started issuing the track warrant that had been pre-prepared in TWACS for the southbound train to proceed from Parikawa to Pines. The driver informed the trainee train controller that the southbound train was already at Pines and that the drivers had already changed trains. He looked at track warrant 18 on the clipboard and saw that Parikawa was the terminating limit.

3.1.16. The previous driver, now on the northbound train, overheard the conversation and sensed that something was wrong, so he moved his train forward a few metres so that he could communicate directly with the other driver through the open cab windows.

3.1.17. A discussion ensued and the track warrant was passed to the driver who had exceeded the limits of the track warrant. He commented to the other driver that the terminating limit was meant to be Pines, so he crossed out Parikawa and wrote in Pines before he handed the track warrant back to the other driver.

3.1.18. Meanwhile, the senior train controller had taken charge and determined that the driver of the southbound train had exceeded the limit of his track warrant.

3.2. Personnel

Driver of the southbound train (Train 723)

3.2.1. The driver was 55 years old and had more than than 36 years' driving experience. He had been based at the Picton depot for the previous 13 years. His certification to drive express passenger trains and express freight trains was current. His knowledge of the rules, regulations and procedures for performing core driving functions had been revalidated when he passed his biennial theory examination on 27 July 2011. The examination had covered nine separate modules, of which one was track warrant control. He had answered correctly all 10 questions from that module.

3.2.2. No areas of concern had been identified during his two most recent main-line-driving practical assessments, carried out on 1 May 2012 and 12 October 2011.

3.2.3. In the 10-day period leading up to the incident, the driver had worked the following roster:

Table 1: Train driver hours worked 10 days prior to incident

Date – 2012	Posted roster hours	Actual hours worked
22 July	1215 to 1755	1215 to 1755
23 July	1215 to 1805	1215 to 1805
24 July	1920 to 0330	1920 to 0335
25 July	1920 to 0330	1920 to 0335
26 July	2230 to 0755	2230 to 0755
27 July	Off duty	Off duty at 0755
28 July	Off duty	Off duty
29 July	1930 to 0255	1930 to 0255
30 July	Off duty	Off duty at 0255
31 July	0230 to 1055	0230 to 1055
1 August (day of the incident)	0230 to 1055	0230 to 1200

3.2.4. In the fortnight starting 24 June 2012 the driver had worked all his 10 allocated work periods, for a total of 80 hours 35 minutes. Similarly, during the fortnight starting 8 July 2012 he had worked all his 10 allocated work periods, which added up to a total of 76 hours 25 minutes.

3.2.5. The driver said that due to a medical condition he had been experiencing pain at work the day before the incident. He had contacted his medical centre after he finished work at 1055 but

had been told that the earliest appointment time available was two days away (the day after the incident). He said that although he was still in considerable pain when he started work on the day of the incident, he thought that he would be able to complete the shift.

3.2.6. The National Rail Safety System Standard Section 3: Health Assessment of Rail Safety Workers (the Standard) formed part of KiwiRail's safety system and provided a generic framework for managing health assessments for rail workers in safety-critical roles. The purpose of the health assessments was to identify health conditions that might affect safe performance. The Standard categorised train drivers as "high-level, safety-critical workers where a serious incident affecting the public or the network could result from ***sudden worker incapacity*** such as a heart attack or a black out".

3.2.7. The Standard required train drivers to undertake periodic health assessments at the following intervals:

- at the time of engagement, then
- five-yearly up to age 50, then
- two-yearly up to age 60, then
- annually thereafter.

3.2.8. KiwiRail was unable to provide the Commission with complete medical records for the driver. The self-assessment part of each periodic health assessment could not be sourced. Those records that KiwiRail was able to provide showed that he had had periodic health assessments on 22 January 1997 at age 40 then on 15 June 2000 at age 43, with subsequent health assessments on 15 June 2003 aged 46 and on 6 June 2006 age 49, with his most recent periodic health assessment having been carried out on 3 June 2009 at age 52. The health professionals had assessed him as "fit for driving duties" each time he presented for a periodic health assessment.

3.2.9. The periodic health assessment that had been due in 2011 was never completed. Instead the driver underwent a "triggered" health assessment, which is a special assessment that drivers can be required to undergo in response to incidents or when there are concerns about their ability to perform their jobs safely.

3.2.10. On 30 August 2002 the driver had experienced chest pains while performing driving duties. Later that day he had been checked at his local hospital Accident and Emergency Department and discharged. A KiwiRail health professional had also examined him the same day and assessed him as "fit to continue driving duties".

3.2.11. On 30 October 2003 he had experienced severe lower back pain from a non-work accident and had sought treatment from a physiotherapist and a chiropractor. He had been assessed by KiwiRail's medical professional as fit to resume driving duties on 15 November 2003.

3.2.12. On 17 December 2005 a train he was driving had struck and fatally injured a trespasser in the rail corridor, and the same had happened again in February 2006. He had had the mandatory stand-down period and received professional counselling before he was assessed by a KiwiRail health professional as fit to return to driving duties.

3.2.13. Late in 2006 he was said to have been still suffering the after-effects of the fatal accidents, so on 3 November his general practitioner had prescribed Cipramil (an antidepressant) and temazepam to help him sleep while continuing to perform shift-work driving duties. KiwiRail had not been aware of this medication.

3.2.14. On 17 January 2007 he had been involved in an altercation with a customer. Later that day he had consulted his general practitioner and made a self-referral counselling appointment through KiwiRail's Employee Assistance Programme (EAP). In the counsellor's report of 30 January 2007 to the EAP manager, concern was expressed regarding the driver's stress levels and the medication he had been prescribed.

3.2.15. On 1 February 2007 the driver had given permission to the KiwiRail regional manager to speak to his general practitioner regarding the medication that he had been taking since November 2006. The regional manager noted the general practitioner as saying, "One of the potential side effects from taking the medication was that the driver could feel tired but it would not make him aggressive, although he was irritable when he last came to see me". Following this consultation the driver had been assessed as fit for driving duties.

3.2.16. In August 2009 he had had a non-work-related accident and injured his tailbone. He had later undergone surgery to relieve his ongoing pain but had continued to experience fluctuating pain levels.

3.2.17. On 2 July 2010 a KiwiRail health professional had assessed the driver as "fit for driving duties" when he presented for a triggered health assessment.

3.2.18. On 22 May 2012 he had had an Accident Compensation Corporation (ACC) sponsored comprehensive pain assessment at the Burwood Pain Management Centre. During the assessment he had reported constant daytime pain aggravated by walking and sitting, associated with stress and anxiety and panic attacks. He had admitted to consuming nine standard drinks of alcohol daily as a coping mechanism. The comprehensive pain assessment report had been forwarded to his orthopaedic surgeon and copied to his ACC case manager and his general practitioner. KiwiRail had not been aware of the process the driver was going through, or the contents of the ACC-sponsored report.

3.2.19. At the time of the incident the driver had been prescribed the following medication to manage his ongoing pain and other medical conditions:

- amitriptyline hydrochloride 10 milligrams (mg), one tablet, Nocte
- norfloxacin 400 mg, one tablet, once daily
- tramadol hydrochloride 50 mg capsule, three capsules, three times daily and wean to one
- simvastatin 10 mg tablet, one tablet, once daily
- gabapentin 400 mg, three capsules, three times daily
- terazosin (Arrow) 5 mg tablet, once daily
- amoxycillin 500 mg, one capsule, three times daily
- citalopram 20 mg, one tablet, once daily.

In addition, he was occasionally taking Nurofen.

3.2.20. Extracts from New Zealand Medicines and Medical Devices Safety Authority (Medsafe) data sheets, revised 6 November 2013, relating to the above medication can be found in Appendix 1.

3.2.21. Following the incident the driver was given a post-incident drug screen test and a breath screen test. The New Zealand Drug Detection Agency reported that both tests gave negative results.

Driver of the northbound train

3.2.22. The driver of the northbound train had worked out of the Christchurch Depot for 41 of his 43 years' driving experience. His certification for driving duties was current.

Train controller B

3.2.23. Train controller B's certification to operate all three South Island train control desks was current. He had gained his initial desk certification for the Main North line on 27 January 2005. He had gained similar certification for the Main South line on 12 October 2005 and for the West Coast and Midland lines on 18 August 2006.

3.2.24. On 14 November 2011 he had completed his biennial train control theory assessment of eight modules, covering alertness management, centralised traffic control, crew resource management, double-line automatic signalling, track warrant, track warrant administration, single-line automatic signalling and the Midland line and project reset. There were 10 multi-choice questions in each module. He was required to answer at least eight of the 10 questions correctly to pass the module. Train controller B had passed all but one of the modules, the exception being track warrant administration. He had answered five of the 10 questions correctly.

3.2.25. He had worked the following hours during the 10 days leading up to the incident:

Table 2: Train controller B hours worked 10 days prior to incident

Date – 2012	Posted roster hours	Actual hours worked
22 July	Off duty	Off duty
23 July	0730 to 1530	0730 to 1530
24 July	0730 to 1630	0730 to 1630
25 July	0730 to 1630	0730 to 1630
26 July	0650 to 1500	0650 to 1500
27 July	0650 to 1500	0650 to 1500
28 July	Off duty	0650 to 1500
29 July	1450 to 2300	1450 to 2300
30 July	1450 to 2300	1450 to 2300
31 July	Off duty	Off duty
1 August (day of incident)	0650 to 1500	0650 to 1500

3.2.26. Train controller B had been responsible for planning and authorising train movements and track occupations on the Main North line (346 kilometres) and from Lyttelton to Studholme on the Main South line (214 kilometres) for the first 40 minutes of his work period before he changed to the "West Coast and Midland line" train control desk at 0730.

3.2.27. Following the incident train controller B was given a drug screen test and an alcohol breath screen test. The New Zealand Drug Detection Agency reported that both tests gave negative results.

4. Analysis

4.1. Introduction

4.1.1. The safe working of the track warrant control operating system is reliant on the performance of a train controller in planning, preparing and issuing a track warrant accurately and on the recipient complying with all aspects of the track warrant. However, humans do not operate with absolute accuracy. Boredom, distraction, fatigue, illness, anxiety, misunderstanding and sensory problems lead to less-than-optimal performance, which makes it important that control mechanisms, or defences, are in place to prevent human error resulting in an accident. One such foreseeable risk associated with the track warrant control operating system is a driver overrunning the terminating limit of their track warrant.

4.1.2. The track warrant control operating system operates over about 60% of the main line rail network. The failure of the track warrant control system in this case could have led to the southbound train colliding with the hi-rail vehicle while the track worker was placing the Compulsory Stop Protection boards had this task not already been completed and the hi-rail vehicle taken clear of the track.

4.1.3. Rules and operating procedures in place to reduce the risk of a driver overrunning the terminating limit of a track warrant running authority included:

- the driver's read-back and the train controller's confirmation of the read-back to ensure that the track warrant had been recorded correctly
- the illuminated clipboard in the locomotive cab to display the driver's active track warrant running authority
- the driver making mandatory channel one radio broadcasts stating his train number, the location approached and the terminating limit of the track warrant running authority
- the driver calling the terminating limit of the track warrant running authority when making a clause 10 radio broadcast to train control to confirm the train's progress
- the train controller checking and accurately recording the progress of the train on the train control diagram.

4.1.4. The following analysis discusses possible reasons for the driver overrunning the limit of his track warrant by some 14.6 kilometres and how each of these defences in the system failed to intervene and prevent the track warrant overrun.

4.1.5. The analysis also considers the following safety issues:

- there was little or no warning systems built in to KiwiRail's procedures to mitigate the risk of the track warrant system failing due to human error
- the driver of the southbound train had been prescribed a collection of medications that either singularly or collectively had the potential to adversely affect his performance, and this had gone undetected or unresolved by KiwiRail's medical professionals
- there was no requirement for general medical practitioners to inform appropriate authorities when medical issues were diagnosed that could affect the performance of people working in safety-critical roles in the rail industry.

4.2. The incident

4.2.1. At some time after receiving his track warrant to proceed from Seddon to Parikawa, the driver of the southbound train was under the impression that his track warrant terminated at Pines despite what he had written on his copy of the track warrant. The driver was unable to explain why that happened. A driver is unlikely to exceed the limit of his track warrant deliberately, so he must have genuinely believed that he was authorised to take his train to Pines. An analysis of the train event recorder showed that the driver was by all accounts handling his train

properly and complying with all the mandatory radio calls as though he were taking his train to Pines.

4.2.2. The driver of the southbound train overheard on the open radio channel the train controller conversing with the driver of the northbound train about his track warrant calls, all of which were about crossing with his southbound train at Pines. This could have either caused or contributed to his developing or maintaining that mind-set. Nevertheless, there were procedures in place designed to capture such an error. These are discussed below.

Issuing the track warrant

4.2.3. The process for issuing the track warrant number 18 to the driver of the southbound train to take his train from Seddon to Parikawa was conducted in accordance with KiwiRail's operating procedures. The train controller had planned well and made allowance for the late running of the southbound train, the shunt work at Wharanui and the fact that there was a planned work activity between Parikawa and Pines. The driver of the southbound train mistakenly recorded his train number as his homeward Train 726 on the track warrant, instead of Train 723. His mistake was picked up by the train controller during the driver's read-back and was corrected. The driver correctly wrote Parikawa as the limit of his track warrant.

4.2.4. The process for ensuring that the track warrant was issued accurately and recorded accurately by the train driver was successfully accomplished. The driver incorrectly recording the train number as the one with which he was to return to Picton could simply have been him inadvertently transposing the numbers of the two trains he was going to drive that night, or it could have been a sign that his mind was already on the return journey and completing his shift. Either way, it was the first indicator that his performance was not optimal.

Channel one radio calls

4.2.5. The driver was required to make general transmissions on the local channel one radio each time he approached a track warrant station. On each of those occasions he was required to check the track warrant on the clipboard in front of him and transmit the terminating limit of the track warrant. The driver said that he did read his track warrant. However, it is highly likely that he either did not read it or did not do so thoroughly, otherwise he would have read that his track warrant terminated at Parikawa, not Pines.

4.2.6. The driver not adhering to standard track warrant procedures was another indicator that his performance was below optimal.

Clause 10 radio check call

4.2.7. The final opportunity to correct the train driver's error was during the required clause 10 call when departing Wharanui, during which the train driver incorrectly referred to Pines instead of Parikawa as the terminating limit of his track warrant. The train controller had only been operating the desk for about 12 minutes following the hand-over and missed that the driver had given the wrong terminating track warrant station. KiwiRail procedures for train controllers were designed to detect such an error.

4.2.8. Section 10.1 – Operating Instructions for Train Control stated in part:

> 12.8.4 Rule 401 e – A proceed track warrant which is issued to an addressee and has an anticipated 2 hours or more to run from the "repeat correct time" before the limits will be cleared, must have a clause 10 call specified from a Warrant Station at approximately each hourly interval and at a Warrant Station which is in the vicinity of 25 to 30 km from the terminating limit. The circled number of the track warrant must be shown adjacent to the blue line on the diagram alongside each of the clause 10 calls.
>
> When the addressee calls, they will advise the location from where the call is being made as well as the terminating limit of the warrant they hold. A check to confirm this information must be made against the warrant line drawn on the diagram, in addition to the call being logged in TWACS (if in use), the time must also be endorsed alongside the call

> location on the diagram and the relevant circled track warrant number crossed out.

4.2.9. Had train controller B followed Rule 401 e and referred to the track warrant line drawn on the train control diagram, he would have seen that the terminating limit for track warrant 18 was Parikawa and not Pines as the driver reported. By not complying with the operating instructions, train controller B missed the opportunity to correct the driver's mistake and consequently prevent the track warrant overrun.

4.2.10. Train controller B's error was consistent with errors he had made when sitting his "track warrant control administration" module when undergoing his most recent biennial train control theory assessment some nine months before this incident. At that time he had answered correctly five of the 10 questions from the module. Two of the incorrectly answered questions were:

- *what colours are used on the train control diagram to represent movements authorised by track warrant?*
- *what happens in TWACS when a call at a location is actioned?*

4.2.11. KiwiRail's Operating Rules and Procedures, Section 10.3, Instruction 5.2 stated in part:

> A pass mark of 80% will apply to all papers sat. The assessor will identify any incorrect answer and following tuition on an educative basis confirm personnel understanding by way of oral assessment, or, as deemed necessary by the Manager, training intervention will be arranged.

4.2.12. Although train controller B had answered correctly only five of the 10 questions from the track warrant control administration module, KiwiRail did not require him to sit an alternative paper. Instead he received tuition from the assessor, who without reference to the train controller's manager then approved him to continue his train control duties.

4.2.13. Instruction 5.2 is unclear on whether a failure to achieve an 80% pass mark should result in the train controller undergoing further training and sitting another paper. The safe interpretation of Instruction 5.2 is that the train controller must answer at least 80% of the questions, and that the assessor can provide tuition and an oral assessment for no more than 20% incorrect answers. Based on this interpretation, a failure to achieve an 80% pass mark should therefore have resulted in the train controller having to sit an alternative exam paper. Since this incident the train control manager has determined that a train controller will have to sit an alternative paper when an 80% pass mark is not achieved. Tuition on an educative basis and oral assessments should only be used for those incorrectly answered questions providing the candidate achieves the 80% pass mark.

4.2.14. The train controller's knowledge deficiency at the time of his biennial theory assessment was a factor that contributed to the incident. KiwiRail will in future need to address the ambiguity with Instruction 5.2 and ensure that it has robust procedures for addressing knowledge deficiencies in staff working in safety-critical roles.

Missing defences

Safety issue – There was little or no warning system built in to KiwiRail's procedures to mitigate the risk of the track warrant control system failing due to human error.

4.2.15. At the time of this track warrant overrun, train controllers knew only the approximate locations of trains within track warrant control territory by relying on the paper-based train control diagram and the clause 10 radio transmissions from drivers. The operating system relied heavily on train controllers recording trains' progress accurately on the train control diagram, and on train drivers and other track users complying with the terms of their running authorities and track occupations. The safeguards at that time for preventing track warrant overruns all involved human input.

4.2.16. Technology existed that could have provided an alternative, independent and automatic detection of trains that had or were about to overrun the limits of their track warrants, such as

global positioning system (GPS) based systems. When considering that 60% of the controlled rail network relies on track warrant control and that the consequences of a train overrunning its track warrant could be serious, the risk to the operation was high.

4.2.17. On 19 December 2014 KiwiRail introduced a software application called 'Watchdog' to monitor the GPS positions of trains to ensure they remained inside valid track warrant authority limits. An alert is activated in train control when a train is detected outside its track warrant authority limit. As well as an audible alert, the train controller receives a message on the computer screen stating:

- the train number
- the date and time
- the track warrant number
- the metrage, location and line of the overrun.

4.2.18. When an alert is received the train controller must:

- immediately refer to the train control diagram to establish the risk of a collision with another train or work group, then
- make a verbal radio transmission over the open radio channel using the phrase [Train number/s] from control STOP, STOP, STOP and keep repeating the phrase until receiving acknowledgement.

4.2.19. The train control shift manager also receives the overrun alert by text message and email as a back-up in the event that the train controller has yet to log in to the Operations Management System[7] due to a shift change or is away from the desk.

4.2.20. The 'Watchdog' application is a secondary safety overlay tool for track warrant control using a combination of GPS information, cellular service providers, a KiwiRail Management System unit fitted to each locomotive, and software applications. There are a number of identified cellular black spots on the rail network where cellular coverage is not available. Because a train does not provide positional updates when travelling within a cellular black spot, the track warrant overrun detection is not available until the train enters a location with cellular coverage. Currently there is cellular coverage over about 80% of the network operating under track warrant control.

4.2.21. The action taken by KiwiRail to introduce the 'Watchdog' software application, to monitor the GPS locations of trains and alert train control automatically when they exit the limits of their operating authorities, has addressed this safety issue.

Findings

1. The driver of the southbound train overran the limits of his track warrant because he forgot which track warrant station he had written on his track warrant and developed a mind-set that he had authority to travel to the next track warrant station instead.
2. The driver of the southbound train overran the limits of his track warrant and created the potential for a collision between his train and a high-rail vehicle that had been occupying the track in the next section ahead.
3. The driver of the southbound train did not follow the required procedure for checking the limits of his track warrant, and in not doing so was denied the opportunity to realise the limit of his track warrant and thus prevent his train overrunning its limits.

[7] The Operations Management System is one of the main systems for managing the railway, including administering speed restrictions and timetables and reporting on the usage of the network and the efficiency of the rail network and its trains.

4. The train controller operating the desk at the time of the incident did not follow the required procedures for checking and monitoring the progress of the southbound train, and in not doing so the opportunity to detect the driver's error and prevent the track warrant overrun was lost.
5. At the time of the overrun there was little or no technological warning system built in to KiwiRail's procedures to mitigate the risk of the track warrant system failing due to human error. KiwiRail has since addressed this safety issue with the introduction of a global positioning system-based system that alerts the train controller when a train has exceeded the limits of its track warrant.

4.3. Train driver performance

4.3.1. The sections above make mention of two indicators that the driver's performance was below optimum leading up to the incident – his error when receiving the track warrant at Seddon, and in not strictly following procedures when making his channel one and Clause 10 radio calls. The driver's actions on learning of or realising his error in overrunning the limits of his track warrant are also worthy of consideration.

4.3.2. KiwiRail's Track Warrant Control Rule 409 stated in part:

> **409 Warrant In Effect Once Issued**
>
> (a) A track warrant, once issued, is in effect until either:
>
> - the addressee has reported clear of the limits of the track warrant,
>
> or
>
> - it has been cancelled by a further track warrant.
>
> (b) A track warrant, once in effect, must not be altered in any way.

4.3.3. When the driver of the southbound train (before the drivers changed trains) asked the other driver to see his track warrant, he altered it by crossing out the destination of Parikawa and changing it to Pines. At that time the track warrant had not been cancelled and was therefore still valid. In doing so he contravened Track Warrant Control Rule 409.

4.3.4. The driver's action had no bearing on the incident because the track warrant overrun had already occurred and the original was held in TWACS at the National Train Control Centre. However, it does raise further questions about the driver's state of mind and how that could have influenced the incident. The Commission considered what factors could have contributed to the driver's performance on the night.

Fatigue

4.3.5. The driver's roster was unremarkable and it alone should not have caused him to be suffering from fatigue. However, the time of day could have been a factor. The early hours of the morning when he started his shift is a period when human performance is known to be at its lowest due to the circadian rhythm of the body clock causing a strong drive for sleep.

4.3.6. There are factors other than his roster that need to be considered. His roster would have governed to a certain extent the opportunities the driver had to rest and sleep. However, whether those opportunities were taken by the driver and the quality of his sleep were important considerations for whether he might have been suffering from fatigue. The driver had a long history of ailments and medication prescribed to treat those ailments. Ailments and certain medications can affect a person's quality of sleep. These are discussed in the following section.

Medical

Safety issue – The driver of the southbound train had been prescribed a collection of medications that either singularly or collectively had the potential to adversely affect his performance, and this had gone undetected or unresolved by KiwiRail's health professionals.

Safety issue – There was no requirement for general medical practitioners to inform appropriate authorities when medical issues were diagnosed that could affect the performance of people working in safety-critical roles in the rail industry.

4.3.7. At the time of the incident the driver had been prescribed several medications. He had been prescribed 450 mg of tramadol tablets daily for pain relief. The Medsafe data sheet included information to patients stating in part:

> … that due to its sedative effect, patients should be advised to avoid driving or operating machinery whilst taking tramadol.

4.3.8. The Medsafe data sheets for amitriptyline hydrochloride included information stating in part:

> The medicine may impair alertness in some patients; operation of automobiles and other activities made hazardous by diminished alertness should be avoided.

4.3.9. The data sheets contained similar information for patients with respect to Neurontin (gabapentin), stating in part:

> Neurontin may impair your ability to drive a car or operate potentially dangerous machinery. Until it is known that this medication does not affect your ability to engage in these activities, do not drive a car or operate potentially dangerous machinery.

4.3.10. The data sheet for terazosin tablets stated in part:

> Patients should also be told that drowsiness or somnolence can occur with terazosin, requiring caution in people who must drive or operate heavy machinery.

4.3.11. Two months before the incident, the driver had undergone an ACC-sponsored comprehensive pain assessment at Burwood Pain Management Centre. From the assessment he had been reported as having persistent pain in his tailbone region with no radiation and no other associated symptoms. He had described pain levels fluctuating from very low on a good day to seven to eight out of 10 on bad days, usually later during the day. On those bad days his pain had been aggravated at times by walking and sitting, stress and anxiety. He had been reported as increasing his daily alcohol intake levels somewhat in the two years since his non-work accident and he was then drinking around nine standard drinks per day.

4.3.12. The driver also reported that on the day of the incident he was experiencing 'considerable pain' from an unrelated medical condition.

4.3.13. The Commission's medical specialist reviewed the driver's medical status. His response is paraphrased as follows:

> The various medications are all known to cause performance impairment and behavioural change when taken individually. They may also act additively or synergistically and have unknown effects when taken in combination. One effect of the combination of Citalopram with other drugs that affect serotonin metabolism is the development of Serotonin Syndrome, which in its mildest presentation, may cause irritability and adverse effects on behaviour, and anxiety, agitated delirium, restlessness, and disorientation in more severe cases. In addition to the effects of a complex treatment regime, many of which interfered with serotonin metabolism, the effects of heavy alcohol consumption may lead to impaired and variable breakdown of the prescribed medications in the driver, preventing attainment of an equilibrium in blood drug levels, with the risk of adverse effects of medication a constantly repeated risk in his pain control.

4.3.14. The driver underwent a KiwiRail drug screen test and breath screen test following the incident, which both proved negative. He was not therefore directly under the influence of alcohol while on duty that morning. However, it is likely that the complex mix of medications the driver was taking in the period leading up to and at the time of the incident, combined with his self-reported daily intake of alcohol, was affecting his performance to some degree. To what degree his performance might have been impaired and the influence this might have had on the incident is, however, difficult to quantify.

4.3.15. What is of concern, however, is that in a period of about two years the driver was suffering from various work- and non-work-related ailments and injuries and had been allowed to continue his safety-critical role of driving trains when he was clearly not fit to do so while under a combination of medications that, together with his daily alcohol intake, was likely to impair his performance.

4.3.16. The correlation of the driver's medical information between the ACC medical professionals, his private medical practitioner and the KiwiRail health professionals was not well managed. The KiwiRail health professionals and the driver's manager had some information that should have caused them to look deeper into the driver's circumstances. However, not all of the information that the KiwiRail health professionals and the driver's manager required to make meaningful assessments of the driver's fitness for duty was made available to them. The information held by the driver's private medical practitioner should either have been offered to them by the driver, or have been automatically accessible to them.

4.3.17. KiwiRail general operating rules required the driver, when prescribed his medication, to "establish whether those medications would impact on [his] performance, and if so, inform his manager"[8]. The driver did not in this case inform his manager. Reliance on this general operating rule alone was not an effective way of ensuring that workers performing safety-critical roles were not working when impaired by prescribed or over-the-counter medication. The driver's knowledge of this general operating rule is less likely to be tested during KiwiRail's various performance observations and biennial theory assessments, which typically focus on his knowledge of operating rules specific to his prime duty of driving trains.

4.3.18. The onus to establish whether a medication is likely to affect a person's ability to perform a particular role is better placed with the Medical professionals, who are knowledgeable in these matters.

4.3.19. The Commission has made a recommendation to the Chief Executive of KiwiRail to introduce a system whereby KiwiRail medical professionals are automatically granted access to employees' medical records held by private medical practitioners as necessary to ensure employees who perform safety-critical roles are not impaired by prescription or over-counter medications.

4.3.20. In the aviation industry Civil Aviation Rules require medical professionals who become aware that their patients are licensed pilots, engineers or air traffic controllers to notify the Civil Aviation Authority of any medical condition that could affect their ability to perform their roles adequately.

4.3.21. The same regime does not exist for the rail industry. A complicating factor is that the rail regulatory regime differs from that for aviation, where the industry operates to a set of national standards that are jointly administered by the regulator and industry participants. Currently there is no railway legislation in place to make requirements on individuals and organisations outside the rail system.

4.3.22. The Commission has made a recommendation to the Secretary for Transport to resolve this safety issue.

[8] KiwiRail General Operating Rule 8(b)

4.4. Health assessments for personnel performing safety-critical rail work

Safety issue – Safety-critical rail workers are not required to declare prescribed medications they are taking when presenting for triggered health assessments.

4.4.1. The Standard sets out the procedures for conducting health assessments and provides the medical criteria for determining fitness for duty. One component of the periodic health assessment is a self-administered questionnaire completed by the candidate before presenting to a health professional, authorised by KiwiRail, for a clinical examination. The questionnaire collects a general history and helps the medical professional to screen for specific conditions that may affect rail safety task performance. The data collected relates to medication, sleep disorders, alcohol dependency and psychological problems. The second part is a clinical examination to conduct a drug screening test and to assess the key body systems, including for cardiovascular, neurological, psychological, musculoskeletal, visual and auditory problems.

4.4.2. Authorised health professionals conduct health assessments in line with procedures set out in the Standard. The relationship between the health professional and the rail worker is governed by privacy laws. The relationship differs from the usual doctor-patient relationship because of the involvement of a third party, the employer. The health professional does not provide medical information to the employer, only information on the worker's fitness for duty or any restrictions, not the underlying medical conditions.

4.4.3. The Standard requires the health professional to liaise with the worker's general practitioner and treating specialists where appropriate to clarify information relating to the worker's current health status. Such communication is restricted to health issues that affect rail safety and only occur with the consent of the worker. However, because KiwiRail's health professionals had no knowledge of the complex pain management regime the southbound driver had been prescribed, no communication could be initiated.

4.4.4. Although the intervals between periodic health assessments for the driver had been variable, he had had five periodic health assessments from the age of 40, consistent with KiwiRail's medical standards. However, his most recent periodic assessment had occurred in June 2009, before his non-work accident after which he was prescribed a complex pain management regime. This was more than three years before this incident. The Standard required a health assessment every two years for rail workers over 50 carrying out safety-critical work, so the driver should have had a periodic health assessment in 2011. This was never undertaken because he was instead undergoing a series of triggered health assessments.

4.4.5. However, triggered health assessments for rail safety workers were introduced to supplement the periodic health assessments when there were concerns about workers' health. The purpose of these assessments was to take preventive action by managing any health conditions likely to affect safety. Examples of when triggered health assessments were required included: when reviewing a worker's fitness to resume duty after an extended absence due to injury or illness or a traumatic event; following recurrent absenteeism; following an accident or incident patterns; and at a worker's request. Unlike the periodic health assessment, a candidate required to undergo a triggered health assessment was not required to complete the three-page health questionnaire and declaration.

4.4.6. Clause 8.2 of the Standard stated in part:

> The program of comprehensive health assessments should be maintained even if more frequent triggered health assessments are performed for an individual's particular condition.

4.4.7. By not following its own procedures with respect to periodic health assessments, KiwiRail denied itself the opportunity to learn about the various medications the driver had been prescribed, as well as the amount of alcohol the driver was consuming. Rail personnel properly following procedures, and KiwiRail setting a culture of compliance with procedures set out in its safety system, are key lessons arising from this inquiry (see section 8).

4.4.8. During the 12 years preceding this occurrence the driver had presented to KiwiRail- appointed health professionals for triggered health assessments on at least seven occasions: in August 2002 after experiencing chest pains; in November 2003 after a non-work accident when he injured his lower back; in late 2005 and early 2006 following trespasser fatalities; early in 2007 after an altercation with a customer; in August 2009 following a non-work injury to his tailbone and most recently on 2 July 2010.

4.4.9. KiwiRail's health professionals had declared the driver "fit for duty" each time he reported for a triggered health assessment. When reporting for his most recent triggered health assessment on 22 December 2010, he had already been prescribed the complex pain relief treatment regime described above. The health professional had declared the driver "fit for driving duties" without the driver reporting his current prescribed medications.

4.4.10. Drivers are not qualified to assess whether an illness or a health problem is likely to affect their ability to drive safely. KiwiRail's health professionals are better placed to make those determinations. In order to do so, the health professionals require records of the workers' current medical treatments and prescribed medications. If drivers are required to fill out the health questionnaire when presenting for a triggered health assessment as well as periodic assessments, they will get an additional direct prompt to declare all prescription medications. Expert health professionals can then assess any implications the medication might have on their safety-critical role.
A recommendation has been made to the Chief Executive of the NZ Transport Agency to address this issue.

Findings

6. The number of medications the driver had been prescribed, combined with his self-reported daily intake of alcohol, is likely to have impaired his performance at the time of the incident, but the degree to which his performance might have been impaired and the influence this might have had on the incident are, however, difficult to quantify.
7. The poor correlation of information between the various health professionals involved with the driver meant that he was allowed to continue driving trains when he was clearly not fit to do so.
8. It is a safety issue that private health professionals are not required to report medical conditions that could render train drivers unfit for duty to the drivers' employers or other appropriate authorities.
9. Train drivers were not required to declare to the employer any medications they were taking when undergoing triggered medical assessments and rail medical officers were not granted automatic access to medical records held by employees' private health professional. These anomalies meant that KiwiRail lost the opportunity to detect that the driver in this case was not fit to drive trains safely.

5. Findings

5.1. The driver of the southbound train overran the limits of his track warrant because he forgot which track warrant station he had written on his track warrant and developed a mind-set that he had authority to travel to the next track warrant station instead.

5.2. The driver of the southbound train overran the limits of his track warrant and created the potential for a collision between his train and a high-rail vehicle that had been occupying the track in the next section ahead.

5.3. The driver of the southbound train did not follow the required procedure for checking the limits of his track warrant, and in not doing so was denied the opportunity to realise the limit of his track warrant and thus prevent his train overrunning its limits.

5.4. The train controller operating the desk at the time of the incident did not follow the required procedures for checking and monitoring the progress of the southbound train, and in not doing so the opportunity to detect the driver's error and prevent the track warrant overrun was lost.

5.5. At the time of the overrun there was little or no technological warning system built in to KiwiRail's procedures to mitigate the risk of the track warrant system failing due to human error. KiwiRail has since addressed this safety issue with the introduction of a global positioning system-based system that alerts the train controller when a train has exceeded the limits of its track warrant.

5.6. The number of medications the driver had been prescribed, combined with his self-reported daily intake of alcohol, is likely to have impaired his performance at the time of the incident, but the degree to which his performance might have been impaired and the influence this might have had on the incident are, however, difficult to quantify.

5.7. The poor correlation of information between the various health professionals involved with the driver meant that he was allowed to continue driving trains when he was clearly not fit to do so.

5.8. It is a safety issue that private health professionals are not required to report medical conditions that could render train drivers unfit for duty to the drivers' employers or other appropriate authorities.

5.9. Train drivers were not required to declare to the employer any medications they were taken when undergoing a triggered medical assessments and rail medical officers were not granted automatic access to medical records held by employees' private health professionals. These anomalies meant that KiwiRail lost the opportunity to detect that the driver in this case was not fit to drive trains safely.

6. Safety actions

General

6.1. The Commission classifies safety actions by two types:

(a) safety actions taken by the regulator or an operator to address safety issues identified by the Commission during an inquiry that would otherwise result in the Commission issuing a recommendation

(b) safety actions taken by the regulator or an operator to address other safety issues that would not normally result in the Commission issuing a recommendation.

Safety actions addressing safety issues identified during an inquiry

6.2. KiwiRail formed a Critical Risk Network team to develop and implement a strategy to reduce the risks of a signal passed at danger. For about 60% of the main line network where train movements and track occupations are authorised by track warrants the risk can be reduced by exploiting the full capability of existing technology and adopting emerging technologies for the railway environment that would include reminder alerts to drivers and interventions from train control.

6.3 On 19 December 2014 KiwiRail introduced a software application called 'Watchdog' that detects and notifies train control should a train overrun its track warrant operating limits. The system uses 'geofences' and live positional reports to track and monitor a train's progress. Should the train exit the limit of its track warrant, the train controller and the train controller's shift manager receive notifications of the over-run. The train controller must immediately refer to the train control diagram to assess the risk of a collision before making a broadcast over the open radio channel instructing the train driver to STOP. There are identified cellular black spots over about 20% of the rail network covered by the track warrant control operating system. A train cannot provide positional updates from within a cellular blackspot. The track warrant overrun protection system is not available until the train enters a location with cellular coverage.

6.4 On 29 June 2015, KiwiRail advised that from 28 May 2015, it had introduced a requirement for rail personnel carrying out safety-critical tasks, to complete the self-assessment questionnaire before presenting for a triggered health assessment.

7. Recommendations

General

7.1. The Commission may issue, or give notice of recommendations to any person or organisation that it considers the most appropriate to address the identified safety issues, depending on whether these safety issues are applicable to a single operator only or to the wider transport sector. In this case, one recommendation has been issued to the Chief Executive of KiwiRail, one recommendation to the Chief Executive of the NZ Transport Agency and one recommendation to the Secretary for Transport.

7.2. In the interests of transport safety it is important that these recommendations are implemented without delay to help prevent similar accidents or incidents occurring in the future.

Recommendation made to the Ministry of Transport

7.3. There is no requirement for health professionals who provide primary health care to transport industry personnel employed in safety-critical roles to inform appropriate authorities when there are concerns regarding the fitness of duty of such personnel under their care. In this instance the driver had been prescribed a collection of medications that singularly or collectively had the potential to adversely affect his performance, yet he continued to drive freight and passenger trains.

The Commission recommends that the Secretary for Transport address this safety issue. (008/15)

7.3.1. On 12 June 2015, the Ministry of Transport replied:

> The Ministry of Transport will consider the implications and options. It will work with the NZTA and the rail industry in looking at options for addressing the intent of this recommendation.

Recommendation made to the NZ Transport Agency

7.4. Safety-critical rail workers are not required to declare prescribed medications they are taking when presenting for triggered health assessments. The driver had been prescribed a combination of medication that was known to cause performance impairment and behavioural changes, anxiety, agitated delirium and disorientation in more severe cases. The medicines also came with a warning to patients to not drive or operate heavy machinery until the effects became known. In this case, although the driver had presented for triggered health assessments, the extent of his medication was not known by a KiwiRail health professional and he continued to drive freight and passenger trains.

The Commission recommends that the Chief Executive of the NZ Transport Agency work with the National Rail System Standards Executive to ensure that it is clearly stated within the Standard that all rail workers performing safety-critical work must complete the self-assessment questionnaire when presenting for any health assessment category, these being; pre-placement, change of risk, periodic or triggered. (009/15)

7.4.1. On 9 June 2015, National Manager, Rail Safety, NZ Transport Agency replied:

> The Transport Agency confirms it will implement this final recommendation.
>
> The guidance for rail licence holders around the conduct of the different health assessments categories is currently outlined in National Rail System Standard 3 (NRSS).
>
> NRSS 3 is to be withdrawn later this year and replaced with the National Transport Commission (Australia) document – National Standard for Health Assessment of Safety Workers (2012). It is anticipated this will be in September 2015.

> The Transport Agency has confirmed with the National Transport Commission (Australia) that the intent of the National Standard for Health Assessment of Safety Workers (2012) is that the self-assessment questionnaire be completed by the rail worker when undergoing *any* type of health assessment.
>
> The Transport Agency gives an undertaking to ensure the NRSS Executive is aware of this intent and that it is clearly conveyed in the Standard.
>
> The time frame for implementation will be communicated to the Transport Accident Investigation Commission as soon as it has been established.

Recommendation made to KiwiRail

7.5. All of the relevant information was not made available to the KiwiRail health professionals and the driver's manager to enable them to make meaningful assessments of the driver's fitness for duty. The information held by the driver's private medical practitioner should either have been offered to them by the driver, or have been automatically accessible to them.

7.6. Rail workers are not required to give permission for rail medical officers to access medical records held by their private practitioners, which means the rail medical officers would not necessarily have access to all relevant medical information in order to determine their fitness for safety-critical duties.

The Commission recommends that the Chief Executive of KiwiRail introduce a system whereby KiwiRail medical professionals are automatically granted access to employees' medical records held by private medical practitioners as necessary to ensure employees who perform safety-critical roles are not impaired by prescription or over-counter medications. (011/15)

7.6.1. On 18 August 2015 KiwiRail replied:

> The new recommendation is considered to be in-line with the other recommendations made in the report, and KiwiRail therefore accepts in principle this recommendation.
>
> In order to achieve the new recommendation, it should be appreciated that other authorities will need to implement changes in order to provide the jurisdiction for allowing the disclosure of medical records held by private medical practitioners to be passed over to KiwiRail medical professionals.

8. Key lessons

8.1. Over-the-counter and prescribed medications have the potential to affect the performance of train drivers and other persons working in safety-critical roles. Any person working in a safety-critical role should notify an industry health professional of any such medication before presenting for further duty.

8.2. Drivers of trains operating under track warrant authority who do not follow the correct procedures are likely to endanger lives by causing accidents.

8.3. Train controllers who do not follow the correct procedures for controlling trains in track warrant territory are likely to endanger lives by causing accidents.

8.4. This report gives an example of KiwiRail not following or enforcing a procedure in its safety system relating to periodic health assessments. A rail operator that does not strictly enforce its own standards will risk engendering a culture of non-compliance among its employees.

Appendix 1: Information from Medsafe data sheets, revised 6 November 2013

1. Medsafe Data Sheets, Revised 6 November 2013, Amirol Amitriptyline hydrochloride, stated in part:

> Amitriptyline is a potent antidepressant with sedative properties. The mechanism of action in humans is not known. It is not a monoamine oxidase inhibitor and it does not act primarily by stimulation of the central nervous system. In broad clinical use amitriptyline has been found to be well tolerated.
>
> Amitriptyline inhibits the membrane pump mechanism responsible for uptake of norepinephrine and serotonin in adrenergic and serotonergic neurons. Pharmacologically this action may potentiate or prolong neuronal activity since reuptake of these biogenic amines is important physiologically in terminating transmitting activity. This interference with the reuptake of norepinephrine and/or serotonin is believed by some to underlie the antidepressant activity of amitriptyline.
>
> Patients and their families should be alerted about the need to monitor for the emergence of anxiety, agitation, panic attacks, insomnia, irritability, hostility, impulsivity, akathisia, hypomania, mania, worsening of depression, and suicidal ideation, especially early during antidepressant treatment. Such symptoms should be reported to the patient's doctor, especially if they are severe, abrupt in onset, or were not part of the patient's presenting symptoms.
>
> The medicine may impair alertness in some patients; operation of automobiles and other activities made hazardous by diminished alertness should be avoided.

2. Medsafe, Data Sheets, Revised 6 November 2013, Tramadol Hydrochloride 50 mg , stated in part:

> For moderate to severe pain, 50 – 100 mg as needed for relief, every four to six hours may be administered. Tramadol 100mg is usually more effective as the initial dose for more severe pain.
>
> The maximum daily dose should not exceed 400mg per day.
>
> Tramadol is known to cause Serotonin syndrome when used coricomita~ltly with other medicines that increase serotonin levels. The presence of another drug that increases serotonin by any mechanism should alert the treating physician to the possibility of an interaction. Signs of serotonin syndrome may be, for example, confusion, agitation, fever, sweating, ataxia, hyperreflexia, myoclonus and diarrhoea.
>
> Due to its sedative effect, patients should be advised to avoid driving or operating machinery whilst taking tramadol.

3. Medsafe, Data Sheets, Revised 6 November 2013, Neurontin (Gabapentin), stated in part:

> **Precautions**
>
> Antiepileptic drugs (AED), including gabapentin, increase the risk of suicidal thoughts or behaviour in patients taking these drugs for any indication. Patients treated with any AED for any indication should be monitored for the emergence or worsening of depression, suicidal thoughts or behaviour, and/or any unusual changes in mood or behaviour.
>
> **Information for Patients**
>
> Neurontin may impair your ability to drive a car or operate potentially dangerous machinery. Until it is known that this medication does not affect your ability to engage in these activities, do not drive a car or operate potentially dangerous machinery.

Effects on Ability to Drive and Use Machines

Patients should be advised not to drive a car or operate potentially dangerous machinery until it is known that this medication does not affect their ability to engage in these activities.

Other adverse effects of Gabapentin listed included:

Cardiovascular system:	hypertension.
Nervous system:	vertigo, hyperkinesia, increased, decreased or absent reflexes, paraesthesia, anxiety, hostility.
Urogential System:	Urinary tract infection.
Special Senses:	Abnormal vision.

Neuropathic Pain

The most commonly observed adverse effects reported with the use of NERONTIN in adults over 18 years of age with neuropathic pain seen in at least twice the frequency among placebo-treated patients, were dry mouth, peripheral oedema, weight gain, abnormal gait, amnesia, ataxia, confusion, dizziness, hypoaesthesia, somnolence, thinking abnormal, vertigo, rash and amblyopia.

Additional post-marketing adverse effects include; depersonalisation, urinary incontinence, delusions, hallucinations, and thinking abnormal.

4. Medsafe, Data Sheets, Revised 6 November 2013, Terazosin Tablets, Terazosin hydrochloride dehydrate 5 mg, stated in part:

Information for Patients

Patients should also be told that drowsiness or somnolence can occur with terazosin, requiring caution in people who must drive or operate heavy machinery.

5. Medsafe, Data Sheets, Revised 6 November 2013, Citalopram hydrobromide 20 mg tablets, stated in part:

Warnings and Precautions

There has been a long-standing concern that some antidepressants may have a role in the emergence of suicidality in some patients. The possible risk of increased suicidality in patients applies to all classes of antidepressant medicines, as available data are not adequate to exclude this risk for any antidepressant. Therefore, consideration should be given to changing the therapeutic regimen, including possibly discontinuing the medication, in patients whose depression is persistently worse or whose emergent suicidality is severe, abrupt in onset, or was not part of the patient's presenting symptoms. Generally, when stopping an antidepressant, doses should be tapered rather than stopped abruptly.

The following symptoms have been reported in adult and paediatric patients being treated with antidepressants for major depressive disorder as well as for other indications, both psychiatric and non-psychiatric: anxiety, agitation, panic attacks, insomnia, irritability, hostility (aggressiveness), impulsivity, akathisia (psychomotor restlessness), hypomania, and mania.

Patients with a history of suicide-related events, or those exhibiting a significant degree of suicidal ideation prior to commencement of treatment, are at greater risk of suicidal thoughts or suicide attempts, and should receive careful monitoring during treatment. In addition, there is a possibility of an increased risk of suicidal behaviour in young adults.

Some patients with panic disorder may experience intensified anxiety symptoms at the start of treatment with antidepressants. This paradoxical reaction usually subsides within the first two weeks of starting treatment. A low starting dose is advised to reduce the likelihood of a paradoxical anxiogenic effect.

As with other psychotropic drugs patients should be advised to avoid alcohol use while taking citalopram.

Effects on ability to drive and use machines

Citalopram does not impair intellectual function and psychomotor performance. However, patients who are prescribed psychotropic medication may be expected to have some impairment of general attention and concentration and should be cautioned about their ability to drive a car and operate machinery.

Recent railway occurrence reports published by the Transport Accident Investigation Commission (most recent at top of list)

RO-2013-104	Derailment of metro passenger Train 8219 , Wellington, 20 May 2013
Urgent Recommendations RO-2015-101	Pedestrian fatality, Morningside Drive level crossing, West Auckland, 29 January 2015
RO-2013-105	*Capital Connection* passenger train, departed Waikanae Station with mobility hoist deployed 10 June 2013
RO-2014-102	High-speed roll-over, empty passenger Train 5153, Westfield, South Auckland, 2 March 2014
RO-2013-106	Track occupation irregularity, leading to near head-on collision, Otira-Arthur's Pass, 10 June 2013
RO-2012-102	Train control power failure, 26 April 2012
Interim Report RO-2014-103	Metropolitan passenger train, collision with stop block, Melling Station, Wellington, 27 May 2014
RO-2013-108	Near collision between 2 metro passenger trains, Wellington, 9 September 2013
11-106	Hi-rail vehicle nearly struck by passenger train, Crown Road level crossing near Paerata, North Island Main Trunk, 28 November 2011
11-102	Track occupation irregularity, leading to near head-on collision, Staircase-Craigieburn, 13 April 2011
RO-2013-104	Urgent Recommendations: Derailment of metro passenger Train 8219, Wellington, 20 May 2013
11-103	Track workers nearly struck by passenger train, near Paekakariki, North Island Main Trunk, 25 August 2011
10-101	wrong route setting, high-speed transit through turnout, near miss and SPAD (signal passed at danger), Tamaki, 13 August 2010
11-104	Freight Train 261 collision with bus, Beach Road level crossing, Paekakariki, 31 October 2011
10-102	collision between 2 metro passenger trains, after one struck a landslide and derailed between Plimmerton and Pukerua Bay, North Island Main Trunk, 30 September 2010

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