

Report 08-102

Metro passenger train derailment, Sylvia Park, 14 April 2008 (incorporating inquiries 08-104 and 08-107) Diesel motor fires on board metro passenger trains, 3 June 2008 and 25 July 2008

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Final Report

Rail Inquiry 08-102

Metro passenger train derailment,
Sylvia Park, 14 April 2008

(incorporating inquiries 08-104 and 08-107)

Diesel motor fires on board metro passenger trains,
3 June 2008 and 25 July 2008

Approved for publication: August 2011

Transport Accident Investigation Commission

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The Transport Accident Investigation Commission (Commission) is 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 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, both domestically and internationally, of the lessons that can be learnt from transport accidents and incidents.

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Important notes

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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: Paperplus New Zealand Touring Atlas

Incident locations

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Abbreviations

ARTA	Auckland Regional Transport Authority
CCTV	Closed-circuit television
Commission	Transport Accident Investigation Commission
DMU	diesel multiple unit
NRSS	National Rail System Standard
RSMA	Rolling stock maintenance agreement
Toll Rail	Toll NZ Consolidated Limited
UTC	Universal co-ordinated time
Veolia	Veolia Transport Auckland Limited

Data summary

The occurrences

Number	Train	Event	Date	Time ¹	Location	Line
08-102	2215	derailment	14 April 2008	0707	Sylvia Park	North Island Main Trunk
08-104	9113	fire	3 June 2008	1905	Glen Eden	North Auckland Line
08-107	9150	fire	25 July 2008	1640	Waitakere	North Auckland Line

Vehicle type	ADL and ADK type of diesel multiple unit (DMU) sets
Vehicle owner	Auckland Regional Transport Authority (ARTA) (see note below)
Vehicle origin	The ADK sets were built in 1968 by Commonwealth Engineering, New South Wales and the ADL sets were built in 2 batches of 5 sets in 1981 and 1985 by A.Goninan and Co Ltd in Newcastle, New South Wales. The DMU sets were sold to New Zealand in 1992.
Licensed vehicle operator	Veolia Transport Auckland Limited (Veolia) (see note below)
Contracted maintainer	KiwiRail (see note below)
Persons involved	Veolia on board staff members and fare paying passengers
Injuries	nil across the 3 occurrences
Damage	minor derailment and fire damage to 3 DMU sets

Notes:

The train operator **Veolia** was known as Connex prior to 1 March 2006.

The contracted maintainer **KiwiRail** was known as Toll Rail prior to 1 July 2008.

The rail regulator, the **NZ Transport Agency** was known as Land Transport New Zealand prior to 1 August 2008 and was known as Land Transport Safety Authority prior to 1 December 2004.

The local government bodies Auckland Regional Council and ARTA were restructured into Auckland Council and Auckland Transport respectively on 31 October 2010.

For consistency, the terms Veolia, KiwiRail, the NZ Transport Agency and ARTA have been retained throughout the report with the exception of some references to Toll Rail.

¹ Times in this report are New Zealand Standard Times (UTC+12) and are expressed in the 24-hour mode.

1. Executive summary

- 1.1. On Monday 14 April 2008, a brake pad calliper fell from a wheel set on the fourth car of a DMU passenger train at Sylvia Park. The brake calliper fell across the rail and derailed one wheel set on the train. The train was stopped, but not before the wheel set, plus another that subsequently derailed, had re-railed. The brake calliper fell because the securing key had either failed or worked loose. Damage to the train was minimal and no-one was injured.
- 1.2. On Tuesday 3 June 2008, and again on Friday 25 July 2008, fires broke out in the area of the diesel auxiliary motors fitted on DMU passenger trains while running scheduled services at Glen Eden and Waitakere respectively. On each occasion the train was stopped and the fire extinguished by the train crews with assistance from the New Zealand Fire Service in one incident, with minimal damage to the train and no persons injured. Both fires were seated on the top of the under-slung auxiliary motors.
- 1.3. The Commission had investigated 3 previous auxiliary motor fire incidents since 2004 and found that cleanliness was an issue in all 3 incidents because oily residue that had accumulated on top of the motors had been ignited.
- 1.4. The cause of all 3 incidents in this report stemmed from inadequate service and maintenance practices at the Auckland passenger vehicle maintenance depot located at Westfield (the “maintenance depot”). The maintenance depot was not delivering a maintenance regime that was in line with sound railway engineering practices, and although the maintenance depot had to cope with more and longer trains than those for which it had originally been designed for, it might have delivered a better level of maintenance if better systems had been in place.
- 1.5. According to the Railways Act 2005 and rail participants’ safety cases, KiwiRail was responsible for maintaining the Auckland metro trains and the operator Veolia was responsible for monitoring KiwiRail’s performance to ensure that the trains were being maintained in accordance with sound railway engineering practices.
- 1.6. The contractual arrangements between ARTA (the owner of the trains), Veolia (the operator of the trains) and KiwiRail (the maintainer of the trains) were consistent with the Railways Act 2005 and the National Rail System Standard (NRSS). A blurring of responsibilities around the contracts and a breakdown of relationships at that time at a senior management level in all 3 entities were hampering the effective execution of those contracts.
- 1.7. Insufficient investment had been put into expanding and improving the efficiency of the then current maintenance facility at Westfield to cope with the planned increase in passenger rolling stock.
- 1.8. KiwiRail has taken safety actions to address the specific maintenance issues contributing to the 3 incidents, and has also made significant modifications to the maintenance depot to improve its efficiency and level of safety.
- 1.9. ARTA and KiwiRail have also allocated some stabling and servicing of the Auckland metro trains to other facilities around Auckland to alleviate the demands placed on the maintenance depot at Westfield.
- 1.10. In view of the safety actions taken, the Transport Accident Investigation Commission (the Commission) has made no new safety recommendations.

Key lessons

- Oily residue or other combustible material that is allowed to accumulate on or around combustion motors is a fire hazard.
- Sound railway engineering practice and procedures are essential for safe and reliable rail rolling stock.

- Rail maintenance facilities should be designed and maintained for the purpose for which they were being used.
- Planning for future rail systems should include all aspects of the rail system, including how rolling stock was going to be maintained.

2. Conduct of the inquiry

08-102 inquiry opened

- 2.1. On 14 April 2008, the NZ Transport Agency notified the Commission under section 13(4) of the Railways Act 2005, of an incident where a metro passenger train had derailed at Sylvia Park. The Commission opened an inquiry that same day and appointed an investigator in charge, who travelled to Auckland, conducted a site inspection, interviewed operating personnel and acquired the relevant maintenance documentation from the operator Veolia and KiwiRail, the maintainer of the train.
- 2.2. The train event recorder was downloaded and studied as part of the inquiry, and closed circuit television (CCTV) recordings were also obtained and studied.

08-104 inquiry opened

- 2.3. On 3 June 2008, the NZ Transport Agency notified the Commission under section 13(4) of the Railways Act 2005, of a fire that had occurred on a metro passenger train at Glen Eden the same day. The Commission opened an inquiry that same day and appointed an investigator in charge, who travelled to Auckland, conducted a site inspection, interviewed operating personnel and acquired the relevant maintenance documentation from the operator Veolia and KiwiRail, the maintainer of the train.
- 2.4. The train event recorder was downloaded and studied as part of the inquiry, and closed circuit television recordings were also obtained and studied.

08-107 inquiry opened

- 2.5. On 25 July 2008, the NZ Transport Agency notified the Commission under section 13(4) of the Railways Act 2005, of a fire that had occurred on a metro passenger train at Waitakere the same day. The Commission opened an inquiry that same day and appointed an investigator in charge, who travelled to Auckland, conducted a site inspection, interviewed operating personnel and acquired the relevant maintenance documentation from the operator Veolia and KiwiRail, the maintainer of the train.
- 2.6. The train event recorder was downloaded and studied as part of the inquiry.

Maintenance

- 2.7. The investigator in charge and the Chief Investigator of Accidents travelled to Auckland in May 2008 (before the 2 fire incidents occurred) and conducted an examination of the maintenance depot at Westfield where all the Auckland metro trains were maintained. Maintenance staff and their managers were interviewed and maintenance processes were examined. Seven internal and external audit reports on the maintenance depot were sourced and cross-referenced with the Commission's own examination to gain a fuller picture of how the facility operated.
- 2.8. Copies of the contractual arrangements that existed between KiwiRail, ARTA and Veolia were sourced and studied. The safety cases that KiwiRail and Veolia had submitted to the NZ Transport Agency in support of their rail licence applications were also obtained and studied.
- 2.9. In June 2008, the investigator in charge and the Chief Investigator of Accidents returned to Auckland and interviewed Veolia management and ARTA management in order to understand the responsibilities each entity had for train maintenance, the supply of passenger services and the provision of locomotive engineers, and how these contracts related to the KiwiRail and Veolia safety cases and the NRSS. This subsequent visit to Auckland coincided with the first fire incident at Glen Eden.
- 2.10. As all 3 inquiries progressed it became apparent that an issue common to all 3 was the standard of maintenance. The Commission at the time had already made recommendations to the Chief Executive of the NZ Transport Agency regarding maintenance standards in the rail industry which were still open at the time.

- 2.11. The Commission then decided to consolidate the 3 inquiries into one under the direction of a single investigator in charge.
- 2.12. Discussions were held with the Ministry of Transport and the NZ Transport Agency on the contractual arrangements for maintenance of the Auckland metro trains and the Commission obtained an independent legal opinion on where responsibilities for maintenance lay.
- 2.13. On 25 May 2011, the Commission approved draft final report 08-102 for circulation to interested persons for comment. The draft final report was sent to senior KiwiRail management members and Veolia, Auckland Transport, the NZ Transport Agency and the Ministry of Transport.

3. Factual information

3.1. Train 2215 derailment at Sylvia Park

- 3.1.1. On Monday 14 April 2008, Train 2215 was the scheduled 0812 Veolia passenger service from Britomart to Papakura. The train was a 4-car DMU set consisting of ADK682 (leading), ADB772, ADB774 and ADK684 (see Figure 1).

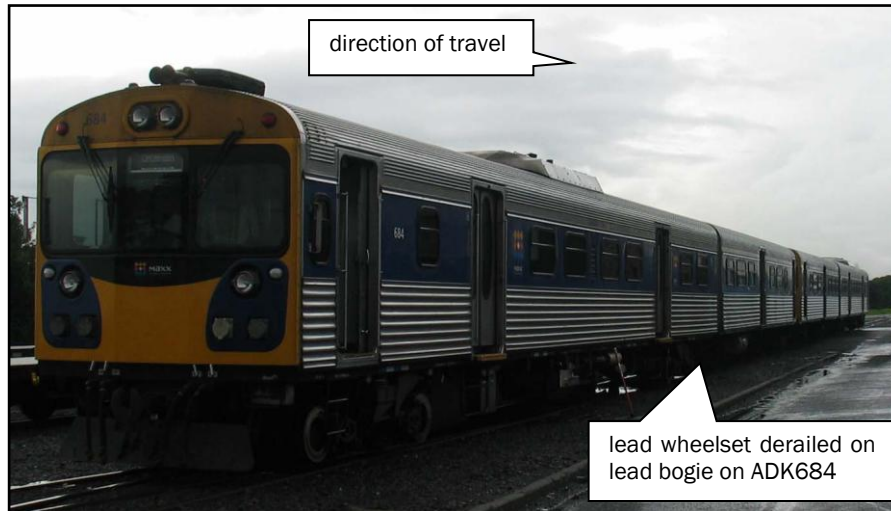


Figure 1
The ADK 4-car set that derailed at Sylvia Park

- 3.1.2. Train 2215 was crewed by 5 Veolia staff members, a driver, a train manager and 3 passenger operators and was conveying 34 passengers seated throughout the 4 cars at the time of the incident. All staff members held current certification for their roles.
- 3.1.3. Train 2215 left Britomart 6 minutes late at 0818 and the journey to Sylvia Park was reported to be uneventful. CCTV footage showed the train stopped at Sylvia Park at 0837 and a number of passengers were seen to alight and board.
- 3.1.4. Train 2215 departed from Sylvia Park at 0838 after a 35-second stoppage. About 2 seconds after departing ADK684 began to shake and rattle as though it had derailed. A rail infrastructure employee riding in the carriage pressed the passenger emergency stop button, stopping the train but not before the shaking had stopped, the 2 wheel sets having apparently re-railed at the curved road of a trailing main line turnout over which the train had just passed. The turnout was located about 200 metres beyond the point of derailment. There were no injuries.
- 3.1.5. The CCTV showed the leading end of the vehicle lurching to the left in the direction of travel, away from the platform.
- 3.1.6. A driver from a following train assisted the Veolia crew in examining the running gear of the DMU set. They did not deduce that a derailment had occurred when they saw the damaged equipment, but after consultation with a Veolia supervisor the train continued at slower-than-normal speed to the next station at Westfield after a 28-minute delay. All the passengers alighted at Westfield and the DMU set was routed to the maintenance depot.

Examination of the site and ADK684

- 3.1.7. Initially it was not understood what had occurred at Sylvia Park. Some hours later when the brake disc was examined, it was found to have been damaged and 2 brake callipers were missing (see Figure 2). Two other brake callipers from the same bogie were damaged as well.

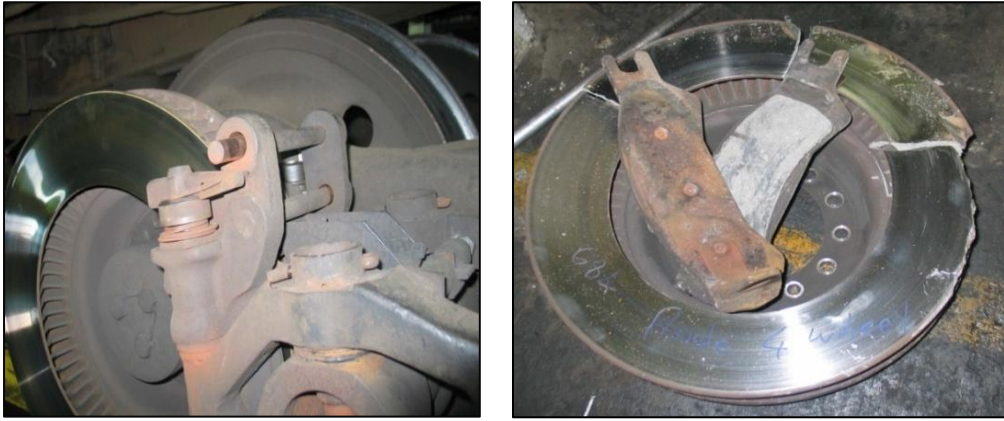


Figure 2
 Photograph of serviceable ADK braking system (left),
 and damaged brake disc and callipers from ADK684 (right)

3.1.8. An inspection at the derailment site revealed witness marks on the rail and the missing calliper was found nearby. A shallow gouge mark was seen where the left-hand wheel flange had climbed over the rail head then struck a concrete sleeper (see Figure 3).

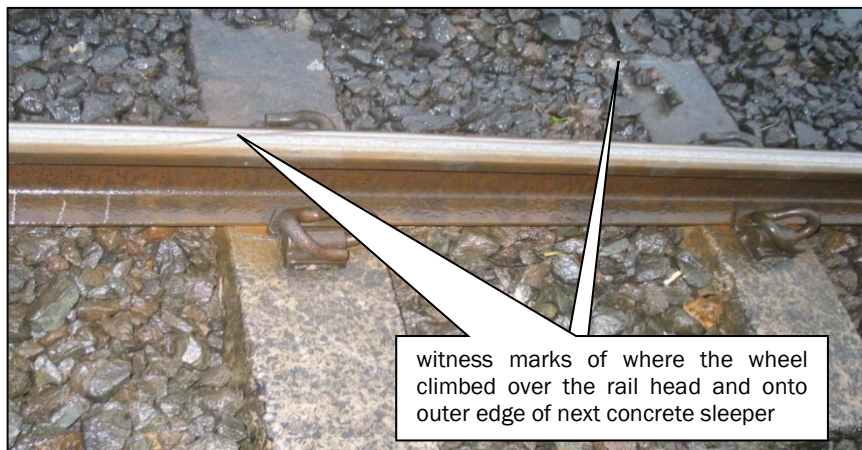


Figure 3
 Witness marks on the track at Sylvia Park

3.1.9. The brake calliper had become disconnected from its mounting backing-plate located on the outside of the brake disc (see Figure 4).



Figure 4
 From left to right, brake calliper,
 backing plate and disc brake arrangement on outside of wheel

- 3.1.10. An investigation into the failure mechanism that had resulted in the brake calliper disconnecting from its backing plate on ADK684 concluded that the securing key had either fractured or had worked out from its slot at the top of the backing plate following the failure or loss of the split pin. The key and its associated cap, spring and split pin were also ejected, but despite an area search at the point of derailment, the 3 items were not found. The calliper showed damage that indicated a wheel may have ridden over it.
- 3.1.11. An examination of the other 8 ADK 2-car sets after the incident showed that the condition of the keys and split pins varied (see Figure 5).

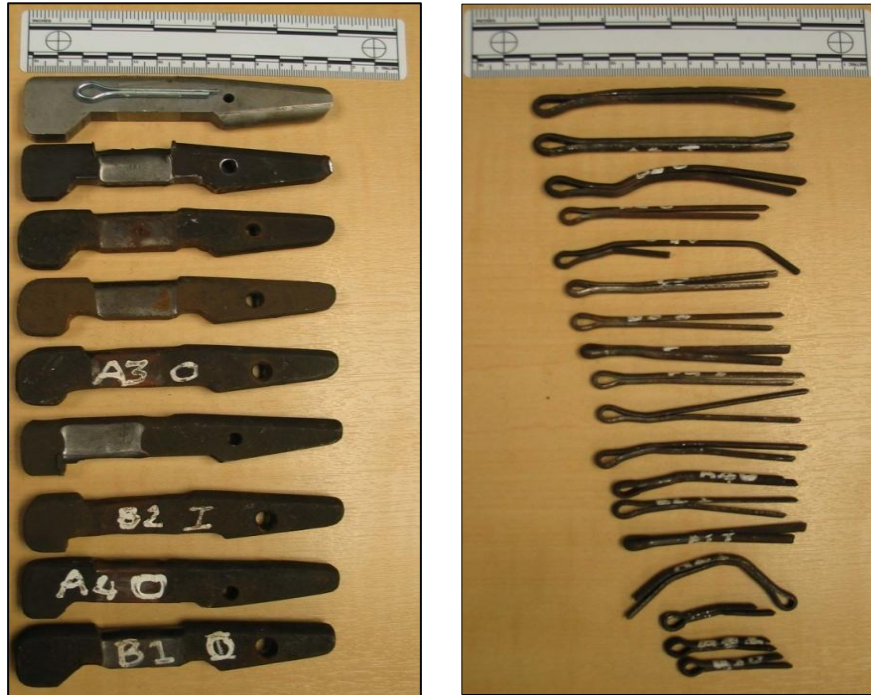


Figure 5
 Photographs showing a selection of worn keys and split pins recovered from other ADK vehicles (top left shows a new key and split pin for comparison)

- 3.1.12. In a matter of days following this incident, KiwiRail changed the process for replacing keys and split pins (refer to the “Safety actions” section of the report for detail).

3.2. Fires on Trains 9113 and 9150

Train 9113, fire at Glen Eden

- 3.2.1. On Tuesday 3 June 2008, Train 9113 was the scheduled 0800 Veolia passenger service from Waitakere to Britomart. The train consisted of a 4-car DMU set with ADL804 (leading), ADC854, ADC858 and ADL808.
- 3.2.2. Train 9113 was crewed by 5 Veolia staff members, a driver, a train manager and 3 passenger operators and was conveying almost a full load of passengers throughout the 4 cars. All staff members held current certification for their roles.
- 3.2.3. Train 9113 departed Waitakere on time and the journey to Glen Eden was reported to be uneventful. CCTV footage showed the train stopped at Glen Eden at 0836. There were a large number of passengers waiting on the platform. Dark smoke was seen coming from the exhaust port on the roof of ADC854, the second car in the train. The train manager alerted the driver, who then went to see what was causing the fire. The locomotive engineer returned to his driving position and shut down the auxiliary motor. This action resulted in light coloured smoke billowing from under the car, so the train crew evacuated all the passengers.

3.2.4. The fire was extinguished by the train crew with help from the Fire Service. There were no injuries. The train was taken out of service and continued to the maintenance depot at Westfield.

Train 9150 fire at Waitakere

3.2.5. On Friday 25 July 2008, Train 9150 was the scheduled 1933 Veolia service from Britomart to Waitakere. The train consisted of a 2-car DMU set with ADC858 (leading) and ADL808.

3.2.6. Train 9150 was crewed by 3 Veolia staff members: a driver, a train manager and one passenger operator, and was conveying one passenger after it left Swanson, the station before Waitakere. All staff members held current certification for their roles.

3.2.7. At about 2035, when the train was travelling through the Waitakere tunnel (between Swanson and Waitakere), a member of the crew noticed smoke and sparks coming from under the train. The train continued the short distance to Waitakere station, where after examination the auxiliary motor was shut down and the fire was extinguished by the train crew. There were no injuries.

3.2.8. The train was taken out of service and returned to the maintenance depot at Westfield.

Examinations of ADC854 and ADC858

3.2.9. The examinations of the ADC854 and ADC858 cars showed fire damage on top of the auxiliary motors which were beneath the carriage floor in a soundproofed enclosure. Oily residue from the motor was known to accumulate in the area between the underside of the floor and on top of the motor, and was observed to have accumulated on other cars inspected at the time.

3.2.10. The need to clean this area had been highlighted in past Commission reports, most recently in report 05-108 published in June 2006. The report contained recommendation 033/06 issued to ARTA that it confirm with Toll Rail that the under-frame on the DMU fleet was currently at an acceptable standard of cleanliness and that the established inspection and maintenance procedures were appropriate to maintain those standards (refer to the "Safety actions" section of the report for detail).

3.2.11. The auxiliary motors drew air through vents near the top of the carriage and through a set of primary and secondary air filters in an integral cylindrical unit. An inspection of these air filters and associated air ducting revealed deformation of both, with the secondary (finer) filter on one having imploded (see Figure 6).

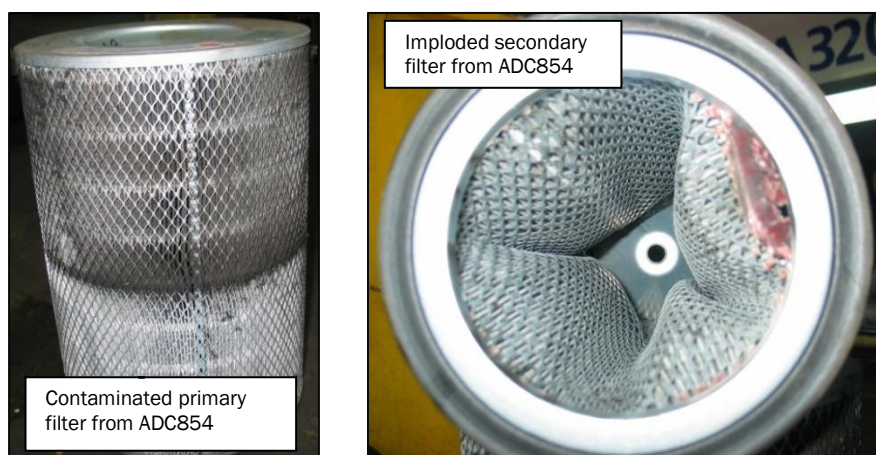


Figure 6
The damaged air filters

- 3.2.12. The air filters from ADC854 were sent to an independent laboratory for analysis. The following conclusions were drawn from this analysis:
- the primary filter was blocked with predominantly iron-bearing particles, about 50% of which were smaller than 53 μm^2 in a liquid medium (the contaminant)
 - the contaminant contained a high proportion of solid particles in a liquid medium that may have been oil but this could not be confirmed
 - the contamination may have originated from a source likely to contain concentrations of iron-bearing minerals such as metallic dust. Possible sources included steel mills, iron foundries and the braking system on the DMU sets
 - the secondary air filter probably collapsed due to an appreciable pressure drop across it caused by the blockage of the primary filter.
- 3.2.13. Discussions with KiwiRail staff were inconclusive as to the source of the contamination. Steel particles (dust) were a by-product of wearing on the cast iron brake blocks fitted to some rail vehicles, and the trains were stabled close to a steel processing plant. Some trains were stabled alongside the train washing facility, which could have resulted in the ingestion of water/debris from the washing process. The auxiliary motors were left running during these periods.
- 3.2.14. The auxiliary motor on ADC854 at Glen Eden did not need to be removed and after damaged wiring had been replaced, the set was returned to service. No repairs were needed to the auxiliary motor on ADC858 at Waitakere before the set was returned to service.
- 3.2.15. There had been a recent change to the supplier of the air filters, and although this was not considered by KiwiRail to be a factor, it reverted back to its original supplier and decreased the time frame for inspection of the air filters from 12 to 6 weeks (refer to the “Safety actions” section of the report).

3.3. The Auckland metro train system

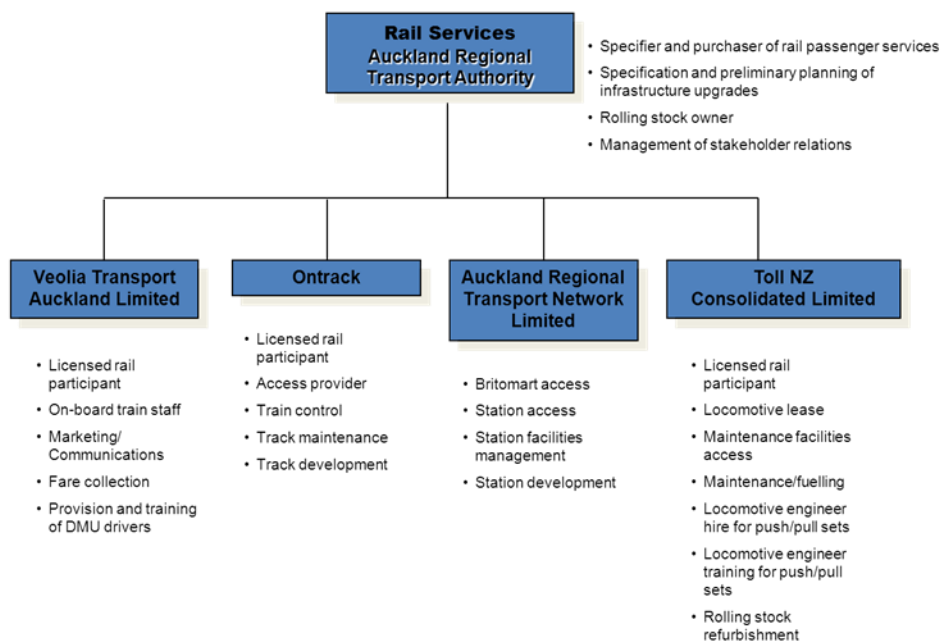
An overview

- 3.3.1. The diagram below shows the entities involved in the Auckland metro train system during the period when the incidents occurred, and at the time when the Commission reviewed the system. Toll Rail became KiwiRail³ in July 2008 and at the same time KiwiRail acquired the management responsibility of network provider, previously performed by Ontrack.

² μm is one millionth of a metre.

³ Reminder: for consistency, the term KiwiRail has been retained throughout the report.

Auckland rail passenger system: participants roles and responsibilities between April and July 2008



3.4. Regulatory framework

- 3.4.1. A document called Rail Safety Licensing and Safety Assessment Guidelines (the guidelines), first published in 2000, was updated in April 2006 by the NZ Transport Agency following the passing into law of the Railways Act 2005. The 2006 guidelines (from which the following information was extracted) related to the safety management of railways in New Zealand and set out requirements of the Government with respect to safety. The guidelines described the onus on each rail participant to take all practicable steps to ensure that none of the rail activities for which it was responsible caused, or was likely to cause death or serious injury to individuals.
- 3.4.2. The Government adopted a co-regulatory approach in defining its policy and designing the applicable legislation, meaning that the technical and operating standards that formed a rail participants' safety systems were the responsibility of the individual rail participants. To gain a licence, each applicant had to show, through the submission of a safety case, that it had taken all practicable steps to ensure that all rail activities were safe. Reference needed to be made to the underlying safety system and in particular, a comprehensive risk assessment. The risk creators (the rail participants and licence holders) carried the responsibility for managing their operations safely.
- 3.4.3. The guidelines said that the key idea behind the rail safety system was that the rail participant was required to "say what you do; do what you say".
- 3.4.4. In September 2007 the Commission published 2 rail reports that highlighted shortcomings in maintenance of the rail infrastructure (Report 05-116) and shortcomings in the construction and commissioning process for new rolling stock (Report 05-123). The Commission recommended that the Chief Executive of the NZ Transport Agency (then Land Transport NZ) take note of those shortcomings and take a more strategic approach to risk management of the rail industry, and in particular that he take more of a leadership role in setting, changing and monitoring compliance with national standards for rail infrastructure and rolling stock (recommendation 035/07).

- 3.4.5. The Chief Executive agreed with the recommendation and over the last 4 years has taken a number of initiatives to work more closely with rail industry to address the short-comings, helped in more recent years with the formation of KiwiRail and the resulting consolidation of rail services into one entity. In particular the NZ Transport Agency has been working with industry to close out a number of the Commission's historical and more recent recommendations. The Commission approved the change of status of recommendation 035/07 to closed acceptable in October 2010.

National Rail System Standard

- 3.4.6. The NRSS was a series of 11 standards or "manuals" designed to provide guidance and set minimum standards for rail access providers and rail operators using the national rail system. The overview of NRSS/2 (Safety Management) described the NRSS as documents designed to be integrated into the rail safety systems of individual access providers and operators, and to provide guidance on the implementation of the requirements of the Railways Act 2005 (NRSS/2, 11 June 2007).
- 3.4.7. Section 2 of NRSS/6 specified that rail operators had to ensure that their rail vehicles were designed, constructed, maintained and operated according to good, sound railway engineering practice and the requirements of their licences and the NRSS.
- 3.4.8. Section 4 of NRSS/2 concerned contract services and specified that where maintenance services were outsourced, the contracts between the parties had to include detailed requirements for service provision to ensure that the services were provided in full compliance with the rail operator's standards and procedures detailed in its safety system documentation.
- 3.4.9. Section 4 dealt with the typical situation where an access provider or rail operator (the licence holders) outsourced maintenance services to a party that was not itself a licence holder. The clause did not directly address the situation where both parties to the maintenance outsourcing contract were rail operators, as was the case with KiwiRail and Veolia. This aspect was dealt with in the contractual arrangements between Veolia and KiwiRail.

3.5. Contractual arrangements

- 3.5.1. Auckland Regional Council had a role in the operation and future planning of the Auckland metro train system. On 19 March 2004, Auckland Regional Council entered into a management services contract with the predecessor to Veolia. The contract was known as the "passenger services agreement".
- 3.5.2. ARTA was established in December 2004 by the Local Government (Auckland) Act 2004 as a separate entity reporting to Auckland Regional Council. It was developed to oversee a co-ordinated regional multi-modal transport network within the greater Auckland area. Neither Auckland Regional Council nor ARTA was required to submit a safety case, because neither was considered a rail operator. A letter from the NZ Transport Agency in June 2005 confirmed that only rail access providers and rail operators were required to be rail licence holders. ARTA as a rail vehicle owner did not meet this criterion. In the same letter the NZ Transport Agency referred to the intent of the Railways Act 2005 being to address the risks that arose from a "direct relationship with the public".
- 3.5.3. Veolia submitted a safety case to the NZ Transport Agency to become a rail operator and allow it to run trains on the national rail system. A condition of being a rail operator was that the agency performed safety assessments to ensure that the rail operator was compliant with the provisions of its safety case and supporting safety systems.
- 3.5.4. The passenger services agreement between Auckland Regional Council and Veolia required Veolia to enter a contract with KiwiRail for the maintenance of the passenger rolling stock. The terms of the contract were negotiated between Auckland Regional Council and KiwiRail, with the initial contract being established on 22 August 2004, and updated and signed by Veolia and KiwiRail on 1 February 2007. The contract was referred to as the "rolling stock maintenance agreement" (RSMA). The contract required Veolia to manage and administer the day-to-day obligations that KiwiRail was to deliver regarding train availability and maintenance requirements.

- 3.5.5. KiwiRail was a licensed rail operator and its safety case included providing rolling stock maintenance, including the contractual arrangements to maintain the ARTA-owned and Veolia-operated fleet.
- 3.5.6. ARTA said that its responsibility was to specify service requirements and to provide Veolia with a set of broad targets, such as, the number of services required to be run during a peak hour on a given line. Veolia was then required to produce a timetable taking into consideration signalling headway⁴, rolling stock, staff resourcing and other operational parameters. ARTA approved the timetable design.
- 3.5.7. The maintenance depot at Westfield was the only facility used for maintaining the metro fleet. To manage the contract, a schedule of meetings was held between KiwiRail and Veolia as follows:
- a daily operations meeting to review rolling stock availability and reliability
 - a weekly operations meeting to address production issues and record the allocation of responsibility for train cancellations and rolling stock “not on time” reportings. The addressing of contractual issues was excluded from this meeting. An ARTA representative also attended this meeting
 - a monthly representative meeting that covered 7 specific agenda items. ARTA representatives attended this meeting.
- 3.5.8. Even though the RSMA was between Veolia and KiwiRail if either party wished to vary the contract it was required to submit a formal request to ARTA; the same applied if either wished to vary the asset management plan. ARTA negotiated directly with KiwiRail to develop the rail infrastructure, such as developing satellite train stabling sites at Papakura, Henderson and other locations, and to develop new rolling stock, such as the introduction of the push/pull trains.
- 3.5.9. At the time of these incidents Veolia’s understanding of the RSMA was that it was intended to provide a “step on/step off”⁵ process for Veolia; it held this belief because KiwiRail was required to be assessed for compliance with its safety case and supporting safety systems by the NZ Transport Agency. Veolia considered that it met its obligations as a rail operator to comply with its safety case by participating in the scheduled maintenance meetings with KiwiRail and ARTA, and through the independent rolling stock condition audits conducted by ARTA from time to time.
- 3.5.10. Veolia said that it interacted with KiwiRail on the day-to-day issues, but on the other hand, ARTA interacted directly with KiwiRail on project matters that required capital expenditure. Veolia added that it did not carry anyone with mechanical engineering knowledge within its organisation and relied on the expertise in ARTA’s mechanical engineering team. Because ARTA was a named party in the RSMA, Veolia saw that the ARTA engineers had a lot of direct contact with the maintenance depot and KiwiRail engineers.
- 3.5.11. During interviews with senior management from Veolia and ARTA, it became evident that each had a level of frustration over the performance of the other. Veolia felt that ARTA was too engaged with KiwiRail on maintenance matters and that it was not being kept informed, and ARTA felt that Veolia was not engaged enough with KiwiRail on maintenance matters.

3.6. Maintenance

- 3.6.1. A KiwiRail management plan for the Auckland passenger rail fleet dated December 2007 said that the DMU sets had an anticipated 20-year life from their introduction to New Zealand in 1993. The management plan said that KiwiRail had continued to improve on its maintenance management and training systems after taking direct control of the passenger vehicle maintenance depot at Westfield in February 2006.

⁴ The defined time period before a second train can follow a preceding train on green signals.

⁵ A phrase used to describe Veolia’s taking over from, and handing back to, KiwiRail of train set.

- 3.6.2. The plan went on to say that workplace skills development for engineering staff throughout New Zealand was then being addressed nationally, particularly through the reinstatement of a coordinated apprentice training scheme. KiwiRail had been fortunate in having a stable engineering workforce that collectively held and passed on knowledge gained in many years of experience. This workforce was ageing, and growth in staff requirements at the maintenance depot meant that, for the first time in many years, there had been a concerted effort to recruit new employees, including apprentices.
- 3.6.3. The requirement to improve on the quality and quantity of technical information and to provide well designed career paths for employees was acknowledged in the plan. Maintenance and task instructions were being developed to assist staff by providing them with the required information to be able to perform routine tasks to a uniform standard with a minimum of one-to-one instruction.

KiwiRail safety system code requirements

- 3.6.4. KiwiRail’s mechanical code M2000 determined that the DMU sets would undergo a daily servicing check at the maintenance depot, as well as a series of periodic maintenance checks as follows:
- A-check routine every 6 weeks with an upper limit of 8 weeks
 - B-check routine every 3 months with an upper limit of 5 months
 - C-check routine every 6 months with an upper limit of 8 months
 - D-check routine every 12 months with an upper limit of 14 months.

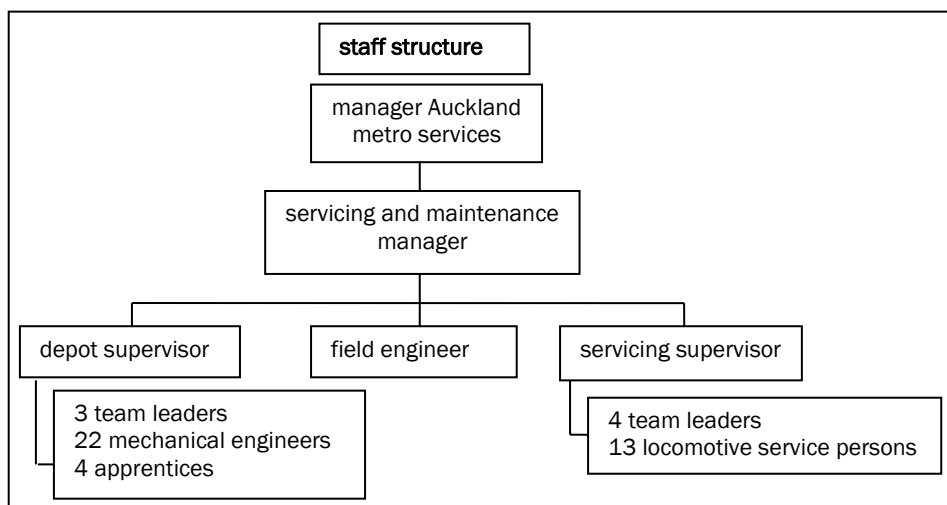
The check routine process included the requirement to complete all lower-order check routines.

- 3.6.5. The following table shows the recorded check routines performed on the vehicles involved in the incidents:

Vehicle	Check cycle	Date completed	Comment
ADK684	A	10 April 2008	4 days prior to derailment at Sylvia Park
ADC854	A	29 May 2008	5 days prior to fire at Glen Eden
ADC858	B	19 June 2008	36 days prior to fire at Waitakere

The Auckland passenger vehicle maintenance depot at Westfield

- 3.6.6. The following table shows the staff structure of the maintenance depot:



- 3.6.7. The maintenance depot was the sole facility available for maintaining the Auckland metro passenger fleets of DMUs and push/pull trains that encompassed 36 (mostly fixed-consist) sets. The maintenance depot at Westfield was one of several similar facilities located throughout the country that maintained KiwiRail’s fleet of locomotives and freight wagons.

- 3.6.8. KiwiRail utilised a contractor, United Group Limited, to maintain all the locomotives, including those leased to ARTA that provided motive power on the push/pull trains and freight trains, but KiwiRail managed the maintenance of the Auckland metro passenger fleet.
- 3.6.9. Because each of the 3 incidents involved maintenance issues, the Commission broadened its inquiry to include an examination of the maintenance depot and an audit of its processes. A number of other internal and external audits and assessments of the maintenance depot were also examined, as shown in the following table:

Date	Type of audit /review	Conducted by
June 2007	annual rolling stock condition assessment	Halcrow of Australia commissioned by ARTA
July 2007	business assurance and internal review	Toll Rail in accordance with Toll Group divisional review plan
March 2008	ordinary safety assessment	NZ Transport Agency in accordance with statutory requirement
April to July 2008	The Commission launches investigations into the 3 incidents covered in this report	
March 2009	ordinary safety assessment	NZ Transport Agency in accordance with statutory requirement
October 2009	Maintenance agreement process review	Arup for Veolia

- 3.6.10. The Commission held discussions with the following maintenance depot staff:
- the management team comprising the manager Auckland metro service (depot manager), the servicing and maintenance manager (maintenance manager), the depot supervisor and the field engineer
 - 5 maintenance and fitting staff (maintenance team) comprising 2 team leaders and 3 mechanical engineers. The 5 members included 2 long-serving New Zealand rail industry tradesmen, and 2 tradesmen and one engineer with overseas railway rolling stock maintenance experience
 - the servicing supervisor and servicing staff (servicing team) comprising one supervisor, one team leader and 2 servicing assistants. The supervisor had overseas experience, the team leader was a long serving New Zealand rail industry tradesman and the 2 assistants were recently employed and held no trade qualifications.
- 3.6.11. The depot manager said that his role was to provide oversight of all the maintenance functions that KiwiRail provided to Veolia and ARTA for passenger trains. The Auckland passenger vehicle maintenance depot had been set up as a separate business unit within KiwiRail.
- 3.6.12. The field engineer said that his role was to provide technical expertise, and since the acquisition of the DMU sets he had been principally involved with setting up various instructions and overseeing modifications of and improvements to the sets. He said that he had become more involved with getting instructional documentation up to date because the fluid workforce situation meant that trade staff were mostly recruited from outside the rail industry. Previously the maintenance workforce had been recruited from the ranks of apprentices undertaking trade training within the rail industry.
- 3.6.13. The maintenance manager said that a nightly visual check covered the serviceability of the braking equipment and all other running gear to ensure all the parts were in place. The depot manager added that the brake components, including the brake callipers, pads and blocks should last 3 months but were then also included in the 6-week check. The check requirements were covered in the M2000 code, which was not explicit on some of the visual aspects of the check requirements. Rather the code relied on people with railway experience looking at a piece of equipment and making a judgement about its serviceability.

- 3.6.14. The depot supervisor said that maintenance staff had fitter or diesel mechanic backgrounds, but servicing staff were not required to be trade qualified. The servicing staff were supervised across all shifts by a qualified team leader.
- 3.6.15. The maintenance team explained that their role was to undertake the programmed maintenance checks on the DMU sets. There was a small team of casualty fitters who worked late shift and night shifts to fulfil a “trouble shooter” role for failures that were recorded on the 54D/FMP repair recording systems when the DMU sets had returned from service.
- 3.6.16. The servicing supervisor said that he had a split role in that he was responsible for servicing the freight locomotive and passenger fleets. To undertake that responsibility he had 4 team leaders and 13 service engineers reporting to him. His staff were rostered to provide 24 hour coverage. When the vehicles arrived at the maintenance depot, they checked the 54D/FMP system for reported defects and replenished consumables such as fuel, oil and water. They checked the brake piston travel and were permitted to replace worn brake items if necessary. If any defect was identified during a check, the team leader was advised so that the fitting staff could be tasked with the repair.
- 3.6.17. The maintenance depot staff felt that there was no undue pressure placed on them and that the availability of further push/pull trains had made things easier. There was general consensus that the maintenance depot facility could be improved immensely, for example to remedy a situation in which the tracks on which work was carried out not long enough to hold a push/pull train which created down time when moving the train in order to continue with the check process.
- 3.6.18. Servicing staff were hampered in undertaking their tasks by the constricted size and layout of the maintenance depot which the supervisor described as a locomotive depot now deputising as a passenger vehicle maintenance depot. For example, he described the fuelling operation as inadequate in not being able to record accurately the dispensing of fuel on individual locomotives or DMU sets. He felt that time could be saved if the system were modified.
- 3.6.19. The team leader explained that having one fuel-recording meter meant that only one vehicle could be fuelled at any one time, but the facility catered for 30 passenger train sets and a number of freight locomotives. This meant that errors did occur in the recording of fuel supplied to a particular vehicle during periods when vehicles were queued at the pump.
- 3.6.20. The team leader explained that although his responsibility was to oversee the servicing assistants, and he reported to the servicing supervisor, he spent the majority of his time performing maintenance tasks such as repairs and checks. He said that because of congestion in and around the repair facility, the assistants needed to service several vehicles at once rather than complete the servicing of one vehicle before moving to the next, and this situation meant that some tasks could be overlooked.
- 3.6.21. During discussions with the maintenance depot staff they raised a number of issues or points of interest relevant to this inquiry. The comments have been paraphrased and grouped by topic or issue as follows:

Staff

- hours of work, environment and medium wages at maintenance depot deterred job applicants
- new staff were mostly employed from outside of the rail industry, including some from overseas
- the maintenance depot resourcing was then currently down on staff allocation with, for example, 4 casualty fitters working an 8-person roster
- some staff had been working for between 130 and 140 hours a fortnight
- some staff said they were feeling tired, creating a risk of injury
- staff shortages led to constant interruptions during routine work.

Processes

- supporting DMU technical information arrived in haphazard condition from Perth
- it was difficult to extract subsequent DMU technical knowledge from Perth
- newly recruited staff did not have current rail mechanical engineering knowledge
- the maintenance depot management had embarked on a process to provide task instructional material to counteract the lack of such knowledge
- the maintenance depot had lost its International Organization for Standardisation Organization (ISO) accreditation
- staff had to apply a level of common sense when following M2000 code instructions
- manuals that were provided were uncoordinated and lacked alignment with specific tasks
- there were no documented wear limits or change-out procedures for the ADK brake components
- engine repair manuals were extensive but, for example, bogie repair manuals were not
- an experienced person would need 12 months to create an integrated library of task manuals
- the manuals would need to cover the variety of DMU and push/pull trains operating in Auckland
- trade-qualified staff used their trade experience to complete some non-documented repair work
- trade-qualified supervisors were not always available to oversee work done by unqualified servicing assistants
- peripheral task specific training was provided, but no formalised training for core tasks
- there was no training package for tasks expected of the servicing assistants, who were likened to forecourt attendants
- a previous maintenance provider had improved DMU train reliability
- uncertainties over electrification timeframes created difficulties with long-term maintenance planning for the current DMU fleets
- ARTA was sympathetic to the maintenance depot's on-going DMU fleet maintenance planning issues
- high customer demand and manpower availability made it difficult to undertake any development work on the DMU fleets
- tool management and sharing between KiwiRail and United Group Limited were also problems faced on a regular basis by the team members. Time was wasted and frustration occurred while members searched for tools in other places in the depot
- missing brake blocks on the push/pull sets were seen 2 or 3 times per month, which was a national problem for which design engineers had been working on a solution for 12 months.

3.6.22. An internal Toll Rail business assurance and internal review dated July 2007 made the following comment on the maintenance depot site:

- The maintenance depot does not have a repair and maintenance depot that fully supports its maintenance and repair efforts on ARTA train sets. The service depot is too small to accommodate ARTA train sets; for example the push/pull sets must be moved at least one additional time to fuel both the generator set and the locomotive. Re-blocking the brakes on the ARTA train sets means multiple moves, as the pit is not long enough
- Space for spare parts and inventory is at a premium and often results in items being stored in any available space around the facility including outside the building
- The lack of space creates problems accessing, controlling and monitoring the spare parts inventory. Maintenance and repair efficiencies are impacted by the need to move train sets multiple times. There is an increased risk to staff as trains are moved multiple times
- The audit report concluded by saying that the controls and processes surrounding the Auckland passenger vehicle maintenance depot were considered to be inadequate. Toll Rail said that an inadequate review rating meant that key controls were missing or were ineffective, presenting substantial risk to the business and required immediate action. There were major non-compliances with policies and procedures and significant time and resources were required to rectify deficiencies.

These comments were consistent with what the Commission learned through its own examination.

3.6.23. The process review of the maintenance agreement between Veolia and KiwiRail conducted by Arup for Veolia was extensive and focused not only on the maintenance depot but also the management of the agreement and relationship issues between the 3 stakeholders: ARTA, Veolia and KiwiRail. With respect to the maintenance depot. The review concluded that:

KiwiRail was limited in its ability to perform to a standard that could be considered leading practice. Maintenance practices at KiwiRail are not modern or optimum. Whilst it would be difficult to achieve leading practice maintenance performance in the existing facilities with the existing rolling stock fleet such as they are, it would be possible to enhance performance through the adoption of modern practices and principles. The adoption of a modern ERP (supply and purchase) system is a good start, but in maintenance operations, effective technical data capture and analysis is vital if continuous improvements are to be made to practices, schedules and ultimately, safety and reliability of the rolling stock.

3.6.24. KiwiRail acknowledged in January 2010 that the maintenance depot had remained unchanged from well before 2006. Toll Rail had participated in a number of projects in conjunction with ARTA to extend some of the tracks (for example) in the maintenance depot. The latest project had reached the point where design and associated rail siding layout work was completed. It was considered that the project would have caused some operational problems during construction but ultimately it would have provided an enhanced facility to match the ever-growing fleet. The proposal did not progress and as a result maintenance continues to be carried out in “a less than ideal facility”.

3.6.25. The audit report conducted by Halcrow in June 2007 included the following score ratings based on its condition inspection of a sample of ADK/ADB vehicles:

Vehicle	Number sampled	2007 expected score (weighted average)	2007 actual score (weighted average)	Variance (actual versus expected)
ADK	3	95%	92%	minus 3%
ADB	3	95%	92%	minus 3%

The report noted that some of the keys on the bogie were fitted with split pins that appeared not suitable for service which was consistent with the description of the keys and split pins recovered from the ADK sets (refer Figure 5).

3.6.26. The NZ Transport Agency audit report of May 2008 included the following observations made at the maintenance depot:

- the maintenance depot had received an internal audit report (KiwiRail business assurance and internal audit) which identified a number of issues. The word “inadequate” was used several times within the report; for example, the opening statement stated that overall:
 - the control and processes surrounding the Auckland passenger vehicle maintenance depot were considered inadequate
 - the measuring and monitoring controls surrounding the fuel dispensing system used in the maintenance depot were inadequate
- site safety was another area where the term “inadequate” was used. For example taggers were able to access vehicles, and doors not being secured correctly after the trains were stabled. As these were passenger vehicles this represented an area of concern
- the maintenance depot had a process that allowed the re-use of split pins within the braking systems. However there was no process for determining that the split pins were fit for purpose i.e. no non-de-structuring-testing or specialist review. This element was left to the rail fitters’ prerogative to determine
- the Commission was currently reviewing why brake shoes are continually being discovered along the rail corridor
- several rail documents were reviewed during the assessment. Maintenance documents that required signature/staff ID numbers were lacking these required authorisations
- within the maintenance depot the requirement for chocking rail vehicles was not being effectively adhered to. This presented a danger to maintenance staff and visiting personnel
- the assessment team observed that the warning bell which was to trigger when a train entered the maintenance shed was malfunctioning. The explanation offered was that it was due to rain ingress and an electrician had been called
- within the maintenance depot the assessment team observed oil and fuel all over the flooring surface. This oil and fuel was then transferred into rail vehicles when operators embarked. As a result there was a potential to transfer these oils etc. into the cabs and public access areas of the rail vehicles
- the servicing record sheet: ADL and ADK, DMU Sets and Railcars: maintenance depot form 002A was reviewed. It was established that the procedure for examining brake pads was not available within the servicing facility. The assessment team asked 2 team leaders what the minimum brake pad requirements were and where they were located [documented]. The responses ranged from “16 millimetres down” to “the cross hatch on the pad”. Only after the intervention of the maintenance depot manager was the correct wear limit identified [from the documents]
- a review of driver safety observations was undertaken. It was established that several maintenance depot rail vehicle drivers (service engineers, team leaders and service personnel) had not had their safety observations (level A and B etc.) conducted within the specified KiwiRail requirements. The records presented identified that several observations were overdue by 100 days or more.

3.7. Australian comparison

Perth

- 3.7.1. The Commission contacted the previous operator/maintainer of the DMU sets in Perth. One of the maintenance engineers, who had 18 years' experience with the vehicles, said that he could recall one incident with a brake pad coming off the brake calliper. The brake pad was never found. A fleet-wide examination found one other bogie with a missing split pin and 2 other bogies with weak springs.

Adelaide

- 3.7.2. The Commission contacted the South Australian Government rail regulator in order to compare rail incident notifications received by that jurisdiction from the operator of the Adelaide suburban rail system. At the time of the incidents in Auckland, the Adelaide operator ran trains comprising 100 train sets (of 4 classes) in comparison with 36 train sets in Auckland (made up of 2 classes of DMUs and 2 classes of push/pull trains). The fleet used in Adelaide was a collection of DMU sets built in Australia between 1978 and 1996 and like Auckland, Adelaide had committed to electrifying its suburban rail system.
- 3.7.3. The regulator said that in a recently completed 5½ year period, 2 small fire events had been reported. There had been 11 notifications of general braking irregularities ranging from insufficient brake pressure to dragging brakes, but none included any reported loss of brake pads or brake blocks disengaging during service.

3.8. Previous Commission inquiries and recommendations

Report 05-108, DMU passenger Train 3334, fire, Auckland, 23 February 2005

- 3.8.1. A finding in this report said that the amount of accumulated debris and oil on top of the engine showed that it had not been cleaned at the prescribed 6-weekly intervals.
- 3.8.2. On 27 June 2005, subsequent to this and one other fire, ARTA wrote to Toll Rail, maintainer of the DMU fleet at the time, expressing its concern at the considerable build-up of oil and attached dirt on the under-frame of the DMUs. ARTA requested that Toll Rail confirm that steam cleaning of vehicle under-frame was currently being carried out at a minimum 6-weekly frequency in accordance with the requirements of the "A" maintenance check and that the cleaning removes all oil, dirt and other debris that could potentially catch fire or affect the correct performance of any other train system.
- 3.8.3. On 18 July 2005, Toll Rail replied to ARTA in part that the 6-weekly cleaning happened most of the time, but sometimes was skipped for logistical reasons. Staff had been sensitised to the dangers inherent in a dirty under frame and had been asked to attend to this duty with renewed diligence. This was specifically being monitored to ensure the quality level.
- 3.8.4. On 15 June 2006, the Commission issued recommendation 033/06 to the General Manager Infrastructure and Rail at ARTA that she confirm with Toll Rail that the under-frame equipment on the DMU fleet was currently at an acceptable standard of cleanliness, and that the established inspection and maintenance procedures were appropriate to maintain those standards.

Report 06-101, DMU passenger Train 3161, fire, Manurewa, 15 March 2006

- 3.8.5. The report included a finding that stated that poor keeping of maintenance records meant the Commission could not determine for how long and at what rate the auxiliary engine had been losing lubricating oil, and could not determine the maintenance history of the oil inlet hose [that had failed]. It also found that there were not sufficient standards for the supply and fitting of engine components in the maintenance system for DMU sets in the Auckland operation.

3.8.6. Recommendation 015/07 to the Director of NZ Transport Agency stated that because of anticipated growth in the rail passenger traffic in the Auckland region in the foreseeable future, and the ageing current rail fleet, all rail participants should be required to operate a maintenance system where:

- engineering standards consistent with world standard practice were identified and adhered to
- manufacturers' inspection, repair and maintenance instructions were documented and followed
- safety-critical components were identified and documented
- work instructions were issued for maintaining safety-critical equipment and work on safety-critical components was signed off by someone other than the maintainer
- all maintenance was recorded.

3.8.7. On 24 July 2007, the NZ Transport Agency responded to the recommendation as follows:

The NZ Transport Agency does not accept that this recommendation is necessary. The reason for this is that the NZ Transport Agency is satisfied that existing safety cases and safety systems of licence holders cover these issues regarding standards; work instructions; maintenance and repair; and keeping of records of this work.

The NZ Transport Agency will continue to approve and monitor operations as and when this documentation is up-dated, and continuous improvement is being sought by the licence holder. These issues will be monitored as being met and maintained through the annual safety assessment programme that the NZ Transport Agency has implemented for all licence holders.

3.8.8. On 26 September 2007, the NZ Transport Agency added further comment to the recommendation as follows:

The NZ Transport Agency will continue to seek assurance, through its annual safety assessment process, that licence holders have robust and appropriate maintenance systems as outlined in approved safety cases and safety systems. Furthermore, the NZ Transport Agency will continue to instruct its safety auditors during their safety assessments of operators to pay special attention to specific safety issues by the Commission's investigations.

The NZ Transport Agency later added that the recommendation was still being worked through with industry. This recommendation was supplanted by a recommendation of similar thrust made in report 06-110 (see below).

[Report 06-110, DMU passenger Train 4045, uncontrolled movement between Britomart station and Quay Park junction, 9 October 2006](#)

3.8.9. The report concluded that considering the maintenance issues raised in report 06-110, including reference to previous Commission reports in which the maintenance of rolling stock was raised as a safety issue, indications were that the standard of maintenance of rolling stock in general on the New Zealand rail network was below a reasonable level.

3.8.10. The report made recommendation 015/08 to the Chief Executive of the NZ Transport Agency which stated as follows:

- There is recurring evidence indicating that the standards of maintenance of rolling stock on the national rail network as demanded in Veolia's and Toll Rail's safety cases are lower than is preferable and reasonable, in that for example:
 - manufacturers' inspection, repair and maintenance instructions are not always documented and followed
 - safety-critical components are not always identified and documented
 - work instructions for maintaining safety-critical equipment are not always issued, and work on safety-critical components is not always signed off by someone other than the maintainer
 - some maintenance is not recorded.

3.8.11. On 26 August 2008, the Chief Executive of the NZ Transport Agency responded in part as follows:

The NZ Transport Agency acknowledges the list of safety issues [safety recommendations].

Because the NZ Transport Agency is not itself a railway operator it cannot directly implement actions in the field but will undertake further work to discuss those safety issues with the rail licence holders concerned with a view to ensuring that they are considered, and, where appropriate actioned, for safety improvement. Until that work is carried out, the NZ Transport Agency is not in a position to advise whether, or when, the recommendation[s] can be closed out. We will keep the Commission informed of progress.

3.8.12. On 25 January 2011, KiwiRail wrote to the NZ Transport Agency requesting that recommendation 015/08 be closed based on the following comment:

It is usual and necessary practice in the railway industry for the maintenance regime originally devised by the vehicle manufacturer to be refined and amended as time goes by. The reasons for this include:

- Incorrect assumptions made about, or changes, to service conditions and/or vehicle utilisation, and
- Responses to experience, e.g. incidents or reliability trends.

All maintenance regimes have to meet conflicting demands such as maximising safety and reliability, minimising maintenance downtime, and incurring reasonable costs. The regime may well be adjusted in search of the ideal compromise.

Also, the maintenance expertise of manufacturers has traditionally varied greatly, as few were involved in maintenance until a last few years, and some had no interest at all in the subject. Thus their recommended regimes did not carry as much weight as may be supposed, in contrast with the aviation industry.

So it is not necessarily a sign of failure that railways develop their maintenance away from the start-point provided by the manufacturer.

KiwiRail operates a system of maintenance management, surveillance and development as described in its Safety Case and the Mechanical Business System. This operates to continuously optimise and improve maintenance operations. It includes:

- Regular review of maintenance outcomes including operating trends
- Specific reports into significant failures and incidents
- Identification of emerging hazards and devising means of managing them, and
- Setting competency standards and devising and delivering training and assessment programmes.

So KiwiRail maintains the competency and the legislative right to set its maintenance standards and regimes. And our contention is that our incident trends and safety outcomes are evidence of a satisfactory performance.

We believe the above clarifies the point raised in the recommendation and request that it be closed.

3.8.13. The NZ Transport Agency forwarded KiwiRail's letter to the Commission to support an application to close the recommendation, but at the time of publishing this report the Commission has not accepted the application. The Commission requires further evidence that the principles of a robust repair and maintenance system as described in the recommendation have been demonstrated nationally.

4. Analysis

4.1. Introduction

- 4.1.1. The 3 incidents examined under this inquiry were not major events, and were not events that occurred frequently on the New Zealand rail network. Although a fire in a passenger train can lead to serious consequences, on these occasions the initial response by the train crews and the subsequent Fire Service response prevented the fires causing serious damage, and no injury resulted.
- 4.1.2. Like fires, derailments can lead to serious consequences depending on the speed of the train at the time and other circumstances. In this case on Train 2215 at Sylvia Park the speed was low and the train had re-railed itself before it was brought to a stop; in fact the crew were unaware that a derailment had even occurred until the train was later inspected at the maintenance facility.
- 4.1.3. The Commission opened inquiries into these 3 events because of the contributory maintenance issues, and because through previous inquiries in addition to those already mentioned (some being 05-116, 05-123, 05-128, 06-102, 07-105 and 08-113) the Commission had formed the belief that there were serious issues with the standard of maintenance generally on the New Zealand rail network.
- 4.1.4. The following analysis comments briefly on what caused each event, but focuses more on the factors underlying the mechanical maintenance system for the Auckland metro passenger fleet. This includes the contractual arrangements between the stakeholders and the management of the sole maintenance facility used to service, maintain and repair the rolling stock.

4.2. Silvia Park derailment

- 4.2.1. The missing brake calliper was found close to the witness marks on the rail that showed where the derailment had occurred, which led to the logical conclusion that the calliper fell from the train and the wheel lifted as it ran over it, and derailed. The train was travelling at slow speed and no other reason for the derailment was evident.
- 4.2.2. The key and split pin that secured the brake calliper were missing, and despite a wide search the items could not be found in the vicinity of the point of derailment. The key failing or working loose would eventually lead to the brake calliper falling from the wheel assembly. An examination of the keys and split pins on the other ADK sets showed that split pins incorrectly sized or incorrectly fitted could fall out or fail, allowing the key to work loose. Alternatively, if a key was left in service for long enough, it could wear to a point where the key itself failed under normal service loads, allowing the brake calliper to dislodge.
- 4.2.3. The amount of wear found on keys from other ADK sets prompted KiwiRail to test the hardness of the keys, whereby it was found that some did not match the appropriate technical specification. This indicated that unapproved manufacturing of spare keys had been undertaken at some time and place.
- 4.2.4. A falling brake calliper could feasibly cause a derailment with the train travelling at a higher speed, but the dynamics of such an event would have to be precise. The circumstances of this derailment could be described as unlucky, with the timing, the angles of the dislodged calliper as it went under the wheel and the dynamics of the carriage at that precise point all coinciding to cause the wheel to climb the rail and derail.
- 4.2.5. This failure, the potential failure of other key and split pin arrangements found on 8 other ADK 2-car sets, and reports of passenger trains arriving at Westfield with missing brake blocks on average 2 or 3 times a month were cause enough to review the maintenance procedures at the maintenance depot.

Findings

Train 2215 derailed when a wheel climbed over a brake pad calliper that had fallen from the wheel assembly because the securing key and split pin had either failed or worked loose and dislodged.

The sub-standard condition of the retaining keys and split pins and the way they were fitted across the ADK fleet, and brake components found missing on the other trains, were examples of inadequate engineering and maintenance standards, and were the most likely reasons for the missing brake components.

4.3. Fires

- 4.3.1. With both fires on the DMUs, the common event was the blockage of the air filters on the auxiliary motor air intakes. The exact source of the filter contaminant was not identified, but could have been from any number of sites where airborne or waterborne metallic particles were present. One likely source was ingestion of contaminated water from the train wash facility at Westfield. It is possible that if a train were standing next to the facility with its auxiliary motors running, residual spray from the cleaning could be drawn into the air filters.
- 4.3.2. The implosion of the air filters shows that the auxiliary motors were struggling for air, which would have resulted in a rise in exhaust temperature. As there was no high-temperature warning system to alert the driver, they would have been unaware of the problem until either the auxiliary motors shut down due to air starvation, or as in these cases, a combination of dark exhaust gases and/or smoke from a fire was noticed by others.
- 4.3.3. A fire requires air, a source of ignition and combustible material, which in these cases was oily residue and possibly other debris accumulated on top of the auxiliary motors. The exhaust side of the turbocharger and the exhaust trunk itself normally operated at 450 to 600 degrees Celsius, which would have been sufficient to ignite oil and debris. In the absence of any other fault found on the auxiliary motors it was difficult to say why a rise in exhaust temperature alone would have caused a fire, when the nominal temperature of the exhaust should have started one anyway. As unusual as it might seem, it could have been a coincidence that both incidents involved auxiliary motors with blocked air filters and that the amount of combustible material building up around the turbocharger simply reached a point where it was going to ignite. We did not know for sure.
- 4.3.4. Unclean motors and motor spaces are a well-known hazard in any combustion engine installation. The accumulation of oily debris on top of the ADL auxiliary motors in particular was a known problem highlighted in a previous report of the Commission (05-108); one that resulted in a recommendation being issued and ARTA writing to KiwiRail raising the issue of unclean auxiliary motor enclosures on the ADL fleet. At that time KiwiRail was redesigning the shroud around the auxiliary motor enclosure to reduce the temperature within the enclosure, allowing better access for cleaning and servicing, and for fire fighting.
- 4.3.5. Despite the new design of the enclosure, maintenance crews still reported difficulty accessing the top of the motors for cleaning. Since then another modification has been made to the diesel fuel tank for the auxiliary motors on the ADL sets that allows better access (refer to the "Safety actions" section of this report).
- 4.3.6. As with the dislodged brake calliper incident, the circumstances of these fires are cause enough to review the service and maintenance procedures at the maintenance depot at Westfield.

Findings

Common to both fires was the air intake filters for the auxiliary motors becoming blocked, which would have caused a rise in exhaust temperature and a consequential rise in temperature within the motor enclosure. This rise in temperature may have been sufficient to ignite oil or other combustible debris that had accumulated on top of the motor in the vicinity of the turbocharger and exhaust trunking.

Oily residue present on top of both auxiliary motors would have been a source of fuel for combustion, which was a hazard made known to KiwiRail from an occurrence in 2005; a hazard that had not been addressed by the servicing and maintenance system at the time of these latest fires 3 years later.

4.4. The Auckland passenger vehicle maintenance depot

- 4.4.1. As detailed in the factual section of this report, the maintenance depot at Westfield underwent no fewer than 7 audits or reviews (including the Commission's inquiry) in a 2½ year period. Some KiwiRail managers expressed frustration at the number of audits and the disruption they caused to the maintenance depot staff.
- 4.4.2. The philosophy of auditing is that where weaknesses in a system are detected then audit and review activity is increased until improvement can be demonstrated, which applies equally to internal and external audits. Lead indicators of issues with the maintenance depot were clearly there to be seen. Maintenance-related events were occurring, so the Commission inquired into a selection of those events and made recommendations which then required follow-up by the regulator. Around the same period dissatisfaction was being voiced from other stakeholders: ARTA and Veolia. When an entity is providing a service for one or more other entities, it is to be expected that those entities will require verification of good and efficient performance. Under the Railways Act 2005, Veolia had an obligation to manage the risk of non-performance by KiwiRail as the maintainer of the rail vehicles it operates. This is discussed in more detail under the heading of "Responsibilities for maintenance".
- 4.4.3. While the focus of most audits was on the maintenance depot, the fact that there was little demonstrable evidence of improvement in the depot was an indication that the issues stemmed from higher up in the system. These issues are discussed in more detail below, but for now we focus on the maintenance depot itself.
- 4.4.4. Broadly speaking, what the Commission found during its examination of the maintenance depot was consistent with what other auditors had found (refer the Halcrow and NZ Transport Agency audits).
- 4.4.5. There was a general lack of documented procedures and task instructions for staff to follow when servicing and maintaining the trains. Normally modern trains come with manufacturers' minimum service and maintenance instructions, which can be modified and built on with operator experience, but the maintenance depot was dealing with an aged fleet that had been modified, rebuilt, or refurbished. The standard of modification or rebuild was generally described as high, with a good system of supporting design documentation.
- 4.4.6. On the shop floor however, this information was not readily available, and nor had a system of preventative maintenance been established for the trains in their new configuration. In the case of older trains that had been purchased overseas and introduced with little modification, the original manufacturers' instructions had either not come with them or not been incorporated into a proper planned maintenance system. The Arup report referred to a KiwiRail estimate that on a time basis planned maintenance made up for 75% of the total, with 25% being for "casualty" (or reactive) maintenance. A review of budget and actual data however suggested around 40% planned and 60% "casualty". These estimates sit with the Commission's observations of the maintenance depot processes.
- 4.4.7. The maintenance staff were observed to be dedicated to their tasks, but at the time of the Commission's review the maintenance depot was short on numbers and some staff were

working long hours. Whereas historically maintenance staff have been sourced from within the rail industry, this is no longer necessarily the case as apprenticeship schemes have declined or disappeared with changes in the industry. This observation was supported by several senior managers interviewed. The consequence of this is that maintenance staff will not necessarily have the rail-specific knowledge and will rely more heavily on training, proper work instructions and checks to complete a task satisfactorily. These task instructions were observed to be not readily available. The example relevant to the brake system on the ADK sets was that there was no work instruction on how and when to change out a brake pad. When a question was put to the staff about when to change a brake pad on a carriage, the answer varied significantly (the NZ Transport Agency assessment).

- 4.4.8. The Commission was told of a case when a brake block was changed during servicing and it fell off just as the train was departing the Westfield yard about to enter passenger operation.
- 4.4.9. The responsibilities between staff were not clear. Who was allowed to perform what maintenance and what qualification was required in order to sign off a task were not always readily apparent, and in some cases when they were apparent, tasks were not always signed off by people with the proper authority.
- 4.4.10. The maintenance depot was unclean and lacked organisation. Uncontrolled work-place hazards were apparent, such as slippery underfoot conditions and safety alarms not working. The tools and spare parts inventory was not well controlled. As with maintenance, unless inventory is controlled and measured, it will be difficult to detect trends in maintenance and therefore more difficult to achieve continual improvement.
- 4.4.11. Some of the deficiencies observed were in part due to the physical limitations of the facility. The purpose for which the facility had been designed no longer matched the purpose for which it was being used. The KiwiRail maintenance operation for ARTA and its own freight operation had outgrown the maintenance depot at Westfield. The inspection pits were 3 cars long and the trains were 4 cars long, soon to be 6 cars long. This required train movements during check routines and maintenance work, which were reported to be laborious and time consuming, and to create additional hazards to staff. The number of trains to be serviced and maintained had steadily increased over the years. This issue was not one created by the maintenance depot managers; it had been created by those entities responsible for the planning of the Auckland metro train system.
- 4.4.12. Substantial resources had been committed to improving the Auckland metro train system and increase the type and number of trains operating on it, but from discussions with senior officials and management within the transport sector proportionally little thought had gone into how the new (modified and refurbished) and expanded fleet of trains was going to be efficiently serviced and maintained. This is discussed in more detail in the following section.

Findings

The maintenance depot was not running optimally because there were inadequate processes to guide maintenance and service staff in their tasks, and minimal attention had been paid to workplace health and safety issues leading to an unclean and in some respects an unsafe working environment.

The maintenance depot was not delivering a maintenance regime that was in line with sound railway engineering practice as required under the NRSS, and under KiwiRail's safety case.

The maintenance depot was not designed to maintain efficiently a fleet of rail vehicles as big and diverse as the current fleet at the time of these maintenance-related incidents.

Despite the physical constraints of the maintenance depot, the systems in place for servicing and maintaining the Auckland metro fleet could have been substantially improved to achieve a better standard of maintenance and a more efficient and safer passenger rail fleet.

4.5. Responsibilities for maintenance

- 4.5.1. To better understand the contractual relationships between ARTA, Veolia and KiwiRail, it is necessary to review the interoperability arrangement between the 3 entities in relation to the Railways Act 2005 and the NRSS.
- 4.5.2. The Railways Act 2005 provided that both rail operators and maintenance providers had responsibilities under the Act for the maintenance of rail vehicles. Rail operators such as Veolia were required to hold rail licences and have an approved safety cases, whereas maintenance providers, if they were only maintenance providers, were not.
- 4.5.3. If KiwiRail had only been a maintenance provider, Veolia would have had sole responsibility under the Act for the maintenance of the Auckland metro trains. However, KiwiRail was also a rail operator by virtue of it operating trains across the rail network, so KiwiRail had a licence and an approved safety case. That safety case specified that one of its rail activities was maintenance of the Auckland metro trains.
- 4.5.4. The Railways Act 2005 contemplated that more than one licence holder could have responsibility for the same rail activity, in this case maintenance of the Auckland metro trains. The precise nature of the responsibility of each licence holder depended on the terms and conditions of its licence and safety case.
- 4.5.5. Veolia's safety case specified that its rail activities include operating the Auckland metro trains, which were supplied and maintained by others, the maintenance being supplied by KiwiRail. Veolia's obligations therefore were to manage the risk of non-performance by KiwiRail through monitoring, reporting, audit and review. The contractual arrangements with KiwiRail had to allow Veolia to do that, and Veolia had to invoke KiwiRail's contractual obligations to manage the interface risk.
- 4.5.6. Because KiwiRail's safety case listed maintenance of the Auckland metro trains as one of its rail activities, both it and Veolia had separate responsibilities in relation to maintenance: KiwiRail was responsible for carrying out the maintenance and Veolia was responsible for auditing, monitoring, reporting on and reviewing KiwiRail's performance. These separate responsibilities were consistent with the requirements of the NRSS, which formed part of both safety cases.
- 4.5.7. The RSMA established the contractual basis of, and obligation on, KiwiRail and Veolia to meet their respective responsibilities under their safety cases.
- 4.5.8. Under the Railways Act 2005, ARTA as a rail vehicle owner was considered to be a rail participant, but not one that was required to hold a rail licence. The only rail participants required to hold a rail licence were access providers and rail operators, the latter being Veolia in this case.
- 4.5.9. ARTA and Veolia were parties to the passenger services agreement under which ARTA procured and funded Veolia to provide passenger rail services in Auckland. The passenger services agreement gave ARTA the right to control how Veolia exercised its rights under the RSMA to ensure KiwiRail maintained the trains to a required standard. This was reflected in Veolia's safety case that the NZ Transport Agency had approved, but under section 13 of Veolia's safety case (process for ensuring that interoperability arrangements between Veolia and other rail participants enhance rail safety), Veolia stated that it would manage interface risks through audits and reviews of services provided by other participants, and that it would invoke contractual and business obligations to manage interface issues, **to the extent allowed by ARTA** (emphasis added).
- 4.5.10. The qualification "to the extent allowed by ARTA" was a reference to the passenger services agreement. One key aspect of the passenger services agreement is it obliged Veolia to exercise its rights under the RSMA in accordance with ARTA's instructions and in the best interests of ARTA.

- 4.5.11. The passenger services agreement allowed ARTA to receive information from and review the compliance by KiwiRail with its RSMA obligations, review Veolia's exercise of its rights under the RSMA, and even instruct Veolia on how to exercise its rights. Given Veolia's ability under the RSMA to influence how KiwiRail was to carry out the RSMA services, this gave ARTA a "reach" through to the RSMA to itself influence KiwiRail's performance of those obligations. Furthermore, under the passenger services agreement ARTA agreed to reimburse Veolia for any amounts Veolia had to pay under the RSMA, which in effect meant ARTA was paying the costs of KiwiRail's maintenance services provided under the RSMA.
- 4.5.12. Depending on the extent to which ARTA exercised its "reach" into the RSMA, the Commission is concerned at what influence, direct or indirect, it could have on matters potentially affecting the safety of the Auckland metro rail services.
- 4.5.13. Because the passenger services agreement conferred on ARTA the means to control how Veolia performed its obligations and utilised its powers under the RSMA to monitor KiwiRail's maintenance performance, this raises an issue of compatibility with Veolia's obligations under its safety case.
- 4.5.14. Under its safety case, Veolia had to exercise its powers to ensure maintenance performance by KiwiRail. If hypothetically Veolia had decided not to do so due to the exercise by ARTA of its powers under the passenger services agreement, Veolia would have been in breach of its obligations as a licence holder under the Railways Act 2005. The Commission is then of the view that the statement "to the extent allowed by ARTA" would not excuse Veolia from complying with its licence holder obligations, which raises the question of why the NZ Transport Agency approved the safety case with such a statement.
- 4.5.15. Section 7 (1) of the Railways Act 2005 stipulated the general safety duties of rail participants: a rail participant must take all practicable steps on its part to ensure that none of the rail activities for which it is responsible causes, or is likely to cause, the death of, or serious injury to, individuals. This general duty of care was applicable to ARTA as a rail participant, even though it was not a rail licence holder.
- 4.5.16. ARTA was one of the principal planners of rail services in Auckland; it owned most of the Auckland passenger trains, and it was the entity that engaged with KiwiRail to draw up the RSMA between KiwiRail and Veolia, the Commission is of the opinion that ARTA did have a duty of care, and therefore responsibility, for ensuring that adequate facilities to maintain its trains were available. That is to say that it would not have been proper to enter Veolia into a contract with KiwiRail that both parties were going to struggle to meet within the then set level of funding and facilities available.
- 4.5.17. No secret had been made of the physical limitations of the maintenance depot, and that it was going to struggle to cater for the increasing number and length of trains entering the network to meet the growing rail transport demand, even to the point where plans had been drawn up to expand the maintenance depot, which hadn't eventuated.
- 4.5.18. A factor that was hindering the planning process for future rail in Auckland was the transitioning of the publically listed company trading as Toll Holdings NZ Limited to the new state-owned enterprise KiwiRail, and the evolving plans to introduce new electric trains that were going to require a separate dedicated maintenance facility. The current train fleet under development was, it was said, an interim arrangement, giving rise to the dilemma of investment in maintenance facilities that might not be required in future.
- 4.5.19. However, the introduction of the push/pull trains to meet demand was always going to be a relatively long-term project (in maintenance terms), with the first push/pull train entering service in 2004 and the fleet growing to cater for the 2011 Rugby World Cup and beyond to present estimations of 2013 for the earliest arrival of any new electric trains.
- 4.5.20. Acknowledging the sunk cost of physically expanding the Westfield depot, investing funds into improving the efficiency of the current facility would have been a prudent measure.

- 4.5.21. KiwiRail of course also had an obligation to not enter into an agreement if there was any chance that it would not be able to deliver the required services, particularly as the services were maintenance of passenger trains, critical to the safety of the passenger train operation. From discussions held with senior management in all 3 entities, it became apparent that the maintenance of the trains had become an issue, and that the 3 entities had become locked into the detail of how to resolve that issue rather than taking a holistic view of the problem. We now comment on why that might have occurred.

Findings

KiwiRail was required under the Railways Act 2005 to hold a rail licence and have an approved safety case. KiwiRail's safety case specified that one of its rail activities was maintenance of the Auckland metro trains, which meant that it had the responsibility for conducting that maintenance in line with good, sound engineering practice.

Veolia was required under the Railways Act 2005 to hold a rail licence and have an approved safety case. Veolia's safety case specified that its rail activities included operating the Auckland metro trains, which were supplied and maintained by others. The contractual arrangements between KiwiRail and Veolia for the maintenance of those trains meant Veolia had the responsibility to intervene if it thought KiwiRail was not maintaining them in line with good, sound engineering practice.

ARTA was not required to have a rail safety licence and did not have any obligations under the Railways Act 2005 other than general safety duties as a rail participant (rail vehicle owner): however, through its contractual arrangements with Veolia and KiwiRail it had the ability to influence decisions that could directly affect railway safety, as though it were a licence holder.

ARTA's ability to influence decisions that could directly affect railway safety did not abrogate KiwiRail's and Veolia's responsibilities under the Railways Act 2005.

As a principal planner of Auckland rail services and owner of the Auckland metro trains, it would have been prudent for ARTA to have better planned for the future maintenance requirements for its fleet as the fleet was predicted to grow.

4.6. Relationships

- 4.6.1. The structure of the rail management teams of ARTA and Veolia at the time did not reflect their respective roles. ARTA had a team of 3 rail mechanical engineers and Veolia had none, yet Veolia had the responsibility for managing the RSMA it had with KiwiRail.
- 4.6.2. Discussions with senior managers from ARTA revealed a level of frustration with Veolia, that it was not managing the contract with KiwiRail. Discussions with Veolia senior management on the other hand revealed a level of frustration with ARTA because it thought that ARTA was dealing directly with KiwiRail on day-to-day issues and keeping Veolia out of the loop. KiwiRail management expressed frustration at Veolia seemingly due to a lack of confidence in its ability to manage the RSMA effectively, and because it perceived Veolia was not consulting KiwiRail on the accuracy of reporting through Veolia to ARTA.
- 4.6.3. These observations by the Commission were confirmed in the process review conducted by Arup for Veolia. The report commented on ARTA's dissatisfaction with KiwiRail's performance around train reliability and requests by KiwiRail for more funding with no succinct reason why.
- 4.6.4. The same Arup report commented on KiwiRail's frustration at putting forward new ideas to Veolia and getting no response.
- 4.6.5. It is not difficult to see how under the climate as described, relationships could and did deteriorate. It was obvious from interviews with management of all 3 entities, but particularly with Veolia and KiwiRail, that the quality of relationships was blocking progress.

- 4.6.6. It became apparent that disagreements and frustrations over the way maintenance systems were being implemented was one of the core issues affecting the relationships as the Commissions' investigations progressed further. Since that time 3 years ago the structure of the industry has changed with the formation of KiwiRail, which has resulted in improved relationships.
- 4.6.7. Underpinning the maintenance and reliability issues with the Auckland metro trains was the performance of the maintenance depot. KiwiRail has started to address these issues with initiatives described in the "Safety actions" section of this report. The Commission has already raised the issue of maintenance standards across the rail industry in a previous recommendation to the Chief Executive of the NZ Transport Agency which remained open at the time of publishing this report.
- 4.6.8. ARTA has since reported an improvement in Veolia's management of the RSMA by employing a person with mechanical engineering knowledge to manage the agreement effectively.

Finding

The breakdown of relationships at that time at the senior management level among ARTA, KiwiRail and Veolia had hampered the process for rectifying deficiencies in the service and maintenance of the Auckland metro trains.

5. Findings

Sylvia Park derailment

- 5.1. Train 2215 derailed when a wheel climbed over a brake pad calliper that had fallen from the wheel assembly because the securing key and split pin had either failed or worked loose and dislodged.
- 5.2. The sub-standard condition of the retaining keys and split pins and the way they were fitted across the ADK fleet, and brake components found missing on the other trains, were examples of inadequate engineering and maintenance standards, and were the most likely reasons for the missing brake components.

Fires

- 5.3. Common to both fires was the air intake filters for the auxiliary motors becoming blocked, which would have caused a rise in exhaust temperature and a consequential rise in temperature within the motor enclosure. This rise in temperature may have been sufficient to ignite oil or other combustible debris that had accumulated on top of the motor in the vicinity of the turbocharger and exhaust trunking.
- 5.4. Oily residue present on top of both auxiliary motors would have been a source of fuel for combustion, which was a hazard made known to KiwiRail from an occurrence in 2005; a hazard that had not been addressed by the servicing and maintenance system at the time of these latest fires 3 years later.

The Auckland passenger vehicle maintenance depot

- 5.5. The maintenance depot was not running optimally because there were inadequate processes to guide maintenance and service staff in their tasks, and minimal attention had been paid to workplace health and safety issues leading to an unclean and in some respects an unsafe working environment.
- 5.6. The maintenance depot was not delivering a maintenance regime that was in line with sound railway engineering practice as required under the NRSS and under KiwiRail's safety case.
- 5.7. The maintenance depot was not designed to maintain efficiently a fleet of rail vehicles as big and diverse as the current fleet at the time of these maintenance-related incidents.
- 5.8. Despite the physical constraints of the maintenance depot, the systems in place for servicing and maintaining the Auckland metro fleet could have been substantially improved to achieve a better standard of maintenance and a more efficient and safer passenger rail fleet.

Responsibilities for maintenance

- 5.9. KiwiRail was required under the Railways Act 2005 to hold a rail licence and have an approved safety case. KiwiRail's safety case specified that one of its rail activities was maintenance of the Auckland metro trains, which meant that it had the responsibility for conducting that maintenance in line with good, sound engineering practice.
- 5.10. Veolia was required under the Railways Act 2005 to hold a rail licence and have an approved safety case. Veolia's safety case specified that its rail activities included operating the Auckland metro trains, which were supplied and maintained by others. The contractual arrangements between KiwiRail and Veolia for the maintenance of those trains meant Veolia had the responsibility to intervene if it thought KiwiRail was not maintaining them in line with good, sound engineering practice.
- 5.11. KiwiRail was contracted to conduct the maintenance of the Auckland metro trains; therefore under the Railways Act 2005 it had the responsibility for conducting that maintenance in line with good, sound engineering practice.

- 5.12. Veolia was contracted to monitor KiwiRail maintenance performance; therefore under the Railways Act 2005 Veolia had the responsibility to intervene if it thought KiwiRail was not maintaining the Auckland metro trains in line with good, sound engineering practice.
- 5.13. ARTA was not required to have a rail safety licence and did not have any obligations under the Railways Act 2005 other than general safety duties as a rail participant (rail vehicle owner); however, through its contractual arrangements with Veolia and KiwiRail it had the ability to influence decisions that could directly affect railway safety, as though it were a licence holder.
- 5.14. ARTA's ability to influence decisions that could directly affect railway safety did not abrogate KiwiRail's and Veolia's responsibilities under the Railways Act 2005.
- 5.15. As a principal planner of Auckland rail services and owner of the Auckland metro trains, it would have been prudent for ARTA to have better planned for the future maintenance requirements for its fleet as the fleet was predicted to grow.

Relationships

- 5.16. The breakdown of relationships at that time at the senior management level among ARTA, KiwiRail and Veolia had hampered the process for rectifying deficiencies in the service and maintenance of the Auckland metro trains.

6. Safety actions

6.1. General

6.1.1. The Commission classifies safety actions by 2 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; and
- (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.

6.2. Safety actions taken by KiwiRail

Maintenance of braking components

6.2.1. Shortly after the derailment of Train 2215 at Sylvia Park, KiwiRail advised that it had taken the following actions in the management of the braking components on the ADK fleet of the DMU sets:

- The retaining key drawing was reviewed and modified to take into account possible security failure when worn.
- The hardness specification of the key was checked and corrected when it was found that previous keys did not meet specification.
- The correct size and length split pin is being supplied with new brake pads and retaining key.
- All split pins to be fitted from the inside to the outside. This allows easy viewing to ensure the split pins are in place and the legs spread out.
- All brake pads and brake block changes and brake rigging sets occur in the maintenance depot during regular checks. (DMU braking consumables were previously managed in this manner).
- A process instruction be posted for all maintenance depot and servicing staff with the following content:
 - The requirement for a new split pin must be used whenever a brake pad is replaced. The correct pin will be supplied with all new brake pads and retaining key.
 - The orientation of the split pins from inside to out.

Maintenance of air filter systems

6.2.2. On 15 June 2010, KiwiRail advised that it had taken the following actions as a result of the contaminated air filter problem:

- Although there was no conclusive evidence that filters provided by a new supplier had directly contributed to these incidents, the Company reverted to the previous brand as a precautionary basis.
- An air pressure gauge was fitted to the filter to provide an indication of the extent of reduction of pressure.
- Filter replacement was reduced from a 3 months (C-Check) to a 6 weekly frequency (B-Check).
- Because there was a higher than expected presence of water likely entering via vents on the side of an air intake, DMUs are no longer stored in the proximity of the vehicle wash facility. This was considered to be the most likely source.

The Westfield maintenance facility

6.2.3. On 14 April 2011, KiwiRail advised that the following improvements had been made to the maintenance facility at Westfield:

- Wash plan overhauled and tracks re-laid
- Two tracks re-laid and lengthened for train servicing
- New electronic fuelling system installed
- Fleet out-stabling sites with the ability to refuel and conduct train preparation created at Henderson, Papakura and Pukekohe
- Establishment of a dedicated maintenance facility at Otahuhu for the 110 carriages used on the 24 push/pull train sets. This facility is separate from the Westfield maintenance facility.

KiwiRail also advised that the following organisational work has been/or is being done:

- Asset management/fleet maintenance system introduced in June 2009
- Development and introduction of a mechanical business system in December 2010
- Mechanical establishment in KiwiRail restructured to realign roles to tasks/locations. This resulted in the creation and filling of a permanent site manager position at Westfield together with the realignment of current managerial positions and creation of 2 new positions. Servicing and maintenance resources were also increased
- Target set for ISO accreditation for all mechanical functions throughout the business, including the Westfield maintenance facility, by July 2011.

6.2.4. On 20 June 2011, KiwiRail advised that the following work had been done to improve the documentation supporting servicing specification detail and the recording of servicing work performed on the DMU fleet at Westfield:

- New locomotive and DMU servicing check specification and servicing record documented procedures became effective at Westfield. The purpose of the new specifications/records was to ensure a consistent standard of servicing across the ADK and ADL fleets. The DMUs would be released to traffic in a reliable, fit for purpose condition, and free of foreign materials including work-related refuse, litter and waste.

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.

Recommendations

- 7.2. There are no recommendations in this report.

8. Key lessons

- 8.1. Oily residue or other combustible material that is allowed to accumulate on or around combustion motors was a fire hazard.
- 8.2. Sound railway engineering practice and procedures was essential for safe and reliable rail rolling stock.
- 8.3. Rail maintenance facilities should be designed and maintained for the purpose for which they were being used.
- 8.4. Planning for future rail systems should include all aspects of the rail system, including how rolling stock was going to be maintained.

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- 07-105 Push/pull passenger train sets overrunning platforms, various stations within the Auckland suburban rail network, between 9 June 2006 and 10 April 2007
- 08-110 Train control operating irregularity, leading to potential low-speed, head-on collision, Amokura, 23 September 2008
- 08-101 Express freight train 923, level crossing collision and resultant derailment, Orari, 14 March 2008
- 06-111 Express freight Train 237, derailment, Utiku, 20 October 2006
- 08-113 empty push/pull passenger Train 5250, collision with platform-end stop block, Britomart station, Auckland, 19 December 2008
- 08-103 Passenger Train 6294, electrical fire and collapse of overhead traction line, Mana station, Wellington, 18 April 2008
- 08-108 Express freight Train 845, track warrant overrun, Reefton - Cronadun, 13 August 2008

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