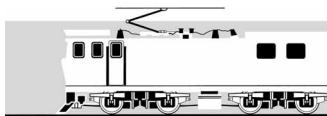
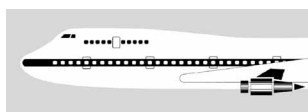


## RAILWAY OCCURRENCE REPORT

04-125      collision between an over-dimensioned road load and rail over road      2 October 2004  
bridge No.98 on Opaki-Kaiparoro Road, between Eketahuna and  
Mangamahoe



TRANSPORT ACCIDENT INVESTIGATION  
COMMISSION  
NEW ZEALAND

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**Report 04-125**

**collision between an over-dimensioned road load**

**and rail over road bridge No.98**

**on Opaki-Kaiparoro Road, between Eketahuna and Mangamahoe**

**2 October 2004**

**Abstract**

On Saturday 2 October 2004, at about 1015, an exhaust outlet at the top of a bulldozer being carried on a road trailer collided with the underside and damaged rail over road bridge No.98, located at 117.95 km on the Wairarapa Line, about 9 km south of Eketahuna.

A nearby farmer who had heard the collision reported details of the damage to train control. The person sent to inspect the damaged bridge inadvertently inspected 2 undamaged bridges located nearby before informing train control the track was safe and clear for traffic.

Two days later on Monday 4 October, another farmer contacted Transfield Services<sup>1</sup> directly to advise of the unsafe condition of the bridge. The bridge was closed to rail traffic and only re-opened after major repairs had been completed.

Safety issues identified included:

- the movement of an over-dimension road load without surveying clearances on the intended route
- communication between field personnel

Two safety recommendations have been made to the Chief Executive of ONTRACK<sup>2</sup> to address these issues.

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<sup>1</sup> Transfield Services were responsible for the inspection, maintenance and renewal of the rail infrastructure.

<sup>2</sup> ONTRACK were the access provider and controller of the rail network.



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## Abbreviations

bridge No.98	rail over Opaki-Kaiparoro Road bridge No.98, Wairarapa Line
HRV	hi-rail vehicle
km	kilometre(s)
km/h	kilometre(s) per hour
Land Transport NZ	Land Transport New Zealand
LTSA	Land Transport Safety Authority
m	metre(s)
mm	millimetre(s)
NZRC	New Zealand Railways Corporation
UTC	Coordinated Universal Time

## Data Summary

<b>Date and time:</b>	2 October 2004 at about 1015 <sup>3</sup>
<b>Location:</b>	rail over road bridge No.98 at 117.95 km between Eketahuna and Mangamahoe, Wairarapa Line
<b>Persons on board truck:</b>	1
<b>Injuries:</b>	nil
<b>Damage:</b>	major to bridge No.98, moderate to tilt deck trailer and minor to bulldozer
<b>Truck operator:</b>	Hoopers Contracting Ltd of Masterton
<b>Investigator-in-charge:</b>	V G Hoey

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<sup>3</sup> All times in this report are New Zealand Standard Time (UTC+12) and are expressed in the 24-hour mode.

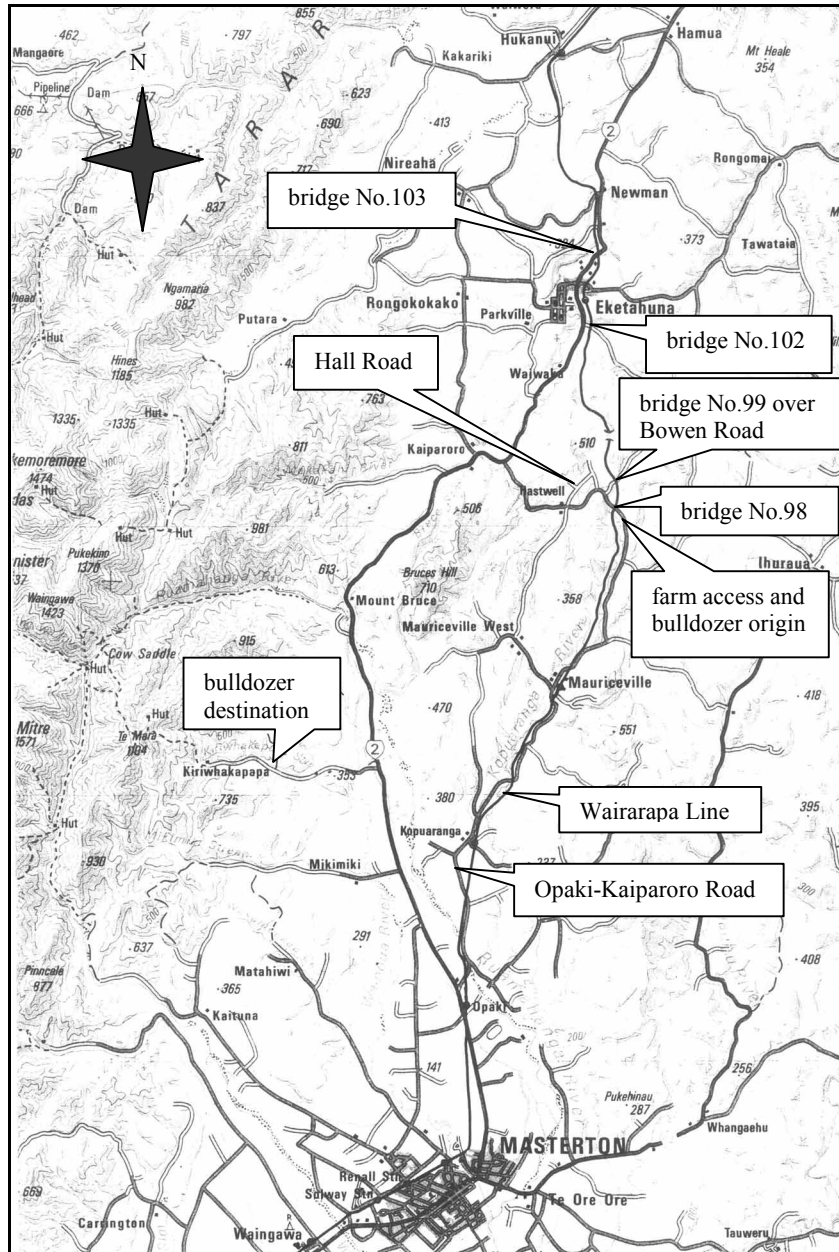




# 1 Factual Information

## 1.1 Narrative

1.1.1 On Saturday 2 October 2004, a haulage contractor was requested to transport a bulldozer from a farm on Opaki-Kaiparoro Road at Hastwell, to another farm on Kiriwhakapapa Road, in the northern Wairarapa (see Figure 1). The contractor assigned a truck and tilt deck trailer to transport the bulldozer.



**Figure 1**  
**Roadmap of northern Wairarapa area with location of bridges**

1.1.2 The bulldozer was loaded and secured by a truck driver and an owner of the machine before leaving the farm access intersection with the Opaki-Kaiparoro Road (see Figure 2). The truck and trailer unit travelled for a short distance, and the truck driver said it was travelling at a speed of about 15 km/h when it reached bridge No.98. He heard a loud noise and stopped the unit at about 1015.

- 1.1.3 The truck driver and owner, who were accompanying the movement, assessed the damage. The front of the trailer had been tilted upwards by the collision and the bulldozer had been pushed a small distance backwards. The 2 support feet at the rear of the trailer had struck and left skid marks on the road surface. When they had carried out some minor repairs to the trailer, they reversed the unit back to the farm access and offloaded the bulldozer.



**Figure 2**  
**Opaki-Kaiparoro Road from top of bridge No.98 looking south to the farm access**

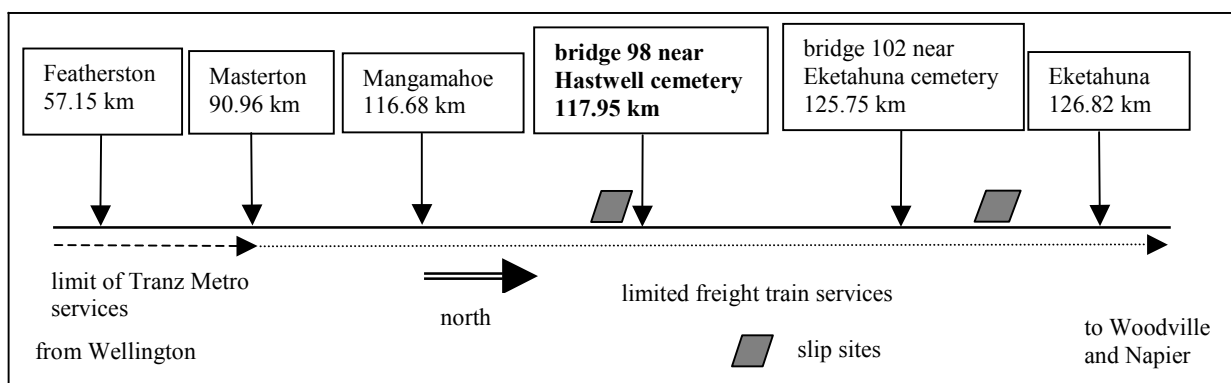
- 1.1.4 The truck driver drove the truck and empty trailer unit beyond bridge No.98, turned around and returned to the farm access, where the bulldozer was reloaded and re-secured. He then drove from Hastwell south on Opaki-Kaiparoro Road to the junction with State Highway 2 and on to Kiriwhakapapa Road.
- 1.1.5 A local farmer, about one km away on Bowen Road, heard the noise of the collision with the bridge but did not take much notice. However about 2 hours later, as he was travelling under bridge No.98, he noticed that it had been dented and looked out of shape, and that there were bits of wood on the road. He returned home and his wife telephoned train control at 1151 and advised “the overhead railway bridge at Hastwell on Opaki-Kaiparoro Road beside the cemetery, about 29 km north of Masterton, has been hit”. At 1156, the farmer telephoned train control again and advised that after her husband had a second look at the bridge, she recommended “don’t let any trains over it”.
- 1.1.6 The train controller passed these details onto a Transfield Services area coordinator, who from his knowledge of the area thought the bridge was located between 118 km and 119 km on the Wairarapa Line. He said that he contacted the farmer’s wife to confirm the location.
- 1.1.7 The area coordinator then contacted an acting ganger, who was working near Dannevirke, and he said that he instructed him to inspect “the bridge at 118 km on Hastwell Road, Eketahuna which was by the cemetery where a big slip had been”. However the acting ganger later said that he was not informed of the metrage by the area coordinator.
- 1.1.8 The acting ganger completed his tasks and drove to Eketahuna, where he obtained a track warrant, on-tracked his hi-rail vehicle (HRV) and travelled to bridge No.102 at 125.76 km. After inspecting the bridge, the acting ganger contacted the area co-ordinator and advised that there was no visible damage. The acting ganger then travelled north to bridge No.103 at 128.73 km, which he inspected and again informed the area coordinator that he could not see any damage.

- 1.1.9 At 1456, the acting ganger ended his search, called train control and cancelled his track warrant, telling the train controller “everything was okay down here”.
- 1.1.10 At about 1300, three hours after the collision, and after the truck driver had completed the delivery of the bulldozer, he telephoned the train control emergency number to advise of the collision. The train controller noted the truck driver’s contact details and told him that someone had been called out to inspect the bridge.
- 1.1.11 Two days later, on Monday 4 October 2004, two other farmers from Hall Road were travelling under bridge No.98 and noticed skid marks on the road surface. One climbed to the top of the bridge and saw that “it had been moved about 2 to 3 inches”.
- 1.1.12 At about 1215, one of the farmers contacted the area coordinator by cellphone and advised him of the situation. The area coordinator instructed another ganger to inspect bridge No.98 immediately. About 30 minutes later he reported back that he considered bridge No.98 was unsafe for trains. The area co-ordinator arranged for the section of line to be closed.
- 1.1.13 The line was re-opened the next day after major repairs, including the replacement of the damaged centre girder.

## 1.2 Site information

### Wairarapa Line

- 1.2.1 The Wairarapa Line ran from Wellington to Woodville over a distance of 171.50 km. Train movements and track occupations on the line were controlled from ONTRACK’s national train control centre in Wellington. Maximum train speed on the line between Masterton and Woodville was 70 km/h. Track warrant control was the operating system in use between Featherston and Woodville.



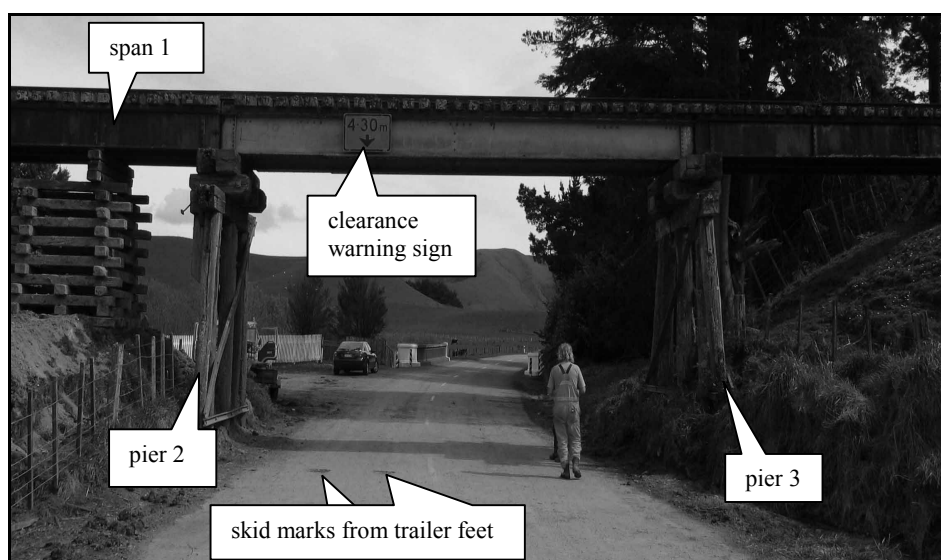
**Figure 3**  
**Site plan of Wairarapa Line (not to scale)**

- 1.2.2 Tranz Metro<sup>4</sup> ran an extensive commuter service on the Wairarapa Line south of Masterton, but north of Masterton the line reverted to a secondary line status. At the time of the incident, rail services were limited to 9 express freight trains running between Wellington and Napier per week. The last train had travelled across bridge No.98 at about 0300 on Saturday, 2 October and the next train was scheduled across the bridge at about 1000 on Tuesday, 5 October. However, additional services could be run at short notice at any time to meet traffic demands. Occasional passenger excursion trains ran at weekends.

<sup>4</sup> Tranz Metro was the group within Toll Rail responsible for the operation of the commuter trains between Wellington and Masterton.

## Bridge No.98

- 1.2.3 Bridge No.98, a rail over road bridge was located at 117.95 km on Opaki-Kaiparoro Road between Eketahuna and Mangamahoe. The bridge was first built in the late 1880s when the Wairarapa Line was built through the area, rebuilt in 1917 and the centre girder was replaced in 1966.
- 1.2.4 Bridge No.98 consisted of 3 two-leaf deck plate girder spans supported by 2 hardwood pile abutments and 2 hardwood timber pile piers. The bridge was on a 300 m radius right-hand curve and speed across the bridge was reduced to 60 km/h. The clearance between the roadway and the centre span was posted as 4.30 m (see Figure 4).



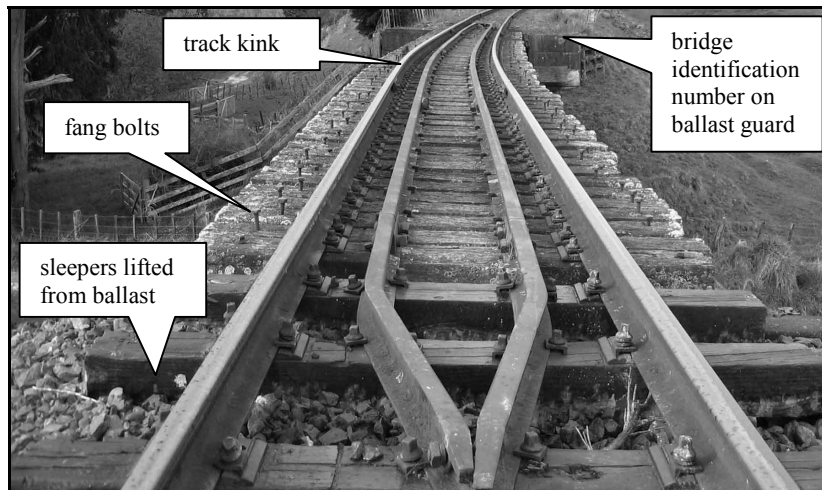
**Figure 4**

### **Bridge No.98 after temporary repairs looking north along Opaki-Kaiparoro Road**

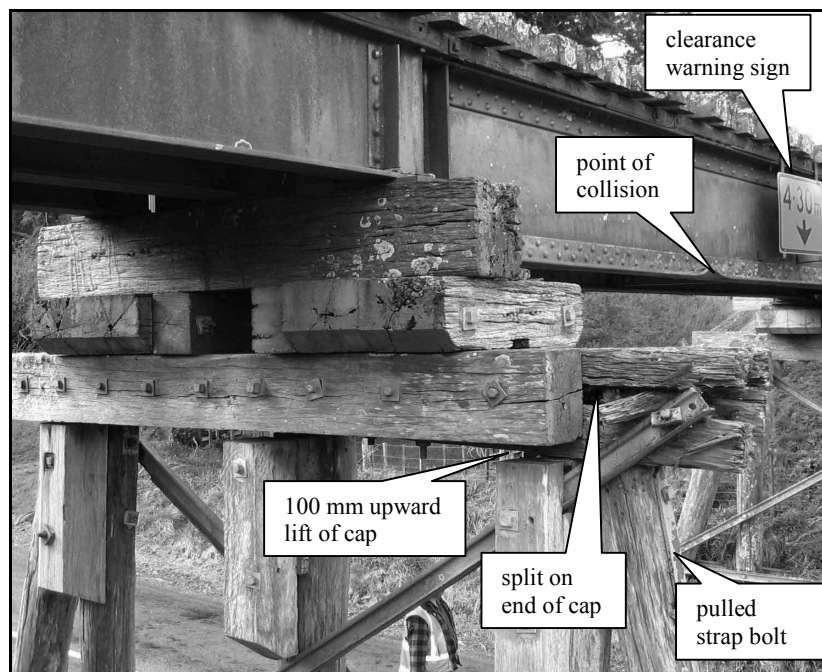
- 1.2.5 Following an inspection, the damage to bridge No.98 was reported as:
- The sleepers on southern side on span 1 had been lifted 80 mm vertically above the running beam<sup>5</sup> with the fang bolts pulled out of the running beam (see Figure 5).
  - The cap on pier 2 had been lifted approximately 100 mm and was sitting on top of the pile tenons<sup>6</sup>. The cap had been shifted to the left by 75 mm and the end of the cap where the collision occurred had been split laterally for about 1500 mm. The strap bolt holding the cap to pile No.1 had been pulled out (see Figure 6).
  - The bottom flange of the plate girder had been bent up by 60 mm and inwards by 80 mm over a lateral length of 400 mm at the point of impact. The web plate of the girder was bent 100 mm towards the middle of the steel plate to a height of 600 mm above the bottom flange over a lateral length of about 2500 mm (see Figure 6).
  - The track across the bridge had been pushed to the left by 75 mm at pier 3 forming a kink (see Figure 5).

<sup>5</sup> A horizontal wooden beam between the underside of the track sleepers and the top of the bridge girder.

<sup>6</sup> An extension at the top of a pile that fitted into a carved out slot on the underside of a cap.



**Figure 5**  
**Damage sustained to bridge No.98 viewed from rail level**



**Figure 6**  
**Damage sustained to Bridge No.98 viewed from the south side**

- 1.2.6 The damage to the centre span was such that it had to be removed and replaced with a similar sized span from a stock of spares held at Woburn workshops.

**Bridge numbering, inspections and impact beams**

- 1.2.7 New Zealand Railways Corporation's<sup>7</sup> (NZRC's) Infrastructure Engineering Handbook specified that bridge numbers must be visible on the right-hand side of the front of each ballast guard (see Figure 5). All bridges, irrespective of their type, were individually numbered, starting at No.1 at the zero metrage on each separate line.

<sup>7</sup> New Zealand Railways Corporation were the access provider and controller of the rail network prior to being branded to ONTRACK on 17 December 2004.

1.2.8 NZRC's Structures Code W 004 specified that rail bridges were to be inspected at yearly intervals for a general inspection, and 8-yearly for a detailed inspection. The most recent detailed inspection of bridge No.98 occurred on 27 March 2000 and the most recent general inspection occurred on 9 December 2003. Bridge No.98 was in an appropriate condition for the amount of rail traffic that travelled over it and there were no significant outstanding structural deficiencies.

1.2.9 The correctness of the soffit<sup>8</sup> clearance was measured during the detailed inspection on bridge No.98 to verify that the measurement on the posted warning signs for road users was still appropriate. The clearances recorded during the 2000 inspection were checked against the 1992 inspection and the following changes were recorded:

<b>Clearances to roadway under bridge No.98</b>	<b>1992 inspection</b>	<b>2000 inspection</b>
Pier 2 northbound carriageway	4.460 m	4.340 m
centreline of roadway	4.410 m	4.380 m
Pier 3 southbound carriageway	4.580 m	4.540 m

1.2.10 As a result of the reduction in clearances during the 8 years, the posted clearance warning signs were changed from 4.40 m to 4.30 m (see Figure 6). In the 4 years since the last detailed inspection, the Masterton District Council advised that the roadway under bridge No.98 was resurfaced with a 10 mm second coat seal but this did not affect the posted clearance.

1.2.11 The differences in the clearance measurements between the northbound and southbound carriageways were due to the rising track gradient to the north.

1.2.12 Three other rail over road bridges also carried the Wairarapa Line over roadways in the Hastwell-Eketahuna area as follows:

- bridge No.99 located at 119.16 km over Bowen Road
- bridge No.102 located at 125.75 km over Mangaoranga Road
- bridge No.103 located at 128.73 km over State Highway 2

1.2.13 All three bridges had posted reduced clearance warning signs.

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<sup>8</sup> The underside edge of an overhead structure.



**Figure 7**

**Impact beam installed on bridge No.103 over State Highway 2, north of Eketahuna**

- 1.2.14 NZRC's Structures Code W 004 specified that rail over road bridges that were considered vulnerable to road vehicle impact damage, and those with a history of bridge strikes<sup>9</sup> were to be fitted with impact beams. Because of a history of bridge strikes on bridge No.103 over State Highway 2, impact beams were chained to the bridge piers (see Figure 7).
- 1.2.15 Impact beams were located parallel with, but slightly away from, the bottom edge of the girder at a number of rail over road bridges throughout New Zealand. In the event of a collision, the beam would absorb and deflect the force of the collision away from the main bridge girders, thus protecting the asset from damage. In the event of a collision, the impact beam was assessed for damage and repaired or replaced without impeding the movement of rail traffic across the bridge.
- 1.2.16 Between January 2004 and the date of the collision at bridge No.98, NZRC had recorded 23 bridge strike incidents affecting different rail over road bridges on its network.

**1.3 Special inspections**

- 1.3.1 NZRC's Infrastructure Group Code and Rail Operating Code and Procedures required in part that:

If any staff have reason to believe that there is any likelihood of damage to or obstruction to the line, they must immediately advise Train Control and if required take steps to prevent any train from proceeding in the direction of the damaged or obstructed line until the line has been examined and is clear and safe for the passage of trains.

Gangers must arrange for inspections as they consider necessary and provide track clearance to train control authorising the resumption of train operations.

If any danger, obstruction or serious defect is discovered which affects the line, immediate action must be taken in accordance with Rail Operating Rules and Regulations by the person making the discovery. Protection must be provided in accordance with the appropriate Rule. As soon there after as possible, and by the quickest means, the Line Manager [Area Coordinator] must always be advised.

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<sup>9</sup>Collisions between road vehicles and overhead road or rail bridges.

The requirements of a track inspection include observing the track, including on bridges, looking for any significant change to top or line, and checking they are satisfactory.

Defects in the parts of bridges and structures, which are the responsibility of the Structures staff, must be reported immediately to the Line Manager [Area Coordinator] if a defect is visible or suspected. If a defect is serious, immediate action must be taken.

- 1.3.2 The process explained the procedures and responsibilities for protecting, inspecting and preventing trains encroaching into a damaged area after notification was received of damage to an infrastructure asset.

#### 1.4 Land transport rule for vehicle dimensions and mass 2002

- 1.4.1 In 1998, statutory changes were implemented to the management of the transportation of over-dimensioned road loads within New Zealand. Prior to 1998, the New Zealand Police through their regional offices were responsible for the issue of general permits for such loads. These general permits were issued to individual operators and could cover an extended period of time allowing the operator to transport over-dimensioned loads throughout the whole of either the North or South Island, depending on the location and extent of their business.
- 1.4.2 After 1998, management of the transport by road of over-dimensioned loads came under the auspices of the Land Transport Safety Authority (LTSA). For the next 4 years, policy was developed in consultation with operators that culminated in the promulgation of the Land Transport Rule 41001, Vehicle Dimensions and Mass 2002.
- 1.4.3 This rule allowed vehicles to convey an over-height load greater than the maximum limit of 4.25 m and up to 5.00 m provided the load was indivisible, and a specialised vehicle was used to transport the load and the operator complied with Section 6 of the rule which stated in part:

Height (m)	Operating conditions
4.25 – up to and including 5.00	<p>Written permission from the owner of an overhead obstruction that the vehicle cannot clear safely.</p> <p>Written approval from the relevant rail service operator if the vehicle travels over a level crossing that does not cross a State Highway, and the vehicle exceeds the height shown on an electrified railway safe height sign.</p>

An over-dimensioned motor vehicle must not interfere with or damage a traffic control device, bridge, tunnel or other structure, or trees or other foliage without the road controlling authorities' or owners' permission.

- 1.4.4 Land Transport New Zealand<sup>10</sup> (Land Transport NZ) calculated there were in excess of 10 000 over-dimensioned loads transported by road annually throughout New Zealand that had height of between 4.25 m and 5.00 m. The ratio of reported bridge strikes was low when compared to the number of movements. The rules stipulated that it was a traffic offence for an over-dimensioned road load to interfere with or damage an overhead structure without permission of the road controlling authority or owner of the structure.

<sup>10</sup> Land Transport New Zealand was created with the merger of the Land Transport Safety Authority and Transfund on 1 December 2004.



- 1.4.5 Land Transport NZ and its predecessor LTSA were responsible for the erection of clearance warning signs. The procedures required that where an overhead soffit clearance on any structure was less than 4.40 m, then signs were to be erected on the structure itself. Signs were also to be erected at least 120 m in advance of the structure to provide approaching drivers with an uninterrupted view in rural areas (see Figure 8). The policy also required that the posted measurement be rounded down to the nearest 100 mm.



**Figure 8**  
**Looking north along Opaki-Kaiparoro Road towards bridge No.98**

## **1.5 Trailer and bulldozer details**

- 1.5.1 The trailer was a tilt deck 3-axle transport trailer equipped with a pintle hook coupling assembly and was registered with Land Transport NZ. It was designed to tilt backwards hydraulically and rest on 2 support feet under the rear of the trailer for stability (see Figure 9). Ramps were then lowered to permit a bulldozer or similar track vehicle not licensed or suitable for travel on a road to be driven on or off. The pintle hook coupling assembly was designed to transfer some the weight of the load being transported through the towbar to the truck pulling the trailer. The height of the trailer when registered was 1.00 m.



**Figure 9**  
**View of trailer and bulldozer**

- 1.5.2 The bulldozer was a Komatsu model D65/8. When built, this model was not fitted with a cab. At some time a protective cab was fitted to the bulldozer to allow the machine to work in the forestry industry. A cab manufacturer described the cab as a non-standard homemade bush cab with an air-conditioning unit fitted at the top.

- 1.5.3 The bulldozer was unregistered, so its dimensions were not held by Land Transport NZ. Industry sources calculated the overall height of the bulldozer, including the cab and the air conditioning unit would have been about 3.50 m. When loaded on the trailer, the overall height would have been about 4.50 m.

## **1.6 Personnel**

### **Truck driver**

- 1.6.1 The haulage contractor had employed the truck driver on a casual basis for 18 months. He held a Class 1 to 5 heavy traffic driver's licence that also allowed him to drive wheeled, tracked and roller vehicles. He was familiar with operation of the contractor's tilt deck trailer and had transported different types of earthmoving machines on main and rural roads in the Wairarapa, including Opaki-Kaiparoro Road, on many previous occasions.
- 1.6.2 The truck driver later said that these machines tended to have width exceedance rather than height exceedance, and he was not supplied with any measuring equipment to gauge the width and or height of over-dimensioned loads. He had received no specific training in the safe transportation of over-dimensioned loads and he was not aware of the Land Transport NZ rules.
- 1.6.3 On the day of the incident, the truck driver drove the empty truck and trailer unit from the contractor's premises in Masterton to the farm access. The owner of the bulldozer drove the machine onto the trailer. Once loaded, the truck driver drove out and stopped at the intersection with Opaki-Kaiparoro road where they secured the bulldozer to the trailer with chains. The truck driver later said that the owner assured him that bridge No.98 had sufficient clearance.
- 1.6.4 With the owner driving a utility vehicle in front, the truck driver drove towards the bridge and stopped as a result of the collision. The owner turned back and together they assessed the damage. The truck driver reversed the unit clear of the bridge where the trailer was re-levelled. The truck driver then reversed the unit back to the farm access and the owner off-loaded the bulldozer.
- 1.6.5 When the truck driver had repositioned the truck and trailer unit, the bulldozer was reloaded and driven to its destination via the alternative route. Later when the truck driver had access to a telephone directory at a friend's house, he rang the listed railways emergency number and informed the train controller of the collision.

### **Area coordinator**

- 1.6.6 The area coordinator was the Transfield Services employee responsible for infrastructure maintenance and renewal from Masterton to Woodville on the Wairarapa Line and from Woodville to Gisborne on the Palmerston North-Gisborne Line. He had almost 37 years of track maintenance experience and had a staff of 20, including the acting ganger. Since 1983 he had several managerial roles relating to track maintenance in the North Island.
- 1.6.7 On the day of the incident, the area coordinator was checking the heat 40-speed restrictions south of Hastings for the upcoming summer months when the train controller informed him of the damaged bridge. He immediately telephoned the acting ganger working north of Dannevirke and, as the acting ganger's work was almost completed, he said that he instructed him to travel and "inspect the bridge on Hastwell Road at Eketahuna which was by the cemetery where a big slip had been".
- 1.6.8 The area coordinator then made contact with the farmer on Bowen Road to confirm the location of the bridge on Hastwell Road. The area coordinator telephoned the acting ganger a second time and said, "the bridge was at 118 km near the cemetery on Hastwell Road where a big slip had been".

- 1.6.9 When the acting ganger told the area coordinator that he had found no damage to the 2 bridges that he had inspected, the area coordinator said that he asked the ganger if he had “checked the bridge at the 118 km”, the acting ganger replied that he had.
- 1.6.10 At about 1345 on Monday 4 October, the area coordinator received a telephone call from the farmer on Hall Road who asked if anybody was going down to check the bridge. He told the farmer that the bridge had been checked. The farmer told him that the bridge was still damaged and needed to be checked again.
- 1.6.11 The area coordinator contacted a ganger working at Eketahuna who informed him about 30 minutes later that bridge No.98 was unfit for trains. The area coordinator arranged for the section of line to be closed.

**Acting Ganger**

- 1.6.12 The acting ganger was the Transfield Services employee responsible for the day-to-day management of operations of a track maintenance gang working between Dannevirke and Masterton on the Wairarapa Line. He had no routine inspection responsibilities, but was required to make special inspections when extreme weather conditions were forecast, and carry out other duties and responsibilities as Transfield Services required from time to time. The search for the reported damaged bridge was one of the “other duties and responsibilities” occasionally required of him. He had been filling the role of ganger Dannevirke for about 2 years.
- 1.6.13 The acting ganger had about 29 years track maintenance experience, in the southern Hawkes Bay, Manawatu and northern Wairarapa areas. He had been back at work for 2 weeks after a 2-month period of leave during which the slip near Bridge No.98 had occurred.
- 1.6.14 On the day of the incident, the acting ganger had been overseeing drain clearing after some recent flooding north of Dannevirke. At about 1200, he received the telephone call from the area coordinator instructing him to travel “to the bridge at Eketahuna that had been damaged previously and was by a cemetery with the slip”.
- 1.6.15 The acting ganger completed his tasks at about 1315, and drove his HRV to a level crossing at Eketahuna where he obtained a track warrant, on-tracked and travelled past a known slip location down to bridge No.102 near the cemetery, south of Eketahuna (see Figure 10). He later said that he had attended a previous incident at Bridge No.102 when a sheep truck was stuck and slightly damaged the bridge. The acting ganger found no damage and reported his findings to the area coordinator.



**Figure 10**  
**Bridge No.102 (left) and bridge No.98 (right) located next to cemeteries**

- 1.6.16 The acting ganger then travelled north of Eketahuna to bridge No.103 over State Highway No.2. Finding no damage at that bridge, he again telephoned the area coordinator.

### **Families farming in Hastwell area**

- 1.6.17 Both the farming families had been farming in the Hastwell area for many years. Their farms were located either side of the railway line and they were frequent travellers along the Opaki-Kaiparoro Road under Bridge No.98. The farmers on Bowen Road were unaware the bridge was numbered for railway purposes, but one of the farmers on Hall Road was aware of its number.
- 1.6.18 The farmers on Bowen Road rang an 0800 number that they had frequently used to obtain authority to move stock across the line, but the farmer on Hall Road rang the cellphone number of the area coordinator as he had retained it from a recent liaison when dealing with the slip south of bridge No.98.
- 1.6.19 The farmers on Bowen Road said that they had noticed stock truck drivers slow their vehicles down under the bridge because of the minimal overhead clearances.

## **2 Analysis**

- 2.1 The collision occurred because an over-dimensioned road load was higher than the soffit clearance at bridge No.98. Clearance warning signs informed road users that there was a minimum 4.30 m clearance for both northbound and southbound carriageways under bridge No.98. Although the actual clearances were slightly greater, Land Transport NZ policy required that the measurement be rounded down for practical reasons.
- 2.2 Rail over road bridges probably made up a large number of overhead structures that had clearances less than the 4.4 m minimum standard set by Land Transport NZ. Historically, many of these bridges were built over unsealed roads and the size of road vehicles at the time was significantly less than today's vehicles. The roading industry has expanded with larger vehicles and roads have been upgraded resulting in more responsibility for truck drivers when approaching restricted height structures with over-dimensioned loads.
- 2.3 With a maximum permitted height of 4.25 m, loaded stock trucks driving under bridge No.98 only had 50 mm clearance between the top of the stock truck and the bridge soffit. The farming family on Bowen Road said that over recent years they had recovered a number of decapitated sheep and cattle heads from under bridge No.98 because of the animals' tendency to poke their heads through the top of stock trucks. This situation highlighted the minimal clearances available at the bridge for stock trucks that did not exceed the 4.25 mm maximum allowable height.
- 2.4 The bulldozer owner's belief that there was sufficient clearance under bridge No.98 was probably based on his previous experience when the bulldozer was delivered to the farm. However on that occasion, it had been delivered on a different trailer, which was probably lower, or had passed under bridge No.98 on the southbound carriageway and had taken advantage of the extra available clearance. This was the first time the bulldozer had been transported on this contractor's tilt deck trailer and it was the first time the truck driver had hauled the bulldozer.
- 2.5 Although he said that he had transported many over-dimensioned loads previously, the truck driver was not equipped, trained or aware of his obligations under Land Transport NZ's rules. Although on this occasion, the owner had told him there was adequate clearance, this did not release the truck driver from his responsibility to measure the height of the load. Had it been measured, then it would have been obvious there was insufficient clearance under the bridge. This would have forced them to travel via the alternative route. In view of the ongoing initiatives Land Transport NZ are undertaking in this area and an article relating to bridge

strikes written in the March 2005 issue of New Zealand Trucking, no safety recommendation has been made to Land Transport NZ regarding this issue.

- 2.6 Had the exhaust outlet fully travelled under the bottom flange of the centre span following the impact, it is highly likely that it would have become jammed between the 2 girders of the bridge span. This would probably have prevented the truck from being driven away from under the bridge without causing further damage.
- 2.7 Arrangements should have been made immediately to contact the railway emergency number in the Telecom directory and advise of the collision and obvious damage to the bridge. There were several farmhouses located nearby where access to a telephone and a directory would have been available. The omission of the bulldozer owner and truck driver to immediately report the collision created a potential serious situation for any trains which may have been running in the area.
- 2.8 The quality of the information supplied by the farmer's wife to the area coordinator was such that he was able to accurately pinpoint the metrage of the bridge. The area coordinator then made two calls to the acting ganger in which he explained that the bridge was located on Hastwell Road, Eketahuna by the cemetery where a big slip had been.
- 2.9 After the second call the acting ganger said that he interpreted the location as being the bridge that had been damaged previously which was near the cemetery and the slip that he was aware of. Whether or not the metrage of the bridge was conveyed by the area coordinator could not be determined. However, had it been, that information would have positively identified the correct bridge. Because he was on leave during the disruption caused by the more recent slip near bridge No.98, he was unaware of the existence of the second slip. His interpretation was probably reinforced by the fact that he had been called out previously to effect repairs to bridge No.102 after it had been damaged in a bridge strike.
- 2.10 In an attempt to improve the identification of bridges a safety recommendation has been made to the Chief Executive of ONTRACK to fix identification plates; visible to road users, on rail over road bridges with restricted clearances.
- 2.11 Despite receiving credible and authentic information relating to the damaged condition of bridge No.98, it appears the area coordinator may not have fully grasped the seriousness of the situation. When he received 2 calls from the acting ganger informing him that the 2 bridges that he had inspected were undamaged, it would have been prudent for the area coordinator to challenge these findings and instruct a more extensive search until the damaged bridged had been located.
- 2.12 Crew Resource Management revolves around communication and encourages team members to question information that is at variance with previous information. If either the area coordinator or the acting ganger had questioned whether the likelihood of the damaged bridge still existed, rather than terminate the inspection at Bridge No.103, they may have concluded that the search should continue. An option that either could have taken was for one of them to contact the farmer on Bowen Road and arrange a meeting at either the farm or the bridge, which would have taken the acting ganger no more than 15 minutes to reach.
- 2.13 Even though the acting ganger had not been appointed to the permanent ganger's role at Dannevirke, he was experienced in the duties of the role, including the undertaking of special inspections at critical times. He had been called out on previous occasions to locate and inspect damaged bridges and was aware of the signs to look for. Having found no damage to Bridges No.102 and No.103, it would have been prudent for the acting ganger to question whether or not he had been sent to the correct location. He could also have asked for contact details of the reporting family. However, at the time he cancelled his track warrant, the acting ganger was at the end of a 9-hour working day; and although eager to get home, he should have continued with the special inspection until the damaged bridge had been located.

- 2.14 Both the area coordinator and the acting ganger were aware of the location of bridge No.98 and both commented later that had a train travelled over the bridge in its damaged condition, then it would have very likely derailed. Their respective experience in conducting special inspections was extensive and both were fully aware of their responsibilities as required by NZRC's codes and procedures. However, in view of the communication breakdown that occurred on this occasion, a safety recommendation has been made to the Chief Executive of ONTRACK to reinforce the principles of effective Crew Resource Management in regard to clear and concise communication to all levels of infrastructure staff.
- 2.15 It was only the vigilance and determination of the two farming families that probably prevented a more serious incident from occurring. Bridge No.98 had been seriously damaged and although the first scheduled service was not due through the area for 3 days, the Wairarapa Line was used for the occasional passenger excursions and diverted express freight trains in the event of a planned or unplanned disruption on the North Island Main Trunk between Wellington and Palmerston North. It was fortunate that during this time, no train movement occurred.

### **3 Findings**

Findings area listed in order of development and not in order of priority.

- 3.1 Bridge No.98 was damaged when the top of an over-dimensioned road load collided with the underside edge of the centre span of the bridge, damaging the steel girder and timber cap on a pier.
- 3.2 Bridge No.98 was in a sound condition prior to the collision and scheduled structural inspections had been performed and recorded in a timely and accurate manner.
- 3.3 Initial notification of the damage to the bridge provided by the farmer was informative and as complete as could be expected from a person unacquainted with the rail industry.
- 3.4 Although the area coordinator correctly concluded the metrage of the damaged bridge, communications between him and the acting ganger regarding location and identification of the bridge were either not complete or misinterpreted, resulting in 2 undamaged bridges being examined and ultimately the line remaining open.
- 3.5 Better communications would probably have led to a clear understanding of the critical task being undertaken and the successful locating of the damaged bridge.
- 3.6 Having received a credible report of damage, a further search should have been instigated until the damage was found.
- 3.7 The damaged bridge remained open for traffic for 2 days until a second farmer notified the damage again after which the line was closed and the bridge repaired.
- 3.8 The actions of all the farmers were commendable.
- 3.9 There was potential for a serious rail accident had a train travelled over the bridge in its damaged condition.
- 3.10 Appropriate warning signs advising of restricted clearances were posted on both sides of centre span and on both the carriageways on Opaki-Kaiparoro Road approaching bridge No.98.
- 3.11 Although the truck driver was appropriately licensed, he was not aware of the Land Transport NZ's rules relating to the transport of over-dimensioned road loads, nor was he trained or equipped to measure the height of the load.
- 3.12 The truck driver was aware of the posted clearance under bridge No.98 but was not aware of the height of his load.

- 3.13 The truck driver was experienced in hauling over-dimensioned road loads, but did not measure the dimensions of these loads, probably developing a degree of complacency, which would not lead him to challenge the advice that the load would pass under the bridge.
- 3.14 Had the truck driver or the owner reported the collision to railways immediately, the damaged bridge might have been located and repaired earlier.

## **4 Safety Action**

- 4.1 On 8 April 2005, Land Transport NZ advised that the March 2005 issue of New Zealand Trucking Magazine included an article that highlighted the current problem of bridge strikes, including rail overbridges and urged truck operators to promote safe practice which stated in part:
- Encouraging drivers of over-height loads to be particularly careful in measuring loads and ascertaining they have safe clearance along a route;
  - Drivers of open deck vehicles paying more attention to the height of loads being carried.

## **5 Safety Recommendations**

Safety recommendations are listed in order of development, not in order of priority.

- 5.1 On 4 April 2005 the Commission recommended to the Chief Executive of ONTRACK that he:

fix identification plates on all rail over road bridges that have a height restriction of 4.4 m or less. Plates should be visible to road users and identify each bridge by its number and rail metrage, and include an emergency contact number. Similar plates should be fixed to other bridges where NZRC determine a need because of previous history (004/05).

- 5.2 On 11 April 2005 the Chief Executive of ONTRACK replied in part:

ONTRACK intends to implement this recommendation.

A final date for the completion of this work cannot be provided, however it will be scheduled over a period of time.

- 5.3 On 27 June 2005 the Commission recommended the Chief Executive of ONTRACK that he:

reinforce the principles of effective Crew Resource Management in regard to clear and concise communication to all levels of infrastructure staff (064/05).

- 5.4 On 5 July 2005 the Chief Executive of ONTRACK replied in part:

ONTRACK intends to implement this recommendation.

ONTRACK have requested that Transfield Services include in their next scheduled toolbox training session the relevant communications elements of the Crew Resource Management principles.

Approved on 30 June 2005 for publication

Hon W P Jeffries  
**Chief Commissioner**











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