NO. 93-129

TRAIN 404

COLLISION WITH MOTOR VEHICLE

NEAR RUAKURA

23 DECEMBER 1993

ABSTRACT

This report relates to the collision between Train 404 and a motor vehicle near Ruakura on 23 December 1993. The safety issues identified in the investigation were the siting of trackside structures, the frangibility of trackside structures,the speed of the railcar and the timetabling of the railcar service, and the conspicuity of level crossing flashing lights against the sun at low angles of elevation.

TRANSPORT ACCIDENT INVESTIGATION COMMISSION

RAIL ACCIDENT REPORT NO. 93-129

Train Type and Number:	Passenger, 404
Railcar:	RM 24
Date and Time:	23 December 1993, 1955 hours
Type of Occurrence:	Collision with motor vehicle
Location:	Telephone Road level crossing between Eureka and Ruakura; 11.08 km East Coast Main Trunk
Persons on Board:	Crew: 3 Passengers: 20
Injuries:	Crew: Nil Passengers: Nil Others#: 1 fatal
Nature of Damage:	Substantial to railcar, trackside structures and motor vehicle.
Information Source:	Transport Accident Investigation Commission field investigation
Investigator in Charge:	R Chippindale

Driver of motor vehicle

1. NARRATIVE

1.1 Train 404 was New Zealand Rail Limited's "Geyserland" Express a passenger railcar service from Rotorua to Auckland.

1.2 At 1950 hours on 23 December 1993 the train was approaching Telephone Road level crossing. As the railcar neared the crossing the Locomotive Engineer saw a car approaching the crossing from Marshmeadow Road at a speed which he estimated at 30 km/h.

1.3 Marshmeadow Road ran in the same direction as Telephone Road both of which were joined by Holland Road which ran at right angles to the roads but parallel to the railway track.

1.4 From the time that the Locomotive Engineer first saw the car driver he expected him, in sequence, to stop at the Stop sign at the intersection between Holland and Marshmeadow Roads, turn left and drive a short distance then turn right across Holland Road into Telephone Road. The distance from the intersection of Holland and Telephone Roads to the tracks on the level crossing over Telephone Road was 18 m and between Marshmeadow Road and Telephone Road 17 m.

1.5 As the Locomotive Engineer watched the car driver negotiate the intersection he noticed the driver did not hesitate at the Stop sign but drove straight past it then on to Telephone Road. The car was travelling slowly and the Locomotive Engineer assumed it was stopping for the crossing warning lights when it passed from his view behind some tall weeds. To his surprise the car rolled on and stopped on the track instead immediately in front of the railcar. It did not display any sign of heavy braking or juddering as might be expected if the driver had not selected the correct gear for the speed at which the car was travelling up the slope.

1.6 The weather was fine and clear with good daytime visibility.

1.7 The railcar event log recorded the railcar's speed as 130 km/h as it approached the crossing.

1.8 The driver had sounded the railcar's horn at the normal point some 150 m from the crossing. He sounded the horn a second time as the car approached the crossing and when this had no apparent effect he resorted to sounding it continuously. With the first sounding of the horn the railcar's headlights would have started flashing alternately left and right. This flashing continued after the horn stopped so the lights would have flashed continuously from the first sounding of the horn until the time of impact.

1.9 The crossing alarms were operating normally as the car approached the crossing. The alarms had been tested and certified as effective on the day before the accident.

1.10 The motorist's view of the railcar was however partially blocked by roadside vegetation due to the approach road being initially some 10 feet below the track level. The trackside telephone poles also obstructed the driver's view of the rail car as he passed through their plane of alignment ie the position at which all the poles were in line from the driver's point of view.

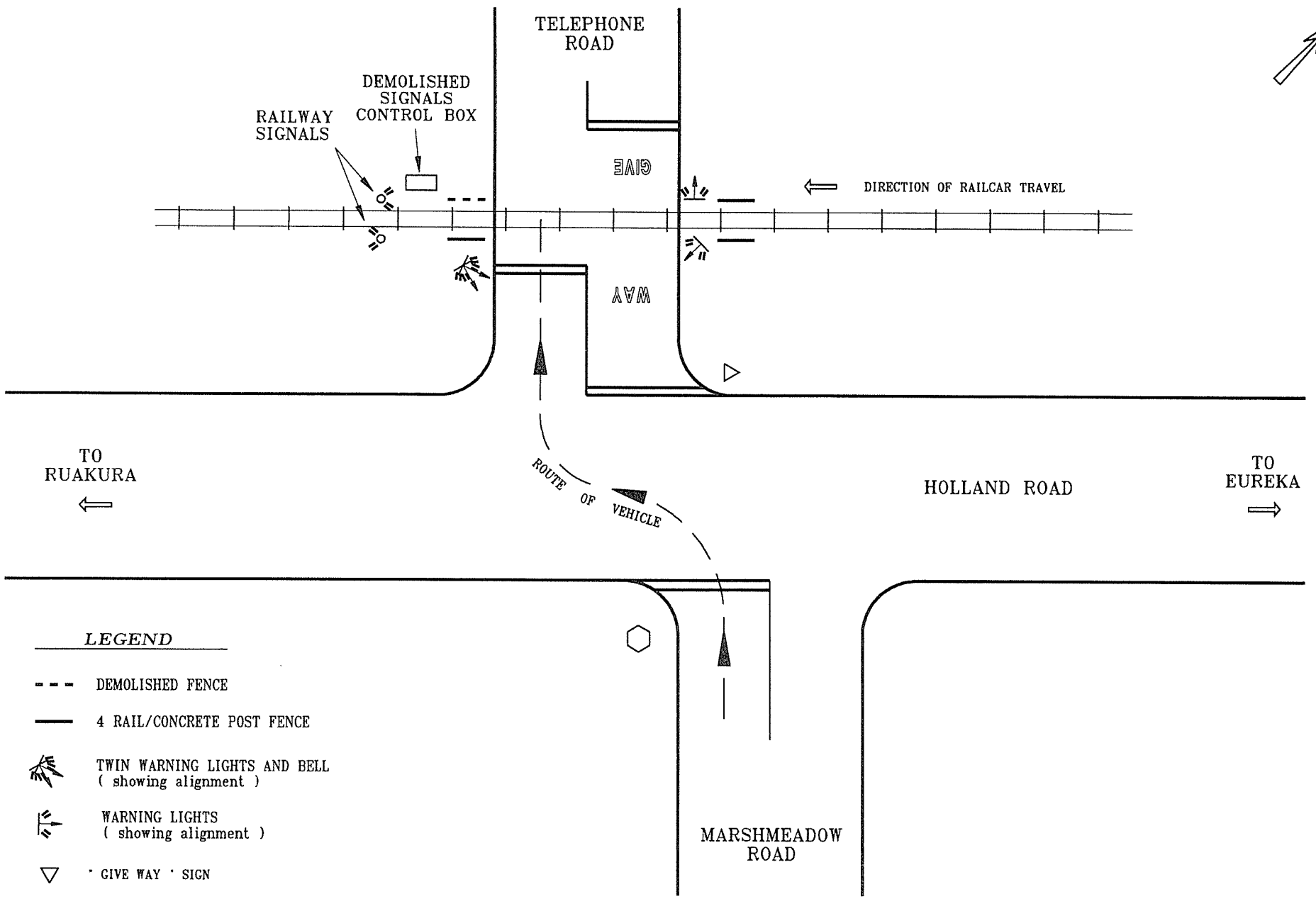
1.11 The traffic on the roads involved in this accident had increased significantly in the last 15 years. In 1978 85 vehicles per day were counted on Telephone Road, in 1991 548, 1992 981 and in 1993 857, of which over 8% were heavy commercial vehicles. Similar increases had been measured on Holland Road from 176 in 1975 to 1534 in 1992 and on Marshmeadow Road from 130 in 1979 to 750 in 1992.

1.12 The lights and bells were installed on the crossing in June 1965 and no additional active warnings had been installed since that date.

1.13 There were signs on Marshmeadow Road warning of a rail crossing ahead even though the crossing was not on Marshmeadow Road or on the road at its end, Holland Road.

1.14 The sun's angle above the horizon and its azimuth would have made the left hand side warning lights difficult to see had the sky been clear at the time. The Locomotive Engineer remembered however that the sun was not in view along that stretch of track as he recalled lifting the railcar's sun visor, when the sky clouded over some time prior to the collision, and leaving it up.

1.15 The speed limit for rail service vehicles on the section of track, which included the crossing, was 90 km/h. The railcar's normal maximum speed was 110 km/h.



TELEPHONE ROAD CROSSING

1.16 The Locomotive Engineer was adamant that he had not exceeded the speed limit at any time.

1.17 A comparison of the distances and the times taken to travel from Rotorua to the accident site indicated that the event recorder was recording actual railcar speeds.

1.18 A subsequent test by New Zealand Rail Limited, in the same railcar but on a different section of track, indicated the correlation between the railcar's speedometer indication and the speed recorded on the event recorder were consistent and accurate.

1.19 The normal practice was for the Locomotive Engineers of the railcars travelling in opposite directions to change trains at Ruakura or an adjacent crossing loop.

1.20 A comparison of the distances and the timetable for the "Geyserland" Express indicated that between Morrinsville and the crossing loop at Ruakura which was intended to be used on this occasion, an average speed of 87 km/h would have been required by Train 404, if it left Morrinsville on time, to arrive in the loop for a changeover on schedule and accomplish the procedure in the planned three minutes. The Locomotive Engineer stated however that he was running late at Morrinsville by a few minutes.

1.21 If Train 404 was one minute late it would have had to average 93 km/h, if it was two minutes late 100 km/h and three minutes late 109 km/h. The top speeds required to attain such averages over the distance would have been in excess of these figures.

1.22 The Locomotive Engineer had heard Train Control advise Train 301 that the changeover with Train 404 would be at Ruakura and stated that although he was a minute late leaving Morrinsville "if everything had gone all right we probably would have arrived there pretty well at the same time".

1.23 Simultaneous berthing was not available in the loop section of track and Train 404 was scheduled to arrive first. This was not immutable and if Train 301 arrived first Train Control could have let it berth first.

1.24 The Locomotive Engineer denied the existence of any pressure to make good published timetables but he did refer to a requirement for the passengers to be informed of the extent of, and reason for, any extended stop between stations or other delays.

1.25 Although the Working Timetable was reasonable as far as the total time allowed for Train 404 to travel from Morrinsville to Hamilton was concerned, the timekeeping to arrive at the change over point was demanding. The need for synchronisation in the timing of the trains' arrival at the crossing loop would have created a further pressure on the train crews by either having to explain the delay or to resist the temptation to make up time on suitable stretches of track. With a timetable which required an average speed almost equal to the maximum permitted, Locomotive Engineers were placed in a difficult position.

1.26 While the evidence relating to the speed of the train was not conclusive it would, at worst, have reduced by 6.5 seconds the normal minimum interval of 21.5 seconds, between the initial switching on of the warning lights and bells and the arrival of the railcar at the crossing. An excess speed of the order of that recorded also had the potential to double the energy of the impact.

1.27 Because the car was stationary on the crossing any excess speed over the maximum authorised for the track, up to the margin recorded, would not have been a significant factor in the outcome of this accident.

1.28 After the motor vehicle was struck by the railcar it demolished two concrete posts and a section of obsolete cattle stop fencing and damaged a crossing signal control box and a railway track signal stanchion.

1.29 The trackside obstructions increased the severity of the damage to the car, and in different circumstances could have made a significant difference to the occupant's chances of survival.

1.30 The Locomotive Engineer had applied the emergency brakes as soon as he saw the car was not going to clear the crossing. Despite this the railcar travelled 468 m with the car trapped under its cow-catcher and front bogie.

1.31 The effect of the wreckage on the braking distance could not be estimated. The motor vehicle did however inflict substantial damage to the rail car. The cow-catcher was damaged beyond economical repair, the sand box was badly damaged, the Westinghouse brake pipe work and hoses were damaged on the front of the railcar, the bogie check chains broken and the brake spreader beams were bent.

2. FINDINGS

2.1 The Locomotive Engineer was keeping a satisfactory lookout and reacted to the car's approach appropriately.

2.2 The train was likely to have been operated at a speed higher than that authorised by New Zealand Rail prior to the accident.

2.3 The Locomotive Engineer had no discretion which allowed him to exceed the speed restriction of 90 km/h.

2.4 The speed of the train was not a contributing factor in the accident.

2.5 The railcar could not have been stopped in time to avoid the collision.

2.6 The approaching railcar would not have been visible readily to the motorist as he looked to his right for conflicting road traffic prior to entering Holland Road.

2.7 The need to comply with a compulsory Stop sign then make two right angle turns before entering the level crossing dictated a slow approach to the level crossing by any motorist who approached the crossing from Marshmeadow Road.

2.8 One pair of flashing red warning lights was directed at the position a driver would occupy immediately before he turned into Telephone Road.

2.9 As the motorist had only the time taken to traverse 18 m after turning into Telephone Road, it was essential that he was alert if he was to realise the warning lights were operating and take the necessary action in time to stop.

2.10 The possibility of a mechanical defect in the motor vehicle which prevented the driver from stopping at the appropriate position prior to the crossing, could not be eliminated.

2.11 An adjacent railway signal mast, the crossing alarm control box, the standards on which the warning lights were mounted, concrete posts for short fences formerly sides to cattle stops and miscellaneous out of use concrete blocks each had the potential to aggravate the consequences of any collision in which a road vehicle was struck by a rail vehicle.

3. SAFETY RECOMMENDATIONS

3.1 As a result of this occurrence it was recommended to New Zealand Rail Limited that they:

3.1.1 Investigate the practicability of "delethalising" the level crossing environment progressively by removing obsolete substantial obstructions, and relocating signal stanchions, equipment housings and other essential structures, sited within 500 m of track distance from any level crossing, so that they were at least 5 m from the trackside and investigate the practicality of improving the frangibility of warning light/barrier masts so that they minimised the damage inflicted on vehicles which collided with rail vehicles (045/94) and,

3.1.2 Review passenger service timetables to ensure the elapse times take into account, the speeds necessary for Locomotive Engineers to arrive at crew changeover positions on time (046/94), and

3.1.3 Encourage Locomotive Engineers to draw attention to any timetables which could not be achieved within normal running speeds (047/94).

New Zealand Rail Limited responded:

3.1.1 "Your recommendation to "delethalise" crossing environments should be made in the context of all level crossings and be compared to all other roadside hazards such as kerbs, powerpoles, traffic islands,

traffic light standards, notices etc, that the motorist faces. The approach for this issue should be through the LTSA working party undertaking the audit of crossing management. The masts supporting the warning light/barrier were not involved in this accident and played no part in the subsequent damage to the road vehicle.

3.1.2 Train schedules are prepared in accordance with NZRL Operating Code, section 7 clause 6.8. As noted in this report, the working timetable was reasonable as far as total time allowed for train 404 to travel from Morrinsville to Hamilton. The location and time of the "change over point" can be flexible depending on operational constraints on the day. NZRL currently reviews train schedules on a regular basis by reference to the actual control graphs."

Section 7, Clause 6.8 stated (in part):

"6.8.1 ***Basic Running Time***

A basic running time refers to a specific section of track, locomotive, train weight and train type. For any given set of conditions, the basic running time may be defined as the least time the specified weight of train could run through the particular section of track, the speed being kept at all times as close as possible to the authorised speeds, up to the performance capacity of the locomotive.

6.8.1.1 These are based on:

- *Normal operating conditions.*
- *Normal condition of locomotives and rolling stock, eg for locomotive performance and train resistance.*
- *Authorised speeds as defined in the Working Timetable for the locomotive and train concerned, including permanent speed restrictions.*
- *Curve speeds as authorised by General Manager, Engineering in consultation with General Manager, Network Operations.*

6.8.1.2 A basic running time does not include any allowance for:

- *Starting and stopping at the beginning and end of the specified sections.*
- *Temporary speed restrictions or deceleration and acceleration in connection therewith.*
- *Standing time at intermediate stops for crossings, crew changes, etc.*
- *Abnormal weather.*
- *Efficiency of signalling system.*
- *Condition of locomotive or rolling stock.*
- *Contingencies or make-up time.*

It must be emphasised that the basic running time is not necessarily the least time a train of specified type and locomotive can run through the section without exceeding authorised speeds. Where the basic running time is mainly governed by locomotive performance as on long undulating grades, trains of less than the scheduled load can run through the section in less time than the BRT for scheduled load trains, without exceeding the authorised speeds. An extreme example would be a light locomotive on a long undulating section. The term "minimum running time", is deemed to mean the shortest possible time that the minimum train could traverse the section concerned without exceeding the authorised speeds."

3.1.3 "NZRL Operating Code Section 4, 5.1. covers reporting of trains unable to maintain the timetable schedule."

Section 4, Clause 5.1 stated:

"Train Unable to Run at Timetable Speeds

If for any reason a Locomotive Engineer is unable to maintain timetable speed, he must inform Train Control of the problem at the first available opportunity, stating clearly the reasons and the procedure he intends to adopt under the circumstances."

NOTES

The problem of trackside structures aggravating the consequences of level crossing accidents has been apparent at other accidents investigated by the Commission. See reports 93-105, 93-112 and 93-115.

The Commission has already made a recommendation that backboards be considered where the efficacy of crossing signals was likely to be affected by the sun.

The trackside growth which formed an obstruction to motorists' views of approaching trains was sprayed with weed killer following a recommendation by the New Zealand Police that this vegetation be removed.

The need for additional traffic signs in relation to the increase in road traffic using this level crossing is expected to be reviewed as part of a nationwide review of such warnings by the Land Transport Safety Authority.

3 May 1994

M F Dunphy
Chief Commissioner