RAIB

Rail Accident Investigation Branch

Rail Accident Report

Fatal accident at Fairfield crossing, Bedwyn, 6 May 2009

Department for Transport

Report 08/2010
May 2010

This investigation was carried out in accordance with:

- the Railway Safety Directive 2004/49/EC;
- the Railways and Transport Safety Act 2003; and
- the Railways (Accident Investigation and Reporting) Regulations 2005.

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Contents

Preface

1 The sole purpose of a Rail Accident Investigation Branch (RAIB) investigation is to prevent future accidents and incidents and improve railway safety.

2 The RAIB does not establish blame, liability or carry out prosecutions.

Key Definitions

3 References to left and right are as seen by a person facing in the direction in which the train involved in the accident was travelling.

4 Abbreviations are explained in appendix A at the rear of this report.

The Accident

Summary of the accident

5 At about 17:30 hrs on 6 May 2009 train number 2K74, the 17:08 hrs service from Newbury to Bedwyn, struck a pedestrian on the footpath level crossing known as Fairfield crossing, near the village of Little Bedwyn, Wiltshire (figure 1). The pedestrian, who was crossing from the north-west side of the railway, was fatally injured.

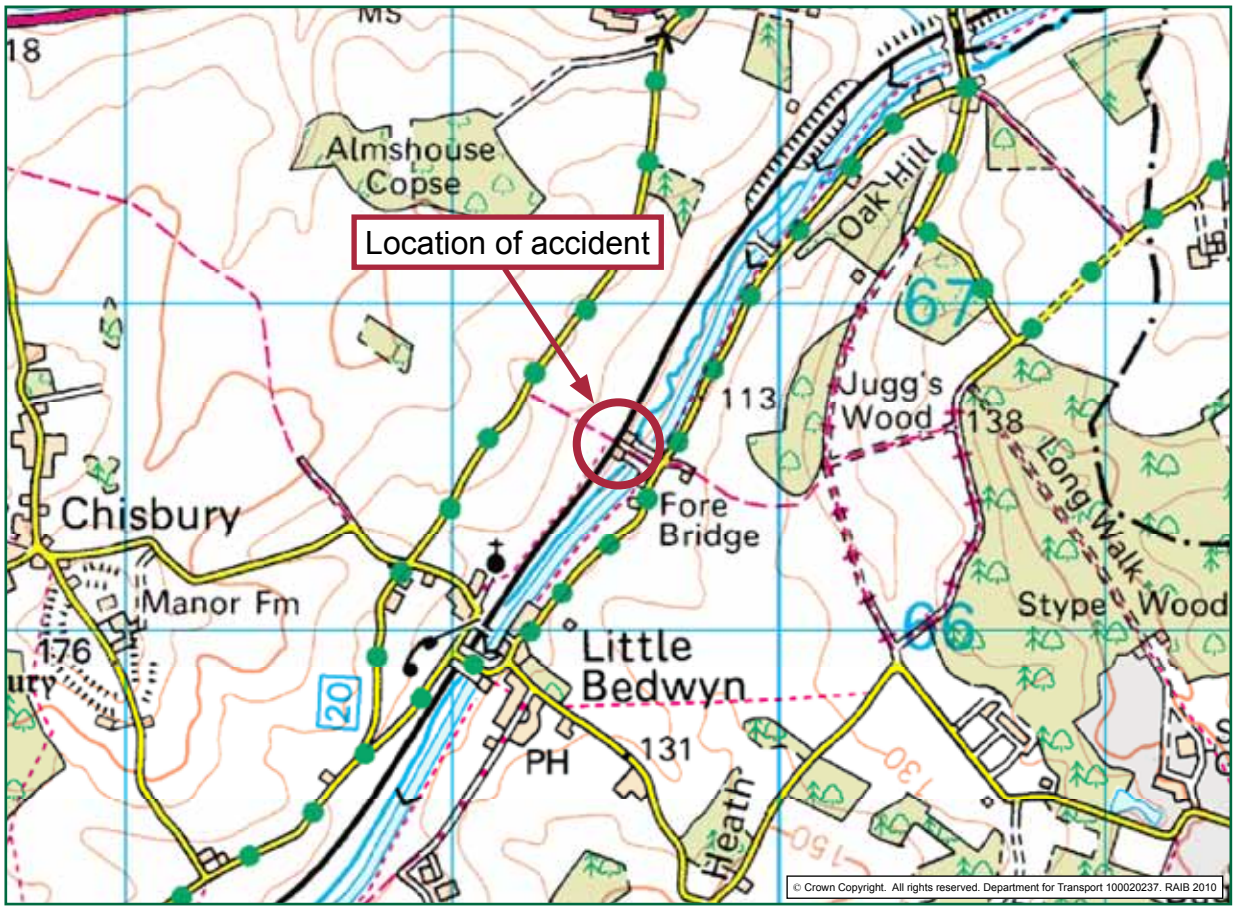

Figure 1: Extract from Ordnance Survey map showing location of accident

The parties involved

6 The railway infrastructure is owned, operated and maintained by Network Rail (Western route).

7 The train was operated by First Great Western (FGW), and the train driver was an FGW employee.

8 The person who was killed, Mrs Julia Canning, was a local resident.

9 Network Rail and FGW freely co-operated with the investigation.

Location

10 Fairfield crossing is on the double track railway between Hungerford and Bedwyn stations, which forms part of the main line route from London (Paddington) to the west of England. Mileages are defined from a zero datum at Paddington station in London, and Fairfield level crossing is at 64 miles 67 chains[1]. The 'up' direction is towards London, and the 'down' direction is away from London. The 'up' side of the level crossing is the north-west side, adjacent to the up line, and the 'down' side is the south-east side.

11 On this section, the railway runs in a north-east to south-west direction, close alongside the Kennet and Avon canal and an unclassified road. At a spot known as Fore Bridge a lane runs north-west from the road, crosses the canal on a narrow bridge, and terminates at the level crossing, where there is a house on each side of the lane. Over the crossing, on the north-west (up) side of the line, open fields (currently used for arable farming) rise gently away from the line. The path north-west from the crossing runs through fields to the unclassified road from Little Bedwyn to Froxfield (figure 1).

12 There are single gates 1.3 metres wide on each side of the crossing, opening away from the railway. At the time of the accident, the crossing had a timber surface over both lines, but the space between the tracks (the six-foot) and the approaches to the crossing were unsurfaced (figure 2).

Figure 2: Fairfield level crossing from the north-west

[1] One chain is 22 yards (20 metres). There are 80 chains in one mile.

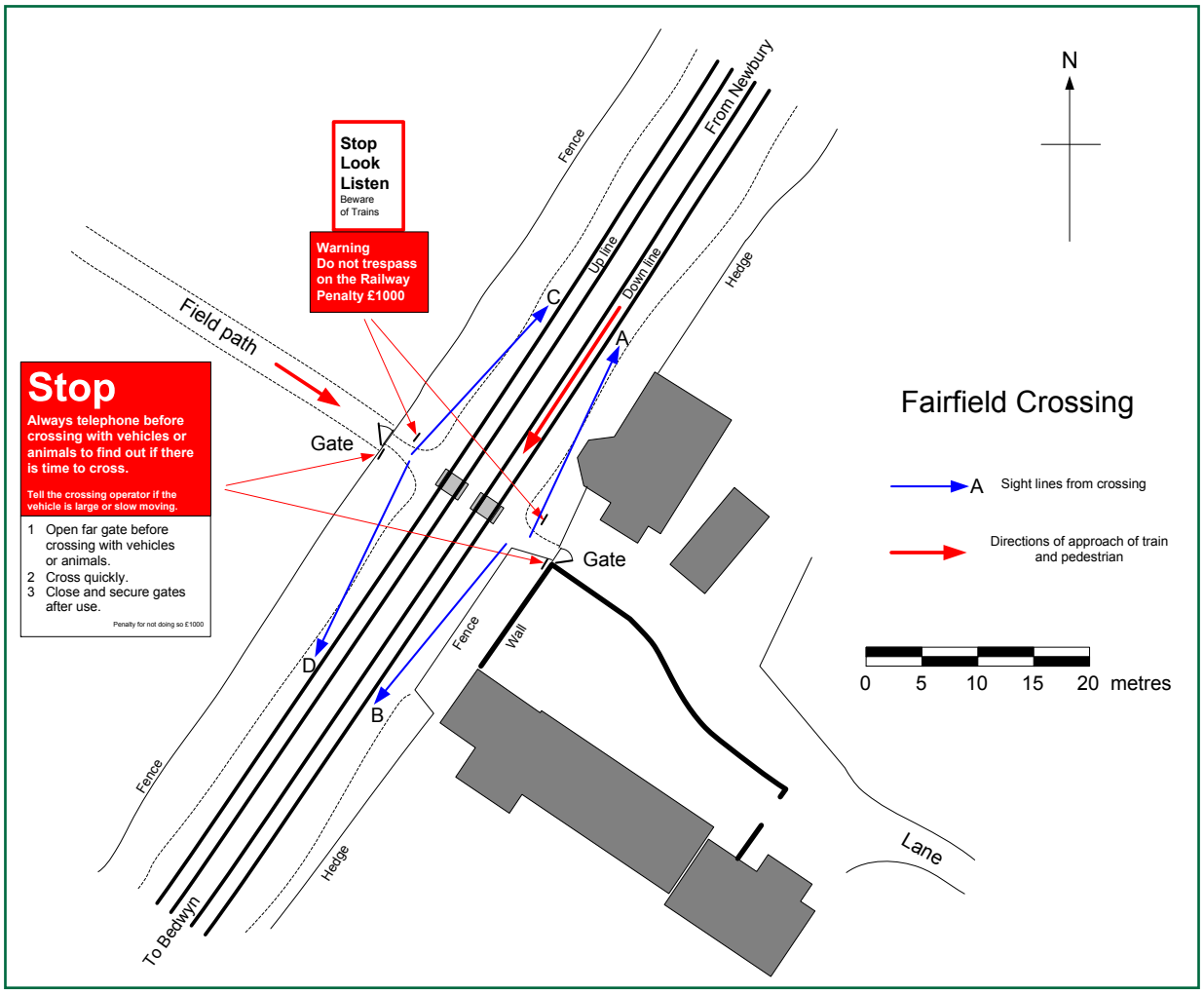

Figure 3: Plan of Fairfield crossing

13 The railway, following the line of the canal, has a sinuous route along this section. There are reverse curves on the approach to the crossing from both directions, which limit the visibility of approaching trains for users of the crossing. Telephones are provided on both sides of the crossing, to enable communication with the signal box at Reading. There are signs at the crossing telling users to 'always use the telephone before crossing with vehicles or animals to find out if there is time to cross' (figures 3 and 4).

14 The crossing is in a quiet rural area, and there are no significant sources of noise nearby.

15 The permitted speed for trains at this location is 100 mph (160 km/h) on both lines.

External circumstances

16 It was a cloudy, dry day, and the light was good. At the time of the accident there was a light (about 8 km/h (5 mph)) south-westerly wind.

The train

17 The train involved in the accident was formed of a three-car class 165 diesel multiple unit[2], number 165113.

Events preceding the accident

18 The train driver had begun his day's duty at his home station, Paddington, at 15:18 hrs, driving a semi-fast passenger train to Bedwyn, calling at Reading, Theale, Thatcham, Newbury, Kintbury and Hungerford. He then drove the same train back to Newbury, arriving at 17:01 hrs. At Newbury, the train waited for seven minutes before returning as 2K74, the 17:08 hrs service to Bedwyn.

19 The train called at Hungerford at 17:19 hrs. On leaving Hungerford, the driver accelerated the train to between 70 and 80 mph (113 and 129 km/h) for the five mile run to Bedwyn.

Events during the accident

20 At just after 17:25 hrs the train was approaching Fairfield crossing, travelling at about 70 mph (113 km/h). The white cottage on the left-hand side at the crossing, which, according to witness evidence, is a prominent landmark for drivers of trains approaching Bedwyn, came into the driver's view. As the train rounded the curve towards it, the driver saw a person with two dogs walk onto the crossing, coming from the right-hand side of the line. He applied the emergency brake.

21 The person continued to cross the line, into the path of the train, and less than five seconds after coming into the driver's view the person and one of the dogs were struck by the train, which was then travelling at 69 mph (111 km/h).

Consequences of the accident

22 The person and one of her dogs were fatally injured.

Events following the accident

23 The train stopped with its leading end about 340 metres past the crossing. The driver made an emergency call on the cab radio to the signal box at Reading, requesting the emergency services. He then attempted to assist the casualty.

24 As train 2K74 came to a stop, a First Great Western high speed train travelling in the opposite direction (train 1A89, the 15:00 hrs service from Plymouth to London Paddington) passed at line speed (100 mph (160 km/h)), reaching the crossing about 36 seconds after the accident. The driver did not see the casualty, who was lying on the far side of the opposite line, and this train did not stop.

25 An air ambulance arrived a few minutes later, and the person was declared dead at the scene.

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[2] A type of train which does not have a separate locomotive, and which is controlled from the leading cab.

The Investigation

Sources of evidence

26 The RAIB investigation has obtained information from:

- witness evidence;
- the data recorder and forward facing CCTV camera fitted to the train;
- site visits;
- discussions with local Network Rail management; and
- records relating to the crossing obtained from Network Rail.

Key Information and analysis

Fairfield level crossing

History

27 The railway from Hungerford to Devizes was constructed by the Great Western Railway under powers given by the Berks & Hants Extension Railway Act 1859, and opened in 1862.

28 For many years up to 1973 a private vehicular level crossing had existed at this location, and British Railways (BR) records at that time noted it as having been unused for several years except as a footpath. A notice of intention to close the crossing completely was posted by BR on 1 February 1973, but objections were received and closure did not take place. In 1976 Wiltshire County Council attempted to downgrade the road to a footpath, but there were again objections from the public to this proposal, and there is evidence that at that time the crossing was in use as a bridleway.

29 At the beginning of 1977 the landowner's private vehicular rights over the crossing were extinguished by agreement. The route over the crossing (previously classed as a 'road used as a public path') was reclassified as a bridleway in 1983. Closure of the crossing was discussed again by BR and the County Council in 1991, but no progress was made and at the time of the accident the crossing remained in use as a footpath and bridleway.

30 Following the accident, and after discussions involving the local authority, Network Rail and the Office of Rail Regulation (ORR), the footpath over the crossing was closed by a temporary order issued by Wiltshire County Council. Network Rail closed the crossing by padlocking the gates. The footpath and crossing were later reopened (paragraph 109).

Crossing dimensions and train speeds

31 The crossing passes over two railway tracks, spaced the normal distance (1.8 metres) apart. The total width of the crossing, from the place where a user begins to cross from one side of the line to the other, is 9 metres. A walking speed of 1.2 metres per second is suggested by ORR[3] for calculating crossing time, which equates to a crossing time of 7.5 seconds at this location. The need to cross areas of rough ballast slows down the walking speed of people using this crossing, and the time which was used by Network Rail for calculating the necessary warning which users should have of approaching trains (the warning time), in a risk assessment carried out in 2008, was 10 seconds. This includes an allowance of 2.5 seconds to take account of the needs of less able or encumbered people and the partial surfacing of the crossing, as stated in the ORR guidance.

32 The gate on the north-west (up) side of the crossing is 5.7 metres from the nearest rail. There is a 'Stop – Look – Listen' notice inside the gate, 4 metres from the nearest rail (figures 3 and 4).

[3] Railway Safety Principles and Guidance Part 2 Section E paragraph 148.

Figure 4: Notices and telephone on the up side at Fairfield crossing

33 The permitted speed for trains at the crossing, in both directions, is 100 mph (160 km/h). The warning time of approaching trains for users should be at least as long as the crossing time. To have 10 seconds warning time for a train travelling at this speed, a crossing user needs to become aware of the approach of a train when it is at least 447 metres from the crossing.

34 The permitted speed of trains at this point has increased since closure of the crossing was first proposed in the 1970s. At that time line speed was 90 mph (144 km/h) in both directions, and it was increased to 100 mph during the 1990s. It has not been possible to establish when the telephones at the crossing were provided, but this may have been in connection with the increase in line speed. However, by the time this occurred the crossing had already been closed to vehicles, although it continued to form part of a bridleway.

Warning of approaching trains

35 The situation of the crossing is described in paragraphs 10 to 15. The signs instruct users with vehicles or animals to make use of the telephone. Network Rail's records show that in the two years before the accident, the phones were used 51 times for the purpose of finding out whether there was time to use the crossing. Of these, four users were recorded as pedestrians, nineteen as horse riders, and the remaining 28 were not identified. The last occasion on which the phones were used before the accident on 6 May was on 2 May at 11:31 hrs, by an unidentified user.

36 The visibility of trains approaching Fairfield crossing can vary greatly depending on where the observer is standing and how well the vegetation along the sides of the line on the approaches to the crossing has been cut back. The views from both sides of the line in both directions are shown in figures 5 to 8.

37 Figures 7 and 8 show the views that the pedestrian (Mrs Canning) would have had as she approached the crossing from the north-west.

38 All of these views show the situation on 7 May, the day after the accident, and the state of the lineside vegetation had not changed since the accident. They are from the viewpoint of an observer standing near the 'Stop – Look – Listen' signs on each side.

Figure 5: View from down side of crossing looking towards Newbury (View A)

Figure 6: View from down side of crossing looking towards Bedwyn (View B)

Figure 7: View from up side of crossing looking towards Newbury (View C)

Figure 8: View from up side of crossing looking towards Bedwyn (View D)

39 The distance at which a train becomes visible was measured by Railtrack and Network Rail staff in the course of data collection, risk assessment and inspection visits (see paragraph 42) on several occasions before the accident, and was also measured by the RAIB as part of the investigation. The results are summarised in Table 1. Details of the assessments and inspections are given in paragraphs 44 to 55.

Event and date	View A	View B	View C	View D
Railtrack inspection and risk assessment 13 June 1999	600 m (13.4 s)	700 m (15.6 s)	200 m (4.5 s)	150 m (3.4 s)
Network Rail inspection 17 February 2003	526 m (11.8 s)	606 m (13.6 s)	600 m (13.4 s)	171 m (3.8 s)
Network Rail risk assessment 29 July 2006	-	-	245 yds (5 s)	129 yds (2.6 s)
Network Rail data collection for risk assessment 26 May 2008	600 m (13.4 s)	571 m (12.7 s)	573 m (12.8 s)	323 m (7.2 s)
Network Rail maintenance inspection 19 August 2008	>310 m (>6.9 s)	>310 m (>6.9 s)	310 m (6.9 s)	180 m (4 s)
Network Rail maintenance inspection 2 February 2009	Good	Good	Good	Poor
RAIB investigation 7 May 2009	564 m (12.6 s)	562 m (12.6 s)	288 m (6.4 s)	228 m (5.1 s)

Table 1: Summary of measured sighting distances (warning times at 100 mph in brackets)

Inspection and risk assessment

40 Network Rail and its predecessors have had an inspection and risk assessment regime for level crossings for many years. The risk assessment process (now carried out every three years at footpath crossings) is intended to ensure that the crossing design and equipment remains appropriate for the location and usage of the crossing, while the inspections (which should take place every six months) check on the condition of the crossing and its surroundings, as part of the maintenance regime for the rail infrastructure. The development of these processes over the last fifteen years is described in detail in appendix B.

41 Table 1 shows that there are significantly different sighting distances at Fairfield crossing, particularly from the up side of the line, as measured or estimated at the various inspections and assessments. Inspection of the crossing and photographs taken at different periods show that a lot of this variation is related to vegetation growth: there is a grassy bank on the up side of the line on both sides of the crossing, and long grass on this bank masks the long-range view of approaching trains.

42 Network Rail staff carrying out maintenance inspections (inspectors) and staff collecting data for risk assessments are required by the Network Rail Operations Manual (section 5-23 'Level crossing risk assessment – site visits and censuses') to measure sighting distances at crossings where the line speed is up to 100 mph when standing at a point two metres from the nearest rail, which is where a crossing user on foot is considered to be in the best position to make the decision on whether it is safe to cross (the decision point). The decision point is described in the Office of Rail Regulation (ORR) publication 'Railway Safety Principles and Guidance part 2 section E, Guidance on level crossings' (RSPG) as follows:

'It is a point where guidance on crossing safely is visible and at which a decision to cross or wait can be made in safety. For footpath crossings this should be not less than two metres from the nearest running rails…For bridleway crossings and user-worked crossings this should not be less than three metres from the nearest running rail.'

Network Rail's standard NR/L2/SIG/19608 'Level Crossing Infrastructure: Inspection and Maintenance', which is used by its level crossing inspectors, says:

'The decision point will depend on the local topography and from where the user will first be able to observe whether a train is approaching, but is generally two metres from the nearest running rail at all footpath crossings where the line speed is 100 mph or less".

The decision point is not marked, and it is left to the crossing user to decide where they can obtain the best view of approaching trains. This may be near the signs which give information about how to use the crossing, or it may be closer to the line. Fairfield is a footpath and bridleway crossing, but telephones were provided for horse riders and so the decision point was considered by Network Rail staff who visited the crossing to be two metres from the track.

43 Between 2002 and 2007, the forms used for level crossing inspection and risk assessment (Network Rail document RT/LS/S/012 Issue 3 Appendix B 'Inspection of Footpath and Bridleway Level Crossings') required the person carrying out the inspection or assessment to check that the signs provided at the crossing were located at the decision point and clearly visible. The form used since the beginning of 2007 (Inspection checklist LXi13) does not require this check to be made. Until 2005 inspection and risk assessment of footpath crossings were carried out together, by the same person, but in 2007 risk assessment using Network Rail's All Level Crossing Risk Model (ALCRM) began to be applied at footpath crossings (see appendix B).

44 A risk assessment was carried out by a Network Rail mobile operations manager (MOM) on 19 March 2006, but on this occasion no details of sighting distances or warning times were recorded. The MOM recommended that 'whistle' boards be provided. A further risk assessment on 29 July 2006 was carried out by a different MOM. Witness evidence indicates that he stood on the up side at a point two metres from the nearest rail, and used a radar gun and stopwatch to detect and time an approaching train, calculating the sighting distance from these measurements. This method of evidence collection was in accordance with the standard that was current at the time. The MOM noted that sighting from the down side of the crossing (views A and B) was unobstructed and approaching trains were in view for more than ten seconds, so he did not take any measurements from this side.

45 The MOM took photographs showing the effect which vegetation was having on the sighting distances on the up side (views C and D, figures 9 and 10). He recommended that the vegetation should be cut back. He noted that telephones were available for users, but that the signs did not invite pedestrians to make use of the telephones. He considered that the crossing was safe if the telephones were used, and suggested that signs should invite pedestrians to use the telephones before crossing from the up side. This assessment was not acted upon, possibly because at the time that it was done, an organisational change was taking place in the Western Route, with the central level crossing department for the route being disbanded and responsibility for level crossing management transferring to area level. There was a delay of six to eight weeks in the transfer of records and it seems likely that the report of the assessment was filed without being seen by the level crossing risk control co-ordinator for the area.

46 Some time after this assessment, Network Rail cut back the vegetation, removing bushes and small trees and cutting the grass on the slope of the shallow cutting on the up side of the line.

Figure 9: View C on 29 July 2006 (Network Rail)

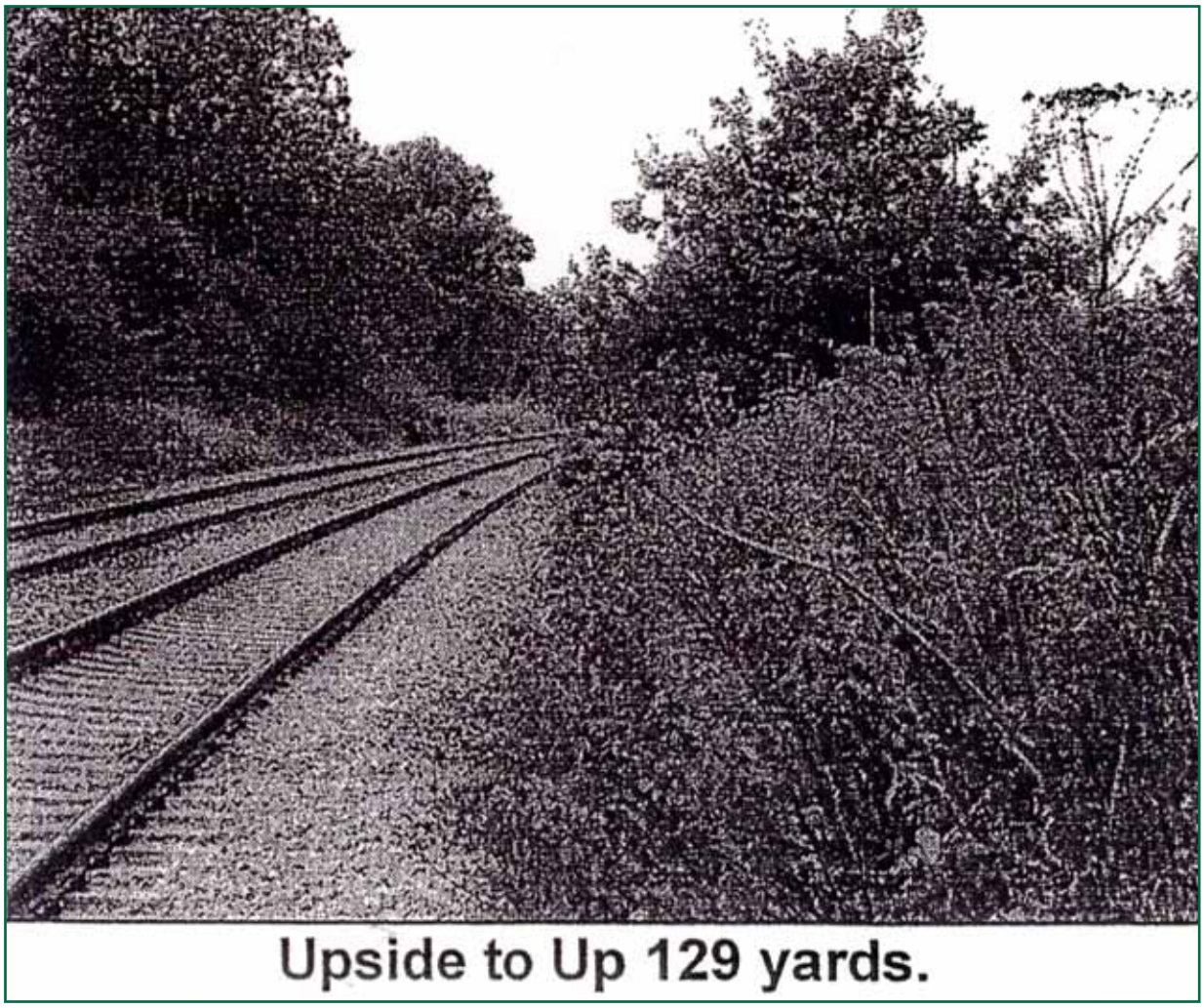

Figure 10: View D on 29 July 2006 (Network Rail)

47 Fairfield crossing was put forward for risk assessment again in 2008, in the second year of the full ALCRM cycle of risk assessments of footpath crossings. The same MOM carried out another visit to collect data for risk assessment, on 26 May 2008. The pictures of views C and D that he took on this occasion are shown in figures 11 and 12. In both cases an approaching train is shown in the picture. The pictures show that the removal of vegetation has resulted in a considerable increase in sighting distance, as shown in the table.

48 In connection with this visit, the MOM carried out a census of crossing usage. He noted that four people used the crossing in the period between 08:45 hrs and 10:30 hrs. The MOM made a similar suggestion to the one he had made in 2006, that the signs should invite encumbered users (such as 'horse riders, those in large groups, the elderly, those with pushchairs, fishing tackle, bikes') to use the telephones at the crossing.

49 In addition to the risk assessment programme, since 2005 Network Rail has had teams of dedicated level crossing inspectors for each area, which are part of the company's maintenance organisation. These teams inspect footpath crossings like Fairfield every six months, carrying out minor remedial works as necessary, and the two most recent inspection visits at Fairfield have been reviewed as part of this investigation.

Figure 11: View C on 26 May 2008 (photograph courtesy of Network Rail)

Figure 12: View D on 26 May 2008 (photograph courtesy of Network Rail)

50 Network Rail had supplied the inspection teams on the Western Route with a database which lists, among other data, the sighting distances which should be maintained at all level crossings on the Route. The origin of this database (within Network Rail) is unclear. It was issued in 2006 and does not appear to have been updated since then. It shows many inconsistencies in the sighting times given for level crossings, and does not appear to have been calculated from the tables in the Network Rail Operations Manual.

51 A sighting distance figure of 338 yards is listed for Fairfield crossing, and the inspection team converted this to 310 metres for use with the forms they are required to complete on each visit to a crossing. A sighting distance of 310 metres gives a warning time of 6.9 seconds, which is less than the 10 seconds required to use the crossing.

52 The inspection teams use range finders and/or measuring wheels to check sighting at crossings. They are required to record the results of inspections as a checklist on Network Rail form LXi01. This form does not provide sufficient space to record all four sighting distances, but the Thames Valley team are in the habit of adding this information to the checklist. At the inspection made on 19 August 2008, the Thames Valley team of two level crossing inspectors recorded 310 metres or more for views A, B and C and 180 metres for view D. They added another extra entry to the LXi01 form, in the shape of a question 'Does provision of phones make sighting less critical?' and answered this with a 'yes'.

53 The next inspection visit took place on 2 February 2009. The same team carried it out, and again found that the sighting distance for view D was less than the 310 metres stipulated in the database. On this occasion they did not record dimensions, but again added extra entries to the LXi01 form and recorded the sighting for this view as 'poor'. The inspection team considered that the limited visibility at view D was caused by vegetation growth, and raised a work order for cutting back vegetation for 200 metres from the crossing.

54 At this visit, and at the previous one, the team recorded other faults with the crossing. These were related to the condition of the crossing surface and the type of latches fitted to the gates (the gates were equipped with gravity latches that could not have been operated by a mounted horse rider, and the inspectors asked for these to be replaced by 'bridleway latches', which have a vertical operating arm projecting above the gate). Work orders for dealing with these were raised at both inspections. No action appears to have been taken to complete this work by the time the accident occurred.

55 The view D sighting (up trains from the up side) is actually limited by the curvature of the line, and no amount of vegetation clearance can increase it to the extent necessary to give ten seconds warning of approaching trains at 100 mph.

56 A non-slip surface (a resin bonded aluminium oxide aggregate on a flexible sheet) had been fitted to the level crossing a short time before the May 2008 data collection exercise (it appears to be new in the pictures taken at that time). However, by the time of the crossing inspection visit in August 2008, the non-slip surface had almost disappeared from the area between the rails (the 'four-foot') of both lines. Torn fragments of the flexible sheet were still attached to the edges of the timber decking. Network Rail has not been able to explain how or why the surface vanished, but the possibility that it was insecurely attached and was torn away by air turbulence caused by passing trains cannot be discounted.

57 The non-slip surfacing was identified for replacement at the crossing inspections in August 2008 and February 2009, but it was still missing at the time of the accident in May 2009.

Previous occurrences of a similar character

58 In 2008 thirteen pedestrians were killed at level crossings on the national network (excluding suicides), three more than the corresponding figure for 2007. Six of the pedestrian deaths in 2008 were at footpath crossings.

59 Since it began operations in October 2005 the RAIB has investigated five fatal accidents to pedestrians at level crossings: at Barratt's Lane, Nottinghamshire on 21 November 2005 (report 13/2006), Elsenham, Cambridgeshire on 3 December 2005 (report 23/2006), West Lodge, Northumberland on 22 January 2008 (report 01/2009), Tackley, Oxfordshire on 31 March 2008 (report 09/2009), Moor Lane, Surrey on 16 April 2008 (report 27/2008), and the double fatality at Bayles & Wylies crossing, Nottingham, on 22 November 2008 (report 32/2009). Relevant recommendations made following these investigations are at paragraph 117.

Identification of the immediate cause[4]

60 The immediate cause of the accident was that Mrs Canning walked onto the crossing as the train approached and was unable to get clear in time to avoid being struck.

Identification of causal[5] and contributory[6] factors

The use of the crossing

61 The events in the last few seconds before the accident were captured by the forward facing CCTV equipment fitted to the train. This shows a pedestrian, with two dogs on leads, walking from the up side of the line onto the track as the train approached, and then breaking into a run as she reaches the space between the tracks at the centre of the railway.

[4] The condition, event or behaviour that directly resulted in the occurrence.

[5] Any condition, event or behaviour that was necessary for the occurrence. Avoiding or eliminating any one of these factors would have prevented it happening.

[6] Any condition, event or behaviour that affected or sustained the occurrence, or exacerbated the outcome. Eliminating one or more of these factors would not have prevented the occurrence but their presence made it more likely, or changed the outcome.

62 It seems likely (from the evidence of the camera and the train driver) that at least one of the two dogs was pulling ahead as its owner came onto the crossing. This may have influenced her to continue in the hope of getting across in front of the train. On the CCTV recording, as the pedestrian reaches the down line on which the train was travelling, at the last moment one of the dogs is seen to hang back. This may have prevented Mrs Canning from getting clear of the line before the train struck her. There may be other factors related to the visibility and audibility of the train that influenced her to begin to cross the line as the train approached (paragraph 70).

The visibility and audibility of the train

63 The train was travelling at about 69 mph as it approached the crossing, with power shut off in preparation for the station stop at Bedwyn. At this speed, it would have been in view from the decision point for 9.2 seconds. The CCTV evidence suggests that the pedestrian passed the 'stop, look and listen' sign about 4.6 seconds before the impact and continued straight onto the track, covering 6 metres at an average speed of 1.4 metres per second, a brisk walking pace, to the point where she was struck. The train was clearly in view at the time that she walked onto the crossing, and visibility was probably not a causal or contributory factor in this accident. However, the sighting of trains was unsatisfactory in several ways.

64 The warning time for down trains approaching the crossing could be marginal for people crossing from the up side, depending on the growth of vegetation on that side of the line (paragraph 39). At the time of the accident this warning time was only 6.4 seconds for a train travelling at 100 mph. The warning time for up trains is always substantially less than required because of the line curvature.

65 If sufficient visual warning cannot be achieved, RSPG permits footpath crossings to be equipped with 'whistle' boards on the approach to them. Train drivers are required to sound the train's horn as they pass these boards, to alert crossing users before the train comes into their view. At the time of the accident, Fairfield crossing did not have such boards.

66 Railtrack / Network Rail inspection/risk assessment reports from 1999 and 2003 included suggestions that 'whistle' boards should be erected, and a sighting form for an up line 'whistle' board was prepared in 2003. It is alleged (though no documentary evidence has been produced) that in the winter of 2005/06 Network Rail proposed to erect 'whistle' boards on the approaches to the crossing to provide additional audible warning of trains.

67 RSPG 2E guidance (paragraph 149) suggests a maximum distance from crossing to 'whistle' boards of 400 metres. Distancing of 'whistle' boards should be considered on a case by case basis taking into account line speed, crossing time and the surrounding area. In more urban areas, 'whistle' boards at or near 400 metres may not have sufficient effect due to ambient noise or obstructions. Although RSPG is guidance, and not a mandatory standard, its provisions carry considerable weight in the railway industry, and decisions to deviate from them are rare. At Fairfield crossing, users need to become aware of a train travelling at the line speed of 100 mph when it is 447 metres away, to give the required 10 seconds warning time (paragraph 31). Therefore, in order for 'whistle' boards 400 metres from the crossing to be effective, the line speed would have to be reduced to 90 mph. It is possible that reluctance to make this change was the reason why the 2003 proposals to fit such boards at Fairfield came to nothing. If any speed reduction was not acceptable, and it was not possible to reduce traverse time sufficiently by improvements to the crossing surface, the next available measure to control the risk, as detailed in RSPG, would have been to equip the crossing with red/green warning lights, operated automatically by approaching trains.

68 The noise made by trains sounding warning horns on the approach to footpath crossings became a source of considerable public concern following the introduction of new types of train from 1996 onwards, because some of these trains had warning horns which were perceived to be much louder than those of the trains they replaced. On 31 January 2006, following a meeting between directors and senior managers of Network Rail and a group of MPs the previous day, Network Rail HQ issued an instruction to its operational areas that 'the fitment of any further 'whistle' boards at level crossings (including any already in the process of being fitted) should be put on hold forthwith'. This was said to be 'pending the development of new guidelines for considering future fitments, and a review process for existing fitments that are the subject of public complaints'.

69 If there was any proposal to fit 'whistle' boards at Fairfield, it was now discontinued, and the recommendation made by the MOM in the risk assessment of 19 March 2006 was not acted on. Although a rule book change which reduced the sounding of horns during the night-time 'quiet period' was implemented in April 2007, a new policy and associated guidelines were not produced by Network Rail until July 2009, and they still strongly discourage new whistle boards. In the intervening period, new 'whistle' boards were provided at three footpath crossings, in Kent, Lancashire and Renfrewshire, and at ten crossings in East Anglia, in response to risks identified at those locations and with the express permission of Network Rail HQ. It is likely that the HQ instruction was interpreted differently by the various routes: the Western route does not appear to have made any requests for whistle boards to be fitted in this period. If 'whistle' boards had been in place, and if the train had sounded its horn accordingly, Mrs Canning would have had more than 10 seconds warning of the train's approach, and might have made a different decision about going through the gate and/or crossing the line. The absence of 'whistle' boards may have been a causal factor in the accident. Research carried out by the Rail Safety and Standards Board (RSSB) and published in 2006[7] found that, although train horns sounded at 'whistle' boards provide a safety benefit for the majority of crossing users, they may be relatively ineffective at preventing accidents to certain categories of users, including dog walkers. This finding (which was based on a small number of examples, including some in which dogs were not on leads) related mainly to the potential for distraction caused by dogs which were not under proper control. Mrs Canning's dogs were on leads, and the CCTV suggests that she was in control of them.

70 The train was approaching from the north-east (view C, figure 7) and became visible from the decision point about 288 metres before it reached the crossing. However, for someone approaching the crossing from the up side of the line, a good view in both directions is obtainable from the path outside the railway boundary. This is because of the slight elevation of the land at this point, which, combined with the curvature of the line, enables approaching trains to be seen when they are further away than is possible for a person standing at the point, two metres from the track, where a decision to cross can be made in safety. The difference, particularly in the case of down trains, is substantial. Tests carried out by the RAIB found that from a position 3 metres back from the fence line, down trains came into view when they were 625 metres away (figure 13). From this position, the first view of the train is in the gap to the left of the large stand of trees: this gap is hidden from a person standing close to the line by the lie of the land.

71 It is possible that regular users of the crossing (such as Mrs Canning was) had become accustomed to looking for approaching trains as they were walking towards the gate, because of this longer view. However, the time taken to get through the gate, particularly for a person encumbered with dogs, would be such that much of this additional warning time resulting from the longer view would have been used up by the time the person reached the side of the track. The way in which people made use of the longer view obtainable before passing through the gates is a possible causal factor in the accident.

[7] T668 Research into the safety benefit provided by train horns at level crossings: RSSB, London, 2006

Figure 13: View from up side towards Newbury (view C) from 3 metres back from fence line

72 If Mrs Canning had begun to cross at the time the train became visible from a point two metres from the track, she would have been clear of the down line about 3 seconds before the train, travelling at about 69 mph, reached the crossing. The sub-standard sighting time was not a causal factor in this accident. However, if the train had been an express travelling at the permitted line speed of 100 mph, it would have reached the crossing 6.4 seconds after coming into view and there would not have been time for a pedestrian to get clear of the line.

73 To summarise, the possible sequences of events leading up to the accident are:

- Mrs Canning saw the train approaching and decided to cross in front of it, misjudging its speed, **or**
- she looked to her left as she approached the gate, and did not, at that time, see the train because it had not yet come into view. She continued through the gate, looking to her right because she had to cross the up line first, and trains from that direction have the shortest warning time. She did not hear the down train (in the absence of 'whistle' boards) and, because she had already looked to her left and seen nothing coming, she did not look that way again until she became aware of the train, only when she was already crossing the up line. She then decided that she would try to continue across the down line before the train arrived (possibly influenced by the dogs pulling her forwards), because waiting where she was would put her at risk from an up train (which she may have known was due).

In either case, she was unable to avoid being struck by the train. Although there is no direct evidence and therefore no certainty, it is possible that, in both cases, the presence of the dogs may have distracted her attention.

The telephones at the crossing

74 The telephones at the crossing were intended for use by horse riders, those herding animals on the hoof and people with vehicles. The signs advising these categories of user to telephone for information on whether it is safe to cross (figures 3 and 4) are of a standard design. They are not clear as to what sort of animals are meant (ie whether dog walkers should use the phones) and contain irrelevant references to long or slow vehicles which could not possibly use the crossing in its present state.

75 The records show that a few pedestrians had used the phones in the two years before the accident. Witness evidence indicates that this is likely to have been when visibility was restricted by fog. Otherwise, the phones appear to have been ignored by most pedestrian users of the crossing.

76 It is possible that if the signs had specifically advised pedestrians to use the phones to obtain information, the accident might not have occurred. However, experience generally indicates that pedestrians are not very likely to make use of telephones at footpath crossings, and so the wording of the signs is not regarded as a possible causal factor.

The driving of the train

77 The train was due to terminate at Bedwyn station, about 1.5 miles (2 kilometres) west of Fairfield crossing. After the passengers had got off, the train was due to reverse in the siding beyond the station. The signalling arrangements for this movement mean that a train driver will normally see a yellow aspect displayed in the signal (R862) that is about 200 yards (180 metres) beyond Fairfield crossing. The driver was looking out for this signal as the train approached the crossing.

78 The train driver was required to make a public address announcement as the train approached Fairfield crossing, advising the passengers that the train would terminate at the next station. As well as looking for the signal, he was preparing to make the announcement as the train approached Fairfield: he shut off power (keeping his left hand on the combined power/brake control handle) and lifted the handset of the public address system from its rest with his right hand.

79 At this moment Mrs Canning appeared. The driver dropped the handset but was not able to sound the warning horn in the period of less than five seconds before the train struck Mrs Canning. It is possible that the sounding of the horn early in this period might have provided Mrs Canning with sufficient warning to have averted the accident. However, although it is not possible to be certain, and making allowance for the likely reaction times of the train driver and Mrs Canning, it is considered more likely that the horn would have been sounded too late to prevent the collision.

80 The driving of the train was not causal or contributory to the accident.

The condition of the train

81 The train driver made an emergency brake application and the train stopped in 21 seconds, an average deceleration of 1.47 ms^{-2} (15% g). This includes a build-up time of about 2.5 seconds before the brakes took full effect, after which the deceleration rate was 1.6 ms^{-2}. These rates are consistent with the emergency braking performance for this type of train specified in Railway Group Standard GM/RT2044 ‘Braking system requirements and performance for multiple units’.

82 The train headlights were checked after the accident and found to be working normally. The condition and performance of the train were neither causal nor contributory to the accident.

Risk assessment of crossings

83 Network Rail's process for formal risk assessment of footpath crossings led to risk assessments being carried out at Fairfield twice in 2006. A visit to collect data for a risk assessment took place in 2008. At two of these visits, the sub-standard sighting of up trains from the up side (view D) was identified by the person visiting the crossing. However, the presence of telephones at the crossing was regarded by the Network Rail staff who visited as a mitigation measure for this, despite the absence of any instruction to pedestrians to use the telephones.

84 The risk assessment process did not result in Network Rail taking any action to reduce the risk at the crossing. The absence of regular communication between the operations and maintenance departments, and the non-entry of data from the 2008 visit onto the ALCRM, meant that Network Rail did not have a co-ordinated view of the condition and maintenance requirements of the crossing.

85 If the risk assessment process had been carried out correctly, the lack of adequate sighting, and the inadequate instructions which made the telephones ineffective as a risk control measure for pedestrians would have been identified. This should have resulted in action to control the risk, which might have consisted of measures such as provision of 'whistle' boards, and/or imposition of a speed limit for trains (paragraph 69). Such measures might have prevented the accident; the absence of an adequate risk assessment is a contributory factor in the accident.

86 Since 2007, Network Rail has been using the ALCRM as a tool in the risk assessment process for footpath crossings. The process is described in appendix B. The output from the ALCRM estimates the safety risk to crossing users, train staff and passengers and the operational risk associated with level crossing accidents and equipment failures.

87 The ALCRM provides two risk values relevant to pedestrians. One relates to the collective risk (expressed as a rate of fatalities and weighted injuries per annum) and the other individual risk (expressed as the risk of death per annum for a regular user).

88 Network Rail's processes mandate that following every risk assessment a review is carried out to identify any reasonably practicable measures to reduce the risk. The priorities for doing this at a particular crossing, following the initial population of the ALCRM, have been primarily determined by the predicted level of collective risk. At a footpath crossing such as Fairfield, the collective risk is low, and the burden of risk is carried solely by the crossing user. Guidance in Network Rail's Operations Manual, section 5-24, says:

> '*If a crossing has an individual risk score ranking between A and C and a collective risk ranking of 4 or 5 then the Operations Risk Control Co-ordinator [previously Level Crossing Risk Control Co-ordinator] shall review the information and consider a site visit to assist in the identification of issues and potential mitigations.'*

The process of review of risk mitigation measures (or 'optioneering' as it is known within Network Rail) is planned for completion at all crossings before the end of 2010.

89 The output from the ALCRM is heavily influenced by the amount of use that the crossing sees, based on the census taken by the assessor during a site visit. Fairfield has a very low usage figure, variously estimated by Network Rail staff at 27 people per day in 2008, and one person per day in 2009. The actual figure is likely to be somewhere in between the two estimates.

90 The results of the 2008 data collection were not input to the ALCRM system by Network Rail until after the accident in May 2009. The reasons for this delay have not been established with certainty, but may be related to a number of personnel changes in the relevant Network Rail offices around this time. Following the accident, the data was input and the ALCRM algorithm then produced a safety risk score of C4. If the information had been input and such a score generated in 2008, the Operations Risk Control Co-ordinator for the area should have been prompted to identify Fairfield as a crossing where the assessment should be reviewed for possible risk mitigation measures, and to consider a site visit.

91 In calculating the risk score, the ALCRM algorithm used a figure of 27 crossing users per day, extrapolated from the census taken by the MOM at the 2008 visit, and 102 trains per day, taken from the timetables for the route.

92 The sub-standard sighting available at the crossing for up trains (view D) might be expected to influence the risk level calculated by the ALCRM. However, the investigation found that changing the sighting distance data input to the ALCRM had a negligible effect on the calculated risk figures. Network Rail use the model to compare risks at different crossings, on the basis that the crossings are already in a condition that complies with the ORR guidance and the Network Rail standards which apply to them. In the past, where sub-standard sighting at crossings has been identified by assessors, they have recommended that action to achieve compliance should be taken independently of any risk assessment (paragraph 45).

93 Although the ALCRM does provide a quantified figure for individual and collective risk, the criteria for considering risk mitigation measures are heavily influenced by the level of collective risk.

94 Network Rail's policy is that investment priorities at its crossings should be based on an analysis of the costs and benefits of risk reduction measures. In line with industry guidance[8], the benefits are generally calculated on the basis of collective risk. This is intended to provide a mechanism for directing expenditure at those crossings where the safety benefit is greatest. However, it is unclear how this policy provides protection to an individual user at a particular crossing who may be exposed to high levels of risk as a consequence of regular exposure to a crossing with sub-standard sighting. This problem will be exacerbated at crossings where the total number of pedestrian transits is very low (so generating a modest collective risk value).

95 Network Rail has defined some minimum design requirements in its standards[9], and inspects the crossings once every six months to assess the degree of compliance. At the time of the accident, local Track Maintenance Engineers were responsible for co-ordinating the rectification of all defects found at an inspection, with no specific requirement to inform Operations staff about any work that was needed.

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[8] The RSSB document 'Taking Safe Decisions' (http://www.rssb.co.uk/safety/safety strategies/sdmoukr.asp).

[9] The standards are based closely on the ORR document, Railway Safety Principles and Guidance. This document was designed to provide guidance on the design of new crossings and was never intended to be applied retrospectively to existing crossings.

96 The non-compliant sighting at Fairfield level crossing was identified as a risk factor on at least two occasions before the accident, but no remedial action was taken. However, because the warning time for the train involved in the accident was greater than the crossing time, this issue was not causal or contributory to the accident.

97 At Fairfield crossing, telephones were provided (paragraph 74). The ALCRM data set for footpath crossings does not take account of the presence of telephones. In view of the very limited extent to which footpath crossing users are known to make use of telephones, this is not considered further in this investigation.

Identification of underlying factors[10]

Closure of the crossing

98 The crossing at Fairfield has been considered for closure on several occasions in the last 40 years (paragraphs 28 to 30). It has been reduced from a vehicular crossing with private rights to a public footpath and bridleway, but total closure has not been possible. There is an existing footbridge 680 metres south-west of the crossing, which could provide an alternative means for pedestrians to cross the railway.

99 Closure of the crossing would remove the risk to pedestrians and horse riders. The crossing's status as part of a public footpath means that if Network Rail wishes to close the crossing, it must apply to the local authority to make an order under section 118A of the Highways Act 1980. The grounds for proposing closure under this section are that it would be expedient for the safety of the public using the crossing. Users of the footpath are entitled to object to any proposal for diversion or closure of the path. If objections are received and cannot be resolved, the order must be submitted to the Secretary of State for Transport for decision, which will usually result in a public inquiry into the proposed closure. Before making the order, the Council or the Secretary of State must have regard to whether it is reasonably practicable to make the crossing safe for use by the public. A test of reasonable practicability requires that a measure to control risk must be adopted unless the cost is grossly disproportionate to the benefit obtained by adopting it.

100 The lack of progress made in the past towards closing the level crossing, and its continued availability to members of the public as a footpath, was an underlying factor in the accident. The legal framework relating to level crossings is currently under review by the Law Commissions, and the closure process is one of the areas being considered.

[10] Any factors associated with the overall management systems, organisational arrangements or the regulatory structure.

Conclusions

Immediate cause

101 The immediate cause of the accident was that Mrs Canning walked onto the crossing as the train approached and was unable to get clear in time to avoid being struck (paragraph 60).

Causal factors

102 Possible causal factors were:

- that (although there is no direct evidence) as she approached the crossing, Mrs Canning may have been distracted when making her decision to cross the line by the presence of her dogs (paragraph 73);
- the way that pedestrians approaching the crossing may have used the longer view of approaching trains obtainable from a position a short distance back from the gate on the up side (paragraph 71); and
- the absence of 'whistle' boards on the approach to the crossing (paragraph 69).

Contributory factor

103 A possible contributory factor was the absence of an adequate risk assessment for the level crossing (paragraph 85).

Underlying factors

104 An underlying factor was the difficulty of closing the level crossing, and its continued availability to members of the public as a footpath (paragraph 100).

Additional observations[11]

105 The sighting distance from the up side of the crossing for trains approaching in the up direction does not provide adequate warning time (paragraphs 55, 94, **recommendation 1**).

106 The database issued to the level crossing inspection team, and including details of sighting distances, contained incorrect and inconsistent information. This gave the inspectors sub-standard distances to use when checking sighting at some level crossings on the Western route (paragraph 50).

[11] An element discovered as part of the investigation that did not have a direct or indirect effect on the outcome of the accident but does deserve scrutiny.

107 Repair work identified by the level crossing inspection teams was not being carried out in the required timescales (paragraph 54). This included the non-slip surface of the level crossing, which was removed (or wore away) shortly after being fitted and had not been replaced when the accident occurred (paragraph 57).

108 Network Rail's processes for the management of risk at footpath crossings do not provide adequate guidance on the action to be taken when sub-standard sighting is identified (paragraph 98, **recommendation 2**).

Actions reported as already taken or in progress relevant to this report

109 Following the accident, the footpath over the crossing was temporarily closed by Wiltshire County Council and the gates were padlocked by Network Rail. In early 2010, following local consultation, Network Rail HQ gave special authorisation for 'whistle' boards to be provided more than 400 metres away in both directions on the approaches to the crossing. A site inspection by ORR on 15 March 2010 found that the crossing had been re-opened, and that the whistle boards appeared to have the desired effect. The very low level of background noise in the area means that train horns are likely to be effective and audible, even when sounded at this greater than normal distance.

110 Network Rail reports that it:

- is revising its procedures for action to be taken following level crossing assessments and inspections (paragraph 95), including revising standard NR/L2/SIG/19608 to require that, if inadequate sighting distance is identified at a crossing, an immediate response from the maintenance organisation is required. If the required sighting distance cannot be achieved by vegetation clearance then the maintenance organisation must advise the Operations Risk Control Co-ordinator to determine what further should be done to manage the risk. In addition, it is enhancing low sighting time reporting within the ALCRM software, to highlight locations where action is required, and requiring a maximum period of six weeks between the data collection visit and sign-off of the resulting risk assessment by a competent person;
- is providing its staff who carry out level crossing risk assessment and inspection with consistent, correct, information about the necessary warning times and sighting distances (paragraph 50);
- is considering moving the 'Stop – Look – Listen' signs at footpath crossings to a position at or very close to the decision point, where it is practicable to do so (paragraph 42);
- has renewed the surface at Fairfield crossing and made it level across the tracks such that a crossing walking speed of 1.2 m/s can now be achieved, and has installed whistle boards;
- has reviewed sighting distances at all crossings in the Western route that are not equipped with lights or barriers, and is considering options for improvement;
- is modifying the software of the ALCRM to specifically highlight to the user of the model if a value entered for the sighting time is less than the traverse time, so that this can be immediately identified for action; and
- is now (May 2010) undertaking an audit of the effectiveness of the level crossing inspection and maintenance regime in its Western route.

111 RSSB is developing research in conjunction with Network Rail on a number of areas within research project T936: Enhancing the accuracy and functionality of the All Level Crossing Risk Model. (The All Level Crossing Risk Model is jointly owned and developed by RSSB and Network Rail). The project is at the scoping stage at present and amongst the areas being taken forward for analysis within the project are:

Undertake research on the following areas identified:

- The validity and accuracy of the quick census multiplier …and its application especially to passive crossings.
- Review the algorithms for sighting at passive crossings especially the effect that sub standard sighting time has on the predictions and modify if required.

Develop new algorithms and modify current algorithms for the following:

- The effect of whistle boards at crossings with short sighting times including the effect on whistle board effectiveness as a result of the night time quiet period and the optimum whistle board positioning.

Review and Develop the algorithms for further crossing types to be modelled as follows:

- Footpath/Bridleway with telephones if deemed appropriate.
- Review and identify whether Footpath/Bridleway crossings should be modelled separately if deemed appropriate.

112 RSSB reports that the issue of dogs, their owners and level crossings has been identified in research and from experience as a potentially significant issue and is currently being reviewed by RSSB's Community Safety Steering Group to consider whether there are any reasonably practicable steps the industry can take to help to highlight these risks further to dog owners.

The decision point

113 The information given to crossing users about how to use the crossing and where they should make the decision to cross is sometimes inconsistent and potentially confusing (paragraphs 32, 42 to 43, 70 to 72, and 74 to 76).

114 Following its investigation into a fatal accident at Tackley on 31 March 2008 (report 09/2009) RAIB recommended that proposals be developed to address this issue by marking the point at which the decision should be made. Network Rail has rejected the above recommendation on the grounds that it does not consider it feasible to mark the decision point at all locations (paragraph 117). The ORR is still considering this response and has yet to decide on the need for further action in response to this recommendation.

115 The RAIB believes that, although it is not possible to know if it was a factor in the accident at Fairfield crossing, the marking of the decision point is likely to be important for the safe use of crossings. However, although marking of the decision point was recently included as an option within the level crossing risk management toolkit (see appendix B, paragraph 11), at present there is no defined standard on how the marking should be done.

116 The RAIB has discussed with Network Rail and other parties the way in which the issue might be taken forward, and believes that Network Rail should provide guidance to its staff who carry out assessment of crossings on the benefits and practicalities of marking the decision point. Network Rail may consider that it is necessary to sponsor research with a view to establishing the best way of doing this (**recommendation 3**).

Status of previous relevant recommendations

117 In its reports of investigations of previous pedestrian accidents at footpath level crossings, the RAIB has made the following recommendations which are relevant to the situation at Fairfield crossing (in each case, the date of publication of the report is given):

Fatal accident at West Lodge crossing, Haltwhistle, 22 January 2008 (report 01/2009, published 20 January 2009):

Recommendation 2

Network Rail should identify any footpath crossings that do not provide adequate arrangements to protect users, and draw up and implement a programme to improve them. The programme should prioritise the order in which the crossings are improved, with crossings presenting the highest risk improved ahead of those of lower risk.

Network Rail has responded, indicating that it accepts the recommendation but believes that its existing process of crossing assessment using the ALCRM and identification of risk mitigation options is sufficient to comply with this recommendation.

Recommendation 3

Network Rail should revise its management systems so that the findings of level crossing inspections and assessments are acknowledged, prioritised and acted upon to provide arrangements that adequately protect users.

Network Rail has responded, indicating that it accepts the recommendation. It reports that it has existing arrangements for crossing inspections by maintenance teams, and that a review of the inspection forms used for each type of crossing will be carried out.

Fatal accident at Tackley station level crossing, 31 March 2008 (report 09/2009, published 30 March 2009):

Recommendation 3

Network Rail should, at unprotected crossings where the location of the decision point is between the instruction sign and the track and therefore potentially counter-intuitive, propose measures to clearly mark the point at which the final decision to cross should be made, for acceptance by the ORR.

Network Rail has rejected this recommendation, responding that: 'Ideally, 'Stop – Look – Listen' signs (etc.) are positioned at the decision points of unprotected crossings. However, in many instances, this is not the case, with the signs instead being positioned as close to the decision points as possible, with either physical constraints (e.g. steep slope approaches) or possible train sighting obstruction constraints, preventing positioning of the signs any closer.

'In such cases, it is not considered feasible to be able to provide a consistent type of durable physical marking at the decision points (e.g. markings on the ground) due to the variation in crossing types (e.g. no decks), crossing approaches and other physical/environmental constraints.'

Recommendation 4

Network Rail should incorporate in its procedures:

a. *Arrangements to routinely pass the findings of level crossing assessments and inspections between operations and maintenance departments, so that the organisation achieves a co-ordinated view of the condition of those assets; and*

b. *An audit process to identify errors, inconsistencies or the application of inappropriate mitigation measures in crossing inspection reports.*

Network Rail has responded, indicating that it accepts the recommendation, but it believes that its existing procedures are adequate on the basis of changes made to NR/L2/SIG/19608 and already comply with this recommendation. Further audits are planned.

Recommendation 5

Network Rail should review its methods for assessing warning time, as the current arrangements which rely on calculations and the measurement of distances using optical equipment have been shown to be unreliable, particularly on curved track. This should include consideration of permanently identifying the sighting distances to be achieved, so that visibility can be positively verified from each decision point when crossings are inspected.

Network Rail has responded that it accepts this recommendation. It reports that it carried out an internal review to examine the methods used for assessing warning/sighting times to identify best practice across the 'Route' based teams and determine whether there are any areas for improvement. The identification (and recording) of the sighting distances to be achieved were also taken into consideration as part of this review. The learning from it is to be embedded within the necessary processes and standards.

Fatal accident at Moor Lane footpath crossing, 16 April 2008 (report 27/2008, published 23 December 2008):

Recommendation 3

Network Rail should revise document NR/SP/OPS/100 to provide better guidance for risk assessors at level crossings on what level of upgrading of the crossing to improve safety can be regarded as reasonably practicable.

Network Rail has responded that it has provided additional guidance in the form of a revised section of its Operations Manual (5-25).

Recommendation 4

Network Rail should revise the guidance it gives to staff inspecting level crossings, ensuring that the importance of the correct position and layout of the warning signs is adequately emphasised.

Network Rail has responded that its risk assessment and inspection processes will be reviewed to determine whether any further guidance is needed in this respect, and that a new standard for requirements at footpath (and other) crossings is to be prepared.

Recommendations

118 The following safety recommendations are made[12]:

Recommendations to address causal and contributory factors

None

Recommendations to address matters observed during the investigation

1 *The intention of this recommendation is to ensure that the impact of limited sighting at footpath crossings is taken into account when assessing risk.*

Network Rail should review the operation of the All Level Crossing Risk Model with respect to sighting times at footpath crossings, to establish whether the sensitivity of the model to variations in sighting can be improved, and should modify the model if this review shows that it is reasonably practicable to do so (paragraph 105).

2 *The intention of this recommendation is to ensure that the risk to users of level crossings is properly managed.*

Network Rail should review the way it manages the risk to users at footpath level crossings, with the objective of highlighting to assessors when sighting is below the mandated standard, and providing clear guidance on the action to be taken if sub-standard sighting is identified during data collection or assessment (paragraph 108).

3 *The intention of this recommendation is to support the application of the mitigation option of marking the decision point identified in the level crossing risk management toolkit.*

Network Rail should provide guidance to risk assessors on the circumstances in which there is likely to be safety value in providing additional marking of the final decision point at footpath and bridleway crossings, and the best means of doing so (paragraph 116).

[12] Those identified in the recommendations, have a general and ongoing obligation to comply with health and safety legislation and need to take these recommendations into account in ensuring the safety of their employees and others.

Additionally, for the purposes of regulation 12(1) of the Railways (Accident Investigation and Reporting) Regulations 2005, these recommendations are addressed to the Office of Rail Regulation to enable it to carry out its duties under regulation 12(2) to:

(a) ensure that recommendations are duly considered and where appropriate acted upon; and

(b) report back to RAIB details of any implementation measures, or the reasons why no implementation measures are being taken.

Copies of both the regulations and the accompanying guidance notes (paragraphs 167 to 171) can be found on RAIB's web site at www.raib.gov.uk.

Appendices

Appendix A - Glossary of abbreviations and acronyms

ALCRM	All Level Crossing Risk Model
BR	British Railways
FGW	First Great Western
MOM	Mobile Operations Manager
ORR	Office of Rail Regulation
RSPG	Railway Safety Principles and Guidance
RSSB	Rail Safety and Standards Board

Appendix B - Level crossing assessment and the All Level Crossing Risk Model

1. Railtrack's Automatic Level Crossing Risk Model (Auto LCRM) was developed from 1993 by A D Little for railway staff to use to assess the risk present at automatic half barrier crossings (AHBs), using a standardised methodology. The initial model, presented to the British Railways Board in 1994, allowed estimation of level crossing risks for any particular site according to crossing type, levels and types of use, rail traffic density and line speed. The model worked within the bounds of quantified risk analysis conducted during its development. It was used in 1994 – 96 to support a number of risk assessments associated with lines of route, individual crossings and more generally in Railtrack Zones.
2. The model was developed steadily, and updated to V2.2 in 1997. This was the first version to be released for widespread use across Railtrack. This version included the ability to distinguish between trains with differing speeds and lengths, an improved user interface, and other refinements. At this stage the model was only regarded as robust for automatic crossings, because 'the fundamental work on human safety performance in relation to sighting times and reasons for user distraction or indiscipline have not been sufficiently explained.'
3. Version V3 of the model was released in late 2002. Changes from V2.2 included (among others) remodelling of user misuse, revised weighting for blocking back, reviewing the pedestrian risk model, and the relationship between risk and train length. The changes required recalibration of the model, which involved running it for all automatic crossings, and this was completed late in 2003. Some changes were then made to the multipliers for 'deliberate abuse' and 'blocking back', and V3.1 of the model was then rolled out and used by Network Rail until 2006. In this form it allowed risk areas to be identified and mitigated, and was used as a tool to help understand where it would be sensible and cost effective to upgrade particular crossings.
4. Further RSSB research projects built on this foundation to develop the Auto LCRM model into the ALCRM which could be used to assess risk at all crossings, including UWCs. New risk assessment methodologies were incorporated into the model for passive crossings, based on earlier research. Safety benefit calculations were included in the ALCRM in order to facilitate comparison of different level crossing upgrade options, and a number of other improvements were introduced into the existing risk assessment methodology. The first version of the model was available for trial in early 2006. It was subsequently verified against the functional specification (which had been defined in 2002/03 by a steering committee of industry experts and managers) and calibrated. This showed, among other things, that risk associated with passive crossing use is broadly in line with that predicted by RSSB's Safety Risk Model. Network Rail then designed and delivered training courses for the model for their various level crossing practitioners.
5. In January 2007, Network Rail launched the ALCRM for use across its network. Its intention was to standardise the assessment of risks for all types of crossings across the network and, the purpose of the ALCRM is to support and inform decision making on level crossings in accordance with standard NR/SP/OPS/100 'Provision, Risk Assessment and Review of Level Crossings'.

6. The relevant section of the Network Rail operations manual, procedure 5-24 'Use of the all level crossings risk model', requires that each level crossing shall be subject to a risk assessment at not more than three-yearly intervals. Additional assessments are required following changes in traffic patterns or after an accident or serious incident. The assessment regime is supplemented by six-monthly inspections by Network Rail maintenance staff.

7. The ALCRM requires the type of crossing to be identified and data from a site survey to be input. This includes sighting distances, line speeds and a census of crossing users. Procedure 5-23 lists three types of census: a 'full census' covering a 24 hour period, for which special arrangements need to be made; a 'quick' census covering a 30 minute period between 09:30 hrs and 16:30 hrs on a weekday, for which the results are multiplied by 27 to give a total estimated usage per day; and an estimate. Procedure 5-23 states that a quick census is the standard requirement for public vehicular crossings and the first preference for other crossings unless use is very light.

8. The risks associated with a particular crossing are divided into collective and individual risk categories. A collective risk is defined as the risk posed to groups, such as on-board staff, train passengers, tractor or vehicle occupants, whereas an individual risk is that posed to a regular crossing user.

9. The model gives the crossing a risk score for each risk category, and identifies the factors contributing to this. It is intended to support and inform an assessor, but the output does not highlight unacceptably short sighting times, take account of the provision of whistle boards or the possible effects to crossing users in darkness. The assessor is required to exercise judgement in reviewing the output.

10. The Operations Risk Control Co-ordinator is required to visit the site and consider risk mitigation if a crossing is assessed as having a collective risk score of 1 to 3 on a range of 1 to 13, where 1 represents the highest risk, at sites where the contribution of the train accident risk comprises more than 50 % of the total risk at the level crossing. A site visit to identify risk issues and their possible mitigation has to be made as a matter of priority for those crossings with a collective risk score of 1 to 3, although all crossings should receive a site visit at some time.

11. The model calculates an equivalent fatalities value, which is a statistical measure, before and after any mitigation is applied. The result is a numeric value which can be used for the purposes of cost-benefit analysis. Network Rail have developed a risk mitigation 'toolkit' to assist Operations Risk Control Co-ordinators in identifying appropriate risk mitigation measures.

12. The initial programme of ALCRM assessments was required to include public vehicular crossings and station foot crossings within the first 12-month cycle commencing in January 2007, with all crossings being incorporated into a 3-year rolling programme. Assessments are normally undertaken by the Operations Risk Control Co-ordinator supported by local mobile operations managers.

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