RAIB

Rail Accident Investigation Branch

Rail Accident Report

Two incidents involving track workers between Clapham Junction and Earlsfield 8 March 2011

Department for Transport

Report 03/2012
February 2012

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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Two incidents involving track workers between Clapham Junction and Earlsfield, 8 March 2011

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Summary

At around 06:00 hrs on Tuesday 8 March 2011, two gangs of Network Rail track maintenance staff were involved in incidents with trains between Clapham Junction and Earlsfield stations. The gangs were setting up an emergency speed restriction after the discovery of a rail defect earlier that morning. The work was being carried out following the late handback of an engineering possession. There were no casualties, and only minor disruption to train services following the incidents.

The staff involved did not follow the rules for setting up safe and appropriate systems of work. This was due to a combination of factors including excessive workload, the pressure to complete the work, fatigue and / or tiredness, the complexity of the rules, the absence of checking of the arrangements by a third party, the ineffectiveness of Network Rail's competence management process and a shortage of staff.

The RAIB has made five recommendations to Network Rail. These relate to the arrangements for carrying out unplanned and / or emergency work, the pressure on those responsible for setting up protection arrangements for access to the railway in such situations, the workload of Track Section Managers, the competence of staff in situations which are encountered infrequently and the provision of confirmation to the signaller that an emergency speed restriction has been set up.

Introduction

Preface

1 The purpose of a Rail Accident Investigation Branch (RAIB) investigation is to improve railway safety by preventing future railway accidents or by mitigating their consequences.

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

Key Definitions

3 All dimensions and speeds in this report are given in metric units, except speed and locations which are given in imperial units, in accordance with normal railway practice. Where appropriate the equivalent metric value is also given.

4 Mileages are measured from London Waterloo station.

5 The terms 'up' and 'down' in this report are relative to the direction of travel; the down line runs from Clapham Junction towards Wimbledon and beyond.

6 The report contains abbreviations and technical terms (shown in *italics* the first time they appear in the report). These are explained in appendices A and B.

The incidents

Summary of the incidents

7 On the morning of Tuesday 8 March 2011, two track maintenance gangs were involved in incidents with trains in south-west London within the space of 30 minutes. The gangs were involved in setting up an *emergency speed restriction* (ESR) and clamping[1] a *class 1A rail defect* which had been identified earlier that morning by a team carrying out ultrasonic rail testing. The work was being carried out following the *handback* of an overnight *possession* which had overrun by 45 minutes.

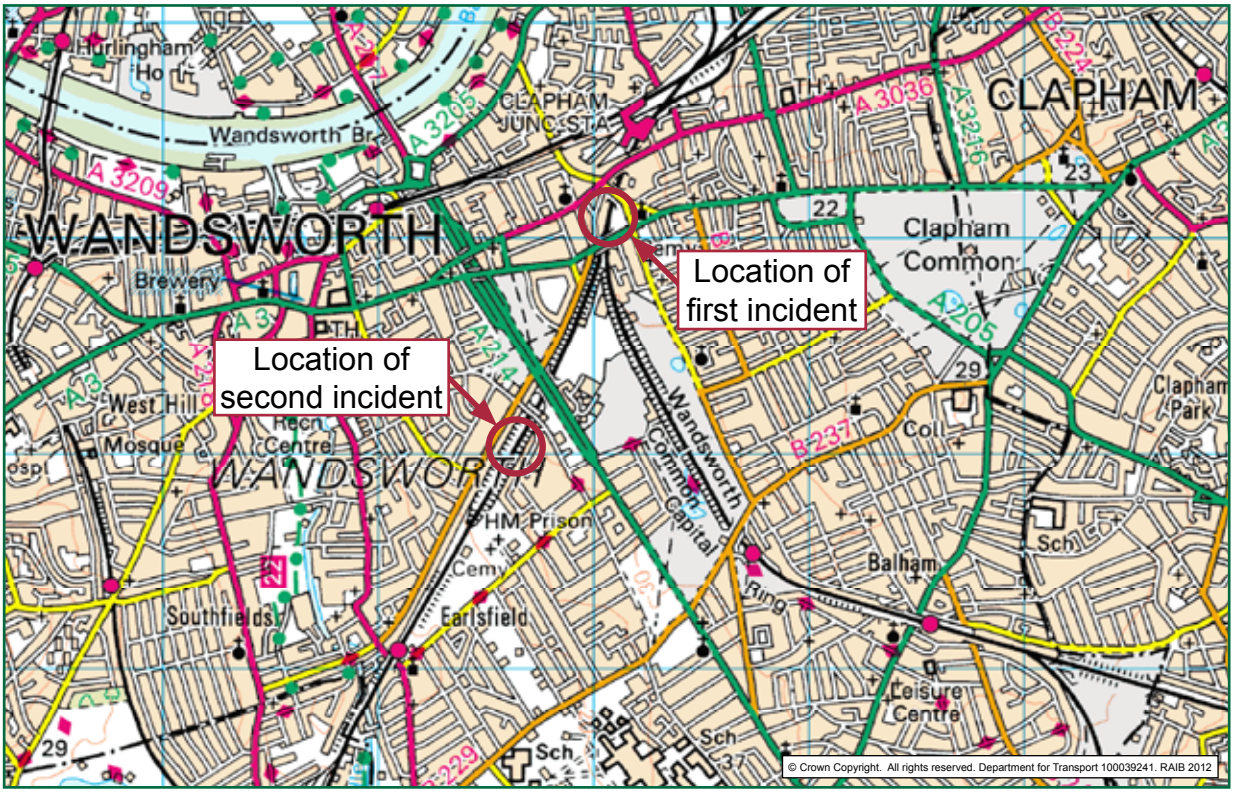

Figure 1: Extract from Ordnance Survey map showing location of incidents

8 The incidents occurred on the Down Main Fast line between Clapham Junction and Earlsfield stations, see figures 2 & 3. Both the *controllers of site safety* (COSSs) believed that they had adequate protection from trains but, in both cases, the signaller was unaware of their presence and signalled a train along the Down Main Fast line while staff were still working on the track.

9 The first gang was unexpectedly passed by a train and the second experienced a *near-miss* with a following train (see paragraph 18 for information about the trains involved). There were no casualties.

10 The first train did not stop. The second train came to a stand at 4 miles 76 chains[2], following an emergency brake application, at 06:10 hrs. It was subsequently moved and the Down Main Fast line reopened to traffic at 07:14 hrs.

[1] ie securing with *emergency clamp fishplates*.

[2] There are 80 chains in a mile.

11 Following the incidents, the signaller did not caution trains to travel at reduced speed (because he had not been requested to do so), although the rail defect had not been secured with emergency clamp fishplates, and the ESR had not been properly implemented. Four trains passed the site before the missing ESR equipment (warning and commencement boards) was reported to the signaller.

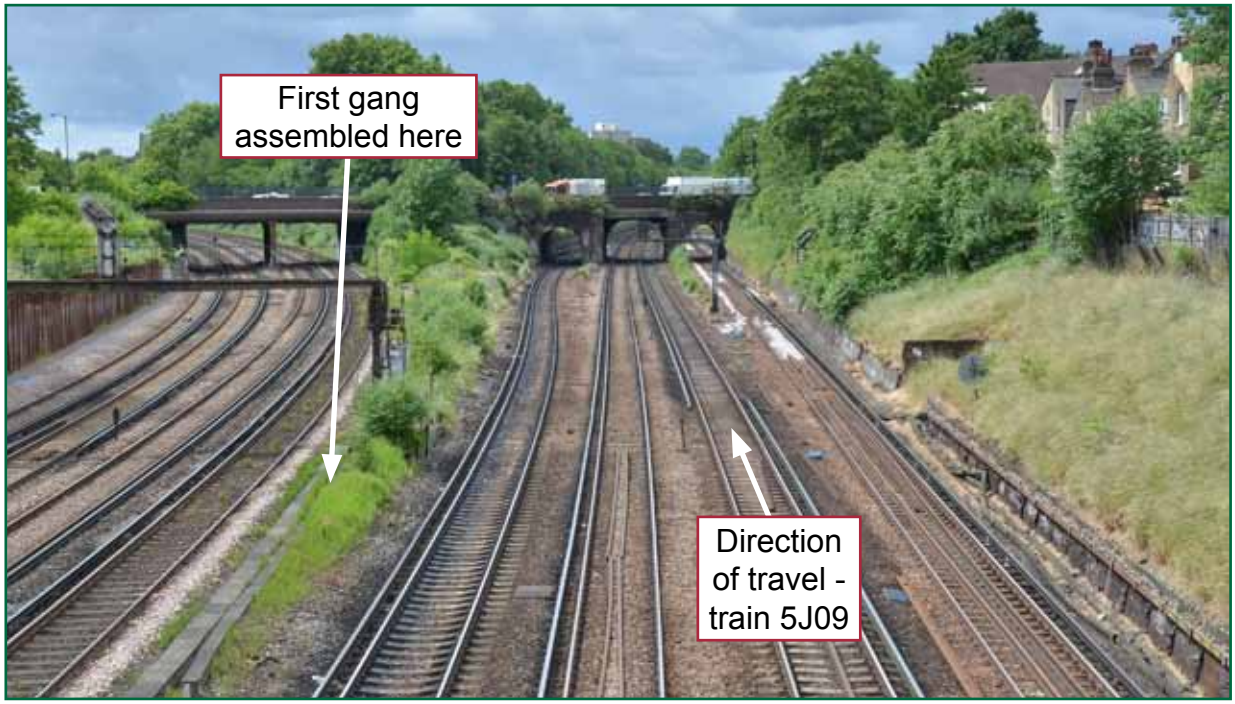

Figure 2: View of Wessex lines at 4 miles 14 chains, showing where the first gang assembled after the first incident at 05:46 hrs

Figure 3: View of Wessex lines at 4 miles 76 chains, showing where the second gang assembled after their near-miss incident at 06:10 hrs

Location

12 Between Clapham Junction and Earlsfield stations, there are four main lines. From East to West, these are the Down Main Slow and Up Main Slow (speed limit 60 mph (97 km/h)) and the Down Main Fast and Up Main Fast (speed limit 75 mph (121 km/h)). The track layout is shown at figure 4. South of Earlsfield station, the Up Main Slow line crosses over the fast lines, so that the order changes from Down, Up, Down, Up (⇄), to Down, Down, Up, Up (⇉). Some witnesses said that this change of order caused them confusion about the direction of traffic on the lines involved in the incidents.

13 The section of railway concerned is generally in a cutting, with retaining walls in some places. It is a *red-zone prohibited area*, requiring work to be carried out under the protection of either a *line blockage* or a possession. *Third rail electrification* is present throughout.

14 Prior to the incidents, all of the four Wessex lines shown in figure 4 had been closed to traffic due to an *engineering possession* between Waterloo and Wimbledon which had been taken in accordance with module T3 of the *Rule Book* (GE/RT8000/T3). This was scheduled to apply from 00:40 to 04:55 hrs; details were published in *Weekly Operating Notice* Ref. P2010/1374825. There had been two *work sites* within the possession; the Wimbledon work site extended from 3 miles 78 chains (Clapham Junction) to 7 miles 0 chains (Wimbledon).

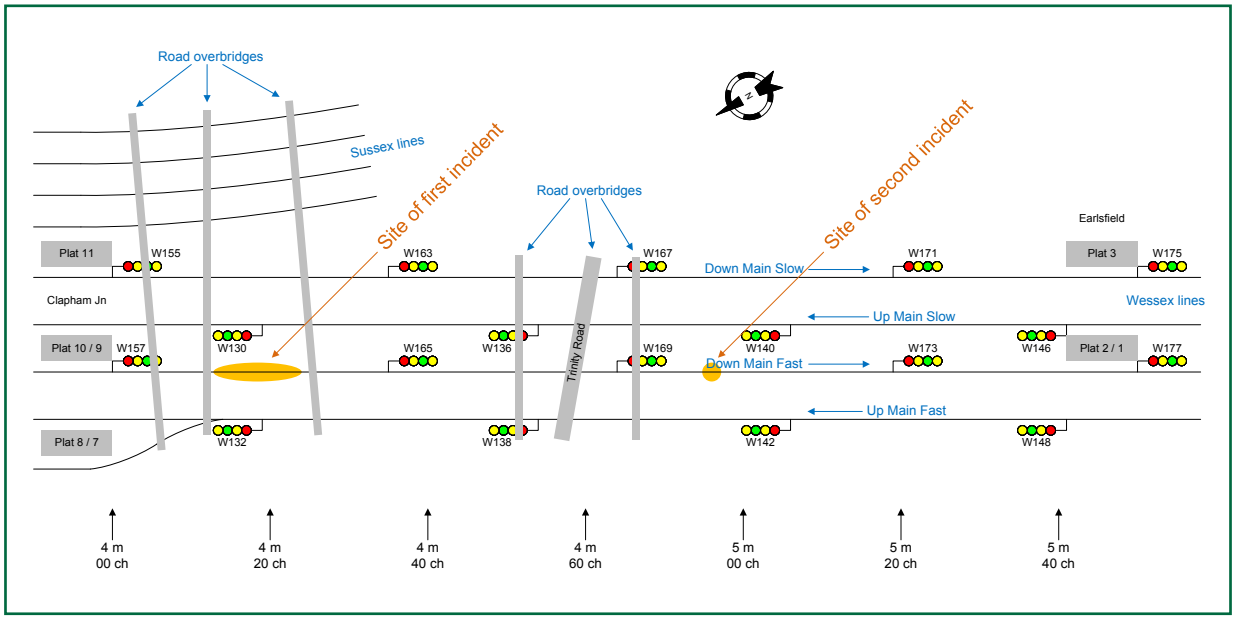

Figure 4: Track layout showing the Wessex lines between Clapham Junction & Earlsfield

Organisations involved

15 Network Rail owns and maintains the track and infrastructure. The following parts of Network Rail were directly involved in the incidents:

a. Wimbledon track maintenance depot and the Wimbledon ultrasonic rail testing team, both of which are part of the Clapham maintenance delivery unit;

b. Wimbledon Area Signalling Centre; and

c. Wessex Integrated Control Centre, which is jointly managed by Network Rail and South West Trains.

16 South West Trains was the operator of both of the trains involved in the incidents.

17 Both Network Rail and South West Trains freely co-operated with the investigation. In addition, Track Access Productions Ltd provided the RAIB with a DVD of the route.

Trains involved

18 Both of the trains involved in the incidents were empty coaching stock movements out of Clapham Yard. They each consisted of eight-coach class 455 electric multiple units.

19 The RAIB has found no evidence to link the type or condition of the trains to the incidents.

Staff involved

20 COSS 'A' was responsible for establishing a safe system of work for the gang involved in the first incident. He had worked for Network Rail for five years, and was employed as a *trackman*; he had been certificated as a COSS since April 2008 under Network Rail's Assessment in the Line process (refer to paragraph 93). At the time of the incident he had been working only night shifts for about seven months. Before working for Network Rail, he had worked in other parts of the railway industry for thirteen years, and had held various posts with different employers. Most of his experience as a COSS had been in carrying out daytime *patrolling* of the track, which he had been doing on this section of line for about two years before he transferred to the night shift.

21 The *Engineering Supervisor* (ES) / COSS 'B' had overall responsibility for arranging the work to clamp the rail defect and implement the associated ESR (refer to paragraph 29). As its COSS, he was also responsible for establishing a safe system of work for the gang involved in the second incident. He had been acting as ES for the Wimbledon work site between Clapham Junction and Wimbledon earlier that night (paragraph 14). The ES / COSS B had thirteen years' experience, all at Wimbledon track maintenance depot. He was employed as a track chargeman and was the night shift team leader, having worked only night shifts for several years. He had been certificated as a COSS since November 2001, as a *protection controller* since September 2002 and as an engineering supervisor since November 2002; all of these competences were managed as part of the Assessment in the Line process.

22 The Assistant Track Section Manager (Assistant TSM) had eight years' railway experience, all at Wimbledon track maintenance depot. He had worked his way up to his current position through the grades, and had 'acted' in the role before being formally appointed about eighteen months before the incidents. He was working on the night shift on 7/8 March 2011.

23 COSS A's work group, all of whom worked only night shifts, consisted of four trackmen, two of whom were also certificated as COSS.

24 COSS B's work group, all of whom worked only night shifts, consisted of a *track chargeman*, two leading trackmen and a trackman. Three members of the work group were certificated as COSS and one of them was also certificated as a protection controller.

25 The signaller on duty at Wimbledon Panel 1 had 21 years' experience as a signaller. He was under instruction on the night of the incident, having transferred to Wimbledon Area Signalling Centre about six months earlier.

External circumstances

26 At the time of the incidents it was starting to get light (sunrise was at 06:31 hrs), and the weather was dry. There was probably some background noise from road traffic and other non-railway activities, which witnesses report to be common in the vicinity of Clapham Junction. There is no evidence that external circumstances affected the incidents.

Events preceding the incidents

27 The work which had been planned for the Wimbledon track maintenance staff to carry out during the possession had overrun by about 45 minutes to 05:00 hrs. This caused a corresponding overrun of the possession, and the *Person In Charge of Possession* (PICOP) handed control of the infrastructure back to the signaller at 05:40 hrs. The engineering supervisor for the Wimbledon work site (the ES / COSS B) had been very busy throughout the possession (refer to paragraph 79).

28 Sometime before 03:20 hrs, a team of ultrasonic rail testers, who were examining suspected rail defects within the Wimbledon work site, advised the ES / COSS B and Wessex Integrated Control Centre that they had found two defects on the Down Main Fast line at 4 miles 76 chains. One of these was a class 1A rail defect which required the immediate fitting of emergency clamp fishplates and the imposition of a 20 mph (32 km/h) ESR. The second defect was less severe, but it also required emergency clamp fishplates to be fitted.

29 At about 03:35 hrs, Wessex Integrated Control Centre telephoned the ES / COSS B to enquire how the rail defects were going to be clamped and the ESR implemented. The engineering supervisor explained that he had no-one available at the time, as he and his team were busy with the planned work, although he hoped the ultrasonic rail testers might help with the clamping of the defects. He was expecting that the possession could be handed back on time and then to take a line blockage to set up the ESR.

30 In parallel, the Assistant TSM, who had been made aware of the situation, telephoned Wessex Integrated Control Centre from Wimbledon track maintenance depot. They also discussed the method of blocking the line, and agreed that it could be accomplished using a line blockage after the possession had been given up. The first part of the ESR equipment (see figures 5a and 5b) would be installed from Clapham Junction station, and the second part from an access point at Trinity Road.

31 The ES / COSS B subsequently arranged for a gang of five people, including COSS A, to meet at Clapham Junction (the Earlsfield end of the platform is at 4 miles 0 chains), after they had carried out their planned activities. These had included the removal of *short-circuiting straps* at Earlsfield and at Clapham Junction, which was completed by 04:43 hrs. The ES / COSS B was planning for this gang to install the *portable AWS magnets*, emergency speed indicator and warning board at three sites on the Down Main Fast line between 4 miles 7 chains and 4 miles 23 chains. When COSS A arrived at Clapham Junction shortly after 05:00 hrs, the ES / COSS B, who had given up the Wimbledon worksite, asked him to act as the COSS for this work group and to arrange a line blockage for the work.

32 The second part of the ES / COSS B's plan was for another gang of five people, with himself as COSS, to meet at the Trinity Road access point (4 miles 58 chains, see figure 5b). They would then clamp the rail defects and erect the ESR commencement and termination boards on the Down Main Fast line at 4 miles 76 chains.

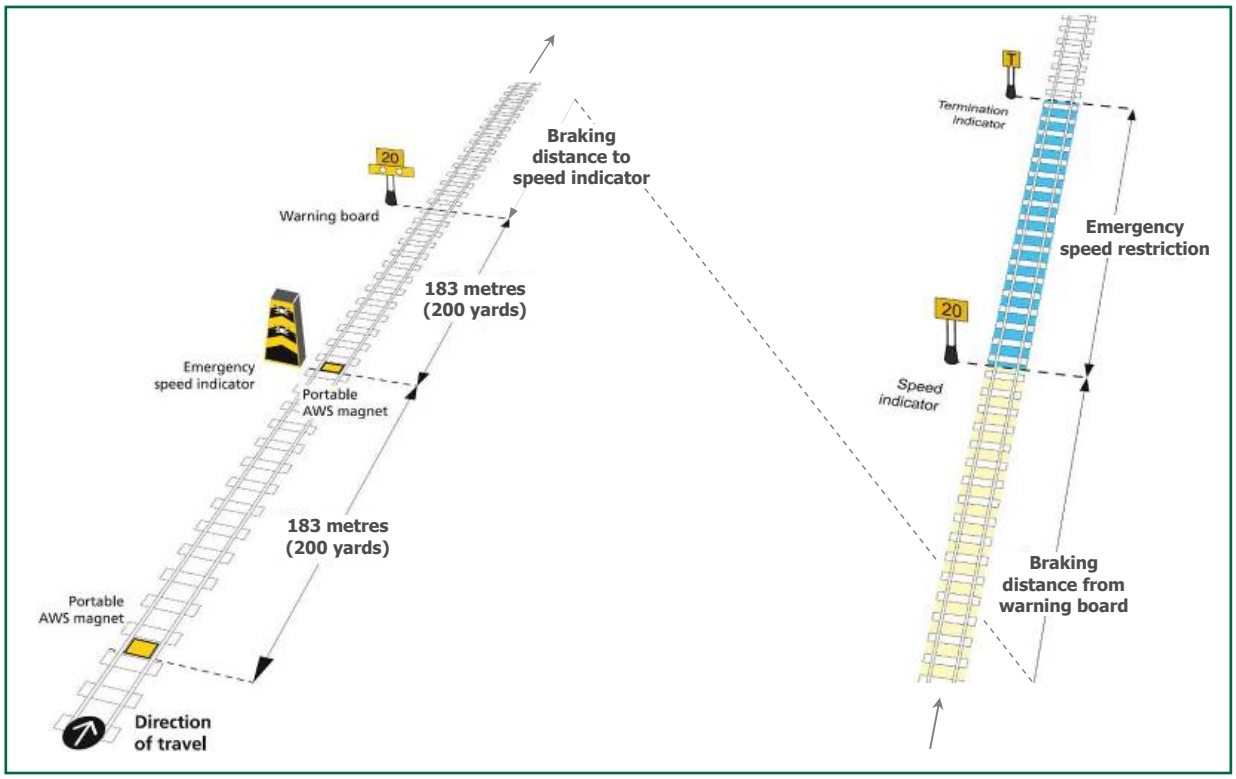

Figure 5a: Layout of the equipment required for an ESR (courtesy of RSSB)

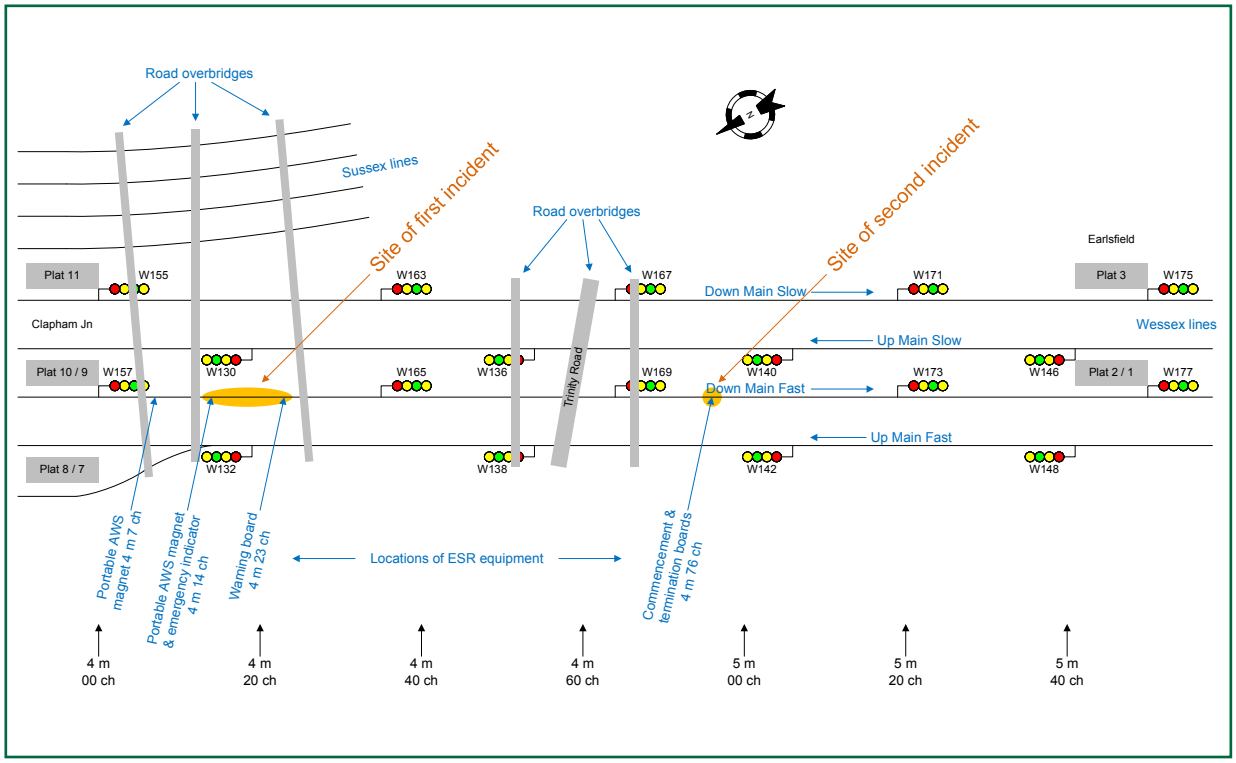

Figure 5b: Layout of the ESR equipment installed on the Down Main Fast line on 8 March 2011

33 The Clapham work site was given up at 04:32 hrs, and the Wimbledon work site was given up at 05:00 hrs by the ES / COSS B, in his capacity as engineering supervisor. The *isolation* was subsequently given up by the PICOP and the conductor rail was re-energised at 05:30 hrs.

34 Meanwhile COSS A had telephoned the signaller at Wimbledon Area Signalling Centre at 05:17 hrs to request a line blockage. The signaller was unable to grant this request as the line was still under the control of the PICOP, because the possession was still in place. The signaller told COSS A to contact the PICOP to request access.

35 After the signaller had refused his request for a line blockage, and instead of speaking to the PICOP, COSS A spoke to the ES / COSS B to tell him that he had been unable to obtain the line blockage. COSS A then took his work group out onto the Down Main Fast line at about 05:30 hrs. He briefed his work group to treat all lines as open to traffic. On arrival at the first site of work, COSS A asked a member of the work group to look out for trains. Although this individual was certificated as a *lookout*, he did not have the required equipment[3] with him. However, he did have a whistle which he habitually kept in his pocket.

36 The PICOP telephoned the signaller to give up the possession at 05:39 hrs. Probably as a result of COSS A's earlier request for a line blockage, the signaller asked the PICOP to confirm whether the ESR equipment had been installed and that everyone was clear of the line. The PICOP assumed that the ESR had been set up during the possession; he told the signaller he believed a speed restriction had been put in place, although he did not know where. He also told the signaller that, as far as he understood, everyone was clear of the line.

[3] A lookout is required to wear an armlet or badge identifying his role, and to carry flags or a coloured lamp, *detonators*, a *track circuit operating clip* and a horn or whistle.

Events during the incidents

37 Train 5J09, the 05:29 hrs empty stock service from Clapham Yard to Hampton Court, passed through Clapham Junction station, on the Down Main Fast line, under clear signals at 05:43 hrs; it was running 12 minutes late following handback of the possession at 05:40 hrs.

38 About 30 seconds after passing signal number W157 at Clapham Junction (4 miles 0 chains), the train passed COSS A and two other members of the work group at 4 miles 14 chains. The person who had been asked to look out for trains alerted the remaining two group members, who were at 4 miles 23 chains, by blowing on his whistle. The train would have been visible for about 30 seconds before it passed the first three group members, and would have taken about another 18 seconds to reach the last two. The driver did not give a warning and did not slow down. The work group members were standing on the adjacent running lines, some on each side of the train, as it passed them.

39 After the passage of the train, COSS A's work group assembled in the space between the Wessex and Sussex lines (figure 2) at about 05:47 hrs. One of the work group members telephoned the Assistant TSM to express his concern about the fact that they had had no protection when trains started running. The Assistant TSM then spoke to COSS A and told him to arrange protection to get the work group back to Clapham Junction. The ESR warning board had not been erected properly and fell over shortly afterwards.

40 COSS A telephoned the ES / COSS B at 05:50 hrs to say that he was going to take a line blockage to get his group back to Clapham Junction station, because trains were running and it was getting dangerous; he did not tell him that his group had been involved in an incident with a train.

41 At 05:52 hrs COSS A telephoned the signaller to arrange a line blockage on the Down Main Fast line; this was granted at 05:56 hrs. COSS A telephoned the ES / COSS B again at 05:59 hrs to tell him he had taken a line blockage for 15 minutes; COSS B then told him he was going to use the same line blockage to go out and clamp the rail and fit the ESR commencement and termination boards.

42 COSS B had been waiting at the Trinity Road access point and had already briefed his work group. Once he had spoken to COSS A, he took the gang onto the track and they walked along the Down Main Fast line to the site of the rail defects, with their backs to traffic.

43 As soon as his work group got back to Clapham Junction, at 06:05 hrs, COSS A phoned the signaller and gave up the line blockage, confirming that all of his staff were clear of the line.

44 Train 5D91, the 05:51 hrs empty stock service from Clapham Yard to Epsom Sidings passed through Clapham Junction station under clear signals at 06:08 hrs, running 15 minutes late. The driver received warnings from the two portable AWS magnets that had been installed by COSS A's gang and observed the emergency indicator, but not the ESR warning board, which had fallen over (paragraph 39). The driver's view of COSS B's work group at 4 miles 76 chains was obscured by a signal post and bridge pier until signal number W169 (approximately 4 miles 64 chains) had been passed. He was accelerating as he passed this signal, and continued to do so for another 2 seconds; the train reached a maximum speed of 46.4 mph (75 km/h).

45 While he was erecting the ESR termination board, COSS B, who was in the habit of looking up from time to time while he was working, saw train 5D91 approaching on the Down Main Fast line and shouted a warning to the other members of his work group. One of the group pulled two others off the Down Main Fast line and they went over to the *cess* adjacent to the Up Main Fast line and all scrambled up the bank (figure 3).

46 The driver observed the workers on the line ahead, applied the emergency brake and sounded the horn. The train stopped 16 seconds afterwards at the immediate location where two members of the work group had been clamping the rail at 4 miles 76 chains. The *shoegear* on the leading bogie damaged the end of the gang's *conductor rail shroud*. The train would have been visible to COSS B's work group for a maximum of about 20 seconds before it stopped at about 06:10 hrs.

47 Shortly after giving up his line blockage, COSS A realised his mistake and phoned COSS B at 06:10 hrs. COSS B explained that his gang had just had a near-miss.

Events following the incidents

48 At the time of their near-miss, COSS B's work group had not finished clamping either rail defect and had not erected the ESR commencement board.

49 COSS B phoned Wessex Integrated Control Centre and spoke to an incident controller, and then to the Assistant TSM at Wimbledon depot, to advise them of the incident with train 5D91. They both told COSS B to leave the tools and equipment his gang had been using where they were, and to return to Wimbledon depot. COSS B was granted a line blockage on the Up Main Fast line, at 06:24 hrs, to get his work group back to the Trinity Road access point.

50 No-one told the signaller that he should caution trains over the class 1A rail defect, which had not been clamped. The conductor rail shroud was removed before trains started to run.

The investigation

Sources of evidence

51 The following sources of evidence were used:

- witness statements;
- PICOP records;
- site photographs;
- voice recordings;
- analysis of on-train recorder data;
- *Control Centre of the Future* data;
- mobile phone records;
- timesheets;
- *Sentinel* & Assessment in the Line records;
- Network Rail standards & procedures;
- a DVD of the route, used for driver training purposes; and
- a review of previous RAIB investigations that had relevance to this accident.

Key facts and analysis

Identification of the immediate cause[4]

52 **Both gangs were working on the track (in a 'red-zone prohibited' area) while trains were running, without protection.**

53 Both COSSs believed that they were protected: COSS A thought he was protected by the possession when he took his gang out onto the track, while COSS B was relying on the line blockage which COSS A subsequently arranged to get his gang back to Clapham Junction (paragraph 40), after the first incident had occurred.

54 In each case, the protecting arrangements were cancelled while they were working and a train was signalled along the Down Main Fast.

Identification of causal factors[5]

The incident involving COSS A

The absence of a safe system of work

55 **COSS A took his gang out onto the track without setting up a safe system of work. This was a causal factor in the first incident.**

56 The requirement for a COSS to establish a safe system of work is mandated by Handbook 7 of the Rule Book (GE/RT8000/HB7), and the process is defined in Network Rail standard NR/L2/OHS/019 'Safety of People Working On or Near the line'. The system of work for planned work is normally developed by a *Planner* and accepted by the *Responsible Manager*. A *safe system of work pack* is then issued to the COSS, who must verify it before going to site. The safe system of work pack includes a partially completed 'Record of Arrangements and Briefing form' (RT9909) and, where the work involves use of a line blockage, a 'Line Blockage Form' (RT3181). Once on site, the COSS must check whether the system of work is appropriate and can be implemented as planned. If so, the COSS then completes form RT9909 and briefs the work group. Individual members of the work group are required to sign the form to show that they have received and understood the COSS's briefing.

57 In an *emergency situation* (requiring urgent track access which has not been planned in advance), standard NR/L2/OHS/019, allows a COSS to decide the system of work at the site of work. COSS A found himself in an emergency situation, as defined in the standard, although he had no previous experience of planning a system of work on site. In such a situation, no authorisation is necessary from the Responsible Manager and the COSS must prepare forms RT9909 and RT3181 (if required) on site; he did not have blank copies of the necessary forms with him.

[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.

58 When COSS A arrived at Clapham Junction to lead the work group to install the first part of the ESR, he had a safe system of work pack which he had used earlier in the shift; this was for work within the Wimbledon work site, which had been protected by the possession and the associated isolation. He did not complete new safe system of work paperwork either (1) for working within a possession but outside a work site (refer to paragraph 85) or (2) for using a line blockage. Witnesses state that he briefed the work group, although no-one signed a form RT9909 to confirm this, and none of them challenged COSS A about the proposed system of work or the absence of relevant paperwork. The RAIB has found that witnesses were aware that they were empowered to stop the work if they had believed it to be unsafe; this is a requirement of Network Rail's *worksafe procedure*.

59 The work group went out onto the track within a possession but outside a work site. COSS A had spoken to the ES / COSS B (his team leader), rather than contacting the PICOP as advised by the signaller. As a result, the PICOP probably did not know that the work group had gone onto the track in the possession, and he subsequently confirmed to the signaller that everyone was clear of the line. Witness evidence indicates that COSS A knew the work site had been given up and that the work group was going into a red-zone prohibited area; he told them to treat all lines as open to traffic (paragraphs 34-36). Despite this, they walked along the Down Main Fast line to their sites of work (paragraph 31) with their backs to traffic.

The effect on COSS A of working permanent night shifts

60 **COSS A may have been fatigued; it was the end of the first night shift of the week. This was a possible causal factor in both incidents.**

61 COSS A took his work group onto the track at about 05:30 hrs, which was the end of the first night shift of the week, and has stated that he was feeling fatigued. He had been working a shift pattern of permanent nights (Monday to Thursday) for about seven months prior to the incidents. COSS A had been off duty on the Friday, Saturday & Sunday nights preceding the incident. He found it hard to adjust his sleep patterns at weekends although he didn't remember anything unusual about the preceding weekend.

62 The *Fatigue and Risk Index* is a model widely used in the rail industry to plan shifts and investigate accidents and incidents; its users include passenger and freight train operators, Network Rail and organisations that work on the railway infrastructure. Its development is described in the HSE report 'The development of a fatigue / risk index for shiftworkers'[6].

63 The RAIB has calculated the Fatigue and Risk Index scores for COSS A at 06:00 hrs as 21.0 for fatigue and 0.82 for risk. These are well below the upper thresholds of 40 - 45 for fatigue and 1.6 for risk, which were identified as representing good practice for railway workers working night shifts in Health and Safety Laboratory report Ref. RSU/08/03, 'The Evaluation of the UK Rail Sector Initial Fatigue & Risk Index Thresholds'[7].

[6] http://www.hse.gov.uk/research/rrpdf/rr446.pdf

[7] http://www.rail-reg.gov.uk/upload/pdf/sres-EvalRailFRIT.pdf

64 The management of fatigue in the railway industry is considered in RAIB report 15/2011, 'Uncontrolled freight train run-back between Shap and Tebay, Cumbria, 17 August 2010'. This report concludes that the Fatigue and Risk Index is likely to under-predict the probability that high levels of fatigue will be experienced by people working a first night shift, and that at the end of a first night shift many people have been awake for around 24 hours and are thus vulnerable to fatigue.

65 Although it cannot be proved, it is possible that fatigue impaired the judgement of COSS A when he took his work group onto the track, and it may also have been a factor in COSS A later forgetting that COSS B was relying on the line blockage that he had arranged (paragraphs 41-43).

The pressure on COSS A

66 **COSS A felt under pressure to complete the work. This was a possible causal factor in the first incident.**

67 COSS A stated he felt under pressure to complete the work as quickly as possible. The reasons included:

a. Staff working on the night shift were booked to finish their shift at 06:00 hrs, although they had an expectation that they would be able to return to Wimbledon depot and go home once the possession had been given up. Witness evidence indicates that the members of COSS A's gang, all of whom were working the first night shift of the week, were tired and keen to complete their additional work quickly so they could go home.

b. COSS A's gang had assembled at the end of the platform at Clapham Junction with the tools and equipment needed to set out the first part of the ESR. There is conflicting evidence from witnesses about what the ES / COSS B told COSS A to do when he telephoned the ES / COSS B after the signaller had refused his request for a line blockage (paragraph 35). COSS A felt under pressure to proceed with the work before the possession was cancelled; he did not feel able to challenge the ES / COSS B about what he thought he was being asked to do. The ES / COSS B was expecting COSS A to wait until he (the ES / COSS B) had contacted the PICOP and was able to advise him how long it would be until the possession was given up. Although the ES / COSS B subsequently spoke with the PICOP before the possession was handed back (at 05:25 hrs and again at 05:28 hrs), he did not speak with COSS A again until COSS A telephoned him at 05:50 hrs to say that he was taking a line blockage.

c. On the morning of the incidents the normal pressure that Network Rail maintenance staff feel not to delay trains was exacerbated by the overrun of the planned possession work, and the resulting haste to set up the ESR.

The incident involving COSS B

COSS B's flawed system of work

68 **COSS B took his gang out onto the track with a system of work that did not secure the safety of his staff. This was a causal factor in the second incident.**

69 Members of COSS B's work group had been involved in lifting the *possession limit boards* and detonators which marked the Wimbledon end of the possession, so they met at the Trinity Road access point later than COSS A's gang had assembled at Clapham Junction. While they were waiting to go onto the track, COSS B briefed them on the proposed system of work, which he had decided on site. Witnesses stated that work group members signed a copy of the RT9909 form, although Network Rail was unable to provide a copy of this to the RAIB.

70 Witnesses state that the system of work relied on a line blockage which was to be arranged by COSS A. However, the arrangements did not comply with the rules for sharing a line blockage (refer to paragraph 72) and created the opportunity for COSS A to surrender the line blockage without remembering that COSS B's gang was relying on it.

71 COSS B knew that the signaller had granted the line blockage to COSS A for a maximum of 15 minutes (paragraph 41). He took his gang out to clamp the rail defects and set up the second part of the ESR at 4 miles 76 chains; the RAIB estimates that it would take a total of 9-10 minutes to walk to and from the site of work from the access point at 4 miles 58 chains; this would have left only about 5 minutes for the gang to complete their work. However, there was no risk to safety in underestimating the time required, as the signaller could not have cleared the line blockage until it was given up by the COSS .

72 The rules for sharing a line blockage are included in Handbook 8 of the Rule Book (GE/RT8000/HB8). This states that if two or more COSSs 'need a line blockage at the same place and same time, a protection controller (PC) must be appointed to take overall control of the shared line blockage'. The other COSS(s) must sign in on the line blockage form (RT3181) held by the protection controller, to confirm that they understand the arrangements for the line blockage before starting work and sign out afterwards to confirm that they no longer need the line blockage.

73 Witness evidence indicates that the ES / COSS B did not recognise that he should have appointed a protection controller in this situation. COSS A had not been trained to act as protection controller, and was therefore not competent to arrange a line blockage on behalf of another COSS; it is also not clear what experience he had of working as a COSS under a protection controller. However, COSS B and another member of his gang were both certificated to act as protection controller. COSS A did not have a line blockage form (paragraph 56), and COSS B therefore did not sign one before he took his gang onto the track. None of the members of COSS B's gang, including the other certificated protection controller, challenged him on the arrangement. As stated at paragraph 58, witnesses were aware that they were empowered to stop the work if they had considered it to be unsafe.

74 COSS B trusted COSS A and thought he had understood the proposed arrangement to share the line blockage.

COSS A's memory lapse

75 **COSS A did not have a line blockage form and gave up his line blockage without remembering that COSS B was relying on it. This was a causal factor in the second incident.**

76 When COSS B told COSS A he was planning to share his line blockage (paragraph 41), it was shortly after COSS A's gang had unexpectedly been passed by train 5J09. It is possible that COSS A was flustered by this incident, and consequently did not fully register the significance of what COSS B had told him. In addition, he was tired and possibly fatigued (paragraph 60). He gave up the line blockage as soon as all of his gang were clear of the line at Clapham Junction. About 4 minutes after he had finished speaking to the signaller, COSS A remembered that COSS B had told him that he was going to share the line blockage, and telephoned him to tell him he had given it up (paragraph 47).

77 If COSS A had held a line blockage form (paragraph 73), and if COSS B had signed it, COSS A probably would not have forgotten about his work group before giving up the line blockage. This is because he would have had to refer to the form while speaking with the signaller, and would have seen the entry for COSS B's work group.

The ES / COSS B's workload and lack of 'thinking time'

78 **The ES / COSS B's decision-making may have been impaired by the demands placed on him during the night shift. This was a possible causal factor in the second incident.**

79 During the earlier possession, the ES / COSS B had been engineering supervisor for the Wimbledon work site. He had been very busy:

a. the work site had overrun by 45 minutes after problems with a rail-drilling machine;

b. he had to arrange to get two on-track machines through his work site and out of the possession, before it was given up;

c. he had been co-ordinating the resources involved in the protection of the possession and work site, and isolation of the third rail (these activities are known as 'blocking & strapping' - see paragraph 107);

d. he had been on site himself, carrying out blocking & strapping duties at Wimbledon Traincare depot; and

e. he had made or received 68 phone calls between 03:00 & 06:00 hrs, totalling 76 minutes.

80 Following discovery of the class 1A rail defect by the ultrasonic rail testers, the ES / COSS B had to arrange for the defect to be clamped and the associated ESR to be set up (paragraph 31). While the Assistant TSM designed the detailed layout of the ESR equipment, based on an existing plan, the ES / COSS B decided how many work groups would be required, who should be in each work group, who should lead them, who should collect the necessary equipment and where the groups should gain access to the track. This constituted an informal plan, which the ES / COSS B developed in addition to his other activities and then had to communicate to all those involved.

81 The ES / COSS B appointed himself to act as COSS for the second work group, and decided the system of work on site (paragraph 69). There were three other members of the work group who were certificated as COSS, any of whom he could have appointed as COSS for the work group.

82 The ES / COSS B was conscious of the need to complete the work as soon as possible, to allow trains to start running normally. Throughout the course of the shift, he had had a number of telephone calls with Wessex Integrated Control Centre about the progress with his work site, as well as the work required to deal with the class 1A rail defect. He probably did not have adequate 'thinking time' to reflect on his plan, which involved sharing COSS A's line blockage, before implementing it.

83 The ES / COSS B may have been fatigued, and this may also have impaired his decision-making. He had been working permanent night shifts (Monday to Thursday) for a number of years. He also worked alternate weekends: prior to 8 March 2011 he had had the Friday and Sunday nights off, but had worked on the Saturday night. The RAIB has been unable to establish his exact sleep pattern. Although he did not recall feeling particularly tired, the ES / COSS B's Fatigue and Risk Index scores at 06:00 hrs were 25.1 for fatigue and 1.58 for risk. The risk score was at the accepted threshold for a night shift, and this may be an underestimate of his actual level of fatigue at the end of the first night shift (paragraph 64).

Identification of underlying factors[8]

The rules for working in a possession but outside a work site

84 **The rules for working in a possession, but outside a work site, are complex and were not well understood by the staff involved. This was an underlying factor in the first incident.**

85 In the circumstances, it would not have been possible for COSS A to establish a safe system of work for work in a possession but outside a work site that was compliant with the Rule Book, for the following reasons:

a. Handbook 9 of the Rule Book (GE/RT8000/HB9) allows a COSS to set up a safe system of work outside a work site with the PICOP's authority, but only where the method of working has been planned before the possession is taken, and the PICOP is aware of what is to happen. Such a safe system of work is not permitted during the hours of darkness. The safe system of work had not been pre-planned, COSS A had not contacted the PICOP and the work was to be carried out during the hours of darkness.

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

b. Alternatively, a COSS may set up a safe system of work for work outside a work site without the PICOP's authorisation. In this case the COSS cannot rely on protection from the possession and must set up a *red-zone* safe system of work. In a red-zone prohibited area this is permitted by Network Rail standard NR/L2/OHS/019, provided 'adequate warning arrangements can be established, taking into account the number and speed of train movements within the possession'; in this case, the warning arrangements would have required the use of lookouts[9]. Handbook 7 of the Rule Book (GE/RT8000/HB7) states that, when a safe system of work relies on lookouts, trains must be limited to 20 mph (32 km/h) during the hours of darkness. No arrangements had been made to caution trains to travel at 20 mph and no lookout had been appointed before the work group went onto the track.

86 COSS A had no experience of applying the rules for working in a possession but outside a worksite. Consequently, he became unsure of how he should act. This may have contributed to his poor decision making during this incident.

87 Witness evidence indicates that COSS A was expecting to be told when the possession had been handed back, so that he could immediately arrange a line blockage with the signaller. However, there was no reason for the PICOP or the signaller to inform either COSS A or the ES / COSS B that the possession had been handed back, and they would have found this out only by observing that trains had started to run.

Review of systems of work developed by a COSS on site

88 **The protection arrangements developed by both COSSs on site were not subject to any checks by a competent third party, as they were not pre-planned. This was an underlying factor in both incidents.**

89 The work on the morning of 8 March 2011 was an emergency situation, as defined in Network Rail standard NR/L2/OHS/019. COSS A therefore did not need any authorisation for his system of work before he led his gang onto the track in a possession (but not in a work site). This method of working deviated from the use of a line blockage, which had been agreed between Wessex Integrated Control Centre, the ES / COSS B and the Assistant TSM nearly two hours before the work group went onto the track (paragraphs 29-30). If COSS A had been required to obtain authorisation for his proposed protection arrangements, it is likely that this would have been refused, which would have prevented one or both of the incidents.

90 Similarly, if COSS B had had to obtain authorisation for his proposed protection arrangements, which relied on a line blockage to be arranged by COSS A, a competent third party should have queried who was to act as protection controller. This might have prevented the second incident.

[9] No equipment was available which could have provided enough warning to allow everyone involved to reach a position of safety before any train arrived at the site of work.

Network Rail's competence management system

91 Network Rail's primary competence management system, Assessment in the Line, was not effective in managing the *competence* of COSS A and COSS B. This was an underlying factor in both incidents.

92 COSS A did not follow the rules which apply to work within a possession but outside a work site. COSS B did not follow the rules for sharing a line blockage. These non-compliances may have occurred because the individuals:

a. lacked the confidence to apply the rules in an emergency situation;

b. had forgotten the rules (both had passed the relevant computer-based knowledge tests);

c. were unable to match the circumstances in which they found themselves with the training they had received, as there was no prompt as to the correct course of action; or

d. understood the applicable rules, but were taking short-cuts to complete the work as quickly as possible.

93 Network Rail uses a competence management system known as Assessment in the Line to manage the competence of its employees involved in work that can affect operational safety or performance. The main elements of Assessment in the Line are:

a. computer-based knowledge tests;

b. line managers' on-site surveillance checks; and

c. line managers' reviews of work experience records.

94 Network Rail standard NR/L2/CTM/021, 'Competence and Training in Track Safety', requires the competence of staff, including COSSs, protection controllers and engineering supervisors, to be '... re-assessed at least once every 24 months and an interim assessment shall be completed between 9 and 15 months. If the person has not carried out the role at least twice prior to the interim assessment, the competence shall be considered withdrawn or no longer valid'. The standard explains that the purpose of the interim assessments is to confirm that:

1. the competence has been used on sufficient occasions for it to remain valid;

2. there have been no incidents, or accidents as a result of the person completing the activities;

3. [for a COSS only] the activities completed meet the requirements of the performance statements in the relevant unit of competence; and

4. the person has the knowledge defined in the relevant competence unit.

95 Network Rail chose to repeat the full Assessment in the Line cycle, including the Assessment in the Line computer-based knowledge tests, every 12-15 months, replacing the interim assessments by line managers. Network Rail advised the RAIB that it believed this approach was more onerous than that required by the standard.

96 The practice within the Clapham maintenance delivery unit was to combine Assessment in the Line on-site surveillance checks (paragraph 93b) with the *planned general safety inspections* mandated by issue 2 of Network Rail company standard NR/L3/MTC/SE0117, 'Planned general safety inspections'. This required careful coordination between a TSM and his deputies to be able to observe all members of staff performing each of their competences within every assessment cycle. Witnesses indicated that it would not be feasible for a TSM to examine all of the lesser-used areas of each competence for every member of staff. For example, preparation of a system of work on site in an emergency situation may be rarely encountered by a COSS (paragraph 56), let alone be witnessed by a line manager.

97 The rate of planned general safety inspections achieved by the Wimbledon TSM and his deputies in the 12 months prior to the incidents was only 35% of the target set within the delivery unit. The low rate of planned general safety inspections was tolerated by management within the delivery unit as there was a belief that Wimbledon depot was short-staffed and under pressure. Witness evidence indicates that a higher priority was given to getting the work done than to completing planned general safety inspections. As a consequence, the priority given to Assessment in the Line on-site surveillance checks by the TSM and his deputies was also reduced. Since the incidents on 8 March 2011, Network Rail has reissued standard NR/L3/MTC/SE0117 to clarify how a line manager may carry out site surveillance activities in conjunction with planned general safety inspections (refer to paragraph 131).

98 The third element of Assessment in the Line (paragraph 93c) is the line manager's review of work experience records. Witness evidence indicates that Wimbledon track maintenance staff were not issued with work experience log books, and that neither the TSM in the period leading up to the incidents on 8 March 2011 nor his predecessors had held face-to-face reviews with depot staff for some years. Such discussions are an implied requirement of standard NR/L2/CTM/201, to review work experience, performance and training needs on an annual basis.

99 Witnesses report that management of the Assessment in the Line paperwork is a burden which inhibits TSMs from spending sufficient time observing the performance of their staff on site. The phase 2b/c reorganisation (refer to paragraph 112) was intended to make sure that TSMs had the right level of resource to discharge their responsibilities; however this did not explicitly consider the scale of the TSM's role itself. The key accountabilities taken from the job description for a TSM are included at appendix D, and the requirement to carry out site surveillance is specifically covered by item 13 on the list.

100 The Assessment in the Line process is paper-driven, and does not require any direct evidence that a line manager is carrying out the required on-site surveillance checks or reviews of work experience records (paragraph 93). In practice the minimum assessment of competence is therefore the computer-based knowledge test, which is carried out in an 'open book' classroom environment. This follows a multiple choice format, which provides prompts as to the possible courses of action and is significantly different from the situations in which that knowledge must be applied. The initial qualification process requires newly trained COSSs to have a period of probationary mentoring before they are deemed to be fully competent; this mentoring is tailored to individual circumstances rather than being intended to cover every possible situation. Subsequent assessments of practical competence are dependent solely on the line manager's observations.

101 COSS A's mentoring, and most of his experience as a COSS, had been while he had been working on day shifts in which the pattern of work was mainly track patrolling using line blockages. On the night shift, most of the work involved possessions. His competence was not reviewed when he moved from days to nights.

102 In September 2010, Network Rail issued a new standard, NR/L3/CTM/306, 'Competence Assurance – Assessment in the Line', and a guidance note, NR/GN/CTM/402, 'Verification Protocol for AiTL'. The compliance date for the standard was December 2010, and this initiated a national verification exercise for Assessment in the Line. The verification process revealed that a significant number of non-conformances with the process resulted from inadequate on-site surveillance and insufficient reviews of work experience records. As a result, the Competence Development Steering Group called for a review of the effectiveness of Assessment in the Line in April 2011. The review has since concluded that there is a need to change the process to address the following issues (refer to paragraph 132):

a. a lack of ownership for delivery & compliance;

b. too much knowledge testing;

c. not enough site surveillance;

d. too disruptive to maintenance delivery units;

e. poor compliance regarding log book completion; and

f. too much paperwork.

103 No distinction between technical and behavioural competence was apparent in the version of Network Rail standard NR/L2/CTM/021, 'Competence and Training in Track Safety', which was current on 8 March 2011, although the standard did define competence as including 'a willingness to undertake activities in accordance with agreed standards, rules and procedures'. Network Rail has now recognised the importance of including behaviours in competence assessments, and is implementing a programme to improve the safety culture of its front-line staff who are responsible for the safety of trackside staff (refer to paragraph 133).

104 There is currently no clear means of training track maintenance staff for situations which are unfamiliar or unusual (for example, paragraph 92), or for managers to assess their competence in these. These may include scenarios for which competence requirements have not been defined. Wessex Route is considering the introduction of situational risk assessments when staff find they are facing an unusual or unfamiliar situation (refer to paragraph 134).

Management of blocking & strapping resources

105 **The demands on the ES / COSS B were exacerbated by the workload associated with implementing a work site in a third rail area. This was an underlying factor in the second incident.**

106 The procedure for setting up an isolation in an area with third rail electrification is specified in Network Rail work instruction NR/WI/ELP/3091, 'DC Electrified Lines Working Instructions'. In order to take a possession and set up a work site, the steps include:

a. taking *signal protection*;

b. installing possession limit boards and detonators;

c. arranging for the electrical controller to turn off the traction current using remotely-operated *circuit breakers*;

d. opening *hook switches* to isolate sections of conductor rail;

e. arranging for the electrical controller to reclose the circuit breakers to restore traction current to areas which are not subject to the isolation;

f. testing the isolation and applying short-circuiting straps;

g. setting up work site *marker boards*; and

h. issuing of *conductor rail permits* to COSSs.

107 Steps (b), (d), (f) and (g) require physical work to be carried out by staff on the track[10], and are collectively described as 'blocking and strapping'. For convenience these may be carried out by the same individuals, although (b) and (d) are the responsibility of the PICOP, while (f) and (g) are the responsibility of the engineering supervisor. These procedures are labour-intensive and time-consuming, and have to be carried out again, in reverse, at the end of the work. Where staff are carrying out planned maintenance work as well as blocking and strapping duties, they may also have to travel to and from the location of work at the beginning and end of the possession.

108 On the morning of 8 March 2011, the ES / COSS B (acting in his capacity as engineering supervisor for the Wimbledon work site) had been managing the blocking and strapping resources, as well as trying to make sure there were people available to carry out the scheduled maintenance work:

a. Only two people (out of eleven night shift staff on duty) were left at the site of work at the beginning and end of the possession. All of the others, including the ES / COSS B and the Assistant TSM, were carrying out blocking and strapping duties.

[10] Other parties involved in the process include the PICOP, the signaller(s), the electrical control room operator and the engineering supervisor.

b. From the scheduled possession start time to the point at which work could start (issue of the conductor rail permits) took 70 minutes, which witnesses report is typical for a *B2 isolation* in the Clapham area, and an equivalent time to reverse the steps at the end of the possession. As a result, there was less than 2 hours working time available within the scheduled possession time of 4¼ hours[11].

109 Due to the difficulties experienced with the work which had been scheduled, this was scaled back.

Shortage of staff at Wimbledon track maintenance depot

110 **The demands on the ES / COSS B were further increased by a shortage of staff at Wimbledon depot. This was an underlying factor in the second incident.**

111 At the time of the incidents, Wimbledon track maintenance depot was short-staffed, including on the night shift. The RAIB previously identified a shortage of staff available to the TSM as an underlying factor in a derailment at Epsom in 2006, RAIB report 34/2007, 'Derailment at Epsom, 12 September 2006'. Recommendation 1 of the report was for Network Rail to review the resourcing at Wimbledon track maintenance depot to ensure that it was adequate for its existing and planned workload. Network Rail wrote to the Office of Rail Regulation (ORR) in September 2009 to say that it had completed the action; this included increasing the numbers of 'direct track staff in post' at Wimbledon by 57%. ORR was satisfied that Network Rail had done all that could be done (so far as was reasonably practicable), although neither Network Rail nor ORR have been able to provide the RAIB with a record of the review.

112 Since the derailment at Epsom in 2006, the workload on the track maintenance section at Wimbledon has increased due to the increase in *rolling contact fatigue*, which Network Rail has stated it believes has probably been caused by the introduction of Desiro trains[12]. In addition Network Rail Infrastructure Maintenance has been reorganised; the most recent reorganisation is referred to as 'phase 2b/c'. This reorganisation resulted in a reduction in the numbers of posts under the Wimbledon TSM. The displaced posts were moved into a newly-created 'works delivery unit', together with the track renewals work which had previously been carried out by the TSM's organisation. Network Rail advised the RAIB that the phase 2b/c reorganisation had therefore not reduced the numbers of track maintenance posts at Wimbledon. However, at the time of the incidents on 8 March 2011, seven of these posts were vacant, and there was a recruitment freeze in the run-up to implementation of the new organisation on 1 April 2011. This meant that the TSM had only 81% of his full complement of staff. Since the incidents, the Wimbledon TSM has been given authority to recruit into these posts and, where necessary, to use labour-only sub-contract staff in the meantime (refer to paragraph 129).

[11] The actual duration of the possession on 8 March 2011 was 5 hours, with 2¾ hours working time, due to the overrunning work site.

[12] The length of sites containing 'heavy' and 'severe' rolling contact fatigue increased by 340% between 2006 and 2011 for the Wimbledon track section area, which compares with 85% for the Wessex Route as a whole.

113 Because there was a minimum number of people involved in blocking and strapping duties, any shortfall in resourcing had a disproportionate effect on the team's ability to carry out their planned workload. The ES / COSS B was already involved in carrying out some of the work himself (paragraph 108a), and he had no spare staff available to clamp the rail defect and set up the associated ESR.

Observations[13]

Train 5D91 approached COSS B's gang at normal speed because no-one had told the signaller to caution trains, and the signaller incorrectly assumed that an ESR had been set up

114 Level 2 modules A01 and B01, which are part of Network Rail company standard NR/L2/TRK/001, 'Inspection and maintenance of permanent way', require the person discovering a serious rail defect to take immediate action to protect traffic and to advise the signaller. Module SP of the Rule Book states that the signaller will be provided with specified information when an ESR is to be imposed, although it does not say by whom. It also includes the requirement for the signaller to stop and caution trains to travel at reduced speed until the ESR equipment has been set up.

115 Although the ultrasonic rail testing team was responsible for contacting the signaller to advise him that there was a serious rail defect, and that there was a need to stop and caution trains to travel at 20 mph (32 km/h) pending the establishment of an ESR, they did not do so. They did however inform the engineering supervisor and the Wessex Integrated Control Centre; they may not have been aware that they should have contacted the signaller, as required by NR/SP/TRK/001/A01 & B01. Witnesses report that, when a defect is found in a possession, staff carrying out ultrasonic rail testing would normally expect the control centre to relay the information on to the signaller. On 8 March 2011, the signaller ascertained that an ESR was being set up from his conversation with COSS A (paragraph 34). The shift signalling manager subsequently telephoned Wessex Integrated Control Centre, who confirmed that an ESR was required due to a class 1A rail defect at 4 miles 76 chains.

116 When the PICOP telephoned the signaller at Wimbledon Area Signalling Centre to surrender the possession (paragraph 36), miscommunication occurred and the signaller assumed that the ESR had been correctly signed. He therefore did not stop and caution trains over the rail defect. The reasons included the following:

a. no-one had asked the signaller to stop and caution trains (paragraph 115);

b. standards do not specify whose responsibility it is to advise the signaller when an ESR has been set up (and that it is therefore no longer necessary to stop and caution trains), so the signaller would not have been expecting such confirmation to have to come from a technically competent person; and

c. the signaller understood from the PICOP, when he handed back the possession, that an ESR had been set up (although the PICOP was not in a position to know this).

[13] 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.

117 After the second incident, the incident controller at Wessex Integrated Control Centre telephoned the Assistant TSM at about 06:20 hrs. Both parties knew that the ESR had not been set up and that the rail defect had not been clamped, and they agreed that the signaller would need to caution trains. They had both told COSS B to go straight back to Wimbledon; neither of them contacted the signaller, possibly because their attention was focused on managing the consequences of the near-miss, or possibly because they assumed that the signaller had already been informed.

118 Four trains subsequently passed along the Down Main Fast line before a driver reported the missing ESR speed and commencement boards to the signaller at about 07:30 hrs. Calculations using data from the Control Centre of the Future system indicate that the average speeds of each of these four trains between W169 and W173 signals, where the rail defect lay, were between 25 and 40 mph (40 and 64 km/h).

Train 5D91 also approached COSS B's gang at normal speed because the driver did not respond to the emergency indicator

119 The driver of train 5D91 received the warnings triggered by the portable AWS magnets and observed the emergency indicator shown in figure 5b; the warning board was probably not visible as it had fallen over (paragraph 39). He did not immediately tell the signaller about the missing warning board as required by module SP of the Rule Book (if necessary stopping his train specially). He had been accelerating as he passed the ESR equipment, using step 2 of the traction controller[14]. About 350 metres further on, just before he passed signal number W165, he increased his traction demand to step 4, and continued until he observed COSS B's gang about 670 metres later (paragraph 44).

120 The RAIB has calculated that, if train 5D91 had been travelling at 20 mph (32 km/h) instead of 46.4 mph (75 km/h) when the driver made his emergency brake application (paragraph 46), the train would have stopped approximately 177 metres short of the site where COSS B's gang was working. Alternatively, if it had been travelling at the full linespeed of 75 mph (121 km/h) at this point, it would still have been travelling at more than 60 mph (97 km/h) when it reached COSS B's gang. In this case the gang would have been able to see the headlights of the train for a maximum of 8 seconds before it reached them.

There is ambiguity about the circumstances in which a line blockage can be shared

121 The rules for sharing a line blockage and those which govern how a COSS develops a safe system of work on site in an emergency situation are given in NR/L2/OHS/019 (paragraph 56). This document does not make clear whether it is permissible to share a line blockage in an emergency situation. Neither COSS involved in the incidents was familiar with doing so.

[14] Class 455 trains have a 4-step traction control, with the maximum acceleration available in step 4.

Summary of conclusions

Immediate cause

122 Both gangs were working on the track (in a 'red-zone prohibited' area) while trains were running, without protection (**paragraph 52**).

Causal factors

123 The causal factors were:

a. COSS A took his gang out onto the track without setting up a safe system of work (**paragraph 55, Recommendation 1**).

b. COSS B took his gang out onto the track with a system of work that did not secure the safety of his staff (**paragraph 75, Recommendation 1**).

c. COSS A did not have a line blockage form and gave up his line blockage without remembering that COSS B was relying on it (**paragraph 75**).

124 It is possible that the following factors were causal:

a. The ES / COSS B's decision-making may have been impaired by the demands placed on him during the night shift (**paragraph 78, Recommendation 2**).

b. COSS A may have been fatigued; it was the end of the first night shift of the week (**paragraph 60**).

c. COSS A felt under pressure to complete the work (**paragraph 66**).

Underlying factors

125 The following were underlying factors:

a. The rules for working in a possession, but outside a work site, are complex and were not well understood by the staff involved (**paragraph 84, Recommendation 1a**).

b. The protection arrangements developed by both COSSs on site were not subject to any checks by a competent third party, as they were not pre-planned (**paragraph 88, Recommendation 1**).

c. Assessment in the Line was not effective in managing the competence of COSS A and COSS B (**paragraphs 91-104, Recommendations 3 and 4**).

d. The demands on the ES / COSS B were exacerbated by the workload associated with implementing a work site in third rail areas (**paragraphs 105 and 133**).

e. The demands on the ES / COSS B were further increased by a shortage of staff at Wimbledon depot (**paragraphs 110, 127 and 129**).

Additional observations

126 Although not linked to the cause or consequences of the two incidents on 8 March 2011:

a. Network Rail standard NR/L2/OHS/019 is not clear whether a line blockage can be shared between COSSs in an emergency situation (**paragraph 121, Recommendation 1b**).

b. Standards do not specify whose responsibility it is to advise the signaller when an ESR has been set up (**paragraphs 114 and 116b, Recommendation 5**).

c. Train 5D91 also approached COSS B's gang at normal speed because the driver did not respond to the emergency indicator (**paragraphs 119 and 130**).

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

Actions reported that address factors which otherwise would have resulted in a RAIB recommendation

127 Network Rail is developing an arrangement to apply short circuiting devices remotely; this is intended to speed up the process for taking and giving up isolations in third rail areas (paragraph 125d). The Thameslink Programme is currently proposing a trial installation in the London Bridge area towards the end of 2012. The Clapham Infrastructure Maintenance Delivery Manager has advised the RAIB that he has requested that Wimbledon is also included as a trial site.

128 Resourcing levels at the Clapham maintenance delivery unit are under review by Network Rail's Wessex Route as part of the post-implementation review process for the phase 2b/c reorganisation (paragraph 125e).

129 The Clapham maintenance delivery unit is taking steps to recruit to fill the vacant posts at Wimbledon track maintenance depot (paragraph 125e).

130 South West Trains has re-briefed its drivers of the Rule Book requirement to tell the signaller immediately of missing or defective ESR equipment, if necessary stopping the train specially (paragraph 126c).

Other reported actions

131 Network Rail has published issue 3 of NR/L3/MTC/SE0117, 'Planned General Safety Inspections and Site Surveillance', with an implementation date of 3 March 2012. This clarifies how to combine the site surveillance activities required by Assessment in the Line and planned general safety inspections (paragraph 97).

132 Network Rail is changing its Assessment in the Line process (paragraph 102). As at December 2011, three phases of change are being proposed:

a. A change in the review frequency, to match the expiry date of competences held (early 2012). This is intended to emphasise the importance of site surveillance by line managers.

b. An organisational change in mid-2012 to deliver 'Local and Route ownership for delivery and compliance', coupled with the replacement of work experience log books with self-declarations of work completed.

c. The introduction of new technology (software and hardware) in 2013, which is intended to deliver improvements in knowledge testing and the capture of work experience and site surveillance records.

133 Network Rail is progressing the following initiatives as part of its safety culture leadership programme which is intended to improve the safety-related behaviours of COSSs and team leaders (paragraph 103):

a. In June 2010 it issued a new competence standard, NR/L2/CTM/223, 'Managing Site Safety', which includes behavioural indicators to be used when making assessments of competence (full compliance is due by June 2014).

b. It is providing linked 'Managing Site Safety' training for approximately 2,800 team leaders[15], with the following aims:

   i. to raise awareness and understanding amongst team leaders about their roles as leaders of site safety;

   ii. to develop new ways of thinking and behaving in the role; and

   iii. to plan for, deliver and review safe and effective working environments and work practices by applying safety leadership behaviours and competencies.

c. It is producing a training DVD to highlight the different safety responsibilities of COSSs and team leaders.

d. It is carrying out work as part of the Quality COSS project, including:

   i. the introduction of behavioural pre-requisites to encourage line managers to appoint individuals who have the appropriate capabilities to the role; and

   ii. changes to COSS training and assessment which will see more focus on the non-technical skills and behavioural elements of being a COSS.

134 Wessex Route is planning to implement an initiative known as 'Take Time' with the Wimbledon mobile operations managers in early 2012 (paragraph 104). This approach has been found to be effective in reducing risk in the Australian mining industry, and is similar to a concept known as 'Stop, Think, Act, Review', which is used in the UK nuclear industry. If successful, it is intended to introduce this approach, which involves the use of situational risk assessments, more widely.

135 The RAIB has written to Network Rail to draw its attention to the non-compliant perception held by some ultrasonic rail testing staff, that they do not need to contact the signaller immediately upon discovery of a serious rail defect, where this is found in a possession (paragraph 115).

[15] This is due to complete in December 2012

Previous RAIB reports and recommendations relevant to this investigation

136 The following RAIB reports on previous occurrences are relevant to issues identified in this report. Recommendations which address factors identified in this investigation are listed, and are not remade so as to avoid duplication:

Derailment at Epsom, 12 September 2006 (RAIB report 34/2007)

A South West Trains service from London Waterloo to Effingham Junction became derailed as it approached Epsom station. The underlying causes included the shortage of track maintenance staff at Wimbledon depot and the workload of staff at all levels in the maintenance organisation (paragraph 111).

Recommendation 1

Network Rail should review the resourcing of the track maintenance organisation in the Wessex area, Wimbledon section to ensure that it is adequate for its existing and planned workload. The review should consider the recruitment and retention arrangements in the area, the numbers of posts and the necessary competences, the arrangements for ensuring that all sections of line are given appropriate levels of attention, and the technical and professional support available to the inspection and maintenance staff.

The ORR reported on 8 July 2008 that the following actions had been taken in response to the above recommendation:

> 'Network Rail advises a review of the resourcing of the track maintenance organisation in the Wessex area, Wimbledon, section has been undertaken to establish its adequacy for its existing and planned workload. The review has considered the recruitment and retention arrangements in the area, the numbers of posts and the necessary competences, the arrangements for ensuring that all sections of line are given appropriate levels of attention, and the technical and professional support available to the inspection and maintenance staff.
>
> 'There is currently a very robust advertising campaign in place to recruit the necessary staff and the response rate to date has been high. The campaign is scheduled to run over the next 3 months. It has been communicated to the line and is being managed through the Area HR Manager.
>
> 'The ongoing recruitment activity will now become part of the 'business as usual' process.'

The ORR stated on 8 December 2009 that it was satisfied that all that could be done (so far as is reasonably practicable) had been done for this recommendation.

Accident at Leatherhead, 29 August 2007 (RAIB report 19/2008)

A member of railway staff, engaged in routine track inspection work, was struck by a train near Leatherhead station and seriously injured. The contributory factors included that the COSS had not been given sufficient guidance on the placing of lookouts and that management had not identified deficiencies in the method of working used by the patrolling gang (paragraph 89).

Collision between a passenger train and two grinding machines, Acton West, 24 June 2008 (RAIB report 15/2009)

A train crossed over from the up main line to the up relief line and struck two rail-mounted grinding machines which were waiting to be pushed towards Ealing Broadway station; the three members of the grinding team scattered as the train approached. The report recommended that Network Rail should conduct a review of arrangements within Western route for monitoring of employees undertaking assessments in the line (paragraph 102).

Track worker struck by train on Grosvenor Bridge, London Victoria, 13 November 2007 (RAIB report 19/2009)

A track worker engaged in a planned track inspection was struck by a passing train and suffered serious injuries. The lack of a complete briefing by the COSS to the work group and the lookout not challenging the COSS may have been contributory factors in the accident (paragraph 58).

Recommendation 4

In order to verify their effectiveness, Network Rail should monitor recently introduced processes that will show whether an individual's on-the-job performance routinely achieves the prescribed level with regard to safety. If necessary these processes should be enhanced.

The ORR has now advised that the following actions have been taken in response to the above recommendation:

> 'ORR has now seen a draft of NR/L3/MTC/SE0117 (issue 3): Site surveillance and safety inspections, with its stated purpose of 'defining the process for planning, conducting and reporting site surveillance, health, safety and environmental inspections in the Maintenance function to check that formal controls are being implemented and unsafe acts or conditions are identified. The aim is also to check the management system is effective and to identify changes to be made that will improve and develop the business.'
>
> 'ORR has also seen the new standard NR/L3/MTC/MG0221: Infrastructure Maintenance management self-assurance procedure, effective from 05 March 2011. This mandates a framework in terms of manager/frequency of checks by the hierarchy of management.
>
> 'As far as behaviours are concerned, Network Rail has held safety culture workshops in all Routes and there is a safety culture leadership programme across the company, which is being managed at a high level. There is also a commitment to run behavioural training courses for all staff.

'In addition a managing site safety course has been developed, and run for 500 staff with the aim of covering 3000 over the next 18 months, and a new standard, NR/L2/CTM/223: Competence and training in managing site safety, was issued on 4 June 2011 with full compliance expected over the next 3 years. This includes behavioural indicators.'

The ORR is considering whether to close the recommendation.

Passenger train struck by object at Washwood Heath, 06 March 2010 (RAIB report 01/2011)

A passenger train passing the site of track maintenance work struck a length of rail being moved as part of the work. Causal factors included the pressure to complete work to meet a deadline and the behaviour of the Assistant TSM (who was also the engineering supervisor and the crane/machine controller), which discouraged challenge by his staff (paragraph 67b).

Recommendation 3

Network Rail should extend the work it is undertaking to improve the methods and criteria used when selecting staff to undertake safety leadership roles to include consideration of the training and assessment of those staff who are already qualified in those roles.

Network Rail has informed the RAIB that it provided a formal response to the above recommendation to the ORR on 20 April 2011, with a revised response on 23 June 2011. The ORR has not yet advised the RAIB of any change in status of the recommendation.

Track worker struck by a train at Cheshunt Junction, 30 March 2010 (RAIB report 06/2011)

A passenger service running from Stansted Airport to London Liverpool Street struck a member of railway staff. A possible causal factor was the use of a single RT9909 form for work at two different sites (paragraph 58); this did not prompt the COSS to take account of the need to implement different safe systems of work.

Uncontrolled freight train run-back between Shap and Tebay, Cumbria, 17 August 2010 (RAIB report 15/2011)

A freight train slowed to a stop, while travelling uphill on the West Coast Main Line, and then ran back until the driver braked and stopped the train. The investigation found that the train driver, who was working the first of a series of night shifts, was probably fatigued and not sufficiently alert at the time of the incident. It also found that the driver had been exposed to a work pattern that was likely to induce high levels of fatigue (paragraph 136).

Recommendation 2

The Office of Rail Regulation should … provide updated and enhanced guidance on shifts that cause high levels of fatigue, which should include:

a. ways to improve those shifts, for example by changing the transition to them, the number of consecutive shifts, their duration and the duties carried out on them;

b. advice on the limitations of mathematical models used to predict fatigue, and how they may be used as part of a fatigue risk management system.

The ORR has not yet reported any actions that have been planned or taken in response to the above recommendation.

Recommendations

137 The following recommendations are made[16]:

1 *The purpose of this recommendation is to reduce the potential for unsafe actions to be taken by a COSS when required to carry out unplanned work in unfamiliar and complex situations.*

Network Rail should review and, if necessary, revise the arrangements for unplanned / emergency work (paragraphs 123a, 123b and 125b) to reduce the potential for:

a. confusion when attempting to apply the rules for working in a possession but outside a work site (paragraph 125a); and

b. confusion when sharing line blockages (paragraph 126a).

Options for consideration should include:

- simplification of the rules, and / or improved COSS training, relating to working in a possession but outside a work site;
- means to control the risk associated with a COSS planning the system of work in unfamiliar and complex situations (such as restricting the definition of an 'emergency situation' or by introducing additional checks on the proposed system of work);
- a review of the risk of shared line blockages for unplanned works and the identification of alternative approaches; and
- adoption of situational risk assessments to inform decision making in unfamiliar and complex situations (such as the 'Take Time' process being trialled by the Wessex Route).

continued

[16] 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 200 to 203) can be found on RAIB's website www.raib.gov.uk.

2 *The purpose of this recommendation is to reduce the pressure on an engineering supervisor and / or COSS when there is an unplanned interruption to the normal passage of trains, due to a possession overrun or the need for emergency engineering access.*

Network Rail should develop a set of proposals for managing the pressures related to train performance on those responsible for setting up protection arrangements for access to the railway in unplanned and / or emergency situations (paragraph 124a). This might include (but should not be limited to):

a. improving the mutual understanding of the challenges faced by shift leaders in maintenance delivery units and incident controllers at route control centres, for example by providing regular experience of working in each others' environments;

b. a suitable briefing to remind trackside staff, as well as route controllers, that trackside staff themselves should decide the most appropriate protection arrangements for carrying out emergency work; and

c. the provision of clear protocols on communication and co-ordination arrangements in situations where pressure may arise particularly where performance may conflict with safety.

3 *The purpose of this recommendation is to determine whether, following the proposed changes to Assessment in the Line, the workload of Track Section Managers is reasonable. If necessary, the role should be restructured to strengthen the supervision of staff competence.*

Network Rail should review the workload of Track Section Managers, to determine whether it is reasonable, taking account of the changes which are due to be introduced in 2012 as part of the 'Assessment in the Line review project'. This review should include the requirement to manage technical, managerial and administrative tasks; specific attention should be given to the work associated with the management of staff competence and on-site surveillance. If this review identifies that the workload of the role is unreasonable following the proposed changes, practical steps should be taken to restructure responsibilities to improve the delivery of safety-related activities (paragraph 125c).

4 *The purpose of this recommendation is to improve the competence of track maintenance staff in safety-critical roles, particularly when exposed to situations with which they are unfamiliar.*

Network Rail should review the adequacy of training and assessment of track maintenance staff to deliver practical competence, particularly in skills or situations which are encountered infrequently (paragraph 125c). Where necessary, improvements should be made to enhance current processes. Consideration should be given to:

a. the extent to which it is appropriate to have detailed and complex rules for responding to infrequently-encountered situations;

b. methods of providing experience in situations which an individual may encounter infrequently;

c. identifying methods of assessment for situations which it is unlikely a line manager would normally be able to observe;

d. reassessing safety-critical competences when there are significant changes in an individual's work pattern, eg changing from day patrolling to planned maintenance work on permanent night shifts; and

e. reinforcing the need for regular face-to-face reviews of staff performance and competence by line managers.

5 *The purpose of this recommendation is to increase the likelihood that a signaller will be correctly informed that an ESR has been implemented by an appropriate person.*

Network Rail should amend its company standards to clarify who is responsible for informing the signaller that the equipment for an emergency speed restriction has been set up, and that it is no longer necessary to caution trains (paragraph 126b).

Appendices

Appendix A - Glossary of abbreviations and acronyms

AWS	Automatic Warning System
COSS	Controller Of Site Safety
ES	Engineering Supervisor
ESR	Emergency Speed Restriction
ORR	Office of Rail Regulation
PICOP	Person In Charge Of Possession
TSM	Track Section Manager

Appendix B - Glossary of terms

All definitions marked with an asterisk, thus (*), have been taken from Ellis's British Railway Engineering Encyclopaedia © Iain Ellis. www.iainellis.com.

B2 isolation	A type of isolation in which short-circuiting straps are required at the extremities of the isolated section, as well as at intermediate locations.
Cess	The space alongside the line or lines. It can provide space for a cess path but is not always a position of safety.*
Circuit breaker	A device built into a third rail substation which allows the electrical control room operator to switch the current to various sections on and off remotely.
Class 1A rail defect	A defect requiring the immediate imposition of a 20 mph (32 km/h) ESR and the fitting of emergency clamp fishplates; the defect must be removed within 36 hours.
Competence (from NR/L2/CTM/021)	The ability to undertake responsibilities and to perform activities to a recognised standard on a regular basis. A combination of practical thinking skills, experience and knowledge and includes a willingness to undertake activities in accordance with agreed standards, rules and procedures. In the context of this specification it also includes: ● the consistent achievement of an identified standard of performance under defined normal, abnormal, and emergency situations; ● the ability to undertake activities to arrange for suitable measures to be put in place aimed at achieving the safety of any individual who might be affected by the work; and ● an appropriate level of fitness.
Conductor rail permit	A form of authority signed and issued by an authorised person to a person in charge of a group working on, or near to, conductor rail equipment. The purpose of the form is to make known to the person in charge exactly which equipment has been made electrically safe (isolated) to allow work to commence.*
Conductor rail shroud (sometimes called an 'insulating trough' or 'juice mat').	An insulated cover used to shield the conductor rail from accidental contact.*
Control Centre of the Future	A system used by control centre staff and others to manage the network and analyse operational incidents.

Controller of site safety (COSS)	A safety critical qualification demonstrating the holder's competency to arrange a safe system of work, ie protecting staff working on the line from approaching trains.*
Detonator	A small disc shaped explosive warning device designed to be placed on the railhead for protection and emergency purposes. It explodes when a train passes over thus alerting the driver.*
Emergency clamp fishplate	A fishplate designed to be secured in pairs by emergency clamps to provide support and registration but not longitudinal restraint to undrilled rail ends, defective welds and suspected rail defects.*
Emergency situation (from NR/L2/OHS/019)	A situation in which (1) 'there is a need to undertake work to avoid or reduce risks to people, or significant disruption to train services, which could not foreseeably have been planned in advance by the designated Planner' and (2) 'urgent track access is required as a result of an incident, fault or failure which is affecting the normal passage of trains'.
Emergency speed restriction (ESR)	A speed restriction imposed for a short time, at short notice, generally for safety reasons.*
Engineering possession	The closure of a specific section of line to railway traffic to allow engineering work to take place on the infrastructure in accordance with module T3 of the Rule Book.
Engineering supervisor	The person nominated to manage the safe execution of works within an engineering work site. This includes arranging the marker boards, authorising movements of trains in and out of the work site and managing access to the site by COSSs.*
Fatigue and Risk Index	A mathematical model, designed to predict fatigue and risk, which was produced for the Health and Safety Executive by QinetiQ in 2006.
Fishplate	Specially cast or forged steel plates used in pairs to join two rails at a fishplated rail joint. Two, four or six fishbolts are used through the fishplates and rail ends to secure the fishplates to the rail ends.*
Handback	Colloquial term for the transfer of responsibility for a section of railway from a PICOP to the signaller at the end of a possession.*
Hook switch	An electrical switch attached to a conductor rail that allows a sub-section to be electrically separated from another sub-section.*
Isolation	The formal procedure of de-energising a section of traction supply equipment, earthing it, verifying its lack of potential and issuing of a certificate to that effect.*

Line blockage	Blockage of the line by a signaller at the request of a COSS or protection controller, other than by means of a possession. The details, including the authority number provided by the signaller, are recorded by the COSS using a 'Line Blockage Form' (RT3181). The process is prescribed in Rule Book Handbook 8.
Lookout	A competent person whose duties are to watch for and to give an appropriate warning of approaching trains by means of whistle, horn or lookout operated warning system.*
Marker board	A device used to delimit the ends of an engineering work site. They are made of yellow plastic and are fitted with two highway-style flashing road lamps. These show yellow on the work site side and red on the possession side. One is placed on each track at each end of the work site, and the area between them is under the jurisdiction of the engineering supervisor. Outside this area is controlled by the PICOP.*
Near-miss	A situation which did not result in an accident, but potentially could have done so under slightly different circumstances. The railway industry generally regards the need for a train driver to use the emergency brake as the criterion for determining that a near miss has occurred.
Patrolling	A pedestrian visual inspection of the track (and superficial inspection of other lineside items) carried out by a trained member of staff on a regular basis.*
PICOP (person in charge of possession)	The competent person nominated to manage the following: ● Safe and correct establishment of the protection for the possession, complete with detonators, point clips, possession limit boards and signals keyed to danger as required. ● Managing access to the possession area by engineering supervisors. ● Managing the establishment of engineering work sites within the possession. ● Liaising with the signaller regarding the passage of the train into and out of the possession. ● Controlling the movement of the train between the protection and work sites. ● Ensuring that all the foregoing is correctly removed in reverse sequence, the possession is relinquished and the line handed back to the signaller at the due time.*
Planned general safety inspection (from NR/L3/MTC/SE0117)	A review of health, safety and environmental conditions at a building location, or at a specific work site, and orientated towards inspections of physical conditions and surveillance of activities, to check compliance with systems of work contained in Health and Safety plans, method statements and other instructions.

Planner	A person responsible for planning safe systems of work. This is a defined competence within Network Rail's competence management system.
Portable AWS magnet	The automatic warning system (AWS) equipment fixed to the track normally consists of a permanent magnet and an electro-magnet. Installations of a permanent magnet on its own will activate the vehicle mounted equipment of a passing train and generate a warning to the driver. The driver then has 5 seconds to acknowledge this warning or the brakes will automatically be applied. Portable permanent magnets are installed to provide warnings to drivers of approaching speed restrictions.
Possession	A period of time during which one or more tracks are blocked to normal service trains to permit work to be safely carried out on or near the line.
Possession limit board	A stop sign, used to denote the boundary between infrastructure which is under the control of the signaller and that which is under possession and controlled by the PICOP.
Protection controller	A nominated competent person whose duties are to arrange and manage the possession arrangements where two or more COSSs are working under the same protection.*
Red-zone	An area that is on or near the line where trains are running normally. Red-zone working can only be used if there is no realistic alternative and is banned in some situations.*
Red-zone prohibited area	A length of track on which work cannot be carried out safely if trains are running. This is normally due to a place of safety not being available in the area. A typical example is the track located between two station platforms.*
Responsible Manager (from NR/L2/OHS/019)	The person responsible for the management of staff who will work on or near the line. This could be their line manager or their on call manager (eg Section Manager within Network Rail Maintenance Delivery Units).
Rolling contact fatigue	Collective term for all rail defects directly attributable to the rolling action of a rail wheel on the rail.*
Rule Book	Railway Group Standard GE/RT8000, which describes the duties and responsibilities of staff and the regulations in force to ensure the safe operation of the railway (see appendix C).
Safe system of work pack (from NR/L2/OHS/019)	A pack of information used by the COSS that provides details of the site of work, the work to be done and the suggested safe system of work in accordance with NR/L2/OHS/019 and the Rule Book GE/RT8000.
Sentinel	Sentinel is the brandname for the competency control system based on photographic identity cards. The cards give details of medical fitness and railway related competences.*

Shoegear	Equipment carried by a train and used for current collection on third rail systems. Shoegear comprises a cast iron shoe that is usually mounted on an insulating beam attached to the side of the bogies, close to rail level.*
Short-circuiting strap	A flexible piece of equipment used specifically for connecting the conductor rail and traction return rail together to prevent the conductor rail becoming energised during a possession.*
Signal protection	Placing signals at danger to stop trains entering an area where other trains, people or objects may be on the track, or where there is no track at all.*
Third rail electrification	A general term used to cover the type of electrification that involves the supply of DC current to trains by means of a conductor rail laid along one side of the track (the 'third rail').
Track Chargeman	The grade applying to the person in charge of a track maintenance gang. The subordinate grades are Leading Trackman and Trackman.
Track circuit operating clip	A pair of spring clips connected by a wire, used to short out a track circuit [an electrical or electronic device used to detect the absence of a train on a defined section of track using the running rails in an electric circuit] by connection across the rails in times of emergency.*
Trackman	A member of staff concerned with the maintenance of the track.
Weekly Operating Notice	A Network Rail document published on a route basis, providing information about engineering work, speed restrictions, alterations to the network and other relevant information to train drivers.
Worksafe procedure (from NR/L2/OHS/00112)	Network Rail procedure which requires any employee who considers their or others safety to be compromised to: ● cease work immediately, assuring themselves that doing so does not endanger themselves or others; ● move to a position of safety; and ● immediately contact the person in charge, explaining that they have invoked the Worksafe Procedure and explain why they have stopped work.
Work site	The area within a possession that is managed by an engineering supervisor. A work site is delimited by marker boards when engineering trains are present. It may contain many work groups, each controlled by a controller of site safety (COSS).* The work site marker boards are erected within the area bounded by the possession limit boards.

Appendix C - Key standards current on 8 March 2011

GE/RT8000 Rule Book: ● Handbook 7: General duties of a controller of site safety (COSS), Issue 1 ● Handbook 8: IWA, COSS or PC blocking a line, Issue 1 ● Handbook 9: IWA or COSS setting up safe systems of work within possessions, Issue 1 ● Module T3: Possession of the line for engineering work, Issue 2 ● Module SP: Speeds, Issue 3	The Rule Book – RSSB Railway Group Standard, available at: www.rgsonline.co.uk
NR/SP/TRK/001: Inspection and maintenance of permanent way, Issue 2	Network Rail business process document
NR/L2/TRK/001/A01: Inspection and maintenance of permanent way – Inspection, Issue 4	Network Rail company standard, level 2 module
NR/L2/TRK/001/B01: Inspection and maintenance of permanent way – Rail management, Issue 4	Network Rail company standard, level 2 module
NR/L2/OHS/019: Safety of People Working On or Near the line, Issue 8	Network Rail level 2 standard
NR/L2/CTM/021: Competence and Training in Track Safety, Issue 4	Network Rail level 2 standard
NR/L3/CTM/306: Competence Assurance – Assessment in the Line (AiTL), Issue 1	Network Rail level 3 standard
NR/WI/ELP/3091: DC Electrified Lines Working Instructions, Issue E2	Network Rail work instruction
NR/L3/MTC/SE0117: Planned general safety inspections, Issue 2	Network Rail Maintenance level 3 standard
NR/L2/OHS/00112: Worksafe Procedure, Issue 2	Network Rail level 2 standard

Appendix D - Key accountabilities taken from TSM's job description

1. Manage and direct the Infrastructure Maintenance delivery team and Contractors to achieve business and functional objectives and meet key performance measures.
2. Manage the development of individuals and the engagement of the team.
3. **Manage the arrangements for staff competence** and welfare.
4. Adhere to company policies and procedures.
5. Carry out work safely and in accordance with the safe systems of work procedures, method statements, plans and other instructions.
6. Implement safety, asset performance, reliability, productivity and efficiency improvement initiatives.
7. Manage the development of work plans that enables work to be delivered safely, efficiently and compliant to standards.
8. Manage and direct the inspection, faulting, maintenance and renewal of assets to standards.
9. Manage and check the quality of work delivered and confirm assets are compliant to standards.
10. Identify and propose asset renewals.
11. Manage the preparation of work and resource specifications, method statements and plans.
12. Manage information to update systems, databases and records.
13. **Undertake a programme of staff surveillance**, work quality and asset condition checks.
14. Contribute to your own development and that of others.
15. Discharge the relevant duties assigned to the 'CDM Contractor' (Network Rail Infrastructure Limited) in accordance with the Construction, Design and Management (CDM) Regulations.

NB: Bold text indicates the accountabilities which relate to line managers' Assessment in the Line responsibilities.

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