RAIB

Rail Accident Investigation Branch

Rail Accident Report

Track worker near miss incidents at Camden Junction South, London 28 February 2017

Report 16/2017
November 2017

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.

Any enquiries about this publication should be sent to:

RAIB
The Wharf
Stores Road
Derby UK
DE21 4BA

Email: enquiries@raib.gov.uk
Telephone: 01332 253300
Fax: 01332 253301
Website: www.gov.uk/raib

This report is published by the Rail Accident Investigation Branch, Department for Transport.

Preface

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. It is not the purpose of such an investigation to establish blame or liability. Accordingly, it is inappropriate that RAIB reports should be used to assign fault or blame, or determine liability, since neither the investigation nor the reporting process has been undertaken for that purpose.

The RAIB's findings are based on its own evaluation of the evidence that was available at the time of the investigation and are intended to explain what happened, and why, in a fair and unbiased manner.

Where the RAIB has described a factor as being linked to cause and the term is unqualified, this means that the RAIB has satisfied itself that the evidence supports both the presence of the factor and its direct relevance to the causation of the accident. However, where the RAIB is less confident about the existence of a factor, or its role in the causation of the accident, the RAIB will qualify its findings by use of the words 'probable' or 'possible', as appropriate. Where there is more than one potential explanation the RAIB may describe one factor as being 'more' or 'less' likely than the other.

In some cases factors are described as 'underlying'. Such factors are also relevant to the causation of the accident but are associated with the underlying management arrangements or organisational issues (such as working culture). Where necessary, the words 'probable' or 'possible' can also be used to qualify 'underlying factor'.

Use of the word 'probable' means that, although it is considered highly likely that the factor applied, some small element of uncertainty remains. Use of the word 'possible' means that, although there is some evidence that supports this factor, there remains a more significant degree of uncertainty.

An 'observation' is a safety issue discovered as part of the investigation that is not considered to be causal or underlying to the event being investigated, but does deserve scrutiny because of a perceived potential for safety learning.

The above terms are intended to assist readers' interpretation of the report, and to provide suitable explanations where uncertainty remains. The report should therefore be interpreted as the view of the RAIB, expressed with the sole purpose of improving railway safety.

The RAIB's investigation (including its scope, methods, conclusions and recommendations) is independent of any inquest or fatal accident inquiry, and all other investigations, including those carried out by the safety authority, police or railway industry.

This page is intentionally left blank

Track worker near miss incidents at Camden Junction South, London, 28 February 2017

Contents

Summary

At around 01:03 hrs on the morning of Tuesday 28 February 2017, a passenger train travelling towards London Euston station nearly struck a track worker in the vicinity of Camden Junction South. The train was travelling at about 47 mph (76 km/h) at the time and the track worker managed to get clear of the line before the train passed him. About four minutes later, the same train was involved in another near miss with a second track worker some 510 metres further up the line towards London. In this case, the track worker was unable to get clear of the line, but the train stopped just before reaching him. There was no injury or significant delay as a consequence of the incidents.

The incidents occurred because the signaller authorised track workers to go onto a line over which he had just routed a train, having overlooked the fact that engineering work was taking place on that line. This was caused by a loss of information during the processes for implementing the engineering work. In turn, this was due to the layout and formatting of documentation associated with the work, as well as the nature and implementation of local processes at the signalling centre. The signaller was also possibly affected by fatigue, and the RAIB observed that, although not causal to the incidents, Network Rail's management of fatigue risk for signallers is not in accordance with current good practice.

One underlying factor was associated with processes and methods for managing and communicating information regarding engineering work in modern, multi-panel signalling centres. A second was that the processes for setting up such work still require people to be present on track, exposing them to risk in the transition period before protection is fully implemented.

The RAIB has made three recommendations and identified two learning points. The recommendations are all addressed to Network Rail and concern improved processes and documentation for supporting the implementation of engineering work, and reducing the exposure of track workers to risk arising from the need to be on the track. The learning points highlight the need for safety-critical staff to be appropriately prepared and fit for duty, and for track workers to be alert to the risks on the railway, even when they believe that they are working under protection.

Introduction

Key definitions

1 Metric units are used in this report, except when it is normal railway practice to give speeds and locations in imperial units. Where appropriate the equivalent metric value is also given.

2 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. Sources of evidence used in the investigation are listed in appendix C.

The incidents

Summary of the incidents

3 At around 01:03 hrs on the morning of Tuesday 28 February 2017, a passenger train travelling towards London Euston station nearly struck a track worker who was involved in taking *possession* of the line for engineering works in the vicinity of Camden Junction South (figure 1). The train was travelling at about 47 mph (76 km/h) at the time and the track worker managed to get clear of the line before the train passed him.

4 About four minutes later, the same train was involved in another near miss with a second track worker some 510 metres further up the line towards London. In this case, the track worker was unable to get clear of the line due to *limited clearance* in the area, but the train stopped just before reaching him.

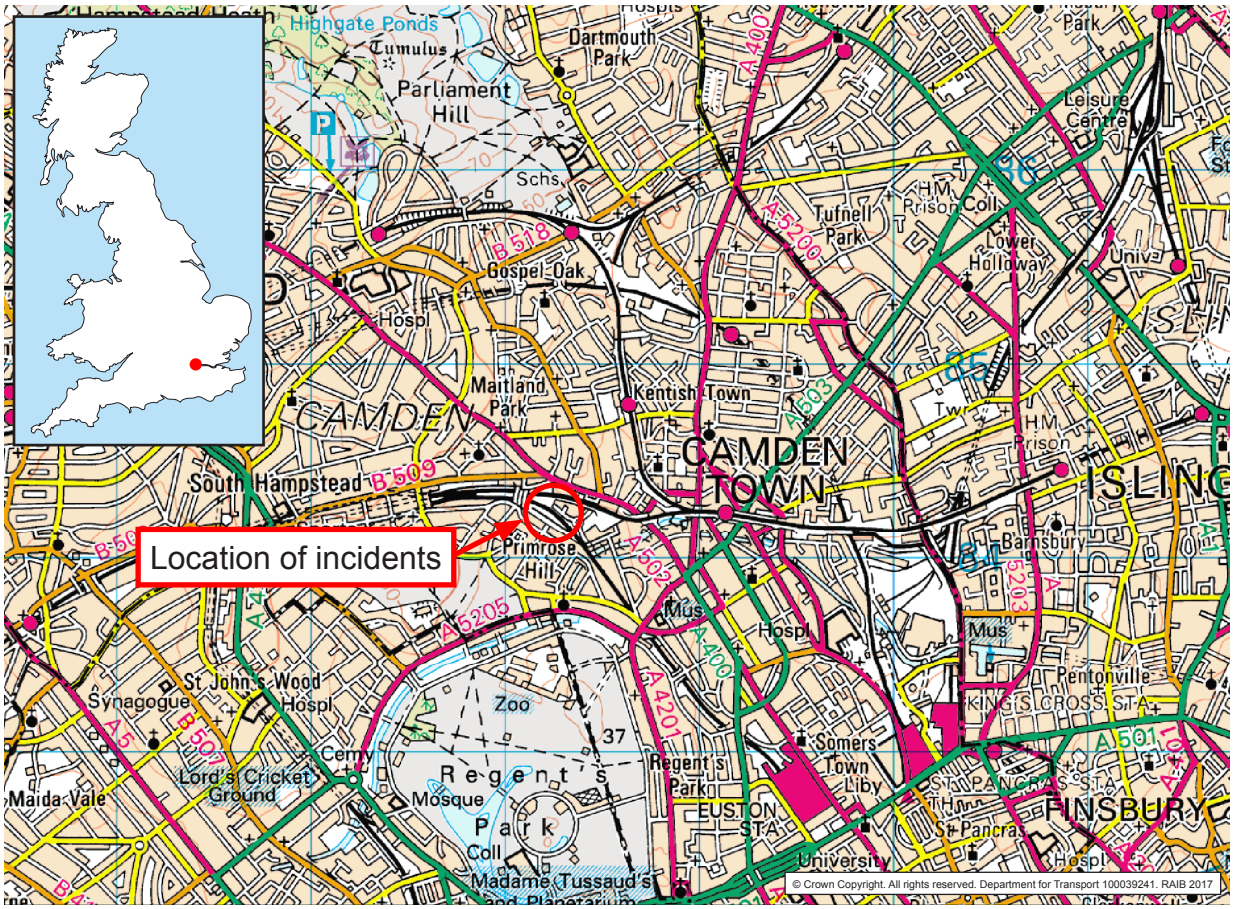


Figure 1: Extract from Ordnance Survey map showing location of incidents

5 There were no injuries or significant delay as a consequence of the incidents; the train had been running around eight minutes ahead of schedule at the time of the first near miss, and arrived at London Euston one minute early.

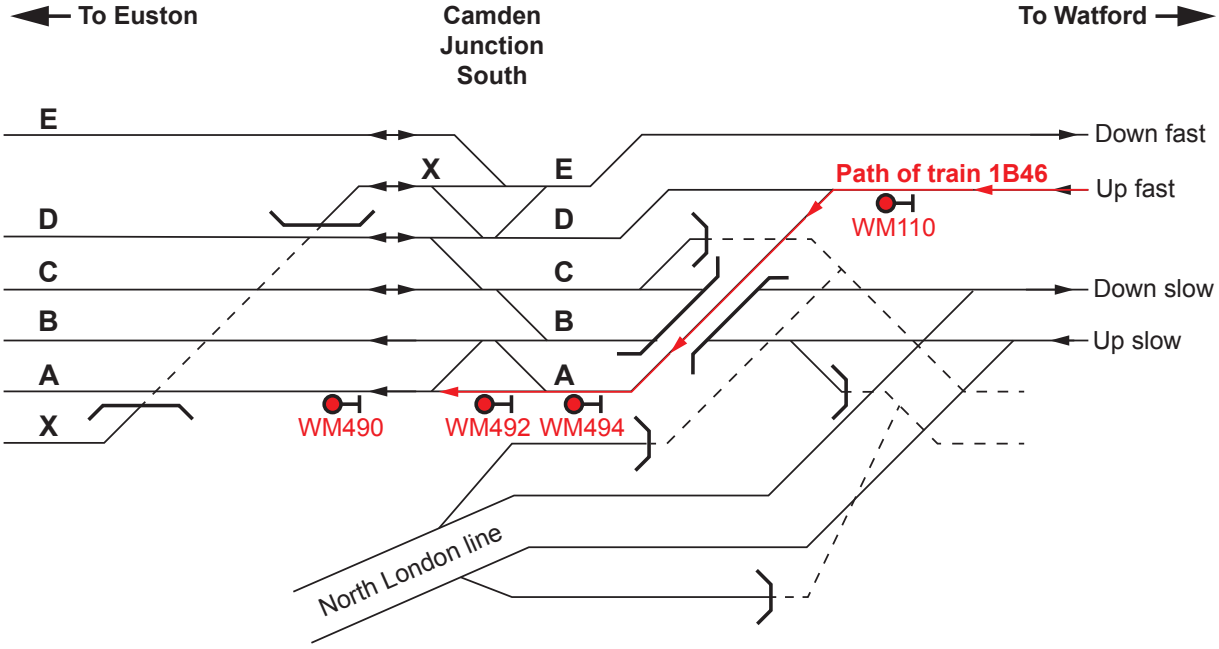
Context

Location

6 Camden Junction South is located 1 mile 10 *chains* (1.8 km) from the terminus at London Euston. The *engineer's line reference* is LEC1, and the railway is part of Network Rail's London North Western (South) route.

7 The tracks at this location divide from conventional *up* and *down*, fast and slow lines into six lines on the approach to London Euston. These lines are designated Lines A to E, plus Line X (figure 2).

8 The train was travelling on Line A, having diverged from the up fast line at signal WM110. The maximum permitted speed in this area is 50 mph (81 km/h), reducing to 40 mph (64 km/h) at signal WM490 (figure 2).



Notes:
Not to scale
Some lines and features omitted for clarity

Figure 2: Schematic diagram of the track layout

9 Signalling in the area is controlled from Wembley Main Line Signalling Control Centre (MLSCC). Operation of the signalling on the main lines in the area controlled by Wembley MLSCC is divided between four *route setting panels*, two of which are of relevance to this investigation. The platforms at Euston and the approach lines are controlled by panel A, while the lines from Camden Junction South and beyond to Queen's Park are controlled by panel B.

10 There is an *access point* adjacent to Line A at Camden Junction South, between signals WM494 and WM492. This was the access point used by the track workers. One then moved north-west (ie away from London towards oncoming traffic) to reach the *blocking point* where he was due to put down *protection* on Line A near signal WM494. The other moved south-east towards London and his blocking point between signals WM492 and WM490 (figure 3). Beyond signal WM492, there is no *position of safety* available due to a bridge parapet running alongside the track.

Figure 3: Google Earth view of the area around Camden Junction South

Organisations involved

11 Network Rail owns and maintains the infrastructure and employs the signallers who were working panels A and B on the night of the incidents.

12 TES 2000 Ltd was contracted to oversee the implementation of the possession on behalf of Network Rail. It employed the *person in charge of the possession* (PICOP) and the two *possession support* (PS) staff who were involved in the near misses.

13 Virgin Trains operated the train involved and employs the train driver.

14 All parties freely co-operated with the investigation.

Train involved

15 Train 1B46 was formed of a nine-car class 390 (Pendolino) unit. It was operating the 22:42 hrs service from Wolverhampton to London Euston.

Staff involved

16 'Signaller A' had been assigned to work on panel A for the night of 27/28 February 2017, but was covering both panels A and B at the time of the incidents (see paragraph 23). He had been a signaller for 37 years, the last 12 of which were at Wembley. Signaller A works as a relief signaller, meaning that he covers the work of other signallers who are on leave, sickness, or other absences. His last annual competence review occurred on 12 October 2016; as such, signaller A is deemed competent on all of the panels at Wembley MLSCC, and all of his competency records were up to date at the time of the incidents. These included non-technical skills (covering conscientiousness, multi-task capacity and communications), last assessed on 5 January 2017, and safety-critical communications, which was last assessed on 27 April 2016 and was graded 'B' ('good'). Prior to that, his communications were assessed on 23 December 2015 (graded C/D – improvement required / poor – and deemed 'competent with minor development' due to issues with not reaching a clear understanding), and on 8 May 2014 (graded B).

17 'Signaller B' was assigned to work on panel B on the night of 27/28 February 2017, although at the time that the incidents occurred she was taking a meal break. Signaller B has 15 years' experience as a signaller, moving to Wembley in 2005. Signaller B is also competent on all of the panels at Wembley, and her last annual competence review took place on 8 August 2016.

18 The PICOP has about 20 years' experience as a track worker, and has worked for TES 2000 for 17 years. He has been a PICOP for 10 years, and currently holds the Senior PICOP competency. The PICOP was based at Rugby for this possession.

19 The possession support worker involved in the first near miss ('PS1' for the purposes of this report) has worked on the railway for 13 years, the last five of which have been with TES 2000. The possession support worker involved in the second near miss ('PS2') has worked for TES 2000 for about two and a half years. Both staff hold the relevant track worker competency certification appropriate for the work that they were carrying out on the night.

20 The train driver joined Virgin Trains in April 2016, prior to which he had around four years' experience driving trains for Southern. After a period of transfer training with Virgin Trains, he was certified as competent in November 2016 and was therefore up to date for the train type and the route at the time of the incidents.

External circumstances

21 Weather data for the area at the time of the incidents showed a temperature of 4°C with light winds. Visibility was clear at the time of the incidents, although it was a dark night with no moonlight. The railway environment was relatively poorly lit, despite the fact that Camden is a heavily populated urban area.

The sequence of events

Events preceding the incidents

22 Signaller A and signaller B started work at 22:00 hrs on 27 February 2017. At 22:15 hrs, the PICOP telephoned panel B to prepare for the first part of the possession, due to start at 23:00 hrs. In keeping with the local processes at Wembley MLSCC (see paragraph 53), signaller B then took the lead in dealing with the PICOP for the subsequent possession arrangements, including recording details of the possession in the panel's logbook of possessions, known as the T3 book (see paragraph 54).

23 After midnight, train movements on panel A subsided, so signaller A offered to cover for signaller B while she took her meal break. Signaller A was therefore covering both panels A and B, meaning that he also took over the lead for extending the area covered by the possession to include part of Line A, which was due to occur at 01:00 hrs.

24 At 00:19 hrs, the PICOP telephoned panel B to begin preparing for the 01:00 hrs extension to the possession. During this call, the PICOP read to signaller A the list of possession limits from the *weekly operating notice* (WON) verbatim; this took one minute and 19 seconds. Line A was included at the end of this list, to be blocked between signals WM494 and WM490. Signaller A confirmed that the limits were correct as written on his paperwork, although he did not read the limits back to the PICOP. The PICOP sought confirmation that the signaller was in agreement with the published limits, and that signaller A would take the lead for all of the other affected panels at Wembley MLSCC.

25 Signaller A then went through the process of placing *reminder appliances* (and *isolation strips*) on panel B, but he omitted Line A from this process.

26 At 00:55 hrs, signaller A set a route for train 1B46 onto Line A, from signal WM110 (at Camden Junction) to signal WM494.

27 At 00:58 hrs, having confirmed with his colleagues that other affected lines were clear, signaller A contacted the PICOP to give him permission to place the protection for the possession. The PICOP again confirmed that this covered the 'agreed and published limits'.

28 At 01:01 hrs, signaller A set the route for 1B46 from WM494 to WM490. Since this route cannot be set from panel A, he did this using controls on panel B.

29 Around 01:02 hrs, the PICOP contacted PS1 and PS2 to give them permission to place protection at their respective blocking points. For PS1, this was just south of signal WM494; for PS2 the associated blocking point was north of signal WM490, around the location of the points for the crossover from Line B.

Events during the incidents

30 Just before 01:03 hrs, the train passed signal WM494 and, immediately afterwards, approached PS1, who had been in the process of placing a *possession limit board* on the track. PS1 heard and then saw the train approaching, and so took the possession limit board and walked off the track to a position of safety to the left of the track (in the direction of travel). The train driver saw PS1 walking off the track, sounded the train's horn and then started braking. PS1 reached the position of safety just before the train passed (figure 4). The train stopped about 25 seconds later, having travelled about 264 metres past the signal (ie all except the last carriage of the train had passed the point where PS1 had been standing). The train driver and PS1 did not have any further interaction.

Figure 4: Image of the first near miss from the train's forward-facing CCTV (left, courtesy Virgin Trains) and comparable daytime view (right) highlighting the approximate position of PS1

31 At 01:04 hrs, the train driver contacted signaller A to report the near miss. The signaller asked the driver for the relevant details, and said he would report it to his shift manager. At the end of the conversation, which lasted for about two minutes, signaller A gave the driver permission to continue his journey into Euston. The train moved off at 01:06 hrs.

32 Just after the conversation with the driver, the PICOP, who had been called by PS1, called signaller A to report the near miss. The signaller paused for about two minutes while he discussed the situation with his shift manager, before responding to the PICOP that he now realised what had happened, stating that he had not noticed that Line A was part of the possession. The PICOP expressed concern for PS2 at signal WM490, but the signaller said that the train had already passed that signal and was on its way into Euston.

33 Meanwhile, at 01:07 hrs, the train passed signal WM492 and then stopped, a few metres before reaching PS2 (figure 5). The train had been moving for half a minute and had reached a speed of about 24 mph (39 km/h) when the driver saw someone on the line ahead, sounded the horn twice very briefly, and began braking. PS2 had been walking towards London (ie with his back to the train) from the access point, in the direction of his blocking point at signal WM490. PS2 had intended to place his protection between signals WM492 and WM490, but when he heard the train approaching and realised it was on Line A, he stepped off the track, about 40 metres past signal WM492. However, due to limited clearance at this point (PS2 was on a bridge), he was not in a position of safety. The driver spoke to PS2 through the cab window, and allowed PS2 to move past the train into a position of safety before moving off again. The driver did not report this second near miss to the signaller.

Figure 5: Image of the second near miss from the train's forward-facing CCTV (left, courtesy Virgin Trains) and comparable daytime view (right) highlighting the approximate position of PS2

Events following the incidents

34 After a minute and a half at a standstill, train 1B46 moved off again at 01:08 hrs and arrived at platform 6 at London Euston at 01:12 hrs.

35 At 01:27 hrs, signaller A was relieved of duty. Signaller B resumed working on panel B, and the extension to the possession was granted at 01:32 hrs.

Key facts and analysis

Background information

36 The Rule Book[1] sets out the processes for a signaller taking possession of a running line for engineering work. This includes:

a. agreeing with the PICOP the line to be taken under possession and the signals that will protect the possession;

b. placing those signals to danger when the line is clear of trains;

c. confirming with other signallers (where applicable) that protecting signals are kept at danger; and

d. recording the details in the *train register*.

When these procedures are complete, the signaller must tell the PICOP who will then complete the first part of the possession arrangements form. After that, the signaller must tell the PICOP that the possession protection can be placed.

37 The engineering work taking place on the night of the incidents involved a possession of several lines in the area bounded by Euston, Wembley (on the main lines) and Watford Junction (on the local or 'DC' lines). The early part of the possession, beginning at 23:00 hrs, mainly affected the slow lines from Camden Junction to Wembley Central, and concerned panels B, C and D at Wembley MLSCC. The possession was due to be extended at 01:00 hrs to include several other lines and affecting all panels at Wembley (figure 6).

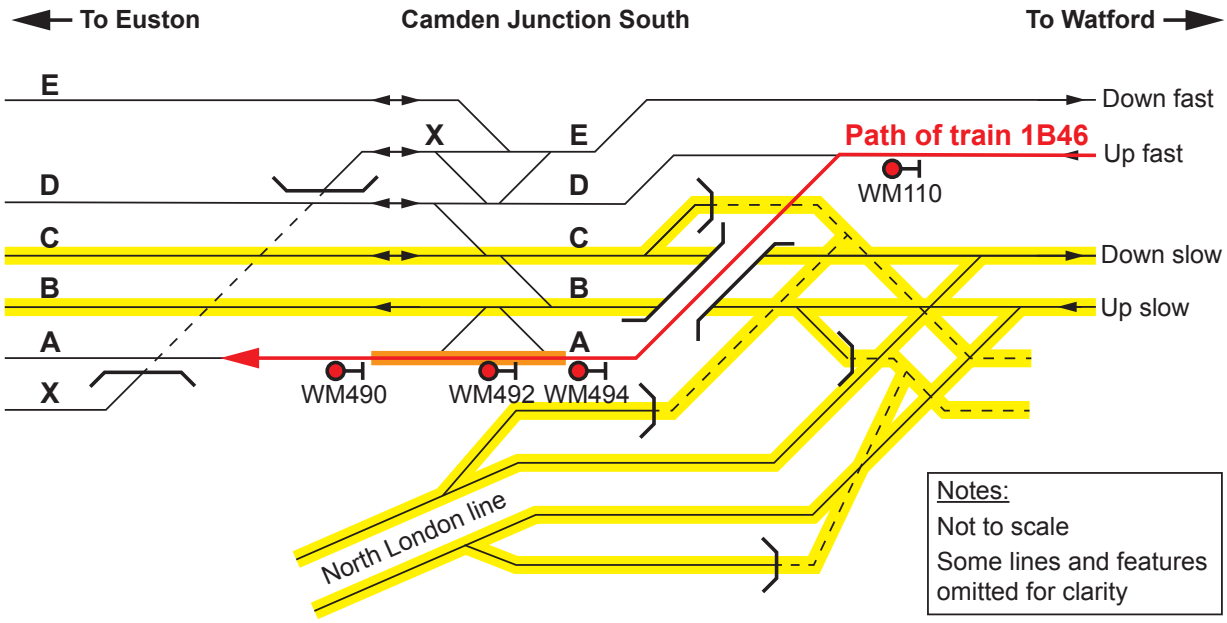


Figure 6: Schematic diagram of the track layout showing lines affected by the possession from 01:00 hrs, including the portion of Line A (shaded orange), and the route taken by train 1B46

[1] GE/RT8000/T3, 'Possession of a running line for engineering work' Issue 7, September 2016 (sections 2.1 and 2.3).

38 The part of the possession relevant to this investigation involved a block of Line A between signals WM494 and WM490 (shaded orange on figure 6). The specific blocking points were planned to be beyond signal WM494 and on the approach to signal WM490 (in the direction of travel of the train), meaning that these signals should be held at *danger* to protect the possession.

39 Line A provides a route into London Euston which long distance trains typically use; train 1B46 is timetabled to use this route under normal circumstances, although the choice of route is always at the signaller's discretion. The common alternative is to route these trains via Line D, which was available on this occasion.

Identification of the immediate cause

40 **The signaller authorised track workers to go onto a line over which he had just routed a train.**

41 Signaller A overlooked the fact that Line A was part of the possession when setting up the reminder appliances and isolation strips (paragraph 25). Consequently, he did not realise that the track workers would be working on that line when he signalled the train and gave the PICOP permission to place protection for the possession.

Identification of causal factors

42 The incidents occurred due to a combination of the following causal factors:

a. the possession implementation processes resulted in a loss of information (paragraph 43); and

b. the signaller was possibly affected by fatigue (paragraph 61).

Each of these factors is now considered in turn.

Possession implementation processes

43 **The possession implementation processes resulted in a loss of information.**

44 Signallers use written and verbal sources of information when setting up a possession, but in this case the processes used by signaller A led to him overlooking the inclusion of Line A in the possession.

45 This causal factor arose due to a combination of the following:

a. the layout and formatting of information on the WON possibly caused the signaller to overlook the fact that Line A was part of the possession (paragraph 46); and

b. local processes at Wembley MLSCC did not prompt the signaller that Line A was part of the possession (paragraph 53).

Information presentation on the WON

46 The layout and formatting of information on the WON possibly caused the signaller to overlook the fact that Line A was part of the possession.

47 For a possession, the WON lists all of the affected railway lines and their associated blocking points in a plain text format. In general, each railway line and its blocking points will usually be presented as a separate line of text.

48 In this case, the complexity of the possession meant that several railway lines shared blocking points, and so they could not be represented as individual lines of text. Instead, all of the down lines were grouped followed by their blocking points, then all of the up lines were presented followed by their blocking points. Line A, being the only line with distinct blocking points, was presented separately at the bottom of the block of text (figure 7).

ITEM 28 CONTINUED

PROTECTION LIMITS
2300 MON TO 0100 TUE
Down Slow, Down North London / Primrose Hill: Beyond WM2100 pts#, WM801# to Approach WM2531A pts#
Up Slow, Kilburn Up & Down Goods Loop, Up Primrose Hill / North London: Beyond WM2531B pts# to Approach WM2101 pts#, NL1202#
ADDITIONAL PROTECTION:
Down North London DC Electric: Approach WM2103 pts
Up North London DC Electric: Beyond WM800#

0100 TUE TO 0500 TUE
Euston Platforms 8-11, Line C, Down Slow, Down DC Electric, Down North London / Primrose Hill, Down North London DC Electric, Down New Line, Willesden Jn Low Level Bay Platform 2, Watford Jn Platforms 1-4: Bufferstops Euston Platforms 8-11, Beyond WM801#, WS23# to Bufferstops Willesden Low Level Bay Platform 2, Bufferstops Watford Jn Platforms 1-4, Approach WM2531A pts#,
Watford Jn Platforms 1-4, Up Slow, Up DC Electric, Willesden Jn Low Level Bay Platform 2, Up New Line, Kilburn Up & Down Goods Loop, Up Primrose Hill / North London, Up North London DC Electric, Line B, Euston Platforms 8-11: Bufferstops Watford Jn Platforms 1-4, Bufferstops Willesden Bay Platform 2, Beyond WM2531B pts# to Bufferstops Euston Platforms 8-11, Approach NL1202#, NL1044#
Line A: Beyond WM494# to Approach WM490#

Figure 7: Reproduction of the section of the WON listing the railway lines and blocking points for the possession starting at 23:00 hrs on 27 February 2017, and extended to include Line A at 01:00 (Line A highlighted in this figure for clarity)

49 Signaller A stated that he overlooked Line A because it was appended to the bottom of the list, implying that it was therefore easy to miss; there is conflicting evidence from other witnesses about whether this layout could cause such confusion. Nevertheless, the RAIB concluded that the formatting was not conducive to optimal readability or understanding[2], particularly given that signallers mentally translate the verbal information into a spatial representation on their panel[3].

50 Network Rail told the RAIB that many possession plans (including this one) are routine and follow a standardised template. The layout and formatting would therefore be familiar to signallers. However, there is no standard layout for these WON items across Network Rail, and there are local variations across different routes.

[2] Guidance on designing text states that lists should be spaced out and separated rather than in continuous prose (Hartley, J. 2004. Designing instructional and informational text. In D. H. Jonassen (Ed.), Handbook of Research on Educational Communications and Technology (pp. 917-947). Mahwah, NJ: Erlbaum).

[3] Research suggests that information is processed more effectively when the nature of such information (ie, verbal or spatial) is consistent across processing stages than when it is inconsistent (eg Wickens, C. D. 2002. Multiple resources and performance prediction. Theoretical Issues in Ergonomics Science, 3(2), 159-177).

51 The WON is prepared by planning specialists at Network Rail using proprietary software systems. These systems do not offer any flexibility for text formatting, other than line breaks, and they impose limits on the number of characters that can be used. The planning specialists refer to a line diagram (similar to that presented in figure 6) when entering the text.

52 The WON is published on a Thursday in advance of the Saturday on which it takes effect. Signallers are expected to familiarise themselves with the content applicable to their area of control, but there is no specific time allocated for this – they take time to read the WON at the start of their shift.

Local processes at Wembley MLSCC

53 **Local processes at Wembley MLSCC did not prompt the signaller that Line A was part of the possession.**

54 The process at Wembley MLSCC involves one signaller dealing with the PICOP on behalf of the whole signal box. That signaller takes the lead on verbal communications with the PICOP, and also writes the possession limits and blocking points (for all panels) in a document that is known locally as the T3 book. This process is reflected in other comparable signal boxes, although the specifics differ depending on location (eg the PICOP might initially contact all affected signallers, then subsequently deal with a nominated lead signaller).

55 The T3 book is a locally produced document, specific to Wembley MLSCC (although other signal boxes use similar documents for their own purposes). It fulfils the Rule Book requirement to record the details in the train register (paragraph 36), using a more convenient format to suit possessions. The lead signaller fills in the T3 book, and signallers on other affected panels sign the book to confirm that they have noted its contents. However, witness evidence suggests that signallers at Wembley largely rely on the WON when actually setting up the possession.

56 On this occasion, signaller B completed most of the details in the T3 book after the initial conversation with the PICOP at around 22:15 hrs (paragraph 22). This included the details for the 01:00 extension to the possession (figure 8). Signaller A did not sign the T3 book at this point because the early part of the possession did not affect panel A.

57 Although the Rule Book[4] describes a handover process for signallers going off and taking duty, there is no formal handover process at Wembley for relieving signallers. Therefore, when signaller A offered to cover signaller B for her meal break after midnight, there was little opportunity to check a mutual understanding of the blocking points for the possession. Since the process did not otherwise require signaller A to review the blocking points, it is therefore likely that the first time he did so was when he took the call from the PICOP at 00:19 hrs (paragraph 24).

58 The purpose of the conversation at 00:19 hrs was to ensure all the necessary preparations were in place in order to take the possession on time at 01:00 hrs, and so that the subsequent phone call (at 00:58 hrs, paragraph 27) to start the possession could be more efficient. As such, the PICOP read all of the possession limits and blocking points during the earlier conversation, taking one minute and 19 seconds to do so.

[4] GE/RT8000/TS1, 'General signalling regulations' Issue 11, September 2016 (section 1.3).

POSSESSION TAKEN

Possession of the lines shown on previous page has been taken by [redacted] ..... name of PICOP

TES 2000 .....(employer) at 2320 (hours) 27 / 2 / 17 (date)

RUGBY .....r place from where PICOP is speaking

[redacted] ..... Signature of signaller

PART D – ALTERATIONS TO POSSESSION LIMITS SHOWN IN PART C

Where possession of additional lines is taken these should **NOT** be entered below, but as a separate entry.

The possession limits have been altered and now reads as follows: EUS PLT 8 TO 11 LINE C, DOWN NLL DC ELEC DN PRIMROSE HILL DOWN SLOW, DOWN DC ELEC, DN NLL, DOWN NEW, WILLESDEN BAY WFD 1-4 lines(s)

from BS EUS 8-11, WM801#, WS23#

to BS WILLESDEN BAY, BS WFD 1 TO 4, WM 2S31A PTS

at 0132 (hours) 28 / 02 / 2017 (date)

*Where the possession has been shortened the portion of line now CLEAR and SAFE TO RUN ON is:

..... line(s) from.....

to .....

(*Delete as necessary)

The possession limits have been altered and now reads as follows: WFD 1-4, UP SLOW, UP DC ELEC UP NLDC ELEC EUS 8-11 WILLESDEN BAY, UP NEW, KILBURN UP+DN LOOP, UP PRM/NORTH LON LINE A LINE B lines(s)

from BS WFD 1 TO 4, BS WILLESDEN BAY WM 2S31B PTS# WM 494#

to BS 8-11, NL1202#, NL1044#, WM490#

at 0132 (hours) 28 / 02 / 2017 (date)

*Where the possession has been shortened the portion of line now CLEAR and SAFE TO RUN ON is:

..... line(s) from.....

to .....

(*Delete as necessary)

Figure 8: Extract from the T3 book at Wembley MLSCC for the night of 27-28 February 2017

59 The Rule Book[5] contains a general requirement that all verbal communications must be repeated back to the other person so that they know the information has been correctly understood. Signaller A did not repeat back the list of blocking points, probably because this would have significantly extended the length of the phone call and because he and the PICOP were both reading from the WON anyway. Evidence suggests that this is not uncommon either for this signaller or other signallers. Whilst there is a chance that a repeat back might have detected the omission of Line A, the RAIB considers that it is also possible that, in this context, signaller A would have read the limits automatically (ie with little conscious attention) and the omission could still have occurred.

60 The possession limits were not repeated by either signaller A or the PICOP in the conversation at 00:58 hrs, for the reasons explained at paragraph 58. While acknowledging the need for efficiency in beginning the possession on time, the RAIB considers that, in general, there are advantages in communicating the information closer to the time that it is actually needed.

Fatigue

61 **The signaller was possibly affected by fatigue.**

62 Signaller A had worked a series of nine consecutive eight-hour shifts (with the exception of one seven-hour shift) from 15 February to 23 February 2017 (inclusive). These shifts varied in start time from 14:00 hrs (on 16, 17 and 18 February) to 06:00 hrs (on 20 and 23 February).

63 On 24 and 25 February 2017, signaller A had two scheduled days off work, attending a signallers' conference in Hull on 25 February. He stayed in a hotel in Hull on the night of 25/26 February. Signaller A had therefore been accustomed to a normal pattern of nightly sleep during this period.

64 On 26 February 2017, signaller A returned from Hull in time to start his 12-hour night shift at 18:00 hrs. He had no other sleep after waking up on Sunday morning, and so had been awake for about 24 hours by the end of this shift at 06:00 hrs on 27 February.

65 On 27 February 2017, the signaller said he obtained about five and a half hours' sleep, which was reasonable for him when working night shifts. Therefore, this was the only sleep he had in the 43 hours between 06:00 hrs on 26 February and the time of the incident at around 01:00 hrs on 28 February. Research on fatigue[6] suggests a minimum requirement of six hours' sleep in each 24-hour period.

66 Fatigue can adversely affect performance in several ways, including awareness, memory and communications[7]. Signaller A's omission of Line A is therefore consistent with a fatigue-related performance impairment.

67 Signallers at Wembley MLSCC receive annual briefings on managing their own fatigue, which focuses primarily on working time limits but also touches on appropriate sleep requirements.

---

[5] GE/RT8000/G1, 'General safety responsibilities and personal track safety for non-track workers' Issue 6, September 2015 (section 5.1).

[6] Dawson, D. and McCulloch, K. (2005). Managing fatigue: It's about sleep. Sleep Medicine Reviews, 9, 365-380.

[7] ORR (2012). Managing rail staff fatigue. London: Office of Rail Regulation.

Workload

68 The RAIB has considered the potential influence of workload on signaller A's performance, and concluded that this was not a factor. Although workload on panel A can be quite demanding during the day, the evidence suggests that this is not the case at night. The RAIB analysed activity on the panel for the night of the incidents and found no evidence that it was unmanageable.

Identification of underlying factors

Processes for managing information associated with possessions

69 **The processes and methods for managing and communicating information associated with possessions are not optimised for modern, multi-panel signalling centres.**

70 The Rule Book[8] states that the signaller and the PICOP must agree the signals leading to the possession that will be kept at danger. On this occasion, signaller A and the PICOP read and cross-checked the blocking points from the WON, which included point numbers as well as signals. The RAIB understands that this is common practice in other comparable signalling centres. Whilst this fundamentally achieves the same objective, it implies an incompatibility between the Rule Book wording and the information used by staff implementing the possession.

71 The Rule Book further requires that details of the possession arrangements are recorded in the train register, in order to ensure that there is a written reference particularly for shift handovers. In modern, multi-panel signalling centres, T3 books or forms are provided for this purpose (paragraph 55), which are designed to accommodate the relevant possession details in a convenient format for signallers. However, evidence suggests that signallers refer to both the WON and T3 book when implementing possessions, with some at Wembley leaving the WON on top of the T3 book on their desk. This suggests some redundancy in the T3 book as a source of information concerning the possession, although it still serves a purpose for other signallers (whether on different panels or subsequent shifts) to cross-check the information. The RAIB also recognises that there is likely to be some value in signallers writing out the possession limits in terms of their processing of the information. However, in a multi-panel signalling centre, only one signaller is likely to do this.

72 Local variations in the processes and the paperwork (paragraphs 54 and 55) may reflect particular local circumstances, but may also point to a need for better systems to meet these requirements. The RAIB concludes that such systems should be designed around the need for a shared understanding amongst the parties involved, rather than to meet rules that were originally intended for individual signallers located remotely from one another in different signal boxes.

[8] GE/RT8000-T3, 'Possession of a running line for engineering work' Issue 7, September 2016 (section 2.1).

Processes for implementing possessions

73 **The processes for setting up possessions still require people to place protection on the track, exposing those people to risk in the transition period before the possession is taken.**

74 A previous RAIB investigation into a track worker fatality east of Reading (RAIB report 21/2008) identified that the requirement for possession support staff to access the track to place and remove protection carries an inherent risk. Staff accessing the railway expose themselves to potential hazards not just from train movements, but also electrification, hazardous materials, and slips, trips and falls. Moreover, the added value of placing possession limit boards and *detonators* is arguably small in the context of the risks faced by possession support staff and the primary protection of the signalling system. The previous RAIB report recommended that Network Rail critically review its possession management process to reduce the need for staff to be on track. The recommendation was reported to be implemented as of 1 April 2011, as Network Rail had carried out a critical review. However, options for reducing the need for possession support staff to access the track were not taken forward because of difficulties in implementing the associated Rule Book changes as well as industrial relations concerns.

75 During the current investigation, Network Rail told the RAIB that it is currently pursuing a Track Worker Safe Access Strategy, focused on medium- and long-term improvements to the reliability of protection systems. For instance, one trial is set to evaluate possession protection without possession limit boards or detonators where there are no trains or other vehicles in or around the possession. Elsewhere, technology is in use on some parts of the infrastructure which enables remote operation of track circuits (via a smart phone app), thereby providing protection for track work while reducing the time required for workers to be on track in order to place the protection. In the longer term, other technological solutions are envisaged which will further reduce the dependence on physical protection being placed by possession support staff by enabling them to interact directly with the signalling and/or train control system. However, there are no timescales for the widespread implementation of such solutions at present.

Factors affecting the severity of consequences

Responses of the train driver and track workers

76 **An accident was avoided due to the observation and reactions of the train driver and track workers.**

77 Trains are not driven by line-of-sight, therefore there is no requirement or expectation that a train will be able to stop short of a hazard. Also, once track workers have been told that a line is blocked to traffic in accordance with protection procedures, they are not required to look out for trains on that line.

78 In the vicinity of signal WM494, where PS1 was placing his protection, Line A is segregated from other lines (making it easier to distinguish) but a curve in the track restricts the available sighting (figure 9).

Figure 9: View of Line A towards approaching traffic from the approximate position of PS1

79 The RAIB's analysis found that PS1 became visible to the driver approximately five seconds before the train passed. The driver sounded his horn within one to two seconds of seeing PS1, and applied the brakes a further two seconds later. Research published by the Transport Research Laboratory[9] shows that most car drivers respond within about two seconds of becoming aware of an unexpected event. The train driver's initial reaction time to sounding the horn is therefore normal in these circumstances.

80 PS1 stated that he usually tries to place protection while facing oncoming traffic. Under the circumstances, this practice may have aided his perception of the train's approach, as he heard and then saw the train approaching (paragraph 30).

81 Compared with signal WM494, the area around signal WM492 affords better sighting as the track is straight at this point, although the layout presents the potential for confusion as all the lines now run parallel with each other (figure 10). Furthermore, PS2 was necessarily facing away from the oncoming train as his walking route from the access point to the blocking point took him in that direction. Nevertheless, PS2 heard the train coming and stepped off the track as far as he could; meanwhile the train had not gathered much speed following the near miss at signal WM494 and the driver was able to stop just before reaching PS2.

[9] https://trl.co.uk/reports/PPR313.

Figure 10: View of Line A towards approaching traffic from the approximate position of PS2 (note that this photograph was taken from a position of safety and therefore does not reflect the exact view of PS2)

Response of the signaller

82 **The signaller allowed the train to continue after the first near miss, and did not realise that another track worker was also on the train's route until after the second near miss occurred.**

83 The train driver's report of the first near miss did not prompt signaller A to realise that Line A was supposed to be part of the possession. At that time, the signaller believed that the track worker had gone onto the track without authorisation.

84 The signaller realised what had happened when the PICOP reported the near miss, but he still did not fully appreciate that another track worker (ie PS2) was in danger from the train's movement. By the time he fully understood the situation, the second near miss had already occurred and the train was on its way into Euston station.

Observations

Network Rail's management of signaller fatigue

85 **Network Rail's management of fatigue risk for signallers does not reflect current good practice.**

86 Network Rail's company standard on fatigue management[10] sets out working time limits and rostering rules for all its employees undertaking safety-critical work. However, signallers' rosters are designed according to historic working time limits, and in accordance with trade union agreements, which pre-date the Network Rail standard. Consequently, these rosters do not necessarily reflect current good practice as endorsed by the Office of Rail and Road (ORR) (see footnote 7).

[10] NR/L2/ERG/003, 'Management of fatigue: Control of working hours for staff undertaking safety critical work' Issue 5, 3 September 2011.

87 Because signaller A is a relief signaller, some of the working time rules (particularly regarding shift rotation) are not applicable when his roster is prepared. The RAIB reviewed a sample of signaller A's shifts leading up to the incident. Of these, 22% were night shifts, while 28% exhibited backward rotation (ie start time earlier than that for the preceding shift) and/or significant variation in shift start times. Although not causal to the incident on 28 February 2017, these are both risk factors for fatigue according to the ORR's guidance. Had the incident not happened, signaller A would have been rostered for a total of seven consecutive nights – the 12-hour shift on the night of 26/27 February, five further eight-hour shifts, and another 12-hour night shift. The 12-hour night shift and the seven consecutive nights exceed the good practice limits set out by both the ORR and RSSB[11] in their respective guidance documents on fatigue.

88 Network Rail calculated the *fatigue index* score for signaller A's shift on the night of the incidents to be 30.3, and characterised this as 'low' in its own investigation of the incidents. However, the RAIB has called into question the use of the fatigue index in its previous investigations (eg uncontrolled freight train run-back between Shap and Tebay, RAIB report 15/2011, and two signal passed at danger incidents at Reading Westbury Line Junction and Ruscombe Junction, RAIB report 18/2016). A score of 30.3 effectively means that the signaller was subject to a 30% risk of feeling very sleepy on this shift; moreover, the fatigue index is only based on shift timings and does not account for sleep duration or quality. For comparison, the RAIB used an alternative fatigue model[12], which does take into account sleep, to analyse signaller A's risk of fatigue; this analysis returned a 60.3% probability of fatigue.

89 The briefings given to signallers at Wembley MLSCC about fatigue contained relatively little guidance on managing their own lifestyle (paragraph 67). Network Rail provides more detailed information on its Safety Central website, which signallers can access on demand. Network Rail told the RAIB that these videos were developed to support the briefing and launch of its forthcoming revised standard for fatigue risk management.

90 Network Rail's revised standard for fatigue risk management makes some improvements to the working time limits and rostering rules, but publication of this standard has been delayed. The RAIB understands that this delay is due to negotiations with the trade unions and difficulties in implementing it in light of signallers' current working practices. Network Rail has stated that implementation timescales are being finalised.

[11] https://www.rssb.co.uk/rgs/standards/RS504%20Iss%201.pdf.

[12] http://facts.circadian.com/.

Previous occurrences of a similar character

91 On 20 November 2016, a similar incident occurred near Northampton involving signallers at Rugby Signalling Control Centre (SCC). On that occasion, the signaller on the Rugby workstation took the lead in dealing with the PICOP and, at 00:03 hrs, called out to signallers on the affected Nuneaton and Northampton workstations to check that the lines were clear before granting permission to place the possession protection. The signaller on the Nuneaton workstation confirmed that the line was clear but there was no response from the Northampton signaller. On granting permission, the Rugby signaller then called out the time of the line blockage, at which point the Northampton signaller noticed and alerted the Rugby signaller to an approaching train. At 00:06 hrs, the Rugby signaller telephoned the PICOP, who confirmed that his possession support staff were in a position of safety.

92 Following the incident, the *Local Operations Manager* issued an operations alert for Rugby SCC which stated that signallers should only give permission for possession protection relevant for their own panel, and that PICOPs must speak to each panel signaller individually to gain the relevant authority. Network Rail's local investigation report into this incident considered 'the lack of a robust T3 process at multi-workstation locations' to be a contributory factor, although it did not specify any actions or recommendations arising from this.

93 A near miss with possession support staff occurred in the early hours of 22 April 2016, when an engineering train was wrongly signalled into a possession at Clapham Junction, south-west London. The driver saw the possession protection and applied emergency braking, but could not stop before striking the possession limit boards and detonators. The possession support staff, who were preparing to remove the boards and detonators, were alerted to the presence of the train by an automated customer announcement at Clapham Junction station.

94 The route was set for the engineering train because the controlling signaller had inadvertently removed a reminder appliance from the protecting signal. This was because he had taken over from another signaller who had set up an earlier part of the possession, and these two signallers adopted different practices for the placement of reminder appliances (although both practices were compliant with rules and procedures).

95 The RAIB recently conducted a class investigation into accidents and near misses involving trains and track workers outside possessions (RAIB report 07/2017), which reviewed several incidents involving similar actions by the signaller (albeit in different circumstances). One of the incidents included in that report occurred on 4 November 2015 at Chathill, Northumberland, when a signaller set a route for an engineering train through a line blockage. The signaller had placed reminders on his panel for multiple line blockages in the area, and he needed to remove these for one line blockage in order for the engineering train to pass. However, he removed all the reminders, not just those for the affected line blockage. Consequently, he set the route for the engineering train to travel all the way through his control area, including the line blockage that was still in place.

96 The signaller at Chathill was working his second of three 12-hour night shifts, having obtained about four hours' sleep on the previous morning following his first night shift.

97 On 19 February 2015, a line blockage irregularity occurred near Morecambe South Junction, Lancaster. On that occasion, the signaller set a route for a passenger train and then immediately afterwards telephoned a *Controller of Site Safety* (COSS) to grant a line blockage in the same area, not having checked that all trains were clear or verifying the location of the work group. The signaller was providing meal relief for another signaller at the time.

98 Of the other incidents in 2015 that were included in the RAIB's class investigation, 18% were primarily due to the signaller's actions, such as signalling a train into a line blockage, granting a line blockage while a train was in the area, or not reaching a clear understanding with track workers.

99 The RAIB is also currently monitoring incidents involving individual actions that have led to a serious incident; two examples are relevant to the current investigation:

a. On 3 November 2014, a signaller granted a line blockage at East Langton, Leicestershire, while a train was in the same track section. The signaller had misread a signal number on the workstation.

b. On 15 April 2015, a signaller authorised track work to take place at Cambridge without having placed reminders on all the relevant signals. Consequently, a train was signalled towards the area of the work. The Network Rail investigation identified issues with communications, workload, and local culture in the signal box.

Summary of conclusions

Immediate cause

100 The signaller authorised track workers to go onto a line over which he had just signalled a train (paragraph 40).

Causal factors

101 The causal factors were:

a. The possession implementation processes resulted in a loss of information (paragraph 43, **Recommendation 1**). This causal factor arose due to a combination of the following:

   i. The layout and formatting of information on the WON possibly caused the signaller to overlook the fact that Line A was part of the possession (paragraph 46, **Recommendation 2**).

   ii. Local processes at Wembley MLSCC did not prompt the signaller that Line A was part of the possession (paragraph 53, **Recommendation 1**).

b. The signaller was possibly affected by fatigue (paragraph 61, Learning point 1).

Underlying factors

102 The underlying factors were:

a. The processes and methods for managing and communicating information associated with possessions are not optimised for modern, multi-panel signalling centres (paragraph 69, **Recommendation 1**).

b. The processes for setting up possessions still require people to place protection on the track, exposing those people to risk in the transition period before the possession is taken (paragraph 73, **Recommendation 3**).

Factors affecting the severity of consequences

103 Factors that affected the consequences of the event were as follows:

a. An accident was avoided due to the observation and reactions of the train driver and track workers (paragraph 76, Learning point 2).

b. The signaller allowed the train to continue after the first near miss, and did not realise that another track worker was also on the train's route until after the second near miss occurred (paragraph 82, see paragraph 125).

Additional observations

104 Although not linked to the incidents on 28 February 2017, the RAIB observes that:

a. Network Rail's management of fatigue risk for signallers does not reflect current good practice (paragraph 85, see paragraphs 110 to 121 and Learning point 1).

Previous recommendation(s) that had the potential to address one or more factors identified in this report

Fatal accident east of Reading station, 29 November 2007, RAIB report 21/2008, Recommendation 3

105 **The RAIB considers that more effective implementation of recommendation 3 in RAIB report 21/2008 could have addressed the underlying factor in this incident associated with exposing track workers to risk when setting up possessions.**

106 This recommendation read as follows:

Recommendation 3

Network Rail should look critically at the possession management process to reduce the need for staff to be on the track for the purpose of taking or giving back a possession.

107 Network Rail reported that work had been undertaken to review the use of traditional means of protection for a possession, and alternative means had been trialled. However, for reasons explained earlier in this report (paragraph 74), this work was not progressed.

108 The ORR noted that it was unfortunate that the work was not progressed but, since Network Rail had critically reviewed the process, it considered the recommendation to be implemented as of 1 April 2011.

109 The RAIB considers that this recommendation is still relevant in light of the current investigation.

Previous RAIB recommendations relevant to this investigation

110 The following recommendations, which were made by the RAIB as a result of its previous investigations, have relevance to this investigation.

Derailment at East Somerset Junction, 10 November 2008, RAIB report 28/2009

111 Recommendation 3 of RAIB report 28/2009 read as follows:

Recommendation 3

Network Rail should develop criteria to determine the circumstances under which proposed or amended rosters to be worked by signallers and other safety-critical staff should be evaluated using the Fatigue and Risk Index or other suitable assessment tools (with the aim of ensuring that defined thresholds are not exceeded) and provide guidance to the routes on this subject.

112 Network Rail reported that a process for risk assessing rosters had been developed, along with new training for frontline operations managers, which included use of the fatigue and risk index (FRI). Integration of the FRI into rostering remained as a longer term strategic goal.

113 The ORR reported that this recommendation had been implemented as of 22 February 2013.

114 Network Rail told the RAIB that although it uses the FRI to calculate post-incident fatigue index scores, it does not routinely design rosters based on the FRI scores. The RAIB has previously expressed concern about use of the FRI in planning shiftwork (paragraph 88), and it is aware of recent research by RSSB[13] assessing alternative models for calculating fatigue.

115 Recommendation 4 read as follows:

Recommendation 4

Network Rail should amend its company standard NR/SP/ERG/003 to include an extended set of limits on working time for safety-critical staff, considering the scope and range of parameters applied to air traffic controllers, the guidance contained in the ROGS regulations, use of both the fatigue and risk elements of the Fatigue and Risk Index and advice from their human factors department.

116 Network Rail undertook to review the standard and a revised version was published on 4 June 2011. This standard does not, in RAIB's view, meet current industry good practice for a comprehensive fatigue risk management system that has since been detailed by both ORR and RSSB (see footnotes 7 and 11), as it focuses heavily on outdated working time limits.

117 The ORR considered that this recommendation was implemented as of 22 February 2013.

118 The RAIB has noted that a further revision to the standard is in progress, which places more restrictive limits on working time. However, its publication is currently being delayed (paragraph 90).

[13] https://www.rssb.co.uk/pages/research-catalogue/pb025463.aspx.

119 Recommendation 5 read as follows:

Recommendation 5

The ORR should agree with Network Rail appropriate timescales for the implementation of Recommendation 4 and devise a programme of intervention to ensure that Network Rail develops and implements adequate measures, as described in Recommendation 4, to address the risk arising from fatigue within those timescales. If the ORR is not satisfied that Network Rail's proposals to change standard NR/SP/ERG/003 address the risk, or consider that insufficient progress is being made, the ORR should consider devising and implementing its own set of working time limits to be applied to Network Rail's safety-critical staff.

120 The ORR responded that it continues to work with industry and supports a goal setting approach to regulation, requiring fatigue risk management arrangements to be in place while not necessarily prescribing working time limits. It considered the recommendation to be implemented as of 4 November 2010.

121 The ORR published its own guidance on managing fatigue risk in 2012 (see footnote 7), in line with the approach it put forward in its response to the recommendation.

Recommendations that are currently being implemented

Overspeed incident at Queen's Park, London, 5 January 2016, RAIB report 19/2016, Recommendation 2

122 The above recommendation (in RAIB report 19/2016) has relevance to one of the factors identified in this investigation, concerning the layout and format of safety-critical information. Although addressed to the train operator in this case, shown below is a recap of its wording and an account of its current status.

Recommendation 2

London Midland should review and improve the communication of safety critical information transmitted to its drivers using traditional methods (eg late notice cases) and any transmitted electronically. The review should include:

- *…*
- *considering the use of differing fonts, differing font sizes and colours;*
- *considering use of maps or plans; and*
- *considering the introduction of a requirement for staff to acknowledge the receipt and understanding of such communications.*

This recommendation may also apply to other train operators.

123 The RAIB is currently awaiting a response to this recommendation.

124 Whilst this recommendation was not addressed to Network Rail, the RAIB considers it to be relevant to the current investigation in that it directly concerns a factor associated with information loss through layout and formatting of written communications.

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

125 Network Rail suspended the signaller's authority to work on 10 March 2017; he was subsequently rebriefed about ensuring that reminder appliances were in place when taking possessions. The signaller returned to work under mentorship on 30 March 2017, which included monitoring of his communications. Following a reassessment, he was back on full duty on 2 April 2017.

126 Virgin Trains commended the driver for his actions but also rebriefed him on safety-critical communications protocols, particularly the importance of stopping and reporting incidents with track workers. This took place on 2 March 2017.

127 Network Rail carried out a formal investigation into the incidents, which set out a number of actions:

a. coaching for the signaller on safety-critical communications;

b. a review of how signallers receive and digest information in the WON;

c. the production of guidance on dealing with large volumes of information to be exchanged;

d. a review of the possession process at Wembley MLSCC; and

e. Wembley MLSCC to issue guidance for signallers covering meal relief in relation to high risk activities.

Recommendations and learning points

Recommendations

128 The following recommendations are made[14]:

1 *The intent of this recommendation is to minimise the possibility of information loss through the possession implementation process in large signal boxes and control centres.*

Network Rail should review and, where appropriate, improve the possession implementation process in signal boxes and control centres with multiple workstations. The objective of any improvement should be to optimise the management of information (both written and verbal) between signallers and PICOPs (paragraphs 101a, 101a.ii and 102a). The review should consider:

- the appropriate design and use of additional books and forms that are intended to meet the Rule Book requirements for recording details of possessions and to support signallers' information needs (specifically considering the use of track layout diagrams);
- the content, timing and structure of verbal communications between the PICOP and signallers at different workstations, taking into account the need for all parties to be fully aware of the relevant information at the appropriate time (including, for example, whether a PICOP needs to contact all signallers affected by the possession, and what level of detail should be included in the various conversations between signaller and PICOP);
- the use of tools or technology to support signallers' information management and decision making; and
- local variations in existing application of these processes, in terms of extracting positive elements from such applications as well as smoothing the transition towards a new process for staff groups who have been familiar with an historic convention.

[14] 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 and Road 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.gov.uk/raib.

2 *The intent of this recommendation is to reduce the risk of confusion arising from the layout and format of the Weekly Operating Notice.*

Network Rail should investigate ways to improve the layout and format of the Weekly Operating Notice with a view to optimising readability and compatibility of the information for its users. This work should specifically consider the greater use of diagrams to represent information where appropriate (paragraph 101a.i).

3 *The intent of this recommendation is to reduce the exposure of track workers to risk arising from the need to be on track to place or remove possession limit boards and detonators.*

Network Rail should, as part of its Track Worker Safe Access Strategy, critically review the possession management process and, where appropriate, reduce the need for staff to be on the track for the purpose of taking or giving back a possession (paragraph 102b). This review should include consideration of newly developed technologies such as remotely operated track circuit operating devices, and the scope for enabling track workers to protect themselves by interacting directly with the signalling and/or train control system.

Learning points

129 The RAIB has identified the following learning points[15]:

1 This incident highlights the need for signallers, along with other safety-critical staff, to ensure that they are appropriately prepared and fit for duty. When working shifts, this includes obtaining adequate sleep to mitigate the effects of fatigue throughout the shift and until the next rest period, and reporting when they feel unfit for duty due to fatigue.

2 This incident demonstrates why track workers who are working alone (such as those responsible for placing or removing possession limit boards and detonators) should always be alert to the risks of working on track, even in situations where they believe that they are working under protection. Where possible, walking or working in a direction facing oncoming traffic provides an opportunity to detect approaching trains earlier and take appropriate action.

[15] 'Learning points' are intended to disseminate safety learning that is not covered by a recommendation. They are included in a report when the RAIB wishes to reinforce the importance of compliance with existing safety arrangements (where the RAIB has not identified management issues that justify a recommendation) and the consequences of failing to do so. They also record good practice and actions already taken by industry bodies that may have a wider application.

Appendices

Appendix A - Glossary of abbreviations and acronyms

COSS	Controller of Site Safety
FRI	Fatigue and Risk Index
MLSCC	Main Line Signalling Control Centre
ORR	Office of Rail and Road
PICOP	Person in Charge of Possession
PS	Possession Support
SCC	Signalling Control Centre
WON	Weekly Operating Notice

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.

Access point	A designated point along a railway at which entry to railway property may be made safely.*
Blocking point	The geographic limit of a possession.
Chains	An imperial unit of length equal to 22 yards. There are 80 chains in a mile.
Controller of Site Safety	A person certified as competent and appointed to provide a safe system of work to enable activities to be carried out by a group of persons on Network Rail infrastructure.*
Danger	A signal indication meaning that the driver must stop. Universal term for a red signal.*
Detonator	A small disc-shaped explosive warning device designed to be placed on the rail for protection and emergency purposes.*
Down	In a direction away from London.
Engineer's line reference	A three or four character identification code used to specify a route or section of a route.*
Fatigue index	A mathematical model developed by the Health and Safety Executive which calculates a numerical risk of fatigue for a given roster pattern.
Isolation strips	A cut-out overlay of sections of line used on signalling panels to show which lines are electrically isolated during a possession.
Limited clearance	An area where there is insufficient space to stand safely during the passage of trains on the adjacent line.*
Local Operations Manager	An individual who manages the day to day operation of a given area of Network Rail infrastructure, and who has line management responsibility for operational staff such as signallers.
Person in Charge of Possession	The competent person nominated to manage the safe and correct establishment of the protection for the possession.*
Position of safety	A place far enough from the track to allow a person to safely avoid being struck by passing trains. On Network Rail infrastructure this is 1.25 m where trains approach at speeds of up to and including 100 mph.*
Possession	A formal temporary closure of a line to trains to allow engineering work to take place.*
Possession limit board	A miniature version of the stop sign used on the roads, denoting the end of a possession.*

Possession support	A person whose role is to place and lift protection at the blocking points at the start and end of a possession when requested by the PICOP. Colloquially known as ‘block roadman’ or ‘blockman’.
Protection	The marking of the limits of a portion of line that has been blocked by detonators on the rail and possession limit boards.
Reminder appliances	A device used by a signaller to remind them that a particular control should not be operated.*
Route setting panels	A signal box panel for a specific geographical area.*
Train register	The book in which a signaller records movements of trains, details of possessions and other duties.*
Up	In a direction towards London.
Weekly Operating Notice	A document published by Network Rail providing information about engineering work and other relevant information.*

Appendix C - Investigation details

The RAIB used the following sources of evidence in this investigation:

- information provided by witnesses;
- information taken from the train's on-train data recorder (OTDR);
- forward-facing closed circuit television (CCTV) recordings taken from the train;
- site photographs and observations;
- documentary evidence associated with the possession;
- signalling and train running data;
- records of voice communications;
- weather reports and observations at the site; and
- a review of previous RAIB investigations that had relevance to this accident.

This page is intentionally left blank

This report is published by the Rail Accident Investigation Branch,
Department for Transport.

Any enquiries about this publication should be sent to:

RAIB
The Wharf
Stores Road
Derby UK
DE21 4BA

Telephone: 01332 253300
Fax: 01332 253301
Email: enquiries@raib.gov.uk
Website: www.gov.uk/raib