RAIB

Rail Accident Investigation Branch

Rail Accident Report

Serious operational irregularity at Balham
20 April 2019

Report 01/2020
February 2020

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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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.

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 RAIB has described a factor as being linked to cause and the term is unqualified, this means that RAIB has satisfied itself that the evidence supports both the presence of the factor and its direct relevance to the causation of the accident or incident that is being investigated. However, where RAIB is less confident about the existence of a factor, or its role in the causation of the accident or incident, RAIB will qualify its findings by use of words such as 'probable' or 'possible', as appropriate. Where there is more than one potential explanation 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 or incident but are associated with the underlying management arrangements or organisational issues (such as working culture). Where necessary, words such as '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 accident or incident 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 RAIB, expressed with the sole purpose of improving railway safety.

Any information about casualties is based on figures provided to the RAIB from various sources. Considerations of personal privacy may mean that not all of the actual effects of the event are recorded in the report. RAIB recognises that sudden unexpected events can have both short- and long-term consequences for the physical and/or mental health of people who were involved, both directly and indirectly, in what happened.

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.

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Serious operational irregularity at Balham, 20 April 2019

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Summary

At around 19:05 hrs on Saturday 20 April 2019, a tamper, a self-propelled piece of on-track machinery, made an unsignalled and unauthorised move of about 600 metres, passing over Balham Junction, and entering platform 3 at Balham station, south London. The tamper could potentially have collided with a passenger train, which had travelled over the same junction in the opposite direction around 75 seconds earlier. The tamper stopped in the station, when the on-board crew realised that it was in the wrong place. There was no damage or personal injury.

The incident happened at the boundary of an engineering possession, where lines were closed for maintenance purposes. The plans for train movements out of the possession required the tamper, which had been working on the down line, to be crossed over to the adjacent up line while it was still inside the area under possession, and leave the possession on the up line. The crossing over move did not take place, and the tamper left the possession on the wrong line.

This happened because the person in charge of the possession (PICOP) provided incomplete information about the position of the tamper; the tamper driver and conductor driver did not query the instructions provided by the PICOP; and two signallers did not query the instructions provided by another PICOP. The standard of safety critical communications was poor throughout, resulting in no party having a clear understanding of the location of the tamper or the actions to be taken, and Network Rail's management of the PICOP role has been ineffective. Underlying factors were that the labour supplier which employed the PICOPs had not effectively managed its own policy on monitoring safety critical communications, and that Network Rail's strategy for improving and maintaining the standard of safety critical communications within the rail industry has been ineffective, and has not changed the work force culture or secured the adoption of good practice in respect of communications with and between signallers and other operations staff.

RAIB has made four recommendations, all addressed to Network Rail. The first calls for a review of the company's strategy for safety critical communications involving its staff and contractors, to address underlying cultural factors and embed the use of standard communication protocols within the railway industry. The second covers a review of the process of handovers between signallers, during and at the end of shifts, to produce a structure which will give the incoming signaller full awareness of all relevant information about the location and intended movement of trains. The third recommendation relates to the provision of a suitable working environment for PICOPs, and the fourth to a review of that role, including the competency requirements and ongoing professional management of PICOPs. Two learning points relate to the need to test staff involved in safety incidents for drugs and alcohol, and the importance of not using mobile phones while driving road vehicles.

Introduction

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 acronyms, which are explained in Appendix A. Sources of evidence used in the investigation are listed in Appendix B.

The incident

Summary of the incident

3 At around 19:05 hrs on Saturday 20 April 2019 a tamper[1], a self-propelled piece of on-track machinery, running as engineering train 6J91[2], made an unsignalled and unauthorised move over Balham Junction in south London. It travelled for about 600 metres on the down Brighton fast line in the wrong or 'up' direction, over the junction and into platform 3 at Balham station (figure 2). The tamper could potentially have collided with a passenger train, the 18:51 hrs Southern service from London Victoria to East Grinstead, train 1L56, which had travelled over the same junction from the down Brighton fast line to the down Crystal Palace line at 19:04 hrs. The tamper stopped in platform 3, when the on-board crew realised that it was in the wrong place. There was no damage or personal injury.

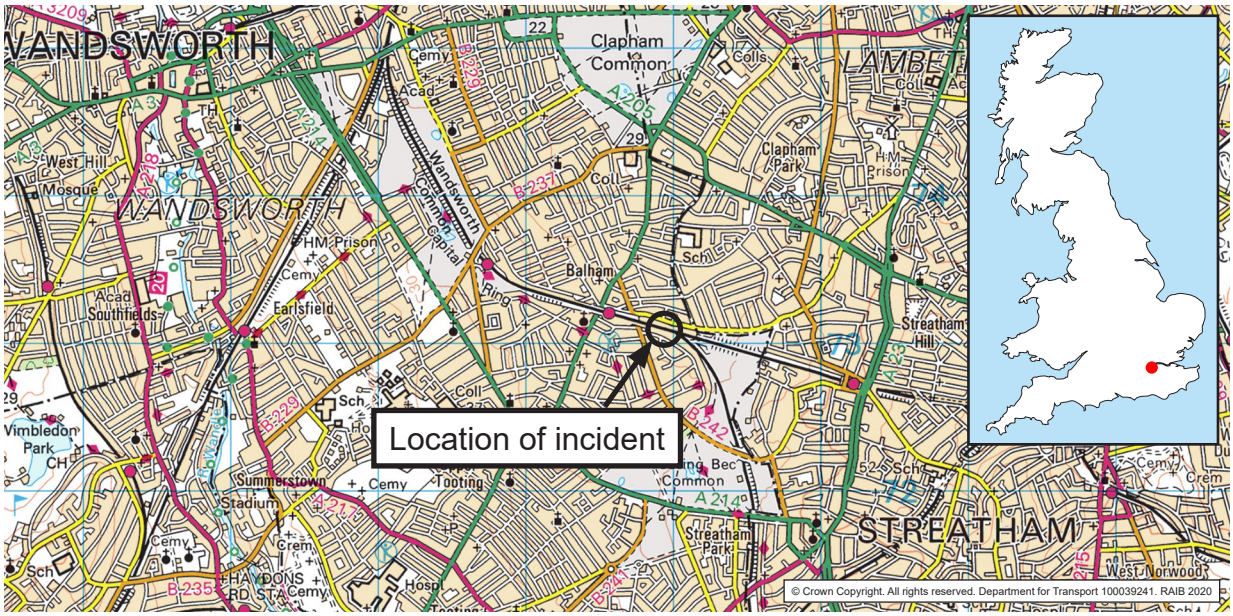

Figure 1: Ordnance Survey map showing location of the incident

Context

Location

4 Balham Junction is located immediately south-east of Balham station on the route between London Victoria and Brighton. The railway through Balham runs north-west towards Clapham Junction and south-east towards Streatham Common. It consists of four lines, made up of the up and down Brighton fast lines, which are on the west side, and the up and down Brighton slow lines. The up Brighton lines approach Balham from the south on a left-hand curve. At the junction the up and down Crystal Palace lines converge from the south-east (figure 2).

[1] A machine used for establishing or correcting the geometry of track by lifting it and compacting the ballast underneath it.

[2] An alphanumeric code, known as a 'train reporting number', is allocated to every train operating on Network Rail infrastructure.

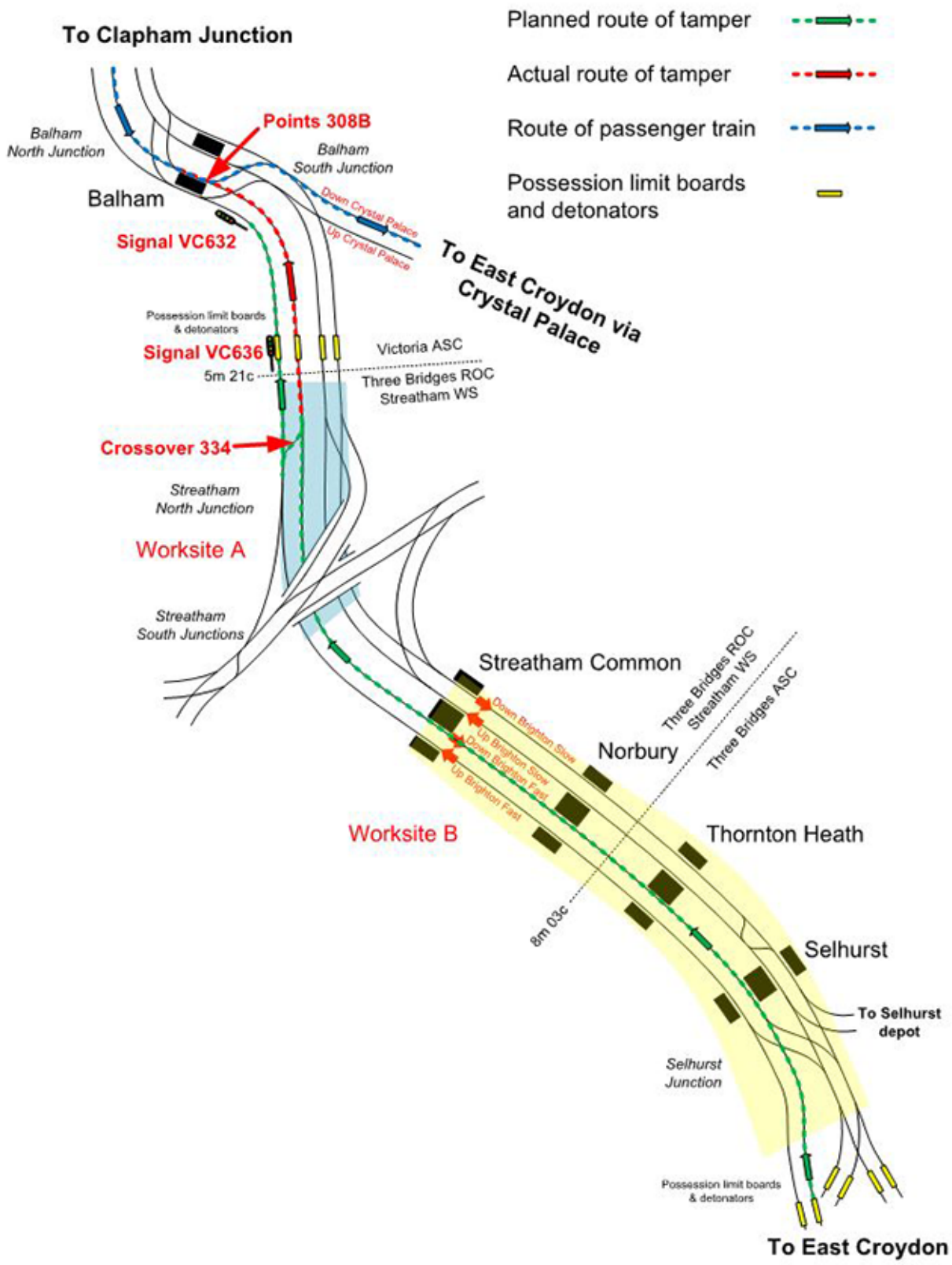

Figure 2: Overview of incident showing geographical relationship of key features

5 All lines in the area are electrified at 750 volts DC using the third rail system.

6 At the time of the incident, the signalling in the area in which the events described in this report took place was controlled from three centres. Balham itself was under the control of panel 2B in Victoria Area Signalling Centre (ASC). On the Brighton lines, 0.4 miles (0.6 km) south of the junction, control passed to the Streatham work station at Three Bridges Rail Operating Centre (ROC). South of Streatham, Three Bridges ASC controlled the route beyond a point 3.2 miles (5.2 km) from Balham, as far as Brighton itself.

Engineering arrangements

7 When the railway is closed to normal traffic for maintenance or other engineering work, the arrangements for the closure are referred to as an engineering possession (a possession). The arrangements are controlled by a person in charge of the possession (PICOP). Movements of engineering trains into and within the area under possession are controlled by the PICOP. Within the area under possession, there may be multiple worksites, each of which is the responsibility of an engineering supervisor (ES) or safe work leader (SWL). The ES controls the movement of trains into and within worksites. The details of these arrangements and responsibilities are set out in the railway Rule Book[3], Module T3 and Handbooks 11 and 12. The limits of the possession and the worksites are marked on the ground by boards and detonators (explosive audible warning devices) (figure 3). At the time of the incident, there was an engineering possession in force on the section of line between Balham and Selhurst (figure 2).

8 Network Rail planned to carry out various works on the railway between Balham and East Croydon over the Easter weekend in 2019 (figure 2). A possession was scheduled to run from 01:20 hrs on Friday 19 April to 04:00 hrs on Sunday 21 April (see paragraphs 26 to 28 for more detailed information).

9 Individual worksites within a possession may be given up when the work within them is completed, which may be some time before the possession is due to finish. In such cases, the ES will hand the section of line in the worksite back to the PICOP, who will control any further movements of trains which had been in the worksite or which have to pass through that area while the possession is in force.

Organisations involved

10 Network Rail owns, operates and maintains the railway infrastructure. At the time of the incident, Network Rail's South-East route had several contracts with labour suppliers to provide staff to the company and its contractors for planning and undertaking some maintenance work. In relation to this incident, Network Rail employed the planners, delivery managers, one of the possession support assistants, and the signallers at Victoria ASC, Three Bridges ROC and Three Bridges ASC.

11 Colas Rail is an infrastructure renewal company which also owns and operates a mixed fleet of on-track plant for maintenance and renewal operations. Colas operated the tamper (figure 4) and employed the driver and conductor driver of the tamper.

[3] The Rule Book GE/RT8000 is published by RSSB, and consists of Modules and Handbooks.

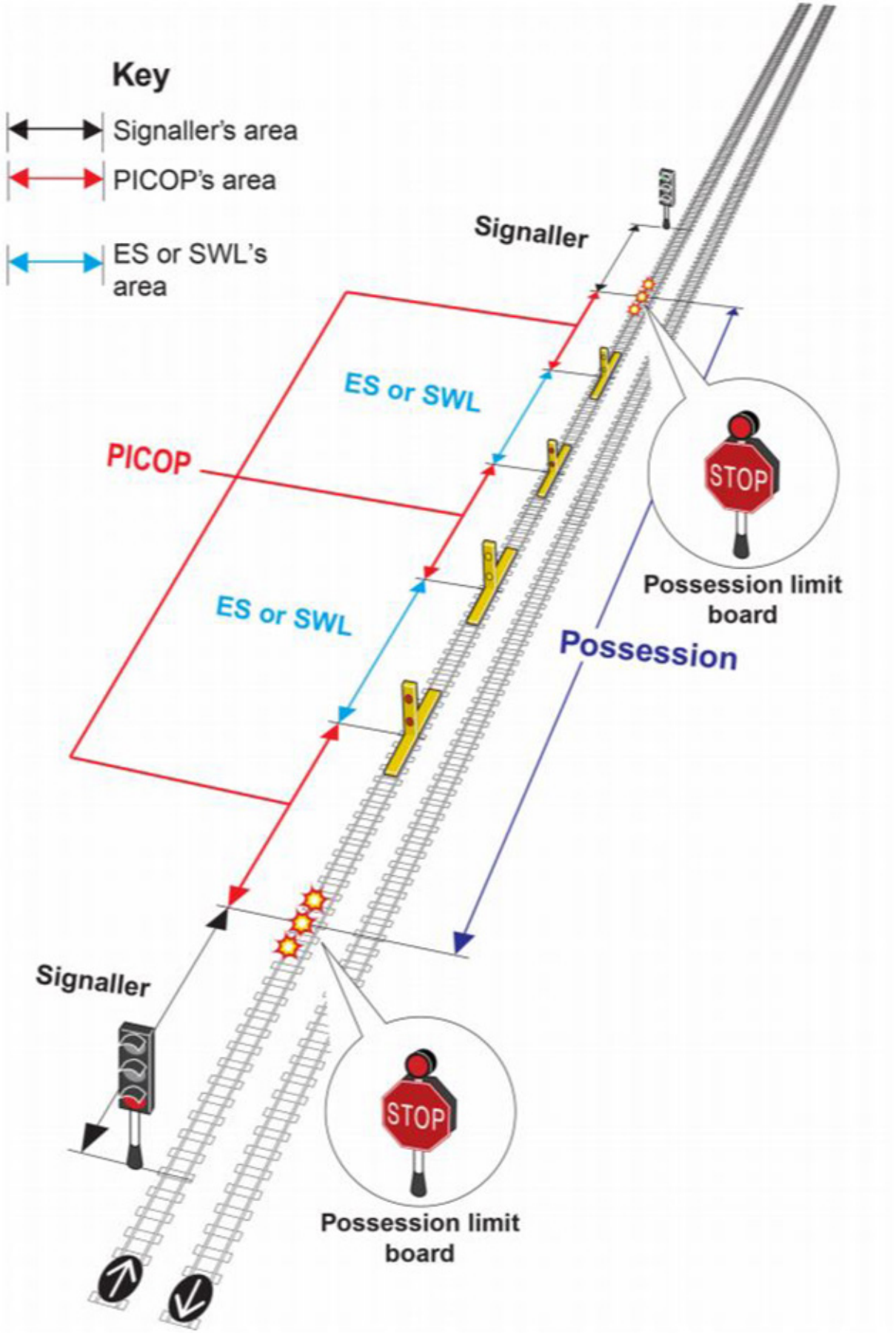

Figure 3: Extract from Rule Book module T3, showing protection arrangements for a possession (RSSB)

12 Cleshar Rail, a labour supplier, is part of the CCS Group of companies. Cleshar provided the engineering supervisor in charge of worksite B.

13 McGinley Support Services engaged and supplied the engineering supervisor's assistant, who was working with the engineering supervisor for worksite B and was located at Streatham Common.

14 Vital Human Resources Ltd (part of Morson Group and referred to as Vital for the remainder of this report) engaged and supplied two 'senior person in charge of possession' (SPICOP) staff for the duration of the work. A SPICOP is a senior PICOP certified competent to manage arrangements connected with the movement of more than one train working within a possession. The two SPICOPs worked the 19:00 hrs to 07:00 hrs night shifts and the 07:00 hrs to 19:00 hrs day shifts throughout the possession, and are referred to in this report as the 'night' and 'day' PICOPs[4].

15 Vital also engaged and supplied the controller of site safety (COSS) who was carrying out the role of possession support (placing and removing ground boards and detonators) at the northern, or Balham end of the possession. The COSS worked with the possession support assistant (paragraph 10). Vital also supplied other staff working in the possession who were not involved in the incident.

16 Govia Thameslink Railway (GTR), trading as Southern, operated passenger train 1L56. The condition and operation of this train were not factors in the incident.

Staff involved

Persons in charge of the possession (PICOPs)

17 The PICOP who was on duty during the day (the day PICOP) started in the rail industry in 2001 working for several contractors in civil engineering, before moving to work on the permanent way. She gained competences as a COSS, possession support (A- strapping and B - Traction Isolation switch equipment), and in 2014 qualified as a PICOP and Senior (S)PICOP. She joined Vital in 2015 and was re-certified as a Senior (S)PICOP in 2019.

18 The PICOP who was on duty during the night (the night PICOP) joined the railway in 1998, and worked for various contractors. He gained competences as a COSS and possession support (strapping (A and B)), and joined Vital HR Ltd in 2012 as an agency PICOP. He became a (S)PICOP in 2014 and a Safe Work Leader (SWL level 2) in 2015.

19 Both PICOPs were managed from and worked out of the Vital office at Farnham, and also used Network Rail's PICOP office within Cover House, near Three Bridges, Sussex.

Tamper driver

20 The tamper driver started work with British Rail in 1981, and following privatisation in the 1990s he worked for various companies; since 2011 he had worked for Colas. Although the tamper driver had some knowledge of the area, he did not have the specific route knowledge to control the movements of the tamper from Thornton Heath to East Croydon sidings via Clapham Junction and Crystal Palace. A conductor driver was therefore provided by Colas.

[4] These working hours are not consistent with published guidance on managing fatigue, such as the ORR document 'Managing Rail Staff Fatigue' and the RSSB document 'Managing Fatigue: A good practice guide', which both provide guidance on the maximum length of shift for day, early and night turn duties.

Figure 4: The tamper involved in the incident (courtesy of Colas Rail)

Conductor driver

21 The conductor driver joined Connex in February 2000 as a trainee train driver. In 2001 he joined Virgin Cross Country as a passenger train driver. In April 2007 he joined Serco as an infrastructure monitoring and testing train driver, and moved to Colas in the same role in September 2015. He had had no training or previous experience of working within a worksite or possession, although he was aware of the role of the PICOP.

Signaller 1

22 Signaller 1 joined Network Rail in 2011 as a track maintenance worker, and gained competences including lookout / site warden and COSS before transferring to the signal and telecommunications department in 2016. In 2018 he transferred to the operations department and started training as a signaller. In January 2019 he joined Victoria ASC and was passed competent to work Panel 2B. On Saturday 20 April he was working a day shift (07:00 hrs to 19:00 hrs).

Signaller 2

23 Signaller 2 joined Network Rail in June 2016 as a trainee signaller, and joined Victoria ASC in Autumn 2016. He was signed off as competent on all panels in 2017. On Saturday 20 April 2019 he was working a night shift (19:00 hrs to 07:00 hrs).

Signaller 3

24 Signaller 3 had four years' experience at Victoria ASC. On 20 April 2019 he was working as meal relief on the night shift, and took over panel 2 around 19:06 hrs, when signaller 2 required a personal needs break shortly after he came on duty.

External circumstances

25 The weather at the time of the incident was dry with minimal cloud with good visibility. There is no evidence that the weather played any part in the incident.

Background information

The engineering possession arrangements

26 The limits of the possession extended from 5 miles 22[5] chains (between Balham and Streatham Common) to 9 miles 60 chains (between Selhurst and East Croydon), on the up and down Brighton fast and slow lines, and the up and down Selhurst spur lines (figure 2). The possession incorporated two separated worksites, A and B:

- **Worksite A:** work planned for track surveying, and signal and telecommunications maintenance work from Balham station to Streatham North Junction (5 miles 22 chains to 6 miles 33 chains).
- **Worksite B:** work planned for track renewal and tamping between Streatham Common station and Windmill Bridge Junction (6 miles 48 chains to 9 miles 60 chains).

The possession limit boards (PLBs) and detonators at the north end of the possession were located at 5 miles 10 chains near VC636 signal. The signal controlling departure from the possession on the up Brighton fast line was signal VC 632.

The role of the person in charge of the possession (PICOP)

27 The role of PICOP is considered to be safety critical[6], as it incorporates tasks including controlling the movement of trains and receiving and relaying safety critical communications between signallers, drivers and others involved in setting up and operating possessions, all of which affects the safety of people working and travelling on the railway.

28 The Rule Book, Handbook 11, outlines the duties of the PICOP, who must be competent in managing the following tasks:

- In conjunction with other safety critical staff (signaller, electrical control operator) establish the protection arrangements for the possession.
- Communicate with engineering supervisors and COSSs to set up safe access to the worksites within the possession.
- Liaise with the signaller regarding the passage of any trains or on-track plant moving into and out of the possession.
- Control the movement of a train travelling between the limits of protection (PLBs) and worksites.
- Communicate with other staff to ensure the protection is lifted, the possession is relinquished and the railway is handed back to the signaller for the safe passage of trains. The competence and assessment of a PICOP is discussed in paragraphs 97 to 104.

[5] Distances are measured from a zero datum at London Victoria. A chain is 22 yards (approximately 20 metres) There are 80 chains in one mile.

[6] Safety critical tasks are defined in regulation 23 of the Railways and Other Guided Transport Systems (Safety) Regulations 2006 (SI 2006 No. 599) (ROGS).

The role of the conductor driver

29 The Rule Book, Module TW1 section 29 'Route and traction knowledge requirements', states that a conductor driver must be appointed if a train driver does not have the required route knowledge. The conductor driver must take responsibility for the safe working of the train, observing all signals, speed restrictions, gradients, curves and any other features of the line the train driver needs to know.

30 The conductor driver may also manage the communications with the signaller, and must pass on any instructions to the train driver. Although no guidance or instruction is provided about when a conductor driver may need to communicate with a PICOP when travelling between a worksite and the possession limits, the conductor driver may also manage these conversations (see paragraph 73).

The sequence of events

Events preceding the incident

31 The arrangements for possessions are published in Network Rail's weekly operating notices. The notice covering the work on the Brighton line (notice WON 04, 20 – 26 April 2019, item 89) was produced on 1 April 2019. On Tuesday 16 April, the possession briefing pack was created by a Network Rail operations delivery manager, who printed the two identical briefing packs for the PICOPs, and on 18 April left them for collection on a desk in the PICOP office at Cover House. Sometime on Wednesday 17 or Thursday 18 April, the operations delivery manager briefed the night PICOP (the time and date could not be confirmed as a briefing sheet was not signed or dated), with the expectation that the night PICOP would then cascade the same briefing, covering the possession arrangements and engineering train movements, to the day PICOP, at the time of the first night to day shift handover during the possession.

32 Also on 18 April, Colas confirmed the duties and emailed the roster for the forthcoming weekend to both the tamper driver and the conductor driver. The roster document included the train running details describing the route the tamper would take after completion of the work within worksite B (figures 5 and 7).

Machine No	73913 - 6J91	**Machine Desc**	08 Compact	**Customer**	SES	**Ord No**	187774
Stable Prior	Site	**Stable After**	East Croydon Up Sidings	**Poss From**	Streatham North Jcn	**Poss To**	Windmill Bridge Jn
Leave Time	20/04/19 12:00	**Return Time**	20/04/19 19:39	**Won**	89	**PTO**	OTM366702
Depot	Track Renewals South East	**Work Site**	Thornton Heath to Selhurst Dn Victoria Fast				

Notes

16/04/19 7:46 "Start on site as second shift.
Tamper to work on Down Brighton Fast in Up direction
Working Direction: C-L Selhurst to Thornton Heath.
On Completion tamper to Crossover to Up Fast via 334 Xover at Streatham North Jn (Fast) and exit on UP Brighton Fast at Balham Jn at VC632
From site: Balham Jn, Clapham Jn RM, Balham, Streatham Hill, West Norwood, Crystal Palace, Norwood Jn, East Croydon RM, East Croydon Up Sdg (PTL)

Figure 5: Extract from the Colas roster document showing the train running details of tamper 6J91

33 The night PICOP arrived at Cover House at around 22:00 hrs on 18 April, and checked both sets of documents (for the day and night PICOPs) to ensure that they were identical and all documents were included.

34 In the early hours of Friday 19 April, the night PICOP, in cooperation with the signallers, arranged the protection for the possession, which was granted at 01:20 hrs. The plan required nine engineering trains to transport materials and equipment within the possession, plus the tamper. From 03:35 hrs on Friday 19 April, trains 1 to 8 ran into the southern end of the possession and entered worksite B on the up Brighton fast line. At around 05:30 hrs on Friday morning the night PICOP left Cover House to drive home, some 70 miles. During the journey home, the night PICOP, using his mobile phone, briefed the day PICOP who had arrived at Cover House and picked up her PICOP briefing pack. During Friday afternoon the day PICOP managed the departure of trains 1 to 3 leaving the possession via signal VC632 at Balham. The day PICOP completed her Friday shift at 19:00 hrs and handed over to the night PICOP who managed two further trains (4 and 5) leaving the possession via the same signal.

35 The possession continued through Saturday morning, with train 9 entering the possession on the up Brighton fast line during the early hours. At 04:01 hrs, train 6J91, referred to as the tamper for the remainder of this report, entered the southern end of the possession on the down Brighton fast line, before entering worksite B. It was due to work in worksite B on the down Brighton fast line from south to north, colloquially referred to as 'Country to London' (C-L, see figure 5), the opposite direction to the normal use of this line (also sometimes referred to as running 'bang road'). The tamper was the only engineering train working on the down Brighton fast line.

Figure 6: Train 6J91 within worksite B on the down Brighton fast line at Thornton Heath

36 Before leaving Cover House at around 05.45 hrs to drive to his home, the night PICOP managed the departure of trains 6 and 7, leaving via VC 632 signal. The day PICOP, who had arrived at Cover House at around 06:20 hrs on Saturday, was called by the night PICOP on his journey home at 06.25 hrs and again at 06.34 hrs. The two PICOPs had conversations regarding the work activities and progress of the possession. The night PICOP queried the planned route of the tamper, which was due to leave via the north end of the possession at Balham, run to Clapham Junction to reverse, and return to East Croydon via Crystal Palace.

37 At 08:47 hrs the day PICOP managed the movement of train 8 leaving the possession via the up Brighton fast line and signal VC632. The work in the possession was progressing well and at around 13:20 hrs the tamper driver, having arrived at Thornton Heath and taken over the tamper, called the conductor driver to advise him to come to Streatham Common station, as it was looking like the work would finish earlier than expected. A short time later the conductor driver (working a 12:00 hrs to 20:00 hrs shift) set off from his home to travel to Streatham Common station.

38 Around midday, the day PICOP left Cover House and made her way home to south London. This was something that she had done before, and had not been challenged on, although after this incident Network Rail issued instructions that PICOPS should work from an office (see paragraphs 93 and 143 (b) iii). At around 14:19 hrs she called the engineering supervisor for worksite B to enquire about the departure point of the tamper (RAIB could not establish if this request related to the worksite or possession departure point). The engineering supervisor was confused by this call, because he did not understand how the PICOP could not be aware of which line the tamper was working on, as it was later due to move into the part of the possession that was the day PICOP's area of responsibility, commonly referred to as 'PICOP land'. The engineering supervisor reported that during this conversation he advised the day PICOP that the tamper was currently working and would remain on the down Brighton fast line and would later be arriving at the worksite marker boards, at the London end of Streatham Common station.

39 At around 15:05 hrs, the tamper finished work on the down Brighton fast line within worksite B. At 15:33 hrs, the engineering supervisor authorised the tamper to travel towards the worksite marker boards, at Streatham Common station where it arrived at 15:40 hrs (figure 7).

40 At around 15:50 hrs, the day PICOP was advised by the engineering supervisor for worksite A (figure 2) that the work had been completed, and worksite A was given up and the marker boards for it were removed (paragraph 9).

41 As the boundary between the area of control of Victoria ASC and Three Bridges ROC (figure 7) was within the possession, the day PICOP would have needed to contact the signaller on the Streatham work station at Three Bridges ROC to arrange for the planned move of the tamper over points 334 from the down Brighton fast line to the up Brighton fast line. At 17:04 hrs the day PICOP called that signaller to enquire if the up Brighton fast line from signal TVC 660 at Streatham Common was clear to the northern limit of the possession and signal VC 632. The signaller confirmed that as far as he knew the route was clear, and requested the day PICOP to instruct the tamper driver to observe and check any points in the route.

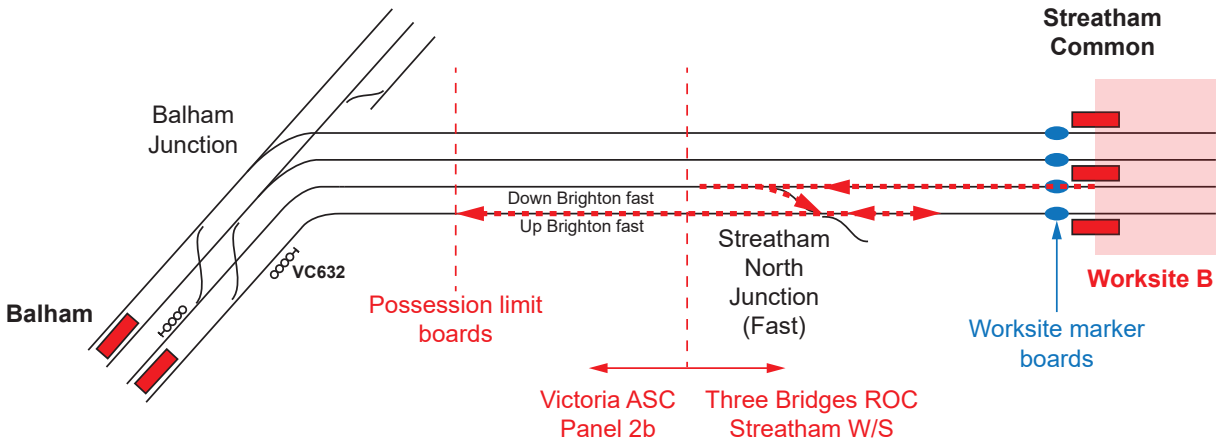

Figure 7: The planned route of train 6J91

42 At 17:21 hrs, the conductor driver arrived at Streatham Common station and made his way to the tamper, which was now standing in the platform on the down Brighton fast line. He introduced himself to the engineering supervisor's assistant (ESA) and the tamper driver on board the tamper.

43 At around 17:24 hrs, the ESA called the day PICOP, who returned the call at 17:33 hrs. The ESA passed his phone to the conductor driver, who had now taken charge of the movements of the tamper. The day PICOP instructed the conductor driver to proceed to the detonator protection once the worksite marker board was lifted. The ESA moved the worksite marker board and the tamper left worksite B at 17:34 hrs travelling in the up direction on the down Brighton fast line, arriving at the PLBs south of Balham Junction at 17.40 hrs (figure 8). When it arrived there, there was no COSS or possession support assistant present. The tamper was not scheduled to leave the possession until 19:00 hrs.

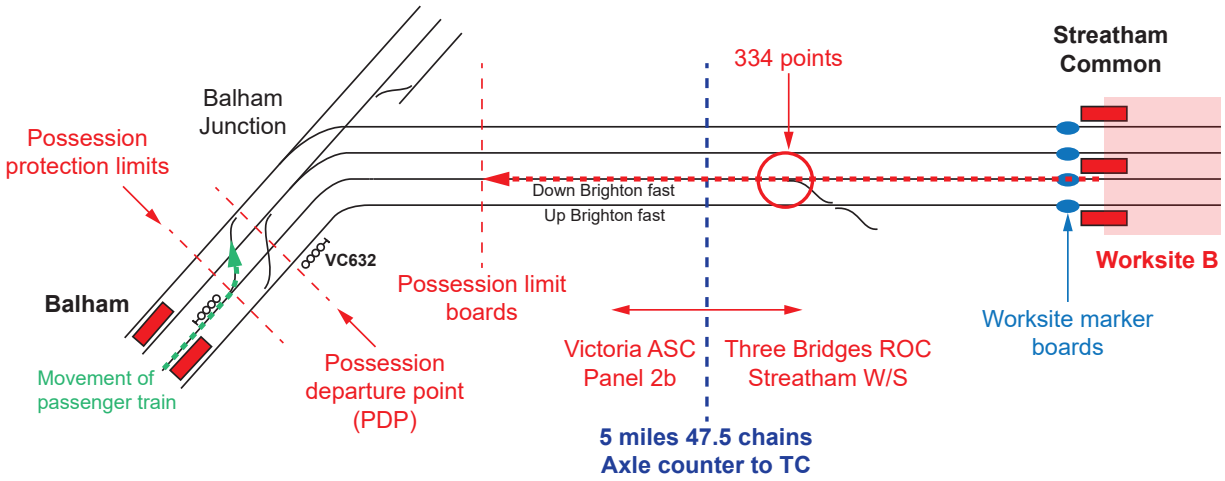

Figure 8: The actual route of train 6J91

44 At 18:41 hrs, the day PICOP called signaller 1 at Victoria ASC to provide the night PICOP's contact details. At 18:45 hrs, the conductor driver called signaller 1, who was working panel 2B (figure 9). The following conversation took place.

Person	Dialogue
SIGNALLER 1	***Victoria panel 2 bravo speaking.***
Conductor driver	*Good afternoon Victoria, yeah, this is the Route Conductor on Six Juliet Nine One, just south of Balham Junction. Um, have you got……?*
SIGNALLER 1	***Six nine one sorry, uh, whereabouts, are you?***
Conductor driver	*Just south of Balham Junction. We're uh, I think it's Victor Charlie six three six we can see. We're in a worksite anyway at the moment, at the stop boards.*
SIGNALLER 1	***What line are you on, sir?***
Conductor driver	*We're actually…wrong direction. We're on the uh, on the down fast in… travelling in the up direction.*
SIGNALLER 1	***On the down fast going in the up direction?***
Conductor driver	*Yeah, well we're not moving obviously. Yeah, we're…yeah. I was just wondering if you've got a number for the PICOP please because they're meant to be up here and we've got nobody to come and remove the detonators and stop boards yet.*
SIGNALLER 1	***You're wanting to know whether we've got the PICOP details.***
Conductor driver	*Yes. Have you got any number or anything for the PICOP?*
SIGNALLER 1	***Yes, I do…***
Conductor driver	*You do? Okay*
SIGNALLER 1	***His details… it's (name of night PICOP provided)***
Conductor driver	*Okay.*
SIGNALLER 1	***Yeah um, it's (telephone number of night PICOP provided)***
Conductor driver	*Lovely. Thank you very much signaller, I'll give him a quick call.*
SIGNALLER 1	***Sorry, what's your name?***
Conductor driver	*My name's (name provided). I'm the Route Conductor on this uh, six Juliet nine one.*
SIGNALLER 1	***(Name confirmed) and its six Juliet….Nine One…***
Conductor driver	*That's right, yeah. We're on the down fast but we're making um, we're going to go across onto the fast up obviously and then we're changing at Clapham Junction. But I mean we can do it Balham actually, and, um, shoot up towards Streatham Hill that way, so instead of going all the way into town, you know what I mean?*
SIGNALLER 1	***Right…right…right, right. Okay. Yeah, speak to the PICOP.***
Conductor driver	*I'll speak to the PICOP anyway. Thanks for your help signaller.*
SIGNALLER 1	***Alright then, no worries.***
Conductor driver	*Cheers then, bye-bye.*

Figure 9: Transcript of the conversation between signaller 1 and the conductor driver

45 At 18:45 hrs, the night PICOP called the day PICOP. During the handover the day PICOP advised the night PICOP that 6J91 was '*ready to come out the Balham Junction end of the possession via signal VC 632 at 19:00 hrs'*. The day PICOP also reported the last remaining train (train 9) would be ready to come out at 20:10 hrs, and that everything was still on schedule and going to plan.

46 At 18:48 hrs, the conductor driver called the night PICOP asking where the possession support staff were, and expressed his frustration at the delays in getting the tamper out of the possession, as it had finished its work in the afternoon and the conductor driver wanted to meet his scheduled arrival time of 19:39 hrs at East Croydon sidings. The night PICOP advised the conductor driver that the possession support staff were not due on shift until 19:00 hrs, and this was the booked departure time of the tamper. The night PICOP advised the conductor driver that when the staff arrived he would get the boards lifted and the tamper could proceed to signal VC 632, the possession departure signal. The PICOP then asked the conductor driver if he would be agreeable to lifting the PLB and detonators himself. He then reconsidered and told the conductor driver to wait for his call, and he would find out when the possession support staff would be on site.

47 At 18:51 hrs, the night PICOP called the night turn possession support COSS, and found that she was driving a road vehicle and was delayed in traffic on her way to the site of work. At 18:52 hrs, the night PICOP contacted signaller 1. The following conversation took place (figure 10).

Person	Dialogue
Signaller 1	***Victoria panel two Bravo***
Night PICOP	*Two bravo, [name given] PICOP for item One Four Two.*[7]
Signaller 1	***PICOP for item One Four Two … yes.***
Night PICOP	*Hello sir, are you good sir.*
Signaller 1	***Yes, good thank you.***
Night PICOP	*We've got this six Juliet nine one sitting at detonator protection at Balham on the up Brighton fast.*
Signaller 1	***Up Brighton fast…yes he gave me a call earlier …up Brighton fast.***
Night PICOP	*That's it.*
Signaller 1	***Six Juliet Nine One.***
Night PICOP	*Yes, he's exiting the signals at Victor Charlie Six Three Two.*
Signaller 1	***Okay.***
Night PICOP	*Okay would it be okay to send them round to victor charlie six three two? And give you a call from there as he's due out at seven o'clock sir.*
Signaller 1	***He's due out at seven o'clock you say.***
Night PICOP	*Yeah nineteen hundred he's due out and he's just said he's got some running to do, so by the time he gets round to the signal it's going to be seven o'clock anyway and you can get him on his way can't you?*
Signaller 1	***So what does he want to do, where is he heading from victor charlie….what he…where's he heading?***
Night PICOP	*Let's have a look …see if I've got the runnings…where's my running gone… here they are…. six Juliet nine one, let's have a look it says…. East Croydon up sidings…*
Signaller 1	***He's going where sorry…***
Night PICOP	*East Croydon up sidings…he's going round the roundabout to get there.*
Signaller 1	***Yeah that's just what I'm trying to think eh……hold on there one second.***
	Phone call muted whilst Signaller 1 talked to his colleagues
Signaller 1	***Hello there how you doing.***
Night PICOP	*Alright sir.*
Signaller 1	***Yeah…mm for that train is it …possible that …he knows the …. road to shunt and turn around at Clapham Junction…***
Night PICOP	*I'm not…I don't have a clue sir (laughing) I don't know what he knows mmm.*
Signaller 1	***Can you find out?***
Night PICOP	*Well, I'll get the driver to contact you from the dets, you can talk to him about that otherwise we're going through three people…*
Signaller 1	***Yeah…. That's true.***
Night PICOP	*I'll get the driver to quickly contact you.... can he contact you on the cab radio can he?*
Signaller 1	***He might not be able to, if he can't… get him to call me on the panel***
Night PICOP	*No worries…I'll sort that out.*
Signaller 1	***Yeah all right no worries.***
Night PICOP	*Okay, thanks.*

Figure 10: Transcript of the conversation between the night PICOP and signaller 1

[7] The possession spanned two weekly operating notices (which run from Saturday to Saturday). The staff involved in the incident made reference to the work being item 142 from the previous Weekly Operating Notice, WON 03, however by the time of the incident this work was actually covered by item 89 published in WON 04.

48 At 18:55 hrs, the night PICOP called the day shift possession support COSS who had now arrived at the PLBs, having been asked by the day PICOP to attend the north end of the possession because the night possession support COSS was delayed in traffic.

49 At 18:54 hrs, signaller 1 ended his duty and was relieved by signaller 2. At 18:58 hrs the conductor driver (who had now been contacted by the night PICOP) called Victoria ASC panel 2B and spoke to signaller 2. The conductor driver did not realise that a handover between signallers had taken place, and believed he was still speaking to signaller 1. The recording shows the following conversation took place (figure 11).

Person	Dialogue
Signaller 2	***Hello, Victoria signaller panel two B signaller***
Conductor driver	*Hello signaller, yeah driver, I'm the conductor driver on six Juliet nine one, you wanted to speak to me about a route we're going back?*
Signaller 2	***Yeah hello there driver of six Juliet Nine One, um, where are you at the moment?***
Conductor driver	*Uh...we're just south of Balham Junction at the moment.*
Signaller 2	***Okay, you're still there. What signal are you actually… going to start coming out from? Do you know?***
Conductor driver	*Um, I can tell you if you bear with me a moment…just bear with me a moment … yeah... I've got a… Balham junction at Victor Charlie Six Three Two……...*
Signaller 2	***Okay yeah, that's what I thought it would be, alright. Um, you have to go to East Croydon now I hear. Is that correct?***
Conductor driver	*Yes, that's correct. East Croydon into the siding there yeah.*
Signaller 2	***Do you sign platform sixteen in Clapham Junction?***
Conductor driver	*Do I sign platform sixteen in Clapham?... yeah.*
Signaller 2	***You do. Yeah okay. You know where to shunt back from when you go through platform sixteen?***
Conductor driver	*Go through platform sixteen, the dummy's down past the platform isn't it in the middle there?*
Signaller 2	***Yeah well if you go through platform sixteen then obviously you've got one four seven shunt signal there, or the signal before it as well six nine five, I think it is…sorry five nine five sorry that's where you can get back onto the down slow and then via Crystal Palace afterwards.***
Conductor driver	*Yeah that's right. I'm going back via Streatham Hill yeah.*
Signaller 2	***That's the one, that's the one. Yeah alright, so just give me a call once you're at six three two and what we'll do is once we've got a good path for you, what we'll do is we will get you going via platform sixteen and turn you around from there and then get you back by Streatham Hill alright?***
Conductor driver	*No worries.*
Signaller 2	***Okay, Six Three Two, no problem, thanks very much, cheers.***
Conductor driver	*Cheers*

Figure 11: Transcript of the conversation between driver conductor and signaller 2

50 At 19:00 hrs, GTR train 1L56 arrived at Balham station on the down Brighton fast line (platform 3), and the signal at the south-east end of the platform (VC 631) cleared to a proceed aspect to allow the train to cross over the junction to the down Crystal Palace line.

51 At 19:01 hrs, the night PICOP called the possession support COSS, who was now in the cab of the tamper. The conductor driver finished his call to signaller 2, took the phone from the COSS and spoke to the PICOP. The conductor driver explained to the PICOP that the signaller was going to take him up to signal VC 632 and he was then going to *'slot him across when he can'.* The night PICOP, still believing that the tamper was on the up Brighton fast line, said he would now have a '*quick word'* with the signaller and as soon as the conductor driver saw the protection (PLB) being lifted he could proceed to signal VC 632.

52 At 19:02 hrs, the night PICOP called signaller 2. The PICOP reported that the conductor driver had now contacted him and his understanding was that signaller 2 was happy for the tamper to proceed to signal VC 632 and take further instructions from signaller 2 when it had arrived at the signal. Signaller 2 agreed that was what he had instructed the conductor driver to do, and requested the PICOP to tell the conductor driver to call signaller 2 when he was at the signal, and signaller 2 would *'sort it out from there'*. The night PICOP stated he would speak to the conductor driver, and would get the protection lifted. However, no further communication between the PICOP and the conductor driver took place.

53 At 19:03 hrs, the night PICOP contacted the possession support COSS and instructed him to lift all protection, stand in a place of safety and call him back once he had replaced the protection. Although no specific details of the line had been discussed, the COSS lifted the protection in front of the tamper, on the down Brighton fast line. The tamper then moved towards Balham station, running northwards against the normal direction of traffic on that line.

Events during the incident

54 Shortly before 19:04 hrs, train 1L56 departed from Balham station and crossed over the junction from the down Brighton fast line, via 308 points, to the down Crystal Palace line (figures 2 and 8).

55 At 19:04:17 hrs, the route from the down Brighton fast line in Balham station to the down Crystal Palace line cancelled automatically following the passage of train 1L56. At 19:04:36 hrs signaller 2 set the route for another passenger train, travelling north from the up Crystal Palace line to the up Brighton slow line. This action resulted in 308 trailing points moving to their normal position, for the straight route along the down Brighton fast line, shortly before the tamper reached them.

56 At 19:04 hrs, the night PICOP called the possession support COSS, who was with the possession support assistant, to give them authority go home, as the night COSS was still delayed on the road and would not be on site until 19.25 hrs. The day COSS stated they would wait 5 to 10 minutes before leaving site. The PICOP did not speak to the possession support assistant at this time (see paragraph 123).

57 At 19:05 hrs, the tamper, travelling towards Balham station, passed over 308 points and entered platform 3, around 75 seconds after train 1L56 had left the same platform.

58 While this was happening, signaller 2 asked signaller 3 to temporarily cover panel 2 while he went to the toilet. At 19:06:45 hrs, the night PICOP called the signal box. He spoke to signaller 3, believing he was speaking to signaller 2, to report that the possession protection was now back in place. Signaller 3 asked the PICOP where the tamper was, to which the night PICOP replied the tamper was '*on the way to the signal'.* No further details were provided by the night PICOP or requested by signaller 3.

59 As the tamper ran into Balham station, the tamper driver expressed concern to the conductor driver that something was wrong. The conductor driver agreed something was amiss and asked the tamper driver to slow down. The conductor driver contacted Victoria ASC as the tamper arrived in platform 3 in Balham station.

60 The call from the tamper was taken by signaller 4, as signaller 3 was otherwise occupied. The conductor driver introduced himself and reported that the tamper was now in platform 3 at Balham travelling *'bang road'* (in the wrong direction). Signaller 4 immediately realised what had just occurred, confirmed the tamper was stationary, and instructed the conductor driver and driver to move to the rear cab of the tamper and that no further movements should be made until the signal box contacted them. Signaller 4 then made the Victoria signalling shift manager (SSM) aware of the incident.

Events following the incident

61 At 19:07 hrs the SSM spoke to the route control manager at Three Bridges. Based upon his initial enquiries, the SSM believed the tamper driver had left the possession and travelled into Balham station without the authority of the signaller. The incident was initially treated as a possession irregularity, but was escalated to a signal passed at danger (SPAD) by the route control manager.

62 A Network Rail local operations manager was appointed to investigate the incident. The local operations manager contacted the SSM to gather evidence and reports, and a Colas on-call manager was advised of the incident. Neither Network Rail nor Colas considered that drugs and alcohol screening was necessary. Therefore, no screening was undertaken on any of the members of staff involved (see paragraphs 127 to 130).

63 At 20:24 hrs the conductor driver was contacted by signaller 2, who authorised the tamper to depart from Balham station. The tamper travelled south via the down Crystal Palace line, arriving at East Croydon sidings at 21:20 hrs. At 21:10 hrs Network Rail's National Operations Centre contacted RAIB to report the incident. The possession was handed back at 02:46 hrs on Sunday 21 April.

Analysis

Identification of the immediate cause

64 **The tamper came out of the possession on the wrong line, having not been crossed over to the correct line.**

65 The tamper was planned to leave the possession on the up Brighton fast line and wait at VC632 signal. It travelled on the down Brighton fast line in the wrong (northbound) direction, passing by up line signal VC632, and continuing over 308 points into Balham station. There was potential for a collision with passenger train 1L56, which had travelled in the opposite direction over 308 points approximately 75 seconds earlier.

Identification of causal factors

66 The incident occurred due to a combination of the following causal factors:

a. The day PICOP provided inaccurate information about the position of the tamper (paragraphs 67 to 70);

b. The tamper driver and conductor driver did not query the instructions provided by the day PICOP (paragraphs 71 to 74);

c. Signallers 1 and 2 did not query the instructions provided by the night PICOP (paragraphs 75 to 85);

d. The standard of safety critical communications throughout was well below that expected during safety critical communications, resulting in no party having a clear understanding of the location of the tamper or the actions to be taken (paragraphs 86 to 91); and

e. The PICOPs' working environment may have resulted in distraction and the loss of paperwork (paragraphs 92 to 95).

Each of these factors is now considered in turn.

67 **The day PICOP provided inaccurate information about the position of the tamper, leading other staff to believe the tamper was on the correct line.**

68 The day PICOP picked up a copy of the possession pack from Cover House on Friday 19 April, and later left to work at home. Witness evidence suggests that sometime between Friday and Saturday morning, the day PICOP lost the train running document that had been in the PICOP pack. The train running document outlined the details (figure 12) of the route the tamper would take after leaving worksite B at Streatham Common station. The main PICOP pack also included details of the planned route of the tamper (figure 13). These details were also shown in the document Colas issued to the crew of the tamper (figure 5).

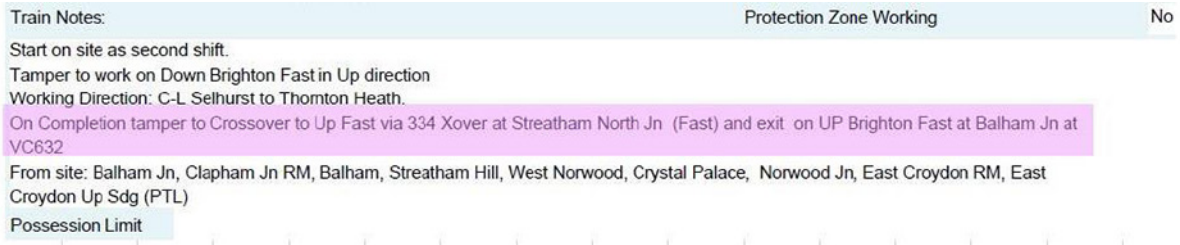

Figure 12: Extract from the train running documentation within the PICOP pack (not highlighted in original)

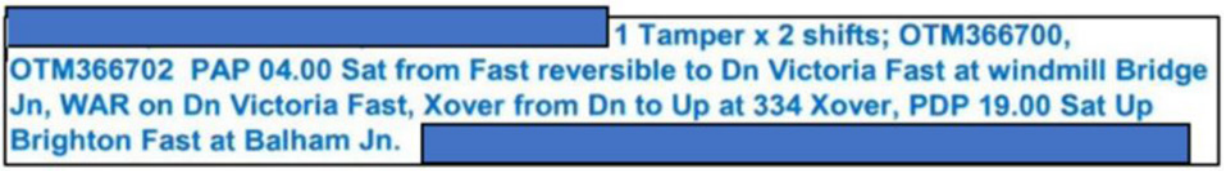

Figure 13: Extract from the PICOP pack

69 Although the night PICOP had previously advised the day PICOP that the tamper was working on the down Brighton fast line, and the same subject had been discussed with the engineering supervisor during Saturday afternoon, the day PICOP was still unsure which line the tamper was on when it was standing at Streatham Common station between 17:00 hrs and 17:34 hrs. The day PICOP could not explain how this came about or why she did not refer to other sections of the PICOP pack which also contained information on the planned route of the tamper. She formed a belief that the tamper was on the up Brighton fast line, and her conversation with the signaller at Three Bridges ROC at 17:04 hrs (paragraph 41) did nothing to dispel that belief; when the signaller confirmed that the route on the up Brighton fast line was clear from the worksite marker boards to signal VC 632, it probably compounded her mistaken belief. Earlier in 2019, the day PICOP had been involved in incidents of incorrect train movement during a possession, and the loss of train running paperwork from a PICOP pack. It is likely that she did not wish to disclose to others that she had mislaid paperwork again, and therefore did not seek to confirm the planned movements of the tamper with anyone else. Based on witness evidence, RAIB believes this is the most plausible explanation for the day PICOP's actions.

70 As a result, she authorised the tamper to leave worksite B, did not organise the movement from the down fast to the up fast line, and subsequently provided incomplete information to the night PICOP that the tamper was at the PLBs ready to exit at the *'Balham end'* of the possession. The handover between the day and night PICOPs was not sufficiently detailed, the information was not repeated back, and an opportunity to identify the correct location of the tamper was missed.

71 **The tamper driver and conductor driver did not query the instructions provided by the day PICOP, resulting in the tamper not being crossed over onto the correct line.**

Tamper driver

72 The tamper driver had worked in the area before, but had no specific route knowledge. Colas had therefore supplied a conductor driver to conduct the tamper driver from the north (Balham) end of the possession to East Croydon sidings. The tamper driver assumed that the conductor driver had the necessary knowledge, and allowed the conductor driver to manage the communications with the day PICOP relating to the movement of the tamper. The tamper driver had experienced previous occasions when details on his train running document (showing the planned route) had been changed after arriving on site, so that the tamper left a possession via a different line or location. This resulted in the tamper driver being generally comfortable with not relying on the details shown in such documents. Witness evidence indicates that after the incident, the tamper driver did recall that the tamper was required to cross from the down to the up fast line via points 334, but for the reasons outlined above, he did not query or challenge what the conductor driver told him, and followed the instructions he was given.

Conductor driver

73 The conductor driver was aware of the role of the PICOP in the management of possessions, but on joining Colas he received no formal training, and had no previous experience, of working within a possession or with a PICOP. The conductor driver stated that he had received the roster and train running document but had not properly reviewed the details. The conductor driver's (correct) understanding was that a PICOP oversaw all train movements in a possession, and should therefore be fully aware of the line and location the tamper was travelling on. As a result, when the day PICOP instructed him to leave the worksite and travel to the PLBs he did not query or challenge the instruction he was given. Because of this reliance on the PICOP's instructions, the conductor driver's focus on his specific route knowledge (particularly the locations of the various signals on the route) within the possession was reduced, and as he did not refer to the train running documentation at that time, the opportunity to stop at the required location to cross over onto the up Brighton fast line was missed.

74 When the tamper arrived at the PLBs, there was an opportunity for its correct location to have been identified. The conductor driver's phone calls did not meet Network Rail's requirements for safety critical communications, as was evident from the recordings of his conversations with signallers 1 and 2, and when he received the instructions for the tamper to leave the possession (paragraphs 134 to 135). Although he evidently referred to the train running document during his conversation with signaller 2 (figure 11), he did not identify that the tamper had not been crossed over to the up Brighton fast line as planned. The conductor driver and tamper driver did not challenge the signallers, and followed the instructions they were given. However, the conductor driver could not explain why he did not notice signal VC 632 on the adjacent line or instruct the tamper driver to stop adjacent to it (figure 14). RAIB considers that this may have been because signal VC632 did not apply to the line that the tamper was on, and so the conductor driver did not consider that it was likely to be relevant to him.

Figure 14: View looking north towards Balham station, with signal VC 632 on the up Brighton fast line (left) and VC 634 on the up Brighton slow line (right)

75 **Signallers 1 and 2 did not query the instructions provided by the day or night PICOPs. This resulted in both signallers being unclear as to the correct location of the tamper and authorising the tamper to leave the possession on the wrong line.**

76 When signaller 1 was contacted by the conductor driver at 18:45 hrs, he did not make a note of the details provided during the conversation, and there was no requirement for him to do so. When the night PICOP contacted signaller 1, seven minutes later at 18:52 hrs, signaller 1 confirmed that he had previously spoken to the tamper driver (this was actually the conductor driver). Signaller 1 did not realise that the night PICOP then supplied details which directly contradicted the location and information that he had previously been given by the conductor driver.

Maintaining situation awareness

77 Network Rail's national operating procedures outline the competence and assessment framework for operating signalling equipment. Section 2 'Attention management' states that a signaller's awareness of the situation is derived from looking at the signalling displays and train running information systems. The signaller should continually be actively searching for information sources to construct an accurate picture of what is going on (for example, where the trains are and how the service is running), which is key to maintaining situation awareness.

78 To assist in maintaining good situation awareness, signallers are now trained to use a method known as the 'finger' test. This method involves the signaller using their finger to visually trace or follow the details on the display monitor or panel, to compare these with the details that are being provided by the person they are speaking to on the telephone, such as route, location and direction. The intention of using this suggested technique is to help ensure the audible and visual details being provided are identical. Witness evidence indicates that signallers 1 and 2 had both been trained to use this method, but they did not feel comfortable about using it in front of their colleagues.

79 Had signaller 1 or 2 used the 'finger test' during the conversations with the route conductor and night PICOP it is probable that they might have identified that the down Brighton fast line was occupied, and more importantly that the up Brighton fast line was unoccupied. However, when lines are under possession, what is shown on the display panel does not always accurately reflect the position of trains, due to the effects on the operation of the signalling equipment of the work itself, and/or train movements in the wrong direction. For this reason signallers become accustomed to getting this information verbally.

80 Later in his shift, signaller 1 did not identify the discrepancy in the verbal details that had been provided to him by the conductor driver and the night PICOP. The information available to signaller 1 could have enabled him to identify that the details he had been provided with must be incorrect. If the tamper had been *'south of Balham on the down fast'* at 18.45 hrs, it would not have then been able to travel south towards 334 points, cross over onto the up Brighton fast line and arrive back at the PLBs, as reported by the night PICOP at 18.52 hrs, all in seven minutes.

Handover process

81 This incident occurred shortly after a shift change in the signalling centre. At the beginning and end of each shift, and on occasions during a shift when a signaller needs to hand over their duties to another person, it is important that the outgoing signaller provides necessary information to enable their colleague to have a full picture of the situation at the time. The Rule Book, module TS1 section 1.3, says that the signaller going off duty must *'tell the signaller taking over what trains are in the section, whether the equipment is in order, and any other necessary information'.* Although it is not considered practical for a signaller to describe or outline to another signaller details of all the trains under their control during the handover process, the quality of the handover and the time taken to do it is important as it ensures both signallers have a good picture of what is going on.

82 When signaller 2 took over duty on panel 2, he was aware that signaller 1 had been talking to a PICOP, as he had heard the conversation when he arrived at around 18:52 hrs. However, the handover between signallers 1 and 2 was not effective. Signaller 1 did not have a clear understanding of the correct location of the tamper, the direction it was facing or the proposed route for it to leave the possession, but these details were not explored during the handover to signaller 2. It is possible that an effective handover (in conjunction with viewing and checking the indications on the signalling control panel) could have identified signaller 1's perception error.

83 During the investigation, RAIB compared the signaller's handover process used by Network Rail with the processes used in the aviation industry during handover between air traffic controllers. In that situation, the responsibility for the quality of the handover and information supplied lies with the controller vacating the desk. No physical checklist is required, and RAIB's observations show that the process is so well embedded within the cultural behaviour of all control room staff that the handover process appears an inherent part of the controllers' activities.

84 There is no such equivalent process within Network Rail's operational standards for signalling staff. Network Rail's guidance for staff relating to the handover process is within company standard NR/L3/OPS/045/2.06 Issue 2 'Competence standard and assessment framework for person operating signalling equipment'. Appendix B, section 2, under the heading of 'Typical Operator Behaviour', says that an operator '*takes time over the shift handover to make sure they have a good picture of what is going on before they take duty'.* The lack of any other guidance, or reference to this topic in company standards or training material, has resulted in a culture which allows handovers to be informal with no recognised structure, unlike air traffic controllers.

85 Witness evidence shows that the handover process within a signal box will depend on the signallers involved. There is no training or competence development for track and signalling maintenance staff, or operations staff who work in engineering projects, in performing an effective handover. Assessment of the ability of staff to undertake a comprehensive and effective handover process does not routinely form part of the management assessment of signallers' competence. Voice recordings and witness evidence show that had any of the handovers been effectively executed, it is highly probable that the correct location of the tamper would have been identified and the incident would have been prevented.

86 **The standard of safety critical communication throughout was well below that expected during safety critical communications, resulting in no party having a clear understanding of the location of the tamper or the actions to be taken.**

87 Several modules in the railway rule book refer to the use of safety critical communications. Rule Book Module G1 section 5.1 'Communicating clearly' states:

> *You must make sure you properly understand the meaning of all messages whether they are communicated by phone, radio or face-to-face.*
>
> *You must:*
>
> - *make sure you are talking to the right person*
> - *give your exact location, if you are using a phone or a radio*
> - *give your name and that of your employer*
> - *state what task you are carrying out*
> - *if necessary, let the person know how you can be contacted*
> - *use the phonetic alphabet to make sure names and locations that are difficult to pronounce are fully understood.*

88 RAIB's analysis of 33 voice recordings of conversations relating to this incident showed the following problems, under some of the headings used in railway industry training material for safety critical communications:

- Communications were not **A**ccurate, **B**rief, or **C**lear (ABC). Had this been the case, the day PICOP, ESA, COSS/PSA, night PICOP and signallers might have identified that the tamper had not been crossed over to the correct line, and errors in the information exchanged during the conversations might have been challenged or queried.
- **Leading the conversation.** The rule book is quite clear that signallers should lead the various conversations. It was not clear from the conversations RAIB has reviewed who was actually taking the lead. When a poor standard of communication was used by one party, the other party did not correct it, leading to both parties 'mirroring' the poor standard of communications.
- **Repeating back.** Analysis of the communications that were available showed very little repeating back of information to demonstrate that it had been correctly heard.
- **Don't be familiar**. During the communications staff were too familiar with each other. This inhibited the use of good safety critical communication, and reduced the ability of one or both parties to challenge each other when poor communication did occur.
- **Clear understanding**. Combinations of the above factors during conversations resulted in no 'contract' or 'handshake' of information being achieved. This led to neither party having a clear understanding of what actions had been agreed, and the opportunity to identify the correct location of the tamper and the unsafe events that were developing being missed.

89 Witness evidence and analysis of the voice recordings show that several witnesses involved in the incident felt embarrassed to use correct safety critical communication methods, both when conversing with colleagues they were familiar with and with members of staff they had not previously encountered.

90 RAIB's research found that the social inhibitors seen in this investigation were also prevalent within the aviation industry in earlier years. Following a number of accidents and incidents, that industry has since the 1990s adopted a new strategy, and developed its communication protocols. This resulted in a change in competence assessment, which was supported by a robust monitoring and enforcement regime. The aviation industry has worked to establish a culture in which standard protocols in communication are almost invariably used. Witness evidence indicates that for staff working in the operational and maintenance sectors of the aviation industry, not using appropriate safety critical communication methods is now seen as an abnormal practice.

91 RAIB's investigation identified that over the past twenty years standard safety critical communication has not been embedded as standard practice in the rail industry, and that this is due to a number of factors, including competence and training, monitoring and social and cultural issues. Several attempts have been made to enhance training and improve the standard of communications. However, RAIB's findings suggest that the standard of verbal safety communication is poor across the different sectors of the rail industry. They also point to a particular concern about the methods of communication adopted by infrastructure operations staff. It is clear that many staff have not adopted the necessary protocols, and that some staff still feel 'socially embarrassed' by using formal methods of communication.

92 **The PICOPs' working environment may have resulted in distraction and the loss of paperwork. This is a possible causal factor.**

93 Over the weekend on which this incident occurred, both PICOPs spent a significant proportion of the time working from their homes. The PICOP competence standards do not provide any clear guidance on where a PICOP should be located during a possession. The rail industry has created PICOP offices in several places to provide suitable facilities for managing possessions. Witness evidence indicates that Network Rail's expectation was that all PICOPs for possessions on the Sussex route would work from the office in Cover House where the environment was quiet, paperwork could be viewed and whiteboards could be used to assist the PICOP's understanding and situational awareness of the activities and train movements taking place within the possession, but no formal instructions to this effect had been issued. However, Vital staff had been told by Network Rail that they were not allowed to work at Cover House if no Network Rail staff were present, because of concerns about office security, and there is conflicting evidence about whether this was a factor in the day PICOP's decision to work at home on 20 April 2019. Witness evidence indicates that Vital managers had told the company's PICOPs that they could work in any location if it was free from distraction and enabled the PICOP to concentrate, although Vital has stated that this was not the company's official view. RAIB understands that the practice of PICOPs working from home was not uncommon.

94 Unless a PICOP has access to a properly equipped office at home, the working environment there is unlikely to provide them with the necessary facilities to effectively manage multiple train movements within a possession. If away from the office, a PICOP does not currently have access to information management systems that would allow documents to be retrieved (to prevent paper documents being lost or misplaced), or facilities to observe where the trains are located. The use of appropriate facilities and access to technology is important in allowing the PICOP to manage train movements in, out and within a possession. In the incident described in this report, suitable office facilities might have prevented the day PICOP from losing the train running documentation, and allowed both PICOPs to observe the position of the tamper and identify the discrepancies in the information being provided.

95 Analysis of the voice recordings shows that the PICOPs' working environment may have been inappropriate. Background noise from their home environments and while driving was apparent (see paragraph 121), and this may have resulted in distraction and may have inhibited the quality and content of the PICOPs' safety critical communications.

Identification of underlying factors

The management of contractors

96 Network Rail's oversight of the performance of contractors that it uses as PICOPs has been ineffective, and is a possible underlying factor.

97 In 2005 Network Rail identified that accidents involving a lack of competence among staff working on the track were still occurring, and it recognised that the role and competence of the PICOP (like the role of a signaller) was critical to ensuring the safe movement of trains within a possession.

98 Network Rail standard NR/CS/CTM/001 'Competence management' states that for people working in roles that affect operational safety, the individual's employer shall appoint a mentor who shall provide suitable[8] training and supervision. The initial period of mentoring shall not exceed four months unless the candidate is unable to fully meet the criteria of competence. Where additional time is required to fill knowledge or skills gaps, extensions to the period can be applied for if a development plan has been set up with the individual. Contractors must have a designated training manager, and safety briefings must take place. The employer should keep records of workplace experience that the individual has completed.

99 Network Rail standard NR/L2/CTM/021 'Competence and training in track safety' describes the training and competence management processes for a PICOP and senior PICOP. A person must hold a COSS or Individual Working Alone certification before applying for a PICOP role. Competence is achieved by passing both written assessments and on-site observations. A PICOP will then be mentored over a period of four months and will be re-assessed at least once every two years with an interim assessment being completed between nine and fifteen months after each assessment or reassessment. The competence for a PICOP is made up of two units:

- Unit 1: Provide safe and effective protection arrangements for a worksite; and
- Unit 2: Support safe and effective engineering activities for a worksite within the possession.

100 Each of the units is split into sub-categories listing the roles, responsibilities and behaviours expected of a PICOP. These sub-categories include the PICOP communicating in a clear and concise manner in accordance with relevant rules and protocols.

[8] Network Rail standards that relate to the role and responsibilities of a PICOP or Senior S(PICOP) are referenced in NR/CS/CTM/001 'Competence management', NR/L2/CTM/021 (Issue 4 – 2016) 'Competence and training in track safety', NR/L3/I N I/C P0064 'Delivery of work within possession' and NR/L3/OHS/019 'Planning and delivering safe work - Implementation principles for infrastructure Projects'.

101 In 2015 RAIB published a report on a class investigation into irregularities with protection arrangements during engineering work on the infrastructure (report 14/2015). One of the significant event categories identified in this investigation was incidents within a protected area, such as unauthorised train movements. In this report, RAIB recommended that Network Rail should develop an action plan to reduce the risk of irregular application of engineering protection arrangements. In February 2018, ORR reported to RAIB that this recommendation had been implemented, but the information supporting this statement does not include any mention of the role of the PICOP, and was focused on revisions to Network Rail's company standard covering the safety of people at work on or near the line, NR/L2/OHS/019.

102 In its response to RAIB's report on the fatal accident involving a track worker at Saxilby in 2012 (report 21/2013), Network Rail indicated an intention to move to a position in which people in safety leadership roles, such as PICOPs, would always be drawn from its own or its principal contractors' staff, and the use of agency labour in this role would cease. However, this has not happened, and the extensive use of agency staff has continued. Witness evidence indicates that one result of this is that Network Rail has been unable to effectively monitor and manage the application of the standards described in paragraphs 98 and 99 to the contractors who are supplied to act as PICOPs on Network Rail's infrastructure.

Competence management

103 **Network Rail and Vital's management of PICOP performance and competence was ineffective. This is a probable underlying factor.**

104 The competence of both the day and night PICOPs was managed by a Vital manager in conjunction with an accredited PICOP assessor. Documentary evidence shows that both PICOPs' training assessments were up to date, with no evidence of knowledge or training gaps having been identified, although no monitoring of performance had been taking place (see paragraph 105). However, witness evidence indicates that the day PICOP had been involved in two previous incidents in 2019 involving the loss of paperwork and mismanagement of trains entering a possession. These incidents had not been formally reported or investigated by Network Rail or Vital, although RAIB understands that a Vital manager had had an informal conversation with the day PICOP after being advised that an incident had taken place. No details were placed on the day PICOP's personal record or training file, as the Vital manager did not believe a development plan was necessary because the matter had not been formally reported.

105 In 2018 Vital introduced technology (an app), and implemented a policy of recording all calls on the mobile phones it supplied to its PICOPs for use in connection with their work. This would enable the company to download, review and debrief safety critical conversations, in accordance with its safety critical communications policy, to develop and improve the competence of its PICOPs. However, witness evidence shows that, prior to the incident, Vital's Farnham office did not have sufficient resources available to undertake this work effectively. Had an effective monitoring process been in place Vital would probably have identified that the standard of communications of both PICOPs was not to Network Rail standards, and taken action to improve the situation.

106 At the time of the incident three regions within Network Rail had adopted a similar process of recording PICOP communications, but the South East (Sussex route) had not adopted the process. Network Rail's standard NR/L2/OPS/033 'Mobile phone technology' will require all routes to have a mobile recording facility for PICOPs, ESs and SWLs involved in the management of a possession, by March 2020.

The management of safety critical communications

107 **The railway industry's strategy for improving and maintaining the standard of safety critical communications has been ineffective, and has not changed the work force culture or secured the adoption of good practice in respect of communications with and between infrastructure operations staff.**

108 During the late 1990s Railtrack's Operations Standards Subject Committee identified that poor safety critical communications was a significant primary cause of accidents. Railtrack decided that work should be undertaken to develop solutions and identify best practice. External consultants were commissioned to review voice communications from internal investigations and to look at the similarities and differences between the aviation and rail industries in the areas of training and enforcement of communications discipline.

109 In 1999 the Railway Safety Group (RSG), an ad-hoc group of safety professionals from Railtrack and train operators, recommended the introduction of a specific objective for the standard of communications, and a framework was developed and applied for all staff performing safety critical roles within the industry to use clear communications. After the guidance was published, the RSG was disbanded as it was believed the issues that were identified had now been addressed. However, in 2005 the RSG was reformed as further incidents involving communication errors had occurred, and actions from the recommendations made in 1999 had not actually led to a sufficient improvement in the standard of communications.

110 From 2006, Network Rail implemented a strategy for safety critical communications which identified that for the company to achieve long-lasting improvements, there needed to be a change in culture to make disciplined communication the normal practice, and for it to become unacceptable not to use the communications protocols. Network Rail has said that it recognised that any cultural change needed to be driven from the highest level of management and be cascaded throughout the organisation, to instil motivation and drive improvement in communication skills and good practice. However, funding for the training associated with this programme ceased in 2009. Since then, witness evidence suggests that a shortage of resources and frequent changes of management staff has resulted in little actual progress in this area.

111 In 2008, as a result of an incident at Haymarket in 2006 which was investigated by RAIB (report 03/2007, see paragraphs 131 and 132) Network Rail developed and circulated a briefing on effective safety critical communications and the management of trains entering and leaving possessions. The briefing was focused on Network Rail operational staff (such as signallers), but not on staff working on the track.

112 In 2012, Network Rail's Head of Operations identified several steps aimed at improving how Network Rail should manage, assess and develop its employees' ability to communicate safely and consistently. Changing culture was highlighted as a key issue and Network Rail concluded that it should focus on changing behaviours rather than reinforcing the plethora of current published guidance and protocols. Network Rail identified from the feedback provided by managers and staff that its internal process of reviewing, scoring and providing feedback on voice communications, which had mainly focused on those involving signallers and train drivers, had resulted in negative perceptions of the process. Witness evidence suggests that the focus of these reviews on what were perceived as superficial elements may have affected staff attitudes to improving the quality of safety critical communications.

113 The company also identified that its infrastructure maintenance and engineering projects staff and its contractors had had very little involvement in the company's strategy for change in this area, and any changes that were recommended should now include both operations and engineering safety teams to ensure a joined-up approach. Network Rail made a proposal in 2013 to RSSB[9] to create a new training strategy with support material aimed at all groups involved in using safety critical communication, across the industry. A series of workshops were held between October 2013 (internal to Network Rail) and March 2014 (involving contractors, freight and passenger train companies). The feedback from the workshops supported the proposal and led to the RSSB research project T1078 'Developing a safety critical communications training programme'.

114 In 2017 RSSB published 'Safety Critical Communications: The Manual', and an associated training programme began across the rail industry. However, during 2019 RSSB identified that the training workshops had been poorly attended, and commissioned external consultants to undertake research as to why. Witness evidence indicates that Network Rail managers believe that internal and external training providers may have the knowledge to brief the correct use of safe communications, but have little or no training or competence in how to change behaviours or culture, and this may be the reason why the managers were reluctant to send staff to the training workshops, and why the recommendations that have been made since 2005 have not led to any change occurring.

115 Several witnesses who were interviewed during RAIB's investigation believed that there has been little or no change in the rail industry's understanding of how to develop and change the culture, behaviour and competence of its staff in using safety critical communication. Witnesses reported that the main reasons for the apparent lack of progress were:

i. The large number of stakeholders (and roles) involved.

ii. Some stakeholders believed their internal training was already fit for purpose.

iii. Historically, Network Rail's initiatives have been primarily focused on communications between signallers and train drivers, and the development and assessment of non-technical skills for other operations staff has not been given the same priority, leading to a lower standard of communications.

[9] A not-for-profit company whose members are the companies in the railway industry. The company is registered as Rail Safety and Standards Board Ltd, but trades as RSSB.

iv. Network Rail's safety critical communications strategy has not been sustainable, with key individual 'champions' involved in communications projects being transferred onto other projects, resulting in very little continuity. The industry's communications initiatives, whether sponsored by Network Rail or RSSB, that have taken place have not been mandated, resulting in lower attendance figures.

v. Management of the safety critical communications review groups on the various Network Rail routes has been inconsistent. For example, Vital had never been invited, and other contractors were not routinely invited to Network Rail's South-East route communications review group.

vi. Although the use of GSM-R[10] radio technology in connection with possession management has been considered within Network Rail (such as by sending a text message to direct or confirm details of train movements previously agreed verbally) no further action has been proposed by the industry.

vii. A general perception among the signalling community was a belief that their professional competence and role within the company is not considered similar to that of a professional air traffic controller working within the aviation industry. Witnesses also said that there is little opportunity for signallers and other staff to practise communicating in a safe training environment.

viii. With devolution occurring within Network Rail (June 2019), witnesses believed there was less support for making a change, with no current central or route-based safety critical communications champion trained to support local managers. Staff also reported that there was inadequate time allocated to review, analyse and learn from local safety critical communications review groups and as such they were 'firefighting'.

116 Although, over the last twenty years, there have been a number of programmes to improve industry safety critical communications, no comprehensive strategy has been implemented by the industry to support the development and adoption of safety critical communications.

[10] Global System for Mobile Communications (Railway) (GSM-R) is the radio system used to communicate with trains on the GB national network.

Observations

The use of mobile phones

117 The day PICOP had transferred the SIM card from her work mobile phone to her personal phone.

118 Vital provided all its PICOPs with mobile phones which were equipped with a recording system, to enable voice recordings to be reviewed for the purposes of competence development and incident investigation. Witness evidence indicates that the day PICOP had removed the SIM card from the work mobile phone and put it in her personal phone. She stated that she had done this because of technical problems with the work phone, believing it would prevent further issues and the recording system would still function. She had not reported the technical problem to Vital. However, the removal of the SIM card disabled the voice recording technology, resulting in the day PICOP's conversations with other mobile phone users in the period leading up to the incident not being recorded, and Vital's difficulties in operating its review policy (paragraph 105) meant that this was not detected.

119 The RAIB investigation into the track worker fatality at Stoats Nest Junction on 6 November 2018 (report 07/2019) identified that PICOPs employed through Vital were using personal mobile phones to make work related calls. Although this was not among the causal factors in that accident, Vital had been advised of the practice in March 2018. Witness and documentary evidence indicates that Vital had not re-briefed its policy for PICOPs to always use their work mobile phones when making work-related calls, and electronic data gathered by RAIB shows the practice had continued after the November 2018 accident.

120 Staff involved in the incident used their mobile phones while driving road vehicles.

121 Evidence from mobile data technology and voice recordings also showed that several communications took place while one or both parties were driving motor vehicles. RAIB understands that although hands-free technology may have been used this is still contrary to Network Rail's policy as expressed in its 'Lifesaving rules', and is likely also to have affected the quality of the communications, since it is impossible to take notes or refer to documents or diagrams while driving.

'Ghosting'

122 The required checks to prevent 'ghosting' were not carried out.

123 The Stoats Nest investigation identified the practice of 'ghosting', in which PSAs were paid for shifts when they had not actually been present, with the assistance of other staff. This resulted in Network Rail and Vital HR instructing all PICOPs to check that both the COSS/possession support and the possession support assistant were present at the start and end of each shift. Both PICOPs were aware of this requirement, but did not follow these instructions over the weekend of the incident at Balham.

Forward-facing CCTV

124 No CCTV recording was available from the tamper.

125 The tamper's forward-facing CCTV system was corrupted, and the Colas maintenance system had not identified the failure before the incident. It is important that CCTV systems on rail vehicles are functional. As well as providing evidence for the investigation of incidents, on some types of machine these systems provide forward visibility for operators during movement of the machine in one or both directions.

Drugs and alcohol screening

126 No drugs and alcohol screening was undertaken after the incident.

127 Rail Industry Standard RIS-8070-TOM (issue 1, December 2016) 'Testing Railway Safety Critical Workers for Drugs and Alcohol' sets out the measures which infrastructure managers and railway undertakings need to take to comply with the requirements of the Transport and Works Act 1992.

128 After the incident was reported, Network Rail appointed a Local Operations Manager (LOM) to lead the local investigation into the incident. The LOM contacted the Victoria SSM and a Colas manager to gather voice communications and request reports from the staff involved. Although the SSM at Victoria did not have access to all of the voice communications and reports from the signallers, she advised the LOM that the signallers had not been involved in the tamper being authorised to leave the possession. The incident was initially categorised as a 'signal passed at danger', with reference to signal VC632, but as the tamper had not passed a signal applying to the line on which it was travelling, the incident was subsequently treated as an operational irregularity.

129 The Victoria SSM later updated the route control manager at Three Bridges, and although the seriousness of the near miss was identified, no further action was agreed and the LOM was not provided with an update. No formal policy decision on for-cause testing was agreed or recorded. Witness evidence shows that had the full facts of the incident been established screening would probably have been requested for some of the staff involved.

130 Since 2016 RAIB has investigated seven accidents and incidents where post-incident drugs and alcohol testing was not carried out in circumstances where it is arguable that it should have been undertaken, in view of the seriousness of the event.

Previous occurrences of a similar character

Unauthorised train movement and derailment, Haymarket, 14 January 2006 (report 03/2007)

131 During engineering work on the railway between Haymarket East Junction and Curriehill a train loaded with spent ballast left the section of line that was under engineers' possession without authority, and ran onto a line open to other traffic. On reaching Haymarket East Junction it was diverted onto a line on which a passenger train was approaching in the opposite direction. The ballast train stopped in Haymarket station when the driver realised that he was travelling on the wrong line. The passenger train was stopped by the action of the signaller.

132 As a result of the investigation RAIB made a recommendation to the Rail Safety and Standards Board (RSSB) to review the railway rule book modules to provide clarity in the requirements for the protection of possessions. Two recommendations were made to Network Rail to review the company's competence management system, with the aim of ensuring that PICOPs and signallers fully understand the relevant modules within the rule book, and to review possession planning arrangements so that they include a process for checking that the location and type of protection is compliant. All these recommendations have since been reported as implemented.

Class investigation into irregularities with protection arrangements during infrastructure engineering work (report 14/2015)

133 RAIB collected data over a two-year period relating to accidents and operating irregularities associated with the protection of those carrying out engineering work on Network Rail's infrastructure. This report described the analysis of this data, which showed that most of the identified operating irregularities were potentially harmful, and that their occurrence was neither infrequent nor reducing. The report then reviewed the various safety issues that would need to be addressed to prevent these events occurring and leading to harm. Two recommendations were made to Network Rail. The first related to the collection of information on events that are indicative of irregular working during infrastructure engineering work and how the lessons should be used to plan and deliver safe work initiatives. The second related to the development of an action plan to reduce the risk of irregular application of engineering protection arrangements by roles that were outside the scope of Network Rail's 'planning and delivering safe work' initiative (for instance a signaller and the PICOP). ORR has reported that the Network Rail response does not show that sufficient action has been taken to address the recommendations, and further engagement is ongoing.

Freight train collision near Logan, East Ayrshire, 1 August 2015 (report 13/2016)

134 During engineering work, a freight train travelling within a worksite collided with the rear of a stationary train at 28 mph (45 km/h). There were no injuries but the locomotive and eighteen wagons were derailed and damaged. The driver of the moving train had mistaken the position of the stationary train, and was driving too fast to be able to stop when it came into view. The driver had received instructions from an ES about the location of the work, but not the position of the train in front. This briefing was carried out over the phone, and the information conveyed was not properly written down by the driver.

135 As a result of the investigation RAIB recommended that, in the short term, the freight operating companies should produce a common form for issue to all freight train drivers to record the instructions briefed to them when making any movement into, within or out of a possession or worksite. It was also highlighted that this recommendation may also apply to other organisations who operate on-track machines in possessions and worksites.

136 The ORR reported to RAIB in March 2019 that this recommendation had been implemented. There is no evidence of such a form being used by the crew of the tamper at Balham.

Summary of conclusions

Immediate cause

137 The tamper came out of the possession on the wrong line, having not been crossed over to the correct line (paragraphs 64 to 65).

Causal factors

138 The causal factors were:

a. The day PICOP provided inaccurate information about the position of the tamper (paragraphs 67 to 70, **Recommendations 1, 3, and 4**);

b. The tamper driver and conductor driver did not query the instructions provided by the day PICOP (paragraphs 71 to 74, no recommendation);

c. Signallers 1 and 2 did not query the instructions provided by the night PICOP (paragraphs 75 to 85, see actions taken paragraph 143b, **Recommendations 1, 2, 3 and 4**);

d. The standard of safety critical communications throughout was well below that expected during safety critical communications, resulting in no party having a clear understanding of the location of the tamper or the actions to be taken (paragraphs 86 to 91, **Recommendation 1**); and

e. The PICOPs' working environment may have resulted in distraction and the loss of paperwork. This is a possible causal factor (paragraphs 92 to 95, see actions taken, paragraph 143b, **Recommendation 4**).

Underlying factors

139 The underlying factors were:

a. Network Rail's oversight of the performance of contractors that it uses as PICOPs has been ineffective, and is a possible underlying factor (paragraphs 96 to 102, **Recommendations 3 and 4**);

b. Network Rail and Vital's management of PICOP performance and competence was ineffective. This is a probable underlying factor (paragraphs 103 to 106, no recommendation, see actions taken, paragraphs 141i, 141ii, 141iv, 141v); and

c. The railway industry's strategy for improving and maintaining the standard of safety critical communications has been ineffective, and has not changed the work force culture or secured the adoption of good practice in respect of communications with and between infrastructure operations staff (paragraphs 107 to 116, **Recommendations 1 and 4**).

Additional observations

140 Although not linked to the accident on 20 April 2019, RAIB observes that:

a. The day PICOP had transferred the SIM card from her work mobile phone to her personal phone (no recommendation, see actions taken, paragraph 141i).

b. Staff involved in the incident used their mobile phones while driving road vehicles (no recommendation, **Learning point 2**).

c. The required checks to prevent 'ghosting' were not carried out (no recommendation, see actions taken, paragraph 141iii).

d. No CCTV recording was available from the tamper (no recommendation, see actions taken, paragraph 142).

e. No drugs and alcohol screening was undertaken after the incident (no recommendation, **Learning point 1**).

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

Vital Human Resources Ltd

141 Vital Human Resources Ltd reported that it has taken the following actions:

i. Suspended the day PICOP's competence while a training and competence development plan was set up. Both the day and night PICOP's were provided with a safety critical communication debrief and reminded of Vital's policy that all work-related calls must be made on work mobile phones.

ii. Reviewed its safety critical audit procedures to ensure all PICOP's communications are regularly reviewed.

iii. Re-briefed the company requirement for all PICOP's to check that both the COSS/possession support and the PSA are present at the start and end of each shift.

iv. Issued electronic devices (tablets) to PICOPs to store possession documentation to avoid the need for paperwork which may be lost or mislaid.

v. Introduced enhanced security measures on all mobile phones issued to PICOPs, to ensure SIM cards are not removed without a manager's authority.

Colas

142 Colas has reported that its maintenance process for the CCTV system on its on-track machines has been reviewed to ensure the system is being maintained to ensure it is functioning correctly. Colas has also introduced a training brief on possessions for all infrastructure maintenance drivers and conductor drivers to outline their area of responsibility when working within a possession. Colas has reported that it intends to make safety critical communications a key competence as part of its competence management system.

Network Rail

143 Network Rail has reported that it has taken the following actions:

a. Network Rail (Sussex) has re-briefed all PICOPs and senior PICOPs on the requirements of the rule book, and reiterated the requirement for the signaller to provide authority for engineering trains entering and leaving T3 possessions.

b. Signallers at Network Rail Victoria ASC were re-briefed on relevant sections of the rule book and when an engineering train comes under their authority. Network Rail (Sussex) also briefed its planners, delivery managers and contractors on the following:

i. A pre-possession briefing from the operations delivery manager will take place in advance of the planned possession and the briefing sheet will be signed as evidence;

ii. In the event of a late published possession, a brief will still take place by the operations delivery manager on duty (the briefing sheet will be signed);

iii. All PICOPs will work from the designated location for the entire length of their possession management, with Network Rail ensuring a manager remains in Cover House if a contractor needs to use the PICOP office;

iv. All handovers will be completed face to face at the designated locations, unless there is are exceptional circumstances with prior agreement with the operations delivery manager on duty; and

v. All paperwork will be returned after the shift (via email or left in the designated place).

c. Network Rail's standard NR/L2/OPS/033 'Mobile phone technology' requires all routes to have a mobile recording facility for PICOPs /ESs/SWLs involved in the management of a possession, by March 2020.

RSSB

144 RSSB has reported that it does not specifically record data related to safety critical communication incidents in the rail industry Safety Management Information System (SMIS). The system can only search communications as a possible cause, or when communication errors are mentioned in the narrative section when a report is entered for a railway operating or signal passed at danger incident. A SMIS form is currently under development and user acceptance testing of the new document started in December 2019. The proposed form will capture some or all of the following causes, although not all of them are mandatory:

- human performance (errors and intentional rule breaking);
- managerial factors (organisational weaknesses); and
- verbal communications (including sub categories for factors associated with no repeating back or not following protocols).

Recommendations and learning points

Recommendations

145 The following recommendations are made[11]:

1 *The intent of this recommendation is for Network Rail to develop a strategy to make the use of standard safety critical communications become embedded in practice.*

Network Rail should develop and implement a strategy to bring about significant improvements in the standard of verbal safety critical communications adopted by its staff and contractors. This should address training and competence in communication skills, and effective monitoring of safety critical communications, between its own staff and contractors as well as understanding the underlying social, cultural and behavioural factors that inhibited the use of effective communications in this incident. The strategy should aim to ensure that such communications become embedded in normal, everyday practice (paragraphs 138a, 138c, 138d, 139c).

2 *The intent of this recommendation is for Network Rail to develop a handover process that can be used by operational staff performing safety critical roles to improve shared situation awareness.*

Network Rail should review the process of handovers between signallers during and at the end of shifts, and develop a formal structure which will give the incoming signaller full awareness of all relevant information about the location and intended movement of trains and the wider operation of the railway in their area of control (paragraph 138c).

[11] 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.

3 *The intent of this recommendation is to improve the workplaces and equipment used by PICOPs, so that they work in locations and with facilities which give them the ability to manage the movement of trains and enhance their awareness of the situation during a possession.*

Network Rail should review its requirements for locations in which PICOPs are permitted to carry out their duties, so that they have adequate facilities, information and equipment to enable them to control train movements associated with possessions (paragraphs 138a, 138c, 139a).

4 *The intent of this recommendation is for Network Rail to review and improve its arrangements for managing the competence of PICOPs to ensure that they have the necessary skills to ensure the safe movement of trains within a possession.*

Network Rail should review its standards, process and arrangements for managing the competency requirements and ongoing professional development of people who control engineering possessions in which train movements take place. This review should cover, but not be limited to, decision making, team working and communications between PICOPs and other operations staff (paragraphs 138a, 138c, 138e, 139a, 139c).

Learning points

146 RAIB has identified the following important learning points[12]:

1 The incident highlights the importance, following an accident or incident, of fully considering the circumstances to establish whether 'for cause' testing should be undertaken, and on whom. This decision should be formally recorded (paragraph 140e).

2 In accordance with Network Rail policy, staff and contractors should not use mobile telephones while driving motor vehicles, even if hands-free equipment is available (paragraph 140b).

Appendices

Appendix A - Glossary of abbreviations and acronyms

ASC	Area signalling centre
CCTV	Closed circuit television
COSS	Controller of site safety
ES	Engineering supervisor
ESA	Engineering supervisor’s assistant
GSM-R	Global system for mobile communications (railway)
GTR	Govia Thameslink Railway
LOM	Local operations manager
PICOP	Person in charge of possession
PLB	Possession limit board
ROC	Rail Operations Centre
RSSB	Rail Safety & Standards Board
SMIS	Safety management information system
SPICOP	Senior person in charge of possession
SSM	Shift signalling manager
SWL	Safe work leader

Appendix B - Investigation details

RAIB used the following sources of evidence in this investigation:

- information provided by witnesses and associated mobile phone records and cell site data;
- possession management documentation;
- signaller occurrence documentation;
- information taken from the OTM on-train data recorder (OTDR);
- closed circuit television (CCTV) recordings taken from Balham station;
- site photographs, measurements and weather reports; and
- a review of previous RAIB investigations that had relevance to this incident.

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

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