



Rail Accident Investigation Branch

# Rail Accident Report



## Accident at Dalston Junction 30 March 2009

Department for  
**Transport**

Report 30/2009  
November 2009

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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# Accident at Dalston Junction, 30 March 2009

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## Preface

- 1 The sole purpose of a Rail Accident Investigation Branch (RAIB) investigation is to prevent future accidents and incidents and improve railway safety.
- 2 The RAIB does not establish blame, liability or carry out prosecutions.

## Key Definitions

- 3 Mileages are defined from a zero datum at the former Broad Street station. The 'up' direction is towards, and the 'down' direction is away from Camden Road West Junction.
- 4 Throughout the report, reference to the 'project' means the North London Railway Infrastructure Project, which was in progress at the time of the accident, being carried out by Carillion Rail under contract to Network Rail.
- 5 Appendices at the rear of this report contain the following:
  - abbreviations and acronyms, in Appendix A; and
  - the rules and standards applicable to the protection of staff working on or near the line, summarised in Appendix B.

## Summary of the Report

### Key facts about the accident

- 6 At 12:43 hrs on 30 March 2009 a passenger train from Richmond to Stratford, travelling at about 15 mph (25 km/h), struck a railway worker on the track at Dalston Junction, north London. The worker's role was to look out for approaching trains, and warn the rest of the group that he was working with. The track worker was struck on the head and thrown to the ground. He was taken to hospital, but was not seriously injured and has since made a full physical recovery.

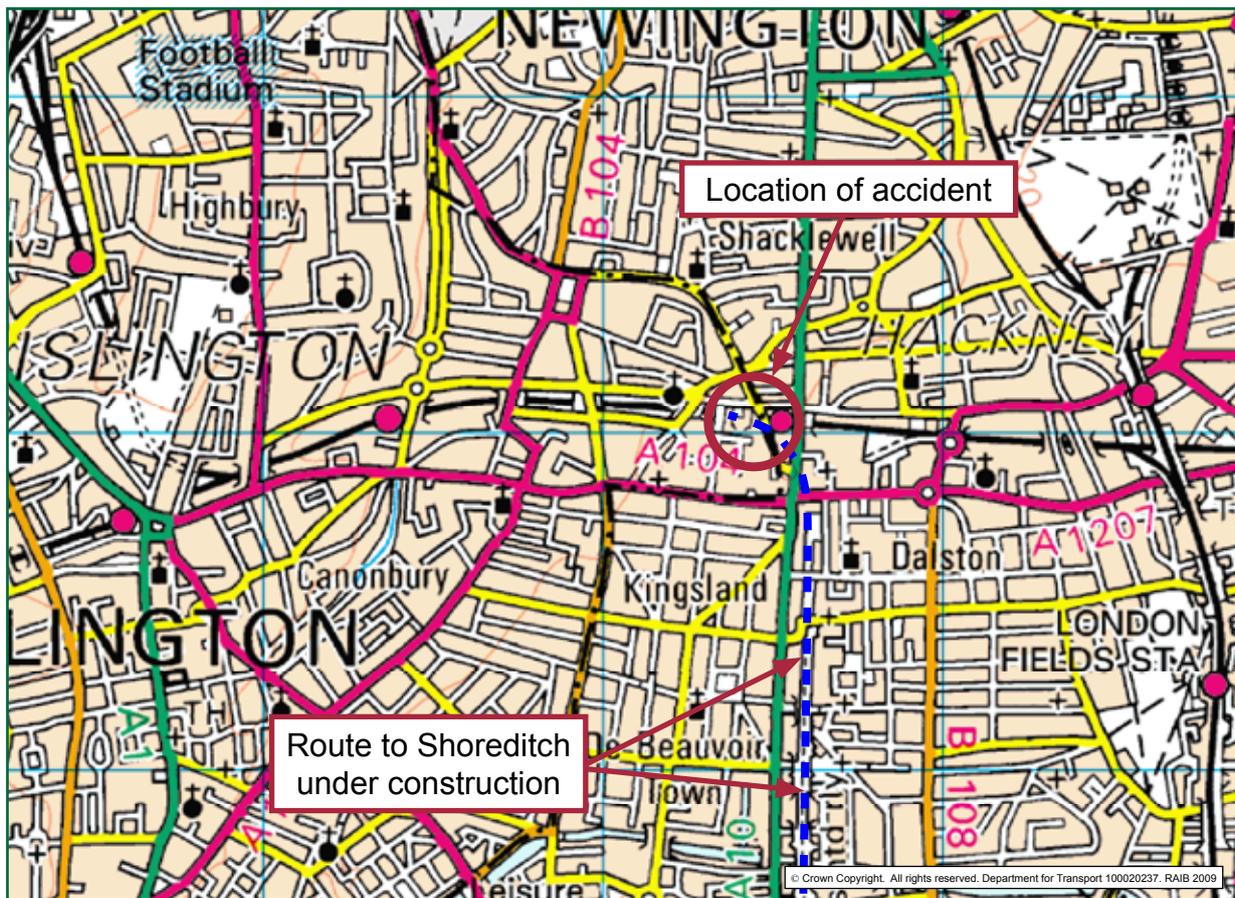


Figure 1: Extract from Ordnance Survey map showing location of accident

### Immediate cause, causal and contributory factors, underlying causes

- 7 The investigation found that the immediate cause of the accident was that the track worker did not react to the warnings sounded by the approaching train by moving clear of the line.
- 8 Probable causal factors were:
- the unfamiliarity of some of the workers with the area, and in particular the injured person's lack of knowledge that the four-track section ended at Dalston Junction; and
  - the planning of the work to take place while trains were running.

- 9 Contributory factors were :
  - a. the way in which the worker and his supervisor worked with each other during the inspection;
  - b. the lack of local knowledge of the staff involved in planning the work; and
  - c. the condition of the area alongside the track, and the consequent need for staff to walk on the line.
- 10 Underlying factors were:
  - a. deficiencies in Carillion's safety management system, in particular the way in which this project was managed in its early stages; and
  - b. the absence of clear guidance in the Rule Book about lookout duties around junctions.

### Management of track worker safety

- 11 This investigation has found that there were a number of causal factors related to the planning and organisation of work activities on or near the line. The RAIB and Network Rail have investigated other accidents in which this has been a factor, and have made recommendations to address these factors. As these recommendations are still under consideration by Network Rail, this report does not make further general recommendations in this area, but does make specific recommendations to the companies involved with the work being done at Dalston.

### Recommendations

- 12 Recommendations can be found in paragraph 162. They relate to the following areas:
  - review of Carillion's processes for the safety management of projects;
  - revision of arrangements to enable people involved in planning and supervising work on the track to become familiar with areas in which they are to work; and
  - revision of the safety management system used on the North London Railway Infrastructure Project.

## The Accident

### Summary of the accident

- 13 At 12:43 hrs on 30 March 2009 the 11:57 hrs passenger train from Richmond to Stratford (Low Level), train 2N54, travelling at about 15 mph (25 km/h), struck a track worker who was acting as a lookout (a person whose only duties are to watch for approaching trains and give warning of them to other workers) for a group of workers undertaking inspection of the lineside areas, at Dalston Junction on the North London Line.
- 14 The track worker was struck on the head and thrown to the ground. He was taken to hospital and found to have sustained cuts and bruises, but he was not seriously injured.

### The parties involved

- 15 Network Rail, East Anglia Route, owns and operates the railway infrastructure. At the time of the accident, Carillion Rail (Carillion), a business unit of Carillion Construction Ltd, as principal contractor was in the early stages of the North London Railway Infrastructure Project (referred to as 'the project' in the rest of this report), a contract to renew and upgrade the infrastructure in the area. Network Rail was the client for this project.
- 16 London Overground Rail Operations Ltd (LOROL) operated the train that was involved, and the train crew were LOROL employees.
- 17 The track worker who was struck worked for SkyBlue Rail (SkyBlue), part of Carillion. The other members of the work gang were also employed by, or under contract to, Carillion and SkyBlue.
- 18 Network Rail, LOROL, SkyBlue and Carillion freely co-operated with the investigation.

### Location

- 19 The North London Line is an orbital route which runs from Richmond to Stratford via Willesden Junction, Camden Road and Dalston. It carries an intense service of both passenger and freight trains.
- 20 At Dalston Junction the North London Line runs in an east-west direction, and is in a deep cutting (Figure 3). There are four tracks west of the junction, and two tracks to the east. This location was formerly known as Dalston Western Junction, and before its closure in 1986 a route diverged from the east-west line towards the south and ran through Shoreditch to terminate at Broad Street station. Work began in 2007 to reinstate part of this route as a section of the East London Line extension project. At the time of the accident there were large quantities of construction materials on the formation of the former route towards Shoreditch just beyond the site of the junction.

21 On the day of the accident the group involved had carried out an inspection along the line from Camden Road station, about three miles (5 km) from Dalston. At this point, at the time of the accident, the North London Line was double track, although the whole of this section of the railway had once had four tracks and the width of the infrastructure still reflected this. A diagram of the tracks on this section appears at Figure 2. In 2009, four tracks began about a quarter-mile (400 metres) to the east at Camden Road East Junction where the freight lines, known as the number one lines, diverged to the north, and ran alongside the passenger lines (the number two lines) for three-quarters of a mile (1.2 km) to Barnsbury Junction, where the number one lines converged into a single bi-directional line. Three tracks continued from this point for 1¼ miles (2 km) to Canonbury East Junction, where the number one lines became double for the half-mile (800 metres) to Dalston Junction, with Dalston Kingsland station a quarter-mile (400 metres) further on. In the route between Camden Road and Dalston there were also junctions with lines on both sides.

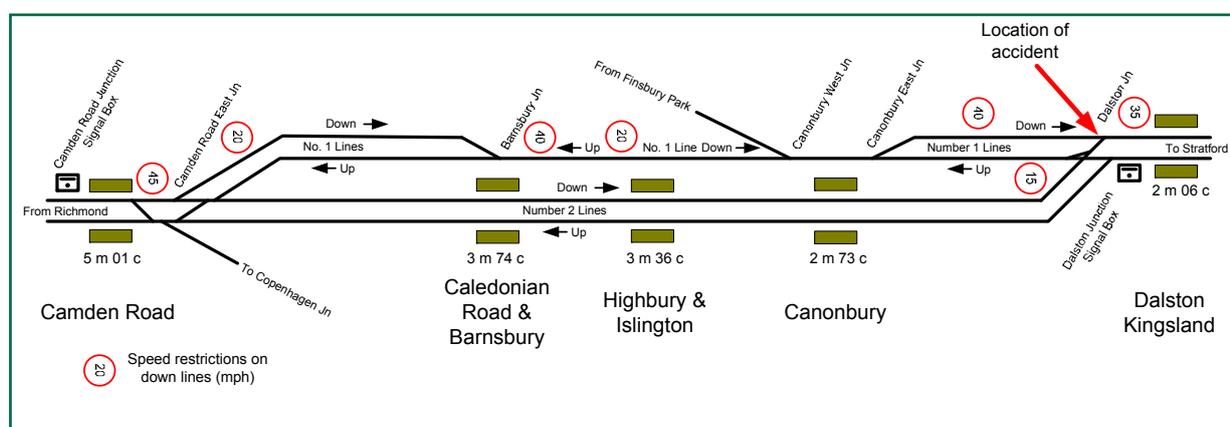


Figure 2: Diagram of tracks, Camden Road – Dalston

- 22 Permitted speeds in the area were 45 mph (72 km/h) on the passenger lines, known as the number two lines, in both directions from Camden Road to Dalston, reducing to 15 mph (25 km/h) through Dalston Junction. In the down direction on the number one line, the permitted speed was 20 mph (32 km/h) between Highbury & Islington and Canonbury, increasing to 40 mph (64 km/h) a quarter of a mile (400 m) before Dalston Junction, and this speed applied through the junction and as far as the signal box, where the permitted speed reduced to 35 mph (56 km/h) towards Dalston Kingsland station, 100 metres further east. These speed limits are shown in Figure 2.
- 23 A more detailed plan of the location at which the accident occurred is shown in Figure 3. At the time of the accident the number one lines, on the north side of the formation, were used by freight trains, and were electrified on the 25 kV alternating current overhead line system. The number two lines, on the south side, were mainly used by passenger trains and were electrified on the 750 V direct current conductor rail system. East of the junction, the double track line towards Stratford was electrified on both systems.

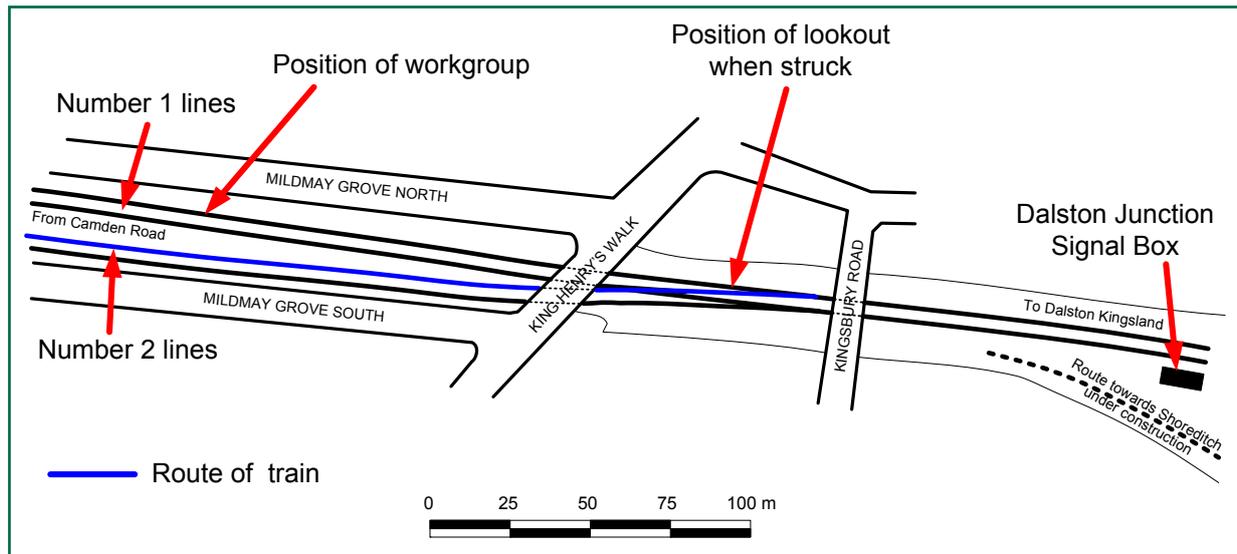


Figure 3: Plan of Dalston Junction area

- 24 Signalling in the area used colour light signals controlled from Dalston Junction signal box, located on the south side of the line 100 metres east of the junction.

### External circumstances

- 25 The weather at the time was fine and sunny, and had no bearing on the accident.

### The train

- 26 The 11:57 hrs train from Richmond to Stratford (reporting number 2N54) was a 3-coach class 313 electric multiple unit. At the time of the accident this type of train was used for all the passenger services on this route.
- 27 The train was equipped with an on-train data recorder (OTDR) monitoring (among other parameters) the train's speed and the driver's use of the traction and brake controls and the warning horn, and also with a forward facing CCTV camera. Both of these systems were active at the time of the accident.

### Events preceding the accident

- 28 A group of Carillion and SkyBlue staff assembled by arrangement at Camden Road station about 09:00 hrs on the morning of Monday 30 March. Their work that day was to inspect and assess the extent of infestation of Japanese knotweed (*Fallopia japonica*), an invasive perennial plant, and to inspect track and structures, as part of scoping works for the project. This inspection concentrated on the north side of the railway, and was intended to cover the route as far as Dalston Kingsland station.

- 29 There were six people initially in the work group, three of whom would be carrying out the inspection work. The other three consisted of a Controller of Site Safety (COSS<sup>1</sup>) and two lookouts. The COSS briefed the lookouts, and then explained to the other members of the group that the work would be taking place under Red Zone conditions, ie while trains were running (see Appendix B). He told the group that there would be two lookouts, and described where the group would be working, and how the lookouts would warn them of approaching trains.
- 30 The COSS briefed the group that the position of safety (where they would be safe from being struck by passing trains), which they should go to when warned by the lookouts, would be the cess on the down (north) side of the line. The cess is the part of the lineside area, outside the edge of the track itself, that should be maintained at a lower level than the track to aid drainage, and sometimes provides a path and a position of safety for people working on the track.
- 31 The group set out eastwards, walking on the northern side of the route, mostly in the cess, although vegetation, litter and items of fixed equipment sometimes forced them to walk on the track nearest the cess. Figure 6 shows the cess in the area where the accident occurred.
- 32 The group reached Highbury & Islington station, where (by prior arrangement) they were joined by three other Carillion staff. The COSS briefed the new arrivals, and the group continued with the inspection. At Canonbury station, two of the people who had joined at Highbury left the group, as previously planned.
- 33 The group, now consisting of seven people, continued from Canonbury towards Dalston. One of the lookouts was walking ahead, while the other remained with the group. As they approached Dalston Junction the first lookout was about 150 metres ahead of the group.
- 34 The 11:57 hrs train from Richmond to Stratford (train 2N54) had begun its journey on time, and left Camden Road on the down line at 12:33 hrs. It was crewed by a driver-instructor, a trainee driver (who was driving) and a guard. At Camden Road East Junction it was routed onto the down number two line. The train called at Caledonian Road, Highbury and Canonbury stations, and was running at 40 mph as it passed through the disused Mildmay Park station, 300 metres from Dalston Junction.

## Events during the accident

- 35 The OTDR indicates that the driver of train 2N54 applied the brakes to reduce the train's speed as it approached Dalston Junction, preparing to observe the 15 mph speed restriction through the junction. As he did so, he saw the group walking beside and on the down number one line, and sounded the horn. At least three members of the group acknowledged the warning by raising one arm above shoulder level as the train overtook them.

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<sup>1</sup> A COSS is a person who holds the safety critical qualification of the same name which demonstrates their competency to arrange and supervise a safe system of work for a group (two or more) of people working on or near the railway.

- 36 The train's speed was reduced to 15 mph about 20 seconds before it reached the junction. The train driver observed the lookout walking ahead of the group, and sounded the horn again, 14 seconds before reaching the junction. The lookout probably acknowledged the warning and continued to walk along the four-foot (the area between the rails) of the down number one line towards the junction (Figure 4). The train driver sounded the horn again about three seconds before the train crossed the junction, but the lookout did not move clear and the left-hand front corner of the train cab struck him on the back of the head.



Figure 4: View from the train, about two seconds before the accident

- 37 The train driver applied the emergency brake at or just before the moment of impact, and the train stopped about one and a half carriage lengths (30 metres) past the point where the lookout had been struck.

### Consequences of the accident

- 38 The lookout was thrown to his left, and landed in the cess clear of the line. He was struck on the head, and sustained cuts and bruises. He appears to have since made a full recovery.
- 39 There was minor damage to the front of the train (Figure 5). No-one on the train was hurt.



Figure 5: Damage to the front of unit 313119

### Events following the accident

- 40 The other members of the inspection group saw the lookout lying on the ground, and ran to the scene of the accident. They gave first aid to the injured man.
- 41 The train driver called the emergency services, who treated the casualty on site. The location of the accident was not accessible by ambulance, and so after treatment the casualty was lifted onto the train, which was then moved into Dalston Kingsland station. From there he was taken to hospital.
- 42 The accident occurred at 12:43 hrs. The train was moved into Dalston Kingsland station at 13:50 hrs. After the injured lookout had been removed, the train was taken out of service, and returned to Willesden maintenance depot, where it was examined by the RAIB and electronic evidence (from the forward facing closed circuit television (FFCCTV) cameras and data recorder fitted to the train) was retrieved. Normal services on the North London Line resumed at 14:16 hrs.

## The Investigation

### Sources of evidence

- 43 The RAIB's investigation has considered evidence from:
- the OTDR and FFCCTV from the train;
  - interviews with witnesses;
  - examination of the train; and
  - documents obtained from Carillion and Network Rail.

## Key Information

### Working on the track- background

- 44 The rate of fatal and serious injuries to track workers has steadily decreased over the last 60 years. At the time of the nationalisation of the railways in 1948, there were over one hundred and fifty staff deaths per year, and this rate has now declined to low single figures. However, track workers are still subject to levels of risk well in excess of the average for all workers in the railway industry. A detailed analysis of the risk profile appeared in the RAIB's report into the track worker fatality at Ruscombe Junction on 29 April 2007 (report number 04/2008). The RSSB's Annual Safety Performance Report for 2008<sup>2</sup> shows that for track workers, the number of fatalities and weighted injuries<sup>3</sup> increased from 9.7 in 2006 to 11.4 in 2008, a rise of 17.5%. This is largely accounted for by the four fatal accidents to track workers that have occurred in 2007 and 2008: there were no fatal accidents in 2006.
- 45 Since 1994 there have been 20 track workers struck and killed by trains, as well as accidents in which workers have been seriously injured. Twelve of the fatal accidents involved staff who were working or walking on or near the line while trains were running, while the other eight occurred during periods when the railway was closed for engineering work.
- 46 The rules and standards applicable to work on the track are described in Appendix B.

### The North London Railway Infrastructure Project ('the project')

- 47 This project is intended to improve capacity on the busy North London Line from Stratford to Willesden Junction (and from Gospel Oak to Barking), involving resignalling, additional tracks, and extensions to station platforms. It is linked to the extension of the former London Underground East London Line from Shoreditch to Highbury and Islington, taking over part of the formation of the North London Line on this section.
- 48 Work package 3 of the project covers the provision of four tracks from Dalston Western Junction to Camden Road West Junction. There were four tracks on this section until the 1980s, when some of it was reduced to three tracks (paragraph 21 and Figure 3).
- 49 The work includes increasing clearances on the route (to allow larger containers to be carried on freight trains) by lowering the track beneath bridges; repairs to retaining walls and other structures; provision of new track; upgrading of four stations, and renewal of a bridge. This package was intended to take twelve months, starting in April 2009.
- 50 Carillion tendered for the works on the whole project during 2008. The company was notified of its preferred bidder status on 24 December 2008, and a letter of intent was issued on 12 January 2009.

<sup>2</sup> Available at <http://www.rssb.co.uk/pdf/reports/ASPR%202008.pdf>.

<sup>3</sup> RSSB's Annual Safety Performance Report looks at the risk in terms of fatalities, injuries and shock and trauma. Injuries are categorised according to their seriousness. Fatalities, injuries, shock and trauma are combined into a single figure, termed fatalities and weighted injuries. In arriving at this figure, 10 major injuries, and 200 reportable minor injuries are considered to be equivalent to one fatality. Details of the weighting given to other injuries, and trauma, can be found on page 2 of the report.

### Project construction health and safety plan

- 51 Carillion prepared a health and safety plan for the early works on the project, covering the period from 6 February to 6 April 2009 (Carillion document NLCIW/ALL/HSEA/PLAN/001). This stipulated that only suitably trained and qualified personnel would be used on the project, that line managers would identify safety training requirements, and that sub contractors should maintain training records for their staff.
- 52 The plan was supported by Carillion's health and safety procedures, including CI/RAIL/HSSQ/PRO/13-21 'Safety of People Working On or Near the Railway'. This document is intended to describe 'how to ensure risk to Carillion Rail staff and sub-contractors from trains, whilst working on Network Rail controlled infrastructure, is minimised'. The document appears to consist of a number of unlinked extracts from the Network Rail document with the same title (NR/L2/OHS/019), some of which refer to a flow chart which is reproduced at the back of the document in a low-resolution form which cannot be read when printed. This chart makes reference to the Network Rail Green Zone Access Co-ordinator (GZAC), who deals with requests from Network Rail departments and contractors for track access which requires lines to be blocked to traffic. The Carillion employee who was responsible for planning the work did not apply to the GZAC for Green Zone access for any work on the North London line in daylight because he believed that this would be refused, for the reasons explained in paragraphs 63 to 66.

### Scoping inspection

- 53 The main phase of work was due to begin in mid-April, but before this could take place some preparatory work, inspection and assessment of the scope of works was required. A particular issue was the presence of Japanese knotweed on the lineside in a number of locations between Camden Road and Dalston.
- 54 This plant is invasive, spreads very rapidly, and is very difficult to eradicate. Its presence was identified before the start of the contract, and Carillion requested that Network Rail take steps to control it. However, Network Rail decided that eradication of knotweed should be included within the project, and varied the contract accordingly.
- 55 It was therefore necessary for Carillion to establish exactly where knotweed was present, and arrange for specialist contractors to eradicate it. At the end of February, the lead track engineer for work package 3 began to make arrangements for an inspection of the north side of the formation between Camden Road and Dalston to identify the locations where knotweed was present and the volume of work that would be needed to remove it.
- 56 An engineer who was responsible for dealing with vegetation in work package 3 was required to be present at the inspection, and the track engineer was given a date for the inspection to be done based on when this person would be available. This was on a weekday, during daylight. It was necessary to carry out the inspection during daylight: identification and assessment of the extent of infestation after dark is not practicable.

57 The track engineer had been told by his superior, the delivery manager for the project, that it was not possible to carry out work on the line under Green Zone conditions (ie on a line that was not open for the passage of trains - see Appendix B) because the route was too busy, nor was it possible to do the survey from outside the railway boundary. He put in a request to the project's work planning department for a plan that would enable the inspection to be done under Red Zone conditions (ie with trains running). The request indicated that access to all four lines was required, although the intention was only to inspect on one side of the track. The planning department ordered protection staff, ie a COSS and two lookouts.

#### Labour sourcing

- 58 Carillion proposed to use their own agency, SkyBlue Rail, to provide the protection staff for work on the track in the early stages of the project. SkyBlue Rail is based in Wolverhampton, with four regional offices, and had recruited many staff from the West Midlands and Yorkshire areas.
- 59 In the early stages of the project, SkyBlue supplied protection staff who were not from the London area, and who had to travel from other parts of the country each day before beginning work. The director of the project became aware of this during March 2009, and asked for the practice to cease and for SkyBlue to supply local labour. This was because, although the use of local labour would not necessarily have produced people who were familiar with the sections of line included in the project, it would have reduced the travelling time to and from work for staff. Carillion and SkyBlue have a policy which limits staff's 'door to door' time for a shift (working time plus travelling time to and from home) to fourteen hours, so any reduction in travelling time would increase the amount of productive time available, and also increase the opportunity to provide briefing and familiarisation before the start of work.
- 60 SkyBlue were unable to meet this demand immediately, and asked to be allowed to phase in local staff as they were recruited. The accident on 30 March occurred while this process was taking place.
- 61 The request for a COSS and two lookouts for an inspection on 30 March came to the Birmingham office of SkyBlue. The clerical staff selected the individuals for this task on the basis that they were available, had the appropriate certification, and would be compliant with Carillion's and Network Rail's guidelines on hours worked and rest time between shifts.
- 62 The COSS and lookouts were picked up at the SkyBlue offices at 06:00 hrs on 30 March and were taken by company transport to London.

#### Availability of Green Zones

- 63 Network Rail maintains an online system for applications for work in Green Zones, which require lines to be blocked to trains. Supporting this, also online, is the Green Zone Guide. This publication indicates the length of time that a Green Zone is likely to be available for working on each section of line throughout the day.

- 64 For the section from Camden Road West to Dalston Junction the Green Zone Guide indicates that there are no periods for Green Zone working available throughout the daylight hours on the number two lines longer than 20 minutes. A planner, seeing this, should understand it to mean that there is in practice no opportunity for Green Zone working on these lines during daylight, because even a twenty-minute window is not appropriate for mobile inspection work. This sort of window could only be used, for instance, by staff who needed a short time between trains to pass through a bridge with restricted clearance.
- 65 The number one lines, used only by freight trains, are not heavily trafficked during the day and, according to the Green Zone Guide, offer at least 20 minutes and sometimes up to 1 hour periods for Green Zone access for most of the day. These were the lines on or near which the inspection team would be working.
- 66 However, Network Rail staff used the information about the number two lines when discussing the opportunities for Green Zone working with Carillion, to avoid creating unrealistic expectations since the most restrictive conditions were on these lines. The Carillion track engineer and planner, who were not familiar with the Green Zone Guide, accepted what they were told about the non-availability of Green Zones as applying to the whole of the North London line and, because they needed daylight for the inspection work, planned to do it in Red Zones.

### Work Planning

- 67 Each piece of work that requires staff to go on or near the line must be planned in accordance with the process defined in the Network Rail document NR/L2/OHS/019 'Safety of people working on or near the railway' (Appendix B, paragraph B12). This is known as 'Rimini planning', from the acronym used when the concept of **risk minimisation** was introduced to the railway in 2002. The process requires that, in normal circumstances, the safe system of work to be used when working on the track when the engineering departments do not have possession of the line should be 'planned by a person who has been assessed and certified as competent in Core Planner Skills'. They should also have good local knowledge, or direct access to information about local features and hazards.
- 68 Carillion had recruited a member of staff as assistant Rimini planner for the project. He took up his post at the beginning of March 2009. He had ten years experience as a track worker, and had recently qualified as a COSS and successfully completed a course in core planning skills for on-track works. He had not worked as a COSS before joining the project.
- 69 The assistant Rimini planner had a large number of requests for work plans during March 2009 as the project got under way. He had had no opportunity to visit the line (other than as a train passenger) or otherwise familiarise himself with the area that he was making plans for, and had to rely on his own interpretation of the information in the documents that he was provided with. These were the Network Rail Sectional Appendix and Hazard Directory covering the North London line. The Sectional Appendix describes the details of the railway infrastructure including the track layout, permitted speeds, signalling system and electrical arrangements. The Hazard Directory is a compendium of information on each line, including buried services, areas where Red Zone working is not permitted, and other site-specific hazards.

- 70 The assistant Rimini planner prepared a pack of documents for the COSS for the inspection. This included:
- pre-completed forms describing the selection of the system of work;
  - a 'record of arrangements' form partially completed (for the COSS to complete on site with the names of the work party and other details);
  - an extract from the Network Rail Hazard Directory for the section of line covered by the inspection; and
  - the relevant pages from the Sectional Appendix for the lines covered by the inspection, including diagrams showing the track layout and permitted speeds.
- 71 This pack consisted of nine sheets of paper. It contained a great deal of information which could be very valuable to the COSS for the work, if that person had time to study it and extract the items that would be important to the work group.
- 72 The assistant Rimini planner passed the pack to his line manager, the Carillion planning manager for the project, for checking. The planning manager, who at the time was also unfamiliar with the North London Line, reviewed the pack and signed it off. He then sent the pack to the people who had requested it: the track engineer and the health, safety and environment adviser for the project, but, due to an oversight, it was not, at this stage, sent to the person who was due to act as COSS for the work.

#### Briefing and instruction

- 73 The health, safety and environment adviser brought a copy of the Rimini pack to Camden Road on 30 March and handed it to the COSS. This was the first time the COSS had seen the pack, and he had about five minutes to look over it before the final members of the party arrived on site.
- 74 The COSS briefed the other members of the party, as described in paragraph 28. People who regularly go on or near the line in a Red Zone are required by Rule Book to be trained and certified in personal track safety (PTS), the basic certification for track work. All of the party had PTS certificates except for the engineer dealing with vegetation, who had been provided with a track visitor's permit. These are issued to people who do not go on or near the line often enough to justify their undergoing training and obtaining the PTS qualification. The COSS was responsible for the safety of the whole party, but he paid special attention to the track visitor's permit holder, who was less familiar with the railway environment.

#### Competence and fitness

- 75 The COSS had worked for SkyBlue for long periods over the last four years, acting all that time in the COSS role. Before that, he had worked part-time on the railway as a track worker, mainly at weekends, for five years. He was certified as a COSS and lookout, and had other competencies relating to track work and protection duties.
- 76 The COSS had not worked on the two days before the accident, and there is no evidence to suggest that he was not adequately rested.

- 77 The lookout who was injured had eight years railway experience, and had been qualified as a lookout for most of that time. He was a track worker, but because of his age (55) he was usually given light duties, such as lookout, rather than heavy labouring. He had worked all over the country, most recently on contract to Network Rail in the Banbury area, acting as lookout for track inspection (patrolling) gangs. This was similar to the work that he was doing on 30 March.
- 78 The lookout had worked on the Monday, Wednesday and Saturday and had not worked on the Sunday before the accident (which was on a Monday). There is no evidence to suggest that he was not adequately rested.
- 79 All the uninjured members of the group were tested for drugs and alcohol following the accident, in accordance with routine industry practice, and were found to be clear of these substances. The lookout, who was taken to hospital, was not tested for drugs and alcohol until some days after the accident.

### Train operation

- 80 The train was being driven by a trainee driver, under the supervision of an instructor-driver. This was a normal part of the driver training process: trainees on LOROL are expected to complete 230 hours of supervised practical handling of trains during their training, including 140 hours on the core route that they will be driving on, before they are allowed to progress to the next stage and qualify as drivers.
- 81 The trainee driver had begun his practical handling training in October 2008, and by 30 March he had completed over 200 hours. He and his instructor began the day at 07:00 hrs at Watford, and drove on the Watford to Euston line before switching to the North London Line after a break at Willesden Junction in mid-morning. He drove from Willesden to Richmond, and then began the return journey at 11:57 hrs. The journey was uneventful as far as Canonbury.
- 82 After leaving Canonbury station, running under clear signals, the trainee driver saw the work group on the number one lines ahead and sounded the horn, although he realised that the group were not on the same line as his train. The CCTV shows that some of the group acknowledged the warning horn by raising their arms in accordance with the Rule Book. They did not move off the line on which they were walking, because they were already clear of the line on which the train was approaching.
- 83 The driver reduced the speed of the train before reaching the beginning of the 15 mph speed restriction, and as he did so he saw the lone lookout ahead of the main group. He sounded the horn again and saw the lookout acknowledge this warning and turn his head to look towards the train (the instructor-driver saw the acknowledgement, but does not recall seeing the lookout turn his head). However, the lookout continued to walk along the down number one line. The driver sounded the horn for a third time and expected the lookout to stop walking or move clear of the track at any moment, and when he realised that this was not going to happen he applied the brake fully. Information from the data recorder fitted to the train suggests that the brake was applied between one and two seconds before the train struck the lookout. The time between the operation of the brake control and the brakes taking effect (the build-up time), is about two seconds on this type of train.

- 84 The train came to a stop in 6.5 seconds, about 22 metres after the brakes took effect, and about 30 metres past the point of impact.

### Previous occurrences of a similar character

- 85 Instances of track workers being struck by a train have steadily reduced for the whole period since privatisation of the railway system in 1994-96, but continue to occur. Since the RAIB became operational in October 2005, it has investigated fatal accidents of this type at Trafford Park, Manchester on 26 October 2005 (report 16/2006<sup>4</sup>), Ruscombe Junction, Twyford on 29 April 2007 (report 04/2008), and Reading on 29 November 2007 (report 21/2008), Non-fatal accidents, in which track workers have been struck by a train and injured, have occurred at Leatherhead on 29 August 2007 (report 19/2008), Grosvenor Bridge, London on 13 November 2007 (report 19/2009), Stevenage on 7 December 2008 (report 23/2009), and Kennington Junction, Oxford on 23 May 2008 (report 29/2009), with near-misses at Manor Park on 19 March 2006 (report 26/2007), Tinsley Green on 17 March 2007 (report 43/2007) and Acton on 24 June 2008 (report 15/2009).
- 86 Relevant recommendations made by the RAIB following these investigations are at paragraph 161.
- 87 The most recent fatal accidents to lookouts occurred at Purley Oaks on 18 June 2001 and Newbridge Junction, Ratho, Scotland on 5 April 2005. Both of these took place before the RAIB became operational.
- 88 A common feature of both these two accidents is that the victims were struck when they were standing in positions which none of the other members of their work group, particularly the COSS, expected them to be in.
- 89 The investigation of the Newbridge Junction accident by the Rail Safety & Standards Board (RSSB) resulted in a recommendation that RSSB should undertake a research study to review the impact which lack of local geographic knowledge has on the ability to plan effectively and carry out work safely. This recommendation was the subject of discussion between RSSB and Network Rail, and was subsequently reassigned to Network Rail. This was done because Network Rail considered that this matter was within its direct control and that it had internal action plans in place to deal with any problems.

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<sup>4</sup> All reports produced by the RAIB can be found at [www.raib.gov.uk](http://www.raib.gov.uk).

90 Network Rail commissioned a research study to carry out this recommendation. The organisational psychology consultants who were contracted to do this work produced a final report on 14 March 2007, which presented the findings of the study and made twelve recommendations. Among these were recommendations that Network Rail should consider:

- certifying COSS qualifications as valid for specific geographical areas;
- expecting that everyone due to work as a COSS should routinely make pre-work site visits; and
- making changes to the required set of competencies to ensure that RIMINI planners acquire and maintain local knowledge of the specific geographical areas for which they create plans.

If the above recommendations had been implemented, it is possible that the accident at Dalston would have been prevented. Network Rail reported at the time (March 2007) that further work was ongoing to apply the study findings to current working practices and arrangements, but the company has not been able to produce any evidence of results of this work.

## Analysis

### Identification of the immediate cause<sup>5</sup>

- 91 The lookout was walking with his back to the approaching train, in the four-foot of the down number one line. In this position he was protected from trains approaching from behind by the presence of the group and the other lookout, who would be expected to give warning of trains approaching from behind on the down number one line.
- 92 The lookout was unaware that the four-track section ended at the junction that he was walking towards, and did not realise this from what he saw of the track layout. Because the lines to Broad Street had previously diverged at this point, the formation remained wide and did not provide an obvious visual clue to the convergence of the two sets of lines.
- 93 The train sounded its horn as it approached the lookout and it is probable (from the FFCCTV evidence and the recollections of the train driver and driver-instructor) that the lookout acknowledged this warning by raising one arm (the FFCCTV image is low-resolution, but suggests that this was the case). He did not move to a position of safety.
- 94 The lookout had no recollection of the events immediately before the accident. He had evidently become accustomed to acknowledging the warnings of the frequent passenger trains that had passed on the number two lines (there had been 12 in each direction in the three hours that the party had been walking and working clear of those lines), without causing him to move clear of the number one lines on which he was walking, and it is possible that he assumed that this final train would also overtake him harmlessly. This was in spite of the proximity of the junction points, the well-used and shiny appearance of the rails of the junction, and the position of the points themselves, set for a train to cross from the number two lines.
- 95 The lookout did not move clear of the line in response to the warnings sounded by the approaching train, although he had probably previously acknowledged its presence, and this was the immediate cause of the accident.

### Identification of causal<sup>6</sup> and contributory<sup>7</sup> factors

#### The lookout

- 96 The lookout was trained and qualified for his duties, and had considerable recent experience of looking out for mobile inspection gangs. He had worked for three days in the previous seven, and had had adequate opportunity for rest before beginning work on the day of the accident. His competence and fitness for work were neither causal nor contributory to the accident.

<sup>5</sup> The condition, event or behaviour that directly resulted in the occurrence.

<sup>6</sup> Any condition, event or behaviour that was necessary for the occurrence. Avoiding or eliminating any one of these factors would have prevented it happening.

<sup>7</sup> Any condition, event or behaviour that affected or sustained the occurrence, or exacerbated the outcome. Eliminating one or more of these factors would not have prevented the occurrence but their presence made it more likely, or changed the outcome.

- 97 The lookout had not visited this part of the North London Line before the day of the accident. He was not familiar with the area, and although he had been briefed by the COSS at the start of the work on the position of safety, he was some distance ahead of the rest of the group, had not had any conversation with the COSS since the group left Canonbury station, and had not been given any warning of the imminent change from four lines to two.
- 98 He was experienced as a lookout and well accustomed to the hazards of the job. If he had been conscious of the presence and significance of the junction at Dalston, he should have verified that no train was approaching before he walked onto it, and moved clear of the line when he was warned of the approaching train, but he did not do so.
- 99 The lookout's unfamiliarity with the area was probably a causal factor in the accident.

### The driving of the train

- 100 The train was driven in accordance with the permitted speeds for the sections of line it was travelling on, and the driver sounded the warning horn appropriately as the train approached and passed the group, and approached the lookout. The driver believed that the lookout had heard and acknowledged the warning, and should then move clear, as required by the Rule Book, at any moment. Right up to the last moment before he was struck, the lookout could have avoided the accident by stopping and standing still, or by moving to his left into the down cess, and the driver's expectation that he would do so was reasonable in the circumstances. The driving of the train, and the trainee status of the driver, were neither causal nor contributory to the accident.

### The performance of the train

#### Braking

- 101 The train driver made an initial full service brake application when the train was travelling at 15 mph, and the train came to a stop 6.5 seconds later, having travelled about 30 metres from the point of impact. The emergency brake was applied 3.5 seconds after the initial brake application. In view of the low speed of the train, and given the very short time before impact, an earlier application of the emergency brake would have had no effect on the outcome. The train brake took less than two seconds to become fully effective after the driver operated the control handle. This is a normal rate of response for this type of brake. The deceleration was at the rate of  $1.03 \text{ ms}^{-2}$  (10.5% g), which is acceptable for a full service brake application. An emergency brake application does not increase the deceleration rate compared to a full service application, but may give a quicker response.

#### Warning horn

- 102 The train's warning horn was tested by the RAIB following the accident, and found to be working normally.
- 103 The performance of the train was not a contributory factor in the accident.

## The organisation of the work

### The COSS

- 104 The Rule Book and the Network Rail standard which applied to the work that was being done made the COSS responsible for setting up the safe system of work, but also stipulated that the work should be planned in advance. The COSS received the pack of papers detailing the system of work, which was specified as Red Zone with lookout protection, immediately before the start of the work. He did not challenge the proposed method of work, and this may have been influenced by his status as a contractor, and the presence in the group of a health and safety adviser and engineering staff who had been involved in planning the work.
- 105 Section 3.1 of module T6 of the Rule Book requires a COSS to be:  
‘aware of any local features at the site of work that will affect the safe system of work to be set up’.
- 106 The briefing pack issued to the COSS was intended to make him aware of the features of the section of track on which he was to work. However, being made aware, by reading a diagram, of the track layout and line speeds is not the same thing as becoming familiar with a location. The Network Rail document NR/L2/OHS/019 ‘Safety of people working on or near the line’ includes a flow chart (figure 2 in that document) which makes it clear that people acting as COSS are expected to familiarise themselves with the location of work as a part of the process of implementing the safe system of work. The COSS had been brought from Birmingham on the morning of the work, was not familiar with the area and had had no opportunity to visit it beforehand. His lack of familiarity with the area was a causal factor in the accident.
- 107 The COSS gave the group a briefing based on the information in the pack, but did not go through the track layout with them in detail at that stage, because of the mobile nature of the work and the many changes to the layout that they would encounter during the inspection. After this he remained with the main group, but instructed one of the lookouts to go ahead of the group to provide a distant warning of approaching trains. The COSS was conscious that one of the group was not a PTS holder, but was present with a track visitor’s permit, and therefore needed to be closely supervised.
- 108 The relatively slow progress of the group while engaged in inspection (it had taken them three and a half hours to cover the two and three quarter miles from Camden Road) had meant that the lookout tended to get some distance ahead of the main group unless called back by the COSS. At the time of the accident he was about 150 metres ahead, and the group was nearing the end of the inspection. For a large section of the inspection, the number one line was single and used by trains in both directions. The permitted speed for down trains (coming from behind the group) was 20 mph, and for up trains (coming from in front of the group), 40 mph (Figure 2). This difference in speed meant that a lookout walking ahead of the group could provide better warning of up trains. The 40 mph permitted speed for trains in the area, and the straight or gently curved track alignment, meant that it was not necessary for the lookout to be very far from the group to give them adequate warning of approaching trains. The appropriate distance varied as the group moved along the line, but would normally be no more than the 50 metres or so necessary for the lookout to be on the far side of bridge piers and other structures from the group.

- 109 The COSS's lack of knowledge of the area meant that he did not realise that the group was approaching the junction where four tracks converged to two. The COSS did not call the lookout to tell him to stop or warn him of the hazard. The COSS should have re-briefed the whole group on the safe system of work to be adopted for the last stage of the inspection, where there was no wide-way and both tracks were intensively used by trains, but because he did not realise the group was about to enter such an area he did not do so.
- 110 The COSS was qualified for the work that he was doing, and had considerable experience of setting up safe systems of work. The investigation considered whether any change to the way in which he had been trained and assessed would have affected the way in which he worked, and concluded that it would not. He was considered by his colleagues and the agency (SkyBlue) to be competent and reliable when undertaking COSS duties. However, the way in which he controlled the group on this occasion did not comply in some respects with the standards expected:
- When it became clear that the cess was not always available as a pathway, the witness evidence suggests that the COSS allowed the group to walk in the four-foot of the down number one line with their backs to traffic, rather than moving over to the up number one line. The need to keep close to the cess to carry out the inspection was the main factor which led to this decision, which was also influenced by the low line speed, the infrequent trains on the number one lines, and the presence of the lookout ahead of the group.
  - The COSS permitted the lookout who was walking ahead of the group to get so far ahead that it was not easy for the COSS to see that he was coming close to a junction. The lookout was positioned ahead of the group so that he could give advance warning of approaching trains. In the changing environment experienced by a mobile work party, the distance between the lookout and the group may need to increase or decrease depending on the curvature of the line and the presence of obstructions such as bridges. The lookout should tell the COSS on each occasion that he needs to change his position significantly relative to the group, and it is an important part of the COSS's duties, as explained in the 'COSS Handbook' (Railway Group Standard RS502) to keep checking that the safe system of work is good enough, especially as the site of work moves. The evidence suggests that the COSS did not make any changes to the lookout arrangements during the inspection.
- 111 The way in which the COSS and lookout interacted was a contributory factor in the accident.

### The planning of the work

#### Red Zone working

- 112 The inspection had been planned to take place in Red Zone conditions, ie when trains were running.
- 113 The need for an inspection had been identified as urgent, and was required at short notice to produce information about the scope of vegetation management that would be needed. It needed to be done in daylight, and the specific date had been requested by one of the engineering staff. The initial request for protection had indicated that access to all lines was required, although in fact only access to the number one lines was needed for the inspection that took place.

- 114 The engineering and planning staff had reached the conclusion, after discussions with Network Rail staff, that Green Zones (protection using module T2 of the Rule Book), were not available on the North London Line during daylight. This was based on the information in Network Rail's Green Zone Guide. However, this advice overlooked the lower frequency of trains on the number one lines. The existence of Green Zone opportunities on these lines of up to one hour appears to have been missed by the planning staff, and because the planner was inexperienced and unfamiliar with the area (paragraphs 68 and 69), he was unlikely to challenge the engineer's choice of protection method.
- 115 It was also the case that compliance with the Rule Book requirements for Green Zone protection would have posed several practical problems, as described in the following paragraphs. Green Zone protection could have been provided by using the procedures described in either module T2 or T12 of the Rule Book.
- 116 The protection procedures set out in module T2 'protecting engineering work or a hand trolley on a line not under possession' are sub-divided into five options: T2-A, T2-D, T2-H, T2-T and T2-X. Of these, only T2-A, T2-D or T2-H could have been considered for use at the location and in the circumstances that applied on 30 March.
- 117 Procedure T2-A involves using a track circuit operating device (T-COD). This consists of a length of cable with clips at both ends which is clamped to the running rails and so keeps the signals protecting that piece of track at 'danger'. This ensures that trains cannot be signalled into the area in which work is taking place. The principal problem with using this type of protection for a mobile inspection is that it is necessary to return to the starting point of the inspection at the end of the work to remove the T-COD, thus reducing the time available for actual work to take place between trains. In the case of the inspection from Camden Road to Dalston, some of the work took place on lines which were signalled for trains in both directions, which could have required the use of more than one T-COD to protect the work as the group moved along the line.
- 118 Procedure T2-D requires a competent person to disconnect signals or signal routes protecting the work. It is not suitable for short duration work because of the time taken to arrange and carry out this process (and the necessary reconnection at the end of the job). It would also be difficult to arrange in the complex area involved in this inspection without causing excessive disruption to rail traffic.
- 119 Procedure T2-H involves the use of handsignallers or protection by placing detonators (explosive warning devices) on the track. In the area in which the inspection was to take place, this would have entailed multiple handsignallers or placing detonators at all the signals that needed to be kept at danger to protect the work. The number of people required to do this would have been excessive given the nature of the work, and the time required to set up and remove these arrangements would have greatly reduced the time available for the inspection.

- 120 Module T12 of the Rule Book, 'Protecting personnel carrying out activities on the line that do not affect the safety of the line' is most commonly used for the protection of staff doing short-term inspection work. The work being done on 30 March satisfied most of the criteria for T12 protection, except for the stipulation that the activity should last no longer than 30 minutes (Module T12, section 2.1). In August 2008, Network Rail had obtained authorisation from RSSB for a temporary non-compliance with the provisions of module T12, increasing the time limit to 60 minutes. As contractors to Network Rail, Carillion would have been entitled to take advantage of this relaxation.
- 121 In these circumstances it is sometimes possible to divide a single inspection into a series of shorter pieces of work, each of which will last for less than 60 minutes, and this would have been an appropriate method of protection on the number one lines. However, to do this effectively the person planning the work needs to be sufficiently familiar with the area to be able to assess how the work can be divided and where the group can wait clear of the line in between each working session. In this case the work planner would not have been sufficiently familiar with the area to make arrangements for T12 protection, had he believed that there were sufficient windows available for Green Zone working, and in any case the request that he had received from the track engineer was for access to all lines (paragraph 113).
- 122 For these reasons Red Zone working with lookouts became the default solution. None of the other methods in the Rimini hierarchy (Appendix B, paragraph B14) was believed to be available or suitable. The relatively low line speed on the North London Line meant that there were no problems with warning times.
- 123 If the availability of Green Zones on the number one lines had been identified, and the work planned accordingly to take place on those lines, the accident is unlikely to have occurred (although a Green Zone on the number one lines would not have extended across the junction itself, so the group would have needed to make alternative protection arrangements for the final part of the inspection). The planning of the work to take place in Red Zone conditions was a causal factor in the accident. The actions already taken by Carillion (paragraphs 155 to 157) have addressed this matter and no recommendation is made.

#### *Rimini planning and local knowledge*

- 124 The documentation that was prepared for the work was in accordance with the Network Rail requirements for COSS briefing packs. It also included extracts from the Network Rail hazard directory for the line. This includes many entries relating to such subjects as buried services, asbestos in buildings, preserved trees, listed buildings and conservation areas, which were not relevant to the COSS or the work group. The format of the hazard directory makes it difficult for anyone who does not have time and office facilities at their disposal to extract useful information from it, and it should not normally form part of the information issued to a COSS.

- 125 At the time the plan was prepared, the assistant Rimini planner had not had the opportunity to familiarise himself with the area and become aware of the specific risks, such as the obstructed cess, that existed. If he had had more information, such as photographs of the actual state of the line, he could have prepared a pack which might have been more valuable to the COSS than the extract from the hazard directory that was actually provided. The pack was reviewed by the planning manager, who also lacked local knowledge at that time and was not able to identify the absence of useful information on site specific hazards.
- 126 The lack of local knowledge of the assistant Rimini planner and the planning manager was a contributory factor in the accident.

### The infrastructure

#### The position of safety

- 127 The Rule Book gives limited guidance on the positioning and behaviour of lookouts. Module T7 section 9.7 says that the COSS:
- ‘must make sure that any distant or intermediate lookouts are located in a position of safety. However, if the site of work is mobile and the intermediate and distant lookouts will walk while carrying out their duties, they may leave the position of safety when they need to pass an obstruction.’
- 128 Module T6 section 7.3 tells the lookout that:
- ‘the COSS will tell you where to position yourself. You must stay there until either:
- you are told by the COSS that the work is finished, everyone is clear and you are no longer required, or
  - you are replaced by another lookout.’
- 129 The combined effect of these rules is to create uncertainty over the extent to which the COSS is expected to control the exact position of the lookouts. Custom and practice among track workers is that, for a mobile work site, the COSS will give lookouts an indication of where they should be (such as ‘in the down cess’) and the lookouts will then use their own initiative to position themselves in locations which will enable them to give the best possible warning of approaching trains. At times this may involve crossing tracks to get a better view. It is not always practicable for a distant lookout to obtain permission for such a move from the COSS, although it is arguable that the rules require that they should do so.
- 130 In this case, witness evidence indicates that the COSS had briefed the lookout that his position of safety was in the down cess. The lookout, and the group, intended to walk in the down cess and carry out most of the inspection from there. However, on this stretch of line the cess was in poor condition and the path along it was uneven, obstructed and in some areas non-existent (Figure 6), and so much of the time the group walked on the sleeper ends or in the four-foot of the down number one line. The accident occurred towards the end of the inspection, when this practice had become habitual. If the cess had been maintained in a usable condition, the lookout might not have chosen to walk in the four-foot of the down number one line.



Figure 6: Down cess adjacent to the accident site

131 The condition of the down cess, and the consequent need to walk on the down number one line, was a contributory factor in the accident. The Network Rail standard relating to the management of lineside vegetation, NR/L2/TRK/5201, requires that the cess area is maintained clear of trees, shrubs and brambles and 95% clear of other vegetation, by annual clearance. The whole of the North London Line is in an urban area and the deposit of litter and rubbish on the lineside is a continual problem. The contract for the project includes removal of rubbish, upgrading of access arrangements and provision of safe walking routes adjacent to bi-directionally signalled lines, which includes the area where the accident occurred, and so no recommendation is made on this issue.

## Identification of underlying factors<sup>8</sup>

### The organisation of the project

132 In the case of this section of the project, the need to assess the additional vegetation control required led to the planning of a walkout inspection at short notice. The planner had been in post for less than a month and had not had a chance to visit the area in which work would be taking place. The chosen labour supplier was not able to supply people with local knowledge, although this had been brought to their attention. Carillion did not provide any opportunity for staff, in particular the COSS, to become familiar with the site of work.

<sup>8</sup> Any factors associated with the overall management systems, organisational arrangements or the regulatory structure.

133 These cases of inadequate and hasty planning came about because of the way in which the project was managed in its early stages. This was an example of deficiencies in Carillion's safety management system, and this was an underlying factor in the accident.

#### The Rule Book and staff behaviour

134 When trains approached on the number two lines (as most of them did) there was, for the whole of the inspection up to the time of the accident, no way in which the trains' presence affected the work of the group, who were one (or more) tracks away from the number two lines. There was therefore no practical need for the group to move clear of the number one lines to avoid being struck by those trains.

135 If a train had approached on the down number one line, from behind the group, the site lookout, who was with the group, would have been expected to give warning, and the group would have moved to a position of safety. That position might have been in the down cess, as briefed by the COSS, or, if the cess was obstructed, in the wide-way between the number one and number two lines.

136 Although the line speed on the down number one line was low<sup>9</sup>, it is an important principle of track safety<sup>10</sup> that, whenever possible, people walking on the track should face the direction of traffic. The group had their backs to traffic, relying on the site lookout to look over his shoulder every few seconds to check for trains approaching from behind on both the number one and number two lines.

137 Similarly, when a train approached on the up number one line, the initial warning to the group came from the distant lookout who was walking ahead, and the same considerations regarding a position of safety would have applied.

138 The Rule Book is clear (module T6, section 5.2.c) that staff must move to a position of safety if a warning is given by a lookout. However, the lookout is only required to give warning of trains that are 'approaching' (module T6, sections 7.6, 7.7, and 7.8). Track workers have generally interpreted this to mean that if they are on or near a track which is a safe distance from the track on which the train is travelling, the train is not considered to be 'approaching' them and no action is necessary.

139 However, where junctions exist at which trains may be switched onto another line, or where (as in this case) two sets of lines converge, a train which initially appears to be running parallel to the track on which the group is walking or working may suddenly change direction and approach the site of work. This was a factor in the fatal accident at Ruscombe, the near miss at Tinsley Green, and the staff injury at Leatherhead (paragraph 85). In such cases there is a conflict between the need to ensure the safety of staff, and avoiding needless disruption to the work by giving warning of trains which are not going to approach the actual line on which work is taking place. In the past, to some extent COSSs and lookouts have attempted to deal with this problem by observing the position of the junction points and using this information to work out the route each train will follow. This issue is discussed in more detail in the RAIB report into the accident on Grosvenor Bridge, London Victoria on 13 November 2007 (report 19/2009, paragraphs 167 to 177, 213 and recommendations 5 and 6).

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<sup>9</sup> 20 mph (32 km/h) rising to 40 mph (64 km/h) a quarter of a mile (400 metres) before reaching Dalston Western Junction (Figure 3).

<sup>10</sup> Rule Book module G2 section 6.3.

- 140 In this case the lookout did not appreciate the significance of the junction points that he was approaching, and did not consider the potential consequences of walking onto the junction. If the rules had been clearer about the way in which lookout duties should be carried out in the vicinity of junctions, he might have stopped and considered what to do next.
- 141 The absence of clear guidance in the Rule Book about lookout duties around junctions was a possible underlying factor in the accident. The RAIB has previously made recommendations covering this topic in relation to facing points (report 04/2008, Track worker fatality at Ruscombe Junction, 29 April 2007, recommendations 1 and 4), and in relation to track inspection generally in the Grosvenor Bridge report referred to in paragraph 85, and these are currently being considered by Network Rail, so no further recommendation is made.

### Severity of consequences

- 142 The train struck the lookout on the back of his head and knocked him to the ground, but he suffered only minor cuts and bruises. He was wearing protective headgear. The damage to the front of the train (Figure 5) suggests that his safety helmet was important in preventing more serious injury to him.

## Conclusions

### Immediate cause

143 The immediate cause of the accident was that the lookout did not react to the warnings sounded by the approaching train by moving clear of the line (paragraphs 91 to 95).

### Causal factors

144 Probable causal factors were:

- a. the COSS and lookout's unfamiliarity with the area, and in particular the lookout's lack of knowledge that the four-track section ended at Dalston Junction (paragraphs 96 to 99, **Recommendations 1 and 2**); and
- b. the planning of the work to take place in Red Zone conditions (paragraphs 112 to 123).

### Contributory factors

145 Contributory factors were :

- a. the way in which the COSS and lookout worked with each other during the inspection, which led to the COSS permitting the lookout to get a long way ahead of the group (paragraph 110);
- b. the lack of local knowledge of the assistant Rimini planner and the planning manager, which led to the COSS receiving a briefing pack which lacked information about the work site, such as photographs, that could have been valuable to him (paragraphs 124 to 126, **Recommendations 1 and 2**); and
- c. the condition of the down cess, and the consequent need to walk on the down number one line (paragraphs 130 and 131).

### Underlying factors

146 Underlying factors were:

- a. deficiencies in Carillion's safety management system, in particular the way in which the project was managed in its early stages (paragraph 133, **Recommendation 1**); and
- b. the absence of clear guidance in the Rule Book about lookout duties around junctions (paragraphs 138 to 141).

### Other factors affecting the consequences

147 The lookout's safety helmet was important in preventing more serious injury (paragraph 142). This was also a factor in the accident at Grosvenor Bridge on 13 November 2007 (paragraph 139).

## Additional observations<sup>11</sup>

### Forward facing CCTV

- 148 Forward facing CCTV equipment is fitted to trains to provide information and evidence about operating incidents, performance and infrastructure condition. In this case the forward facing CCTV equipment fitted to the train provided valuable evidence about the actions of the work group and the lookout. However, the CCTV system had been designed and installed so that power supply to the camera is linked to the collection of traction current by the vehicle in which the camera is mounted. This means that when the vehicle passes over a gap in the conductor rail which is long enough to cause both collector shoes to lose contact with it, the CCTV recording stops.
- 149 In the case of this accident, the recording was interrupted when the leading coach reached the conductor rail gap at Dalston Western Junction, about two seconds before the lookout was struck (the image shown in Figure 4 is the last frame that was recorded). The train stopped before the leading coach reached the conductor rail again, and the recording did not resume until the train moved off, about one hour later.
- 150 The absence of a recording in this period was not critical to this investigation. However, in other circumstances this feature could result in the loss of valuable evidence.

### Planning of the inspection

- 151 The COSS briefing pack did not include any specific instructions (such as the scope of the work, details of equipment to be used, or access requirements) on how the actual inspection was to be carried out, because none of the people involved considered that it was part of their job to produce any. The engineer and health and safety adviser who had initiated the work (paragraph 55) were among the group doing the inspection. They had some prior knowledge of the conditions on site and helped the COSS to understand where the work was going to take place. This lack of a site-specific method statement was not in accordance with Carillion's safety management system for the project.

### Safety Management

- 152 The Carillion document CI/RAIL/HSSQ/PRO/13-21 'Safety of People Working on or Near the Railway' is described in paragraph 52. It appears to be incomplete and of little practical value to staff who are required to plan safe systems of work, and does not identify the importance of local knowledge and/or opportunities for site familiarisation for people acting as COSS (**Recommendation 3**).
- 153 The project director was aware of previous fatal accidents to staff, specifically the Newbridge Junction accident of 2005 (paragraph 89), but he did not know of any lessons from these that could be transferred to the project. The relevant recommendations were those relating to the importance of local geographic knowledge for planning staff.

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

154 Carillion staff are given monthly briefings on health and safety issues, using material prepared by a senior health and safety manager using Network Rail briefings and lessons from accidents and incidents. The briefings are delivered by local management, and the delivery of briefings is recorded (**Recommendation 1**).

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

- 155 Following the accident, Carillion stopped all work on or near the line, for 48 hours for evaluation of the safety systems. It then imposed an immediate prohibition on Red Zone working throughout the project.
- 156 The effect of this is that all Rimini plans in the project which specify Red Zone working are now required to be approved by the project health safety and environment team. As a consequence of these actions, no Red Zone working took place in the project after the beginning of May 2009.
- 157 The Rimini planners on the project have now walked through the entire project area to familiarise themselves with it, and a core group of 8 COSSs has been allocated to the project and given training on the route and the features of the area. A set of photographs has been taken and these are now included in briefing packs given to COSSs.
- 158 SkyBlue issued a briefing document about the accident to all its staff, and Carillion and Sky Blue have briefed all workers on the project about the accident.

## **Actions reported which address factors which otherwise would have resulted in an RAIB recommendation**

- 159 In paragraphs 148 to 150, reference is made to the design of the FFCCTV equipment on the train, which resulted in the failure of the equipment to record for the last few seconds before the accident.
- 160 The class 313 trains in service with LOROL are due to be replaced with new trains over the next twelve months, and some of the class 313 trains will be transferred to other operators. Their replacements, the class 378, are now under construction. The new trains will have forward facing CCTV which will not suffer from this problem, because the power supply is not fed directly from the traction current, and so in view of the existing trains' limited life span and the equipment on the new trains which will address the factor identified in paragraph 150, the RAIB has decided not to issue a recommendation in this area.

## Recommendations made as a consequence of other RAIB investigations

161 In its reports of investigations of previous accidents and incidents involving track workers, the RAIB has made the following recommendations which are considered to be relevant to the circumstances at Dalston:

Published before the accident on 30 March 2009:

*Near miss at Tinsley Green, 17 March 2007 (report 43/2007, published 18 December 2007)*

### **Recommendation 5:**

*Network Rail should carry out a detailed assessment of the way in which Business Process Document 0019 and Standard Maintenance Procedure 0094 are being applied. This assessment should include a survey of Work Schedulers to assess the extent to which they feel able to question, or challenge, requests made to them. The results of this assessment should be used to inform a review of the effectiveness of the existing management arrangements and steps taken to rectify any deficiencies identified.*

Network Rail has responded, indicating that action to implement this recommendation is still ongoing. Network Rail's review of these standards began in April 2008.

Published after the accident on 30 March 2009:

*Collision at Acton West, 24 June 2008 (report 15/2009, published 18 June 2009)*

### **Recommendation 1:**

*Network Rail should:*

- a. *re-brief the requirements (now in standard NR/L2/OHS/019) for the COSS pack to be prepared and checked by individuals who have geographical knowledge of the relevant area and for COSSs to have geographical knowledge of the area in which they are to work;*
- b. *take steps to achieve compliance with the requirements defined in 1a; and*
- c. *conduct a compliance audit after a suitable period of time to confirm that these requirements defined in 1a are being implemented satisfactorily.*

The RAIB has not yet received a response to this recommendation.

### **Recommendation 2:**

*Network Rail should, in its current project to overhaul the RIMINI planning process:*

- a. *involve those who will use the information on site in developing a revised format for the COSS pack (and the RT9909 form);*
- b. *include a role for the COSS in the planning of their safe system of work; and*
- c. *improve the format of the COSS pack (and the RT9909 form), with particular emphasis on the clarity and consistency of information presented, including, but not limited to:*
  - *consistency in the method for identifying key locations such as the site of work, limits of possession and access points;*

- *clarity over the information that is required in each section of the new forms;*
- *the option of identifying in the COSS pack where access to site can be achieved by walking lineside as opposed to on or near the line; and*
- *the use of diagrams and maps to show key locations and their relationship with each other.*

The RAIB has not yet received a response to this recommendation.

[Injury to track worker at Grosvenor Bridge, 13 November 2007 \(report 19/2009, published 16 July 2009\)](#)

**Recommendation 5:**

*Network Rail should propose a change to the Rule Book and the COSS Handbook, in accordance with the Group Standards code, that amends the procedures for Red Zone working with lookout protection in a multi-track area to:*

- *Clearly define an approaching train.*
- *Clarify the criteria for setting up a safe system of work, including the circumstances that require pre-planning. Consideration should include:*
  - a) the practical capabilities of lookouts;*
  - b) the possibilities for human error and its consequences;*
  - c) the ability to identify the track a particular train is using;*
  - d) the likelihood of multiple train movements;*
  - e) the complexity of track layout;*
  - f) the nature of the work being undertaken; and*
  - g) the size and disposition of the work group for continued observation by the lookout.*

The RAIB has not yet received a response to this recommendation.

## Recommendations

162 The following safety recommendations are made<sup>12</sup>:

### Recommendations to address causal and contributory factors

- 1 Carillion Construction Ltd, through its Carillion Rail business unit, should review its processes for mobilisation of projects following contract award, so that these processes include arrangements for staff to become familiar with the areas in which they will work, and the provision of suitable and sufficient resources to facilitate this (paragraphs 144a, 145b, 146a, 154).
- 2 Carillion Construction Ltd, through its SkyBlue Rail business unit, should revise its operating procedures to include processes to enable people supplied to work in safety critical roles to be familiar with the locations where they are to work, either by previous experience or, where this is not the case, with familiarisation by an appropriate means provided by the client (paragraphs 144a, 145b).
- 3 Carillion Construction Ltd, through its Carillion Rail business unit, should review its safety management policies and procedures relevant to the protection of people on or near the line that are used in the North London Railway Infrastructure Project and revise them where necessary, so that they are complete and coherent and describe a safety management system that is suitable and effective for the protection of the people who are working on or affected by the project (paragraph 152).

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

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

- (a) ensure that recommendations are duly considered and where appropriate acted upon; and
- (b) report back to RAIB details of any implementation measures, or the reasons why no implementation measures are being taken.

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

## Appendices

### Appendix A - Glossary of abbreviations and acronyms

COSS	Controller of site safety
FFCCTV	Forward facing closed circuit television
PTS	Personal track safety
Rimini	<u>R</u> isk <u>m</u> inimisation, shorthand for a system of work planning which uses a hierarchy of protection methods to select a safe system of work.
RSSB	Rail Safety & Standards Board

## Appendix B - Rules, Standards and Procedures

B1 The Rule Book (Railway Group Standard GE/RT/8000) describes two systems for carrying out work on or near the line. These are:

- Green Zone: a site of work in which there are no train movements.
- Red Zone: a site of work which is not protected from train movements.

It is Network Rail's policy that work should take place in a Green Zone whenever this is reasonably practicable. However, to create a Green Zone for work on the track it is necessary to prevent trains approaching the site of work. This can be disruptive to the running of the railway network, and if the work needs more than a few minutes it can normally only be done at night when no trains are running, during pre-planned engineering periods during the night or at specific weekends that have been identified a long period in advance.

B2 If it is not practicable to establish a Green Zone, it is sometimes permissible for work to be carried out in a Red Zone. This is standard practice on the national network for patrolling inspections on lines where the combination of train speeds and sighting of approaching trains is sufficient for it to be possible for workers to be given sufficient warning of an approaching train to enable them to reach a position of safety at least ten seconds before it arrives.

B3 The Rule Book defines the arrangements that must be made for working in a Red Zone in modules T6 and T7. The provisions relevant to the work being done at Dalston on 30 March are summarised in the following paragraphs.

B4 Module T6, section 3.6 sets out the briefing arrangements for staff. The COSS will tell staff about the hazards at the work site. The staff receiving the briefing are required to sign the 'COSS Arrangements and Briefing Form' (RT9909), to confirm their understanding of the system of work that will apply. Section 3.6 also requires staff to move to a position of safety in the event that there is any doubt about the safety of the system of work.

B5 Module T7, section 9.7 stipulates that the COSS must decide where to position the lookouts. Section 9.3 requires the COSS to calculate the warning time required, and make arrangements for warning to be given, taking the following points into consideration:

- **Time** – the minimum time needed to stop work, down tools and reach a position of safety **at least 10 seconds** before a train arrives at the site of work.
- **Speed** – the speed of approaching trains including any temporary or emergency speed restrictions imposed for the work.
- **Distance** – the distance needed for the equipment to detect, or for the lookout to clearly see an approaching train.

A method for calculating warning time, supported by a table of sighting distances, is provided in Module T7 to help the COSS work out the distance needed.

B6 Module T6, section 5.1, deals with the methods of warning to be given by the lookout, and section 5.2 lays down what staff must do when warning of an approaching train is given:

- acknowledge the warning by raising an arm above the head;
- immediately move to a position of safety; and
- stay in the position of safety until the COSS tells them it is safe to start work again.

B7 Module T6, section 7, covers the responsibilities of the lookout. Section 7.6.c says:

‘You must give a warning by:

- sounding your horn or whistle; and
- by shouting if necessary.

If anyone you are warning does not acknowledge your warning by raising one arm and does not move to a position of safety, you must give a series of short sharp blasts (which means an urgent warning) on the horn, or whistle until everyone has moved to a position of safety.’

B8 Section 7.10 of module T6 requires the lookout to give a warning to the group if for any reason they are unable to perform their duties in a safe manner. Once every person in the group has gone to a position of safety the lookout should then explain to the COSS what the concern is.

B9 Module T7 section 1 describes the responsibility of the COSS to make suitable arrangements for a safe system of work on the line. The object of a safe system of work is to ensure that staff working on the track or walking as a group ‘are not put in danger from any passing train or movement’.

B10 This module requires that whenever possible, the safe system of work must be planned in advance and provided to the COSS. Section 3.1 of module T7 requires the COSS to make sure that the planned safe system of work is adequate. The Rule Book does not explain how the COSS is to do this, or who is to plan the work, but Network Rail provides some guidance (see paragraph B17).

#### Planning safe systems of work

B11 The way in which work on or near the line is to be planned is described in Network Rail specification NR/SP/OHS/019 ‘Safety of people working on or near the line’. In the first instance (section 4) this document requires that, where a risk assessment has identified a need for people to go on or near the line, ‘consideration shall be given to alternative means of carrying out the work which will remove this need’.

B12 NR/SP/OHS/019 says that, having confirmed that it is necessary for people to go on or near the line, the work planner must use a defined process to arrive at the appropriate safe system of work for the activity. This involves consideration of the opportunities for carrying out the work when the line is closed to traffic.

B13 The work planner should take into account the risk minimisation hierarchy set out in the Rule Book and in NR/SP/OHS/019, which is:

1. Safeguarded Green Zone
2. Fenced Green Zone
3. Separated Green Zone
4. Red Zone with automatic track warning system (ATWS)
5. Red Zone with train operated warning system (TOWS)
6. Red Zone with lookout operated warning system (LOWS)
7. Red Zone with lookout using Pee Wee (a particular type of LOWS)
8. Red Zone with lookout with no additional equipment

B14 Level 8 (Red Zone with lookout unassisted by other equipment) is to be regarded as the last resort. However, this is qualified by NR/PRC/MTC/PL0094, which says (at 4.4): 'Generally, you should not plan to use Green Zone arrangements or Red Zone level 4 – 7 arrangements if it would increase total man-hours to complete the work by more than 25%, including time spent track-side waiting and time spent setting up the arrangements.'

B15 Once the planning is complete, a pack of information, partly completed with details of the location, is prepared for the COSS. This is specified as consisting of the RT9909 form, supported where applicable by the 'line blockage form' (RT3181), which is used in connection with establishing protected areas in accordance with modules T2 and T12 of the Rule Book, and where appropriate by a site diagram showing the relevant running lines, signals, points and work location.

### Setting up safe systems of work

B16 On site, Rule Book module T7 makes the COSS responsible for setting up a safe system of work. Section 3.1 says (referring to the COSS):

'Before you start to set up the planned safe system of work, you must make sure it is adequate. You may have to vary the planned arrangements in which case you must get any necessary authority before you do this.'

B17 Section 3.1 of module T6 says that the COSS must be

'aware of any local features at the site of work that will affect the safe system of work to be set up.'

B18 Network Rail document NR/SP/OHS/019 says (at 4.5):

'If the COSS considers the safe system of work to be inadequate or cannot implement it as planned, he/she shall be required either to:

- vary the arrangements as necessary to ensure that an adequate safe system of work is established [q] **or**
- abort the work until such time as an adequate safe system of work can be established [q]'

B19 Note [q] to this document says:

*'Under certain circumstances, the planned safe system of work may prove to be inappropriate. Such situations could include:*

- *The COSS is unable to implement the safe system of work (eg Green Zone working planned but not granted at the time of the work, ATWS planned but equipment found defective during pre-use checks, lookout planned but actual sighting conditions mean more than one intermediate lookout would be required in any one direction, or scheduled resources not available)*
- *The COSS considers the safe system of work to be inadequate*
- *Conditions (eg weather) change after work has started*

*In such circumstances, the COSS should be permitted to implement an alternative safe system of work or to adjust the work or planned safe system of work. The COSS should not be permitted to implement a safe system of work that is lower in the hierarchy without specific authority from a designated manager who should have a sufficient understanding of the relevant Rules, this specification, and the arrangements for the work to make an informed decision.*

*It should be emphasised that the COSS retains ultimate responsibility for safety on site and has the final decision as to whether a planned safe system of work is acceptable. Under no circumstances should the COSS attempt to commence or complete the work without adequate arrangements in place.'*

B20 Once the COSS is satisfied that the planned safe system of work is adequate, on the basis of the information available, then the COSS should complete the COSS Briefing Form (RT9909) with details of the actual method of protection and, where lookouts are in use, the sighting distances that are required.

B21 The COSS must brief the members of the group on the arrangements, confirm that they are all appropriately qualified for their duties, and obtain their signatures on the RT9909 form to confirm that this part of the process has been carried out and that the group has understood the briefing.

B22 Section 9.7 of module T7 specifies the requirements for using lookouts. In particular, if a combined total of more than four distant and intermediate lookouts would be required to get adequate sighting distance, the COSS must not use lookouts and must find an alternative safe system of work. The COSS is not permitted to act as a lookout while also carrying out the duties of a COSS.

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