



Rail Accident Investigation Branch

# RAIB Bulletin 01/2014

## Engineering train collision at Kitchen Hill, near Penrith, 12 January 2014

### Preface

- 1 The purpose of an RAIB investigation is to improve railway safety by preventing future railway accidents and mitigating their consequences. Accordingly, it is inappropriate that RAIB reports should be used to assign fault or blame, or determine liability, since neither the investigation nor the reporting process has been undertaken for that purpose. The RAIB's investigation is independent of all other investigations, including those carried out by the safety authority or railway industry.

### Description of the accident

- 2 At 13:25 hrs on Sunday 12 January 2014 two freight trains, which were being operated in connection with engineering work, were involved in a collision at Kitchen Hill access point on the West Coast Main Line, around five kilometres north of Penrith station (figure 1). Both trains were within a *work site*<sup>1</sup> contained inside an *engineering possession*. Train 6L43<sup>2</sup> was stationary and waiting for permission to pass the *work site marker boards* at the north end of the work site. Train 6L42 was also preparing to leave the work site and was making a move, authorised by the *Engineering Supervisor*, towards the north end of the work site. It ran into train 6L43 at 17 mph (27 km/h), and pushed it forward around 20 metres.
- 3 Around 20 metres of rail fastenings unclipped as a result of the collision, allowing the track gauge to spread and causing four wheelsets of train 6L42 to derail. Wagon buffers overrode at two locations: between the leading wagon on train 6L42 and the locomotive, and mid-way along train 6L43 (figure 2). The driver of train 6L42 jumped from his cab just before the collision. He sustained abdominal injuries and was detained in hospital overnight. No-one else was injured.
- 4 The West Coast Main Line remained closed between Penrith and Carlisle for recovery of the trains and repair to the track until 14:04 hrs on Monday 13 January 2014.

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<sup>1</sup> Technical terms are shown in italics the first time they appear in the report and explained in the Glossary of Terms.

<sup>2</sup> An alphanumeric code, known as the 'train reporting number', is allocated to every train operating on Network Rail's infrastructure.

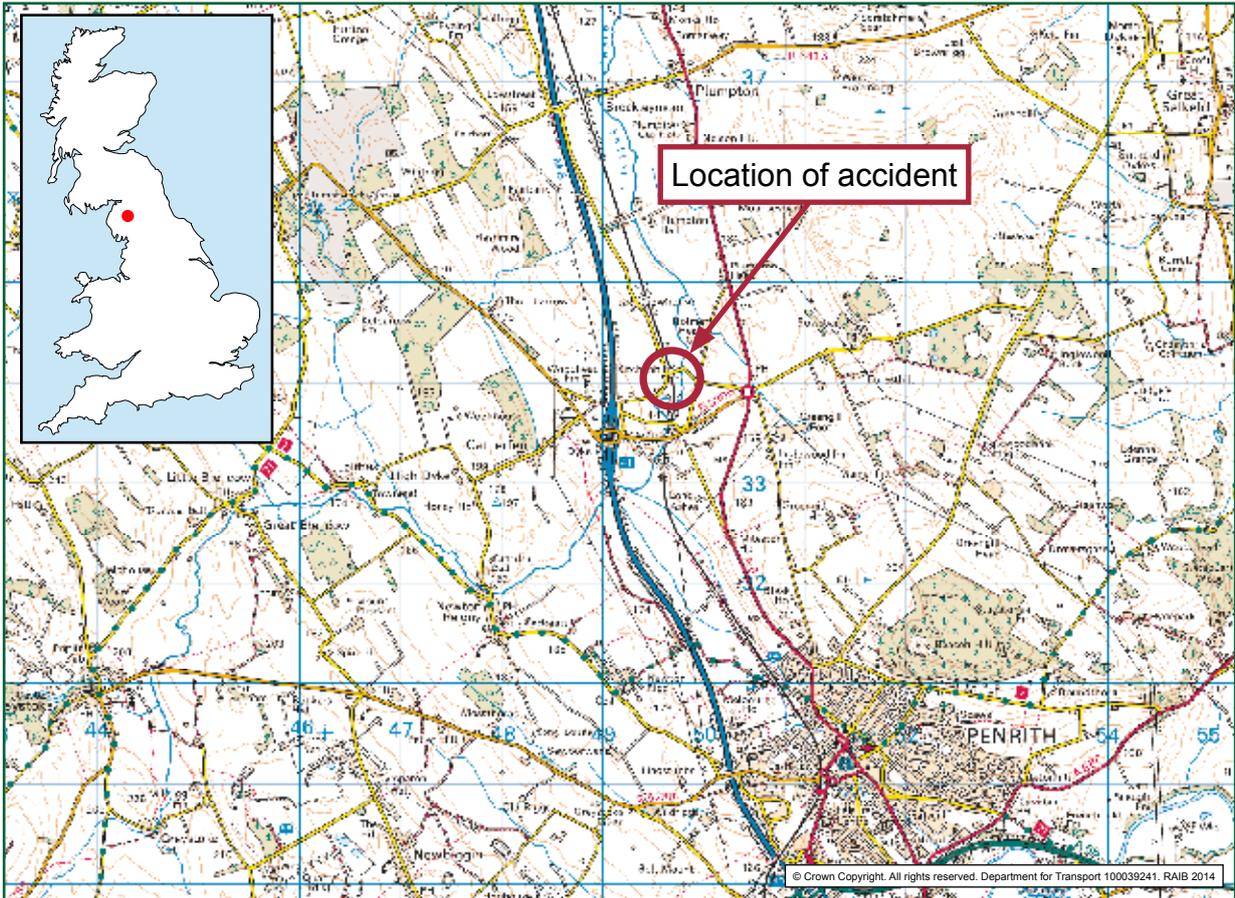


Figure 1: Extract from Ordnance Survey map showing the location of the accident



Figure 2: Trains 6L43 and 6L42 after the collision (photographs courtesy of Network Rail)

## The work site and train operation arrangements

- 5 The West Coast Main Line near Penrith comprises two lines, the *Up* Main and the *Down* Main; through Penrith station, the Down Main splits into the Down Slow and Down Fast. The work site where the collision occurred was within an engineering possession on the West Coast Main Line, which had been planned to last from 12:50 hrs on Saturday 11 January to 15:30 hrs on Sunday 12 January. The possession was 60 km long, and required the blockage of all lines between its south end at Tebay South Junction, and as far north as Carlisle South Junction<sup>3</sup>.
- 6 The work site, referred to in this report as work site F<sup>4</sup>, had been arranged so that Babcock International (a renewals contractor working for Network Rail) could replace a set of *points* at the north end of Penrith station. Work site F incorporated all lines. Penrith station was designated as the site access point.
- 7 Additional work, including rail repairs, drainage renewals and surveying, was planned at eight other work sites within the possession. The points renewal at Penrith was part of a wider programme of infrastructure work that Babcock International was undertaking in the area. It had arranged a similar work site during the previous weekend to renew points at the south end of the station.
- 8 Work site F was originally planned to extend a distance of nearly six kilometres between marker boards at 49 miles 47 chains<sup>5</sup> in the south, near Eamont Viaduct, to 53 miles 20 chains in the north, at Long Ashes user-worked crossing. However, Network Rail's possession management briefing pack showed that it was later agreed to place the northern marker boards at a location around five kilometres further along the track, at the north end of Plumpton Loop.
- 9 In addition to a self-propelled *tamping machine* (train 6J72), the briefing pack recorded that a total of four engineering trains were required in the work site:
  - Train 6L41, operating on the Down Main, and hauling ballast wagons and two rail-mounted cranes.
  - Trains 6L42, 6L43 and 6L44, all operating on the Up Main, and hauling only ballast wagons.
- 10 The trains on the Up Main were re-marshalled during the site work. At the time of the collision, trains 6L42 and 6L43 were formed as follows:
  - Train 6L42: class 66 diesel-electric locomotive (66061) hauling ten bogie ballast wagons (a mixture of MCA, MDA and MOA types), with another class 66 locomotive (66126) coupled on the rear.
  - Train 6L43: class 66 diesel-electric locomotive (66186) hauling a mixture of 20 bogie ballast wagons (again a mixture of MCA, MDA and MOA types).

Both trains were operated by DB Schenker and were scheduled to return, via the West Coast Main Line, to Carlisle Kingmoor yard.

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<sup>3</sup> Some adjoining lines immediately south of Carlisle South Junction were also blocked.

<sup>4</sup> As defined in Network Rail's possession management briefing pack.

<sup>5</sup> Mileages in the report are measured from a zero datum at Lancaster station.

11 Babcock International was responsible for supervising the work (including train movements) within work site F, and appointed an Engineering Supervisor (ES) for this purpose. The ES on duty for the shift when the accident occurred had an assistant (ES assistant) to help him in his role. The same ES had also set up work site F on the afternoon of Saturday 11 January. The marker boards at the south end of the work site were placed south of Eamont Viaduct as planned, but the ES decided to place those at the north end adjacent to Kitchen Hill access point<sup>6</sup>, 3.7 km south of the planned location at the north end of Plumpton Loop (paragraph 8). The *Person in Charge of the Possession* (PICOP) granted the ES authority to start work at 13:29 hrs. The key locations associated with the work site are shown on figure 3.

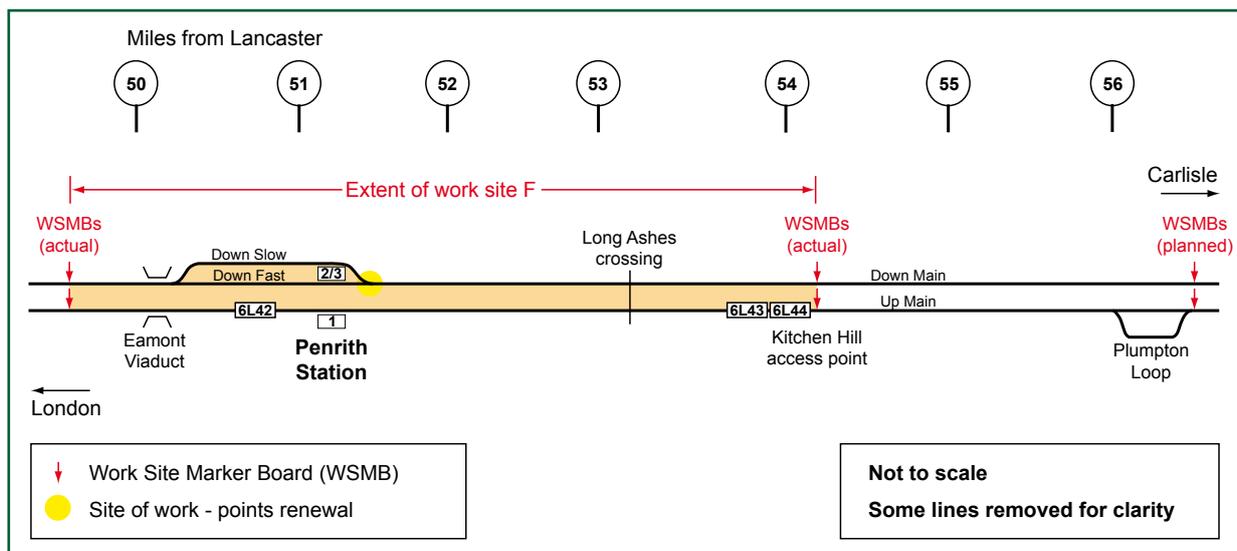


Figure 3: Work site F – also showing the stabled location of the trains on the Up Main (paragraph 12)

## Sequence of events

- 12 The trains on the Up Main finished working overnight and were shut down awaiting new drivers. Train 6L44 was *stabled* just inside the marker boards at Kitchen Hill, with train 6L43 close behind; train 6L42 was stabled approximately half a mile south of Penrith station (figure 3).
- 13 The new drivers arrived at Penrith station (the work site access point) around mid-day on Sunday, and the ES assistant took the drivers of trains 6L43 and 6L44 by road to Kitchen Hill where he made arrangements with the PICOP for train 6L44 to leave the work site.
- 14 The ES told the driver of train 6L42 to walk to his train. Shortly after the driver reached the train, the ES called him by radio and asked him to bring the train into the station (platform 1) where he would brief him on the movement he wanted him to make. The driver was told not to go beyond the platform as signalling staff were still working on the track near the replaced points (around 200 metres from the station). The *on-train data recorder* (OTDR) on locomotive 66061 shows that train 6L42 arrived into platform 1 at 13:11 hrs.

<sup>6</sup> There is witness evidence that Kitchen Hill is regularly used as a location for work site marker boards.

- 15 The ES briefed the driver from the platform, through the cab window, after first having instructed the signalling staff to move clear. The driver stated that the ES told him to proceed at no more than 5 mph (8 km/h) until he had gone past the signalling staff, and then to go on 'about three-and-a-half miles'<sup>7</sup> to the work site marker boards where the PICOP and the ES assistant would meet him. The driver said that he was told that once he had passed the points, he should not expect to encounter any other people on the line until the marker boards (although he was additionally warned to look out for users on Long Ashes crossing) and that he could travel at up to 40 mph (64 km/h). The driver said he questioned the speed, and the ES confirmed that he had his authority to move up to the marker boards at up to 40 mph (64 km/h) once he had passed the signalling staff. The driver stated that the ES advised him that train 6L43 might still be at the marker boards, although it might have departed.
- 16 The driver reported that the ES had first told him that the marker boards were at a place (Kitchen Hill) which he had never heard of. He asked the ES if he meant 'Plumpton', and he reported that the ES confirmed this. He stated that the ES did not give him a *mileage* for the location of the marker boards.
- 17 The ES's account of the briefing was broadly consistent with that of the driver. The main differences were that the ES:
  - stated that he told the driver the mileage of the marker boards at Kitchen Hill (54 miles 15 chains) and that the driver was now (at Penrith station) roughly just under three miles away from them<sup>7</sup>; and
  - did not mention the driver questioning the name he had used for the location of the marker boards.

There is no written or electronic record of the briefing, and neither Module T3 nor Handbook 12 of the Rule Book (paragraphs 23 and 24) require this. Following its investigation of a collision at Leigh-on-Sea in April 2008 (paragraph 43), the RAIB recommended that Network Rail introduce a procedure to provide a written record of the instructions given by the ES to the driver. However, Network Rail advised that it felt the burden of reporting made this impracticable.

- 18 Records from the OTDR on locomotive 66061 show that train 6L42 departed from platform 1 at 13:16 hrs and travelled at around 7 mph (11.3 km/h) for 0.3 miles (0.5 km) (past where the signalling staff were working); it then accelerated to a maximum speed of 28.6 mph (46 km/h). Near Long Ashes crossing is the start of a reverse curve, the railway turning first to the right and then to the left, after which, at Kitchen Hill access point, it continues straight for around three kilometres to Plumpton Loop (figure 4). On passing through the second (left-hand) curve at around 28 mph (45 km/h), according to the driver, he was surprised to see the rear of train 6L43. Although he had already started to brake for Plumpton Loop, he realised he was unlikely to stop before hitting the train in front and, at 13:25:07 hrs, he operated the emergency brake plunger.

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<sup>7</sup> Kitchen Hill access point is 2 miles 75 chains (4.7 km) from Penrith station (1 mile = 80 chains).



Figure 4: West Coast Main Line north of Penrith

- 19 The driver stated he was concerned about the speed of his train. He was aware that the train brakes were in the 'goods' timing<sup>8</sup> setting and would therefore take a while to fully apply. He was also concerned that the rear wagons of the train ahead might override onto his locomotive cab in a collision. He therefore opened the cab door to see if it was safe to jump out. He decided it was and left the cab, landing on a grass bank along the side of the railway.
- 20 At 13:25:26 hrs train 6L42 collided with the rear of train 6L43. The ES assistant was at Kitchen Hill and heard the collision. He called the ES (who was still at Penrith) to notify him. After being updated on the severity of the accident, the ES called the Babcock International on-call manager.
- 21 While on the side of the track, the driver of 6L42 called the driver of 6L43 to see if he was all right and to ask him to come and assist; he then called the DB Schenker duty manager to notify him of the accident. After this he returned to the locomotive cab to stop the engine and apply the locomotive parking brake. He then tried to apply the parking brakes on the wagons, but only managed this on three before the injuries he had suffered made this too painful. The ES assistant, together with the driver of 6L43 and a member of DB Schenker ground staff, made their way to the point of the collision and found the driver of 6L42. On realising the extent of his injuries, the ES assistant took the driver to hospital.

<sup>8</sup> The brakes on the train were air operated, the braking force varying according to the air pressure in the brake cylinders (brake cylinder pressure). The time taken for the brake cylinder pressure to build to the full demanded value, and therefore for the brakes to fully apply, depends on whether individual brake valves (distributors) located each vehicle/wagon are set to 'goods' timing or 'passenger' timing. In response to an emergency brake demand, the brakes should take between 18 and 30 seconds to apply in 'goods' timing, and between 3 and 5 seconds in 'passenger' timing (the time for the brake cylinder pressure to reach 95% of maximum on a single pipe brake system, as on train 6L42, see Railway Group standard GM/RT2045, Braking Principles for Rail Vehicles).

## Investigation findings

### Control of the speed of train 6L42

- 22 As train 6L42 was passing through the reverse curve approaching Kitchen Hill, it was travelling at too high a speed for it to be able to stop short of train 6L43 when the driver first sighted it.
- 23 Railway Group standard<sup>9</sup> GE/RT8000, the railway Rule Book, applies to work sites and train movements within them. The driver's duties are described in section 9 of Module T3, where it states that a train movement must be made 'at caution' in a possession. Section 25 of Module TW1 explains the meaning of driving 'at caution'; it states that when a driver is instructed to proceed 'at caution' they must, as well as not exceeding any speed specified, proceed at a speed that will allow the train to be stopped within the distance that they can see to be clear.
- 24 Train movements in work sites are not made under the control of a signalling system, but under the authority of the ES. The duties of an ES are described in Handbook 12 of the Rule Book. At the time of the accident, this stated that the ES must instruct the driver to make each 'movement "at caution" and to be prepared to stop within the distance that can be seen to be clear'<sup>10</sup>. Neither the driver nor the ES reported that the ES mentioned the need to drive 'at caution' when the ES briefed the driver in Penrith station.
- 25 In the current issue of Handbook 12 (Issue 3, dated June 2014) the requirement for the ES to tell the driver to make a movement 'at caution' has been removed on the basis that drivers know 'from their own rules that all movements within possessions (and therefore also work sites) must be made at caution'<sup>11</sup>.
- 26 The driver stated he was aware of the need to drive 'at caution' and to be prepared to stop within the distance that he could see to be clear.
- 27 Making movements 'at caution' requires drivers to be aware of the braking capability of the train so that they understand the stopping distance they need to allow for. When taking over a new locomotive-hauled train, like train 6L42, drivers are required to carry out a running brake test at the first opportunity to be sure that the brake is effective<sup>12</sup>. The driver reported undertaking this as part of the initial movement into Penrith station. He found nothing untoward and was aware that the brakes were set to 'goods' timings (paragraph 19) and therefore that it would take longer for them to fully apply than if set to 'passenger' timings. Railway Group standard GO/RT3056, 'Working Manual for Rail Staff – Freight Train Operations', states that the brakes on a Class 6 freight train like train 6L42, which can run up to 60 mph (96.5 km/h), can be set in either 'goods' or 'passenger' timings.

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<sup>9</sup> Railway Group standards are available at [www.rgsonline.co.uk](http://www.rgsonline.co.uk).

<sup>10</sup> The RAIB observes that later in Handbook 12 it states that the ES must tell the driver that 'the movement must be made at caution and at no greater speed than 5 mph through the site of work' if the ES has 'agreed that movements will only be made at caution' (within the work site). Note: 'site of work' is a specific place within a work site where engineering work is being carried out. In the case of work site F, it would apply to the points at the north end of Penrith station, and explains the reduced speed limit that the ES requested through this area.

<sup>11</sup> RSSB Rule Book briefing leaflet, June 2014.

<sup>12</sup> Rule Book Module TW1, section 4.

- 28 After the accident, the RAIB oversaw the examination and testing of the brake system on the train that was carried out by DB Schenker. On completion, DB Schenker reported that, although on some of the wagons the recorded brake cylinder pressures were lower than expected, on others they were higher. It concluded that overall the pressures were within acceptable limits and that this variation would not have contributed to the accident. The RAIB has drawn a similar conclusion given that the emergency brake was demanded only 19 seconds before the collision<sup>13</sup> and that, in ‘goods’ timings, sufficient brake cylinder pressure would not have established for long enough to have been effective<sup>8</sup>. The examination and testing did not identify any other untoward issues that were relevant.
- 29 Weather stations in the area<sup>14</sup> recorded no precipitation for the previous six hours, and the RAIB found no visible signs of rail head contamination on the immediate approach to the collision site. From this, in combination with an analysis of information recorded on the OTDR, the RAIB concluded there was no evidence to suggest that low rail head adhesion affected the braking of train 6L42. There was also no evidence that environmental conditions reduced the driver’s visibility of train 6L43, the driver reported there was no mist.
- 30 The RAIB surveyed the sighting on the Up Main line and estimated that the rear of train 6L43 would have come into view shortly after train 6L42 had passed over the *AWS magnet* for colour-light signal CE219 (figure 5). The locomotive’s OTDR recording showed that the driver had operated the emergency brake around a second after responding to the AWS cab warning he received, indicating that alertness and distraction were not factors in this accident. The driver also reported that he did not feel under any particular time pressure. Although he was aware that those engaged with the renewal work were tidying up and were keen for the engineering trains to leave, he was also aware that the possession was not due to be given up until 15:30 hrs and that he therefore had sufficient time for the movement he had to make.



Figure 5: Sighting of the location of train 6L43

<sup>13</sup> The driver demanded the emergency brake at 13:25:07 hrs (paragraph 18); the trains collided at 13:25:26 hrs (paragraph 20).

<sup>14</sup> At Carlisle (around 23 km north of Kitchen Hill) and at Shap (around 23 km south of Kitchen Hill).

31 The RAIB found no evidence that fatigue affected the driving of the train. The driver reported that he had been at home off duty the day before and felt rested when he booked on at around 10:00 hrs on Sunday 12 January at his depot in Motherwell. He travelled to Penrith by taxi.

#### Actions of the driver

- 32 The driver had understood that the marker boards were at Plumpton Loop (paragraphs 16 and 18). From his route knowledge and experience, he knew that, after passing through the reverse curve between Long Ashes and Kitchen Hill, there was a long straight before the point where he was expecting to see the rear of train 6L43. On passing Kitchen Hill access point, the driver would have had good visibility towards Plumpton Loop (figure 6). The loop is around 0.7 km long, and even had the marker boards been at the nearest (southern) end, there would have been more than sufficient distance, 2.5 km, for train 6L42 to brake from the speed at which it was travelling (28 mph (45 km/h) – paragraph 18) and stop short of train 6L43<sup>15</sup>.
- 33 The speed at which the driver controlled train 6L42 approaching Kitchen Hill was almost certainly influenced by his belief that the line ahead of what he could see was clear, based on what he had understood from the ES briefing.
- 34 The ES had briefed the driver that, once past the points at the north end of Penrith, he could expect the line to be clear all the way to the marker boards where he might expect to find train 6L43 parked (paragraphs 15 and 17). He therefore did not expect to encounter any obstruction that he would need to be aware of, and brake for, until approaching the rear of train 6L43. Since he stated he believed the marker boards to be at Plumpton he did not expect to have encountered train 6L43 so soon after leaving Penrith.
- 35 At the time of the accident, Handbook 12 of the Rule Book required the ES to give the driver instructions on the authorised speed during a movement<sup>16</sup>. This speed depends on the safe system of work agreed with the individuals responsible for each of the sites of work (see footnote 10) within the work site. The driver was told not to exceed 5 mph (8 km/h) passing the site of work where the signalling staff were still working. However, after this he was told he could travel at up to 40 mph (64 km/h) (paragraph 15), the maximum movement speed allowed in a work site. Being authorised to travel at up to this speed may have additionally suggested to the driver that the line ahead was clear up to Plumpton (where he had expected to see the rear of train 6L43).

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<sup>15</sup> Railway Group standard GM/RT2043, Brake system requirements for freight trains, requires that a freight train can stop within 401 metres from 30 mph on level track. The gradient profile between Kitchen Hill and Plumpton Loop varies between 1 in 187 (down) and level.

<sup>16</sup> These requirements were re-worded when Issue 3 of the handbook was published. However, with the exception of deleting the need to tell the driver to make movements 'at caution' (paragraph 25), the intent has remained essentially unaltered.

### Understanding of the location of the work site limits and train 6L43

- 36 Handbook 12 of the Rule Book requires that the ES gives the driver the 'exact location that the movement is to proceed to' and furthermore requires him to check that the driver has understood this<sup>17</sup>. However, as a result of his briefing the driver did not realise that the work site marker boards were at Kitchen Hill, but thought they were at a location three kilometres or so further on at Plumpton Loop (paragraph 16).



*Figure 6: View from the up cess at Kitchen Hill access point towards Plumpton Loop*

- 37 The ES and the driver did not reach a mutual understanding regarding the location of the work site marker boards (and where the driver could expect to find train 6L43 standing) and therefore where the movement was to proceed to. The driver was not aware of Kitchen Hill as a location. He stated that, when the ES told him that the marker boards were at Kitchen Hill, he wondered whether the ES was referring to Plumpton Loop and questioned whether this was correct. The ES stated that he had no recollection of the driver querying the location.
- 38 The requirement in the Rule Book to drive 'at caution' in work sites means that a knowledge of location is not necessary to avoid collisions (although this particular accident would have been avoided had the driver correctly understood the location of the work site marker boards). However, the RAIB observes that accurate location information is sometimes important for other reasons in work sites, for instance to know where different speed restrictions apply at sites of work (paragraph 35).

<sup>17</sup> These requirements remain the same in the current version of Handbook 12, Issue 3.

- 39 The driver stated that he knew where Plumpton Loop was and that marker boards had been sited there on previous occasions.
- 40 Various Network Rail sources of information list the names of locations on the railway. However, the same names are not always used to describe the same locations, and some locations that are well known to certain parties may not be referred to in reference documents used by others. The RAIB found this was the case with Kitchen Hill. Kitchen Hill is an official access point on the West Coast Main Line (figure 7) that local infrastructure staff would be familiar with. However, while both 'Long Ashes' crossing and 'Plumpton Loop' are referred to, Kitchen Hill is not listed in Network Rail's Sectional Appendix - one of the key documents that operations staff, such as drivers, use. Similarly, while 'Long Ashes', 'Kitchen Hill' and 'Plumpton' are all place names in Network Rail's Local Hazard Directory, some of them are used to define a number of different locations. Significantly, 'Plumpton' is used to describe places both north and south of Kitchen Hill access point.



Figure 7: Signage at Kitchen Hill access point

- 41 The ES stated that he had also told the driver the mileage of where the marker boards were. Although the driver stated he did not recall this (paragraph 16), they both stated that the ES had referred to the marker boards being about three miles<sup>18</sup> from Penrith station (paragraphs 15 and 17). Either piece of information could have been a clue to the driver that the boards were not as far away as Plumpton Loop. However, there is evidence that by this time the driver already had a picture in his mind of where the marker boards were, and that they were at Plumpton Loop.
- 42 Network Rail's possession management briefing pack showed that it had been planned to site the marker boards at Plumpton Loop (paragraph 8). The RAIB did not find that this, and the subsequent decision to relocate them (paragraph 11), was relevant to the driver's misunderstanding. The paperwork that DB Schenker had given him beforehand did not refer to this planned location and the driver's account did not indicate that he was aware of such a plan.

## Previous accidents

- 43 RSSB<sup>19</sup> has provided the RAIB with information on around 30 collisions involving trains and on-track machines and plant that have occurred in possessions since 2007. The RAIB has investigated a number of such events. The most recent of these was at Arley on 10 August 2012 and involved a collision between two on-track maintenance machines, a stoneblower and a stationary ballast regulator, within a long work site (around 16 km long). The investigation report (RAIB report 12/2013<sup>20</sup>) also includes summary findings of other investigations of particular relevance, including collisions at Badminton (October 2006) and Leigh-on-Sea (April 2008).
- 44 The investigation of the collision at Arley identified the following causal factors that are relevant to this bulletin:
- the driver did not control the stoneblower to a speed such that, on sighting the regulator, he was able to stop short of it; and
  - the stoneblower driver's speed of travel was probably influenced by his belief that the line was clear to his authorised stopping point<sup>21</sup>.

It also identified the following underlying factor:

- that, in the absence of controls to keep trains and plant apart, long worksites tend to increase the risk of collision.

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<sup>18</sup> The driver stated the ES told him three-and-a-half miles.

<sup>19</sup> A not-for-profit company owned and funded by major stakeholders in the railway industry, and which provides support and facilitation for a wide range of cross-industry activities. The company is registered as 'Rail Safety and Standards Board', but trades as 'RSSB'.

<sup>20</sup> RAIB reports are available at [www.raib.gov.uk](http://www.raib.gov.uk).

<sup>21</sup> In the collision at Arley, the driver correctly understood where he was authorised to move to, but was misled regarding the location of the regulator, an intermediate obstruction.

- 45 The RAIB made two associated recommendations to Network Rail. The following extracts from the RAIB report on the Arley accident are relevant to the accident at Kitchen Hill on 12 January 2014:

*Recommendation 1a (extract of Recommendation 1 in RAIB report 12/2013)*

*(Network Rail should) review (and implement the appropriate measures identified within a timebound programme) potential systems of work, and/or technical solutions, for reducing the risk of collision between trains when travelling to and from their sites of work. This review should include consideration of the following options:*

- i. greater use of the signalling system during engineering work for controlling the movement of trains;*
- ii. means for detecting the position of trains when normal signalling is suspended; and*
- iii. planning arrangements for engineering work that address the issue of simultaneous movements of trains travelling to and from their sites of work and which minimise the potential for such moves to bring trains in close proximity.*

*Recommendation 1b (extract of Recommendation 1 in RAIB report 12/2013)*

*(Network Rail should) review (in consultation with RSSB as appropriate) (and implement the appropriate measures identified within a timebound programme) permitted train speeds applying to movements in sections of line that are closed to normal traffic for engineering work, taking account of human factors affecting a driver's ability to judge the distance they can see to be clear, the stopping distance that can be achieved by their train's braking performance, the limitations of headlight illumination in darkness and a driver's route knowledge.*

*Recommendation 2ai (extract of Recommendation 2 in RAIB report 12/2013)*

*(Network Rail should review the equipment and protocols used by those managing possessions for communicating with train drivers to ensure that) drivers are provided with all the information they need to carry out movements safely. The review should consider the use of a standardised format so that any missing information can be readily identified and queried with the driver. In addition to information such as the authorised maximum speed of travel and the driver's treatment of signalling aspects, the format could also include confirmation that there are no vehicles obstructing the line to the driver's authorised stopping point.*

- 46 Insofar as the above recommendations relate to this bulletin, Network Rail has advised the RAIB that it is looking to identify improvements in the instructions for train movements and the communication between ESs (and PICOPs) and drivers (and machine operators); these are matters that arise out of recommendations 1b and 2ai. It has already held a joint workshop with representatives of the various stakeholders involved, including train and plant operators, RSSB (the authors of the Rule Book) and the Office of Rail Regulation (the safety regulator). Network Rail has advised that the actions being considered include:

- the production of an industry education video, using an accident scenario derived from the Arley and Kitchen Hill collisions, highlighting lessons concerning train speed control and reaching a clear understanding during communications;

- the development and trialling of an aide-memoire for PICOPs, ESs and drivers with the aim of confirming that instructions given for train movements are clear and understood;
- a proposal for RSSB to consider research into the driver's perception of suitable speeds when train movements are required to be made 'at caution';
- a proposal to review the requirements in the Rule Book concerning the permitted speeds in work sites and possessions;
- arrangements to record radio and mobile telephone voice communications and mentor staff on improvement; and
- efforts to better enable direct communication between responsible persons (eg ES and driver), and therefore removing the need for another person to act as an intermediary.

Network Rail has advised the RAIB that it is not considering developing and implementing any technical solutions that would address recommendation 1a. The Office of Rail Regulation has yet to report to the RAIB on the formal status of Network Rail's full implementation of recommendations 1 and 2 from the RAIB's investigation of the collision at Arley.

- 47 Network Rail also advised that it issued a brief for PICOPs and ESs after the collision at Arley that contained relevant learning points. The RAIB's investigation report (paragraph 43) includes further detail.

## Learning points<sup>22</sup>

- 48 This accident emphasises the importance of the previous recommendations 1b and 2ai from the RAIB's investigation of the collision at Arley (paragraph 45) with respect to the rules for permitted speeds in work sites (and possessions) and the related information given to drivers. The RAIB has not conducted any further investigation since it believes it unlikely that this would lead to the identification of any new recommendations.
- 49 However, the accident has highlighted the importance of the following two learning points:
- 1 that all movements of engineering trains (and on-track machines and plant) in work sites (and possessions) are made 'at caution' – this means that trains should **always** be capable of stopping in the distance ahead that the driver can see the line to be clear; and
  - 2 ESs (and PICOPs) are aware of the risks of misunderstanding railway place names and that they take the most appropriate measures to check that drivers (and machine controllers) clearly understand the locations associated with movements in work sites (and possessions).

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<sup>22</sup> 'Learning points' are intended to disseminate safety learning that is not covered by a recommendation. They are included in a report when the RAIB wishes to reinforce the importance of compliance with existing safety arrangements (where the RAIB has not identified management issues that justify a recommendation) and the consequences of failing to do so. They also record good practice and actions already taken by industry bodies that may have a wider application.

## Glossary of terms

AWS magnet	A magnet on the track that is used to activate a safety device in the cab warning the driver of the need to slow down or stop.
Down	At this location, in the direction away from London (northbound).
Engineering possession	A specific section of line that is closed to railway traffic to allow engineering work to take place on the infrastructure in accordance with Module T3 of the Rule Book (paragraph 23).
Engineering Supervisor (ES)	The person nominated to manage the safe execution of engineering work within a work site. This includes arranging the work site marker boards and authorising movements of trains into, out of and within the work site.
Mileage	Distance along the railway measured from a zero datum (see also footnote 5).
On-train data recorder (OTDR)	A data recorder fitted to a train that records information on the operation of the train and the status of on-board equipment, including speed and brake applications.
Person in Charge of the Possession (PICOP)	The competent person nominated to: establish the protection for an engineering possession (and its removal at the end); control the movement of trains between work sites and between the protection and work sites; liaise with the respective Engineering Supervisors regarding the passage of trains into and out of work sites; and liaise with the signaller regarding the passage of trains into and out of the engineering possession.
Points	A section of track with moveable rails that can direct a train from one track to another.
Stabled	Temporarily parked while not in use.
Tamping machine	An on-track machine that is used to lift and slew the track, and simultaneously compact the ballast under the sleepers, in order to maintain the geometry of the track.
Up	At this location, in the direction of London (southbound).
Work site	An area within an engineering possession where engineering work is carried out and associated movements of trains and plant may take place.
Work site marker boards	Signs, with flashing lamps, that are placed at each end of the work site, in the centre of the track, to delimit a work site where an engineering train is present.

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