



Rail Accident Investigation Branch

RAIB Bulletin 03/2015

Collision between a train and a wooden sleeper, near Somerleyton, Suffolk, 18 June 2015

Preface

- 1 The purpose of an RAIB investigation is to improve railway safety by preventing future railway accidents or mitigating their consequences. 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 On 18 June 2015 at about 05:50 hrs, a train struck a wooden sleeper lying across the track just after passing through Somerleyton station (figure 1), while travelling at about 35 mph (56 km/h). The train, reporting number¹ 5J61, was the 04:20 hrs empty coaching stock service from Norwich Crown Point depot to Lowestoft, comprising two class 170, three-car diesel multiple units. At the time the driver did not know what his train had struck and in response he applied the train's brake and brought the train to a stand.
- 3 After contacting the signaller and being given permission to go onto the tracks to examine his train, the driver found a wooden sleeper wedged underneath the front of the train. There were no injuries and there was only minor damage to the train.

Background information

- 4 Somerleyton station is located at 18 miles 0 *chains* (from a zero reference at Norwich station) on the railway line between Norwich and Lowestoft (figure 2a). At this location, the railway comprises the Up Lowestoft and Down Lowestoft lines (referred to as the up and down lines in this bulletin). Train 5J61 was travelling on the down line which has a maximum permitted speed of 60 mph (97 km/h).

¹ An alphanumeric code, known as the 'train reporting number', is allocated to every train operating on Network Rail's infrastructure.

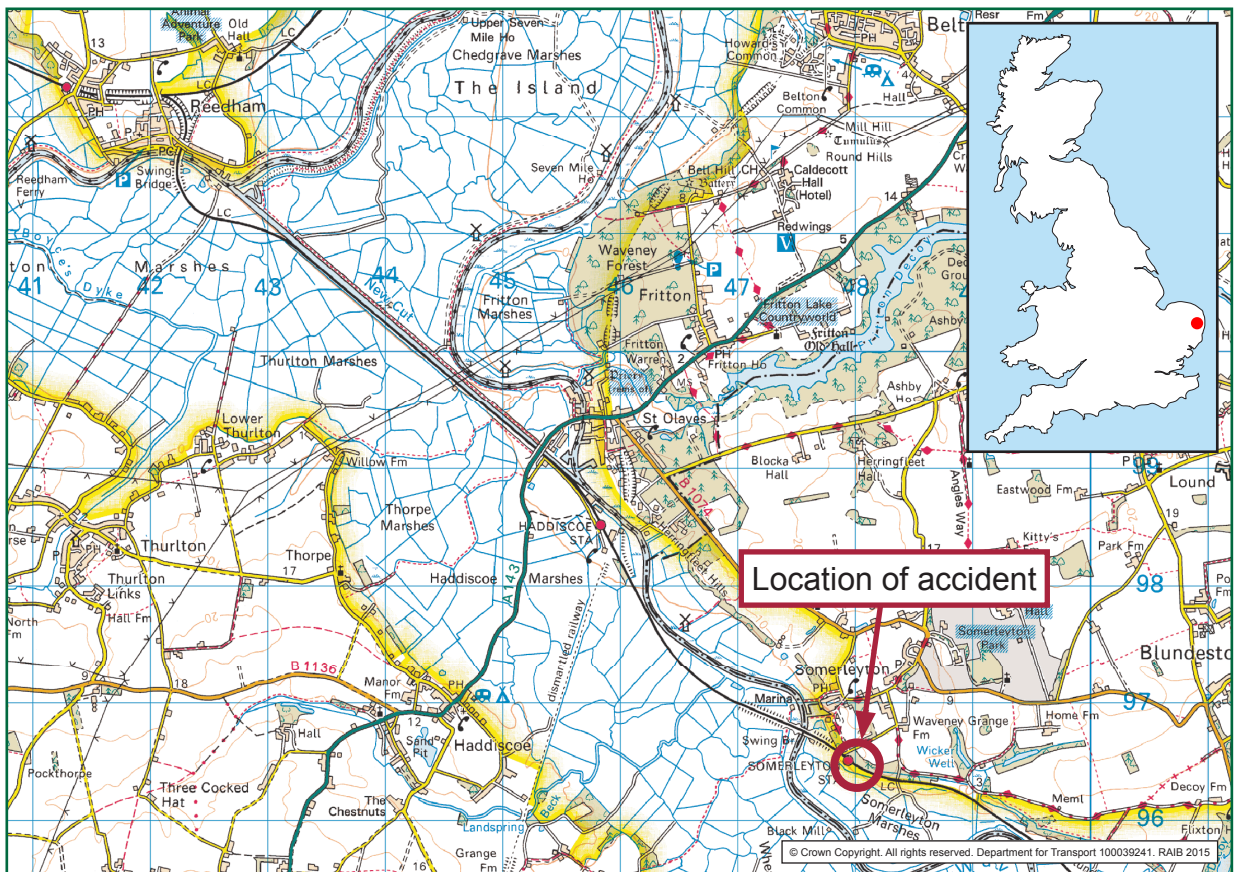


Figure 1: Extract from Ordnance Survey map showing location of accident

- 5 A crossover between the up and down lines is located on the Lowestoft side of the station at 18 miles 7 chains (figure 3). The points of the crossover can be moved using levers in a *ground frame*, which is located adjacent to the crossover. The ground frame is locked and the levers cannot be moved unless the signaller at Somerleyton signal box (figure 2a) gives permission by releasing them.
- 6 There is a station yard between the crossover and the station, which can be accessed from the down line (figure 2b). This yard is used by Network Rail to stable rail mounted equipment such as *road-rail vehicles* (RRVs) and trailers, and to store materials.
- 7 Network Rail had planned a *possession* of the railway between Reedham junction (at 12 miles 28 chains) and Lowestoft (at 23 miles 41 chains) from 00:15 hrs to 04:50 hrs on 18 June 2015 (figure 4). The possession plan called for two *work sites* to be set up. One of these work sites included Somerleyton, extending from 16 miles 75 chains to 23 miles 41 chains, which is up to the buffer stops at Lowestoft station (figure 4). The planned activity within this work site was for members of the local track maintenance team, based at Network Rail's Norwich depot, to collect scrap material from alongside the railway.

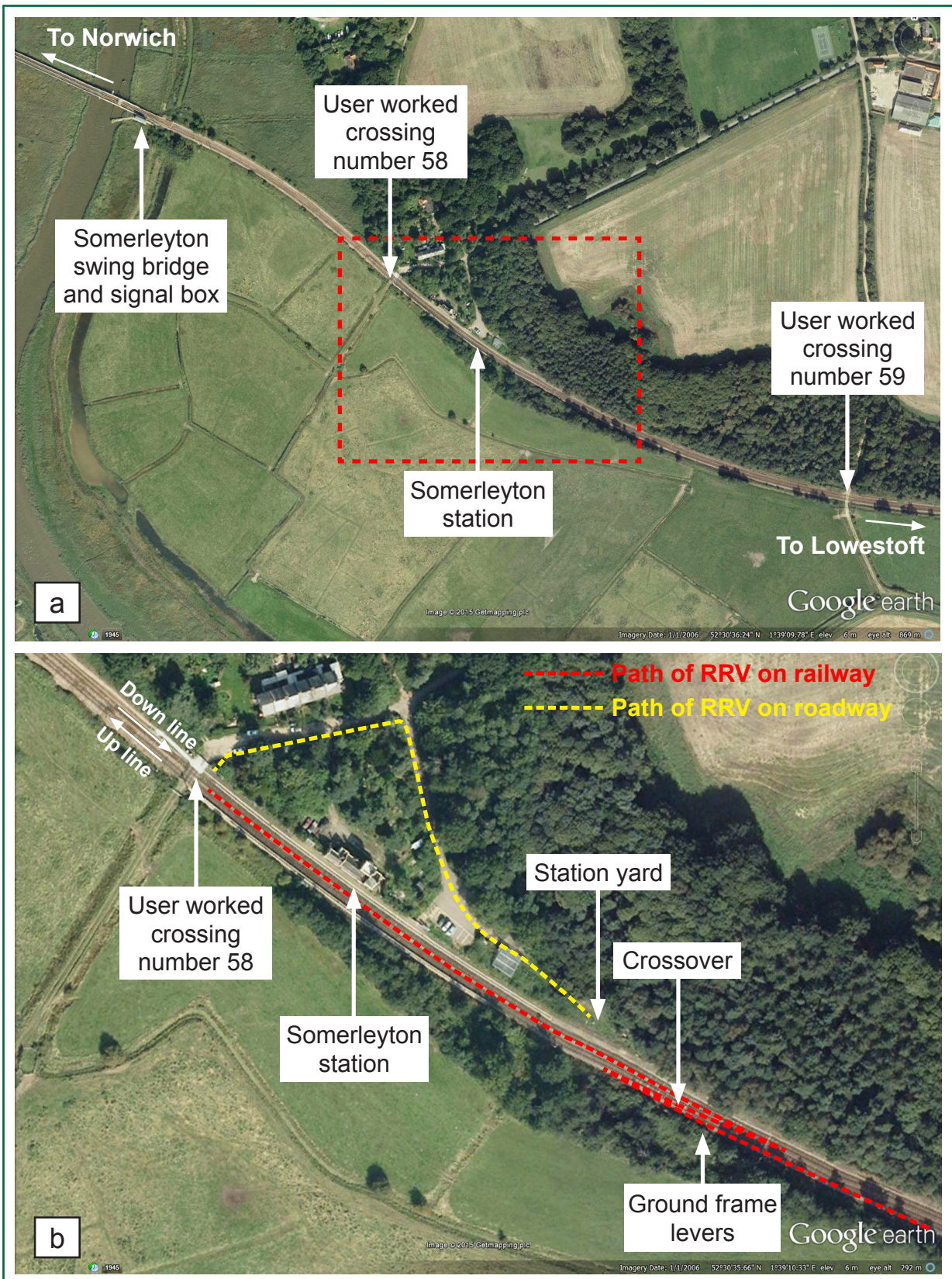


Figure 2: Layout at Somerleyton station

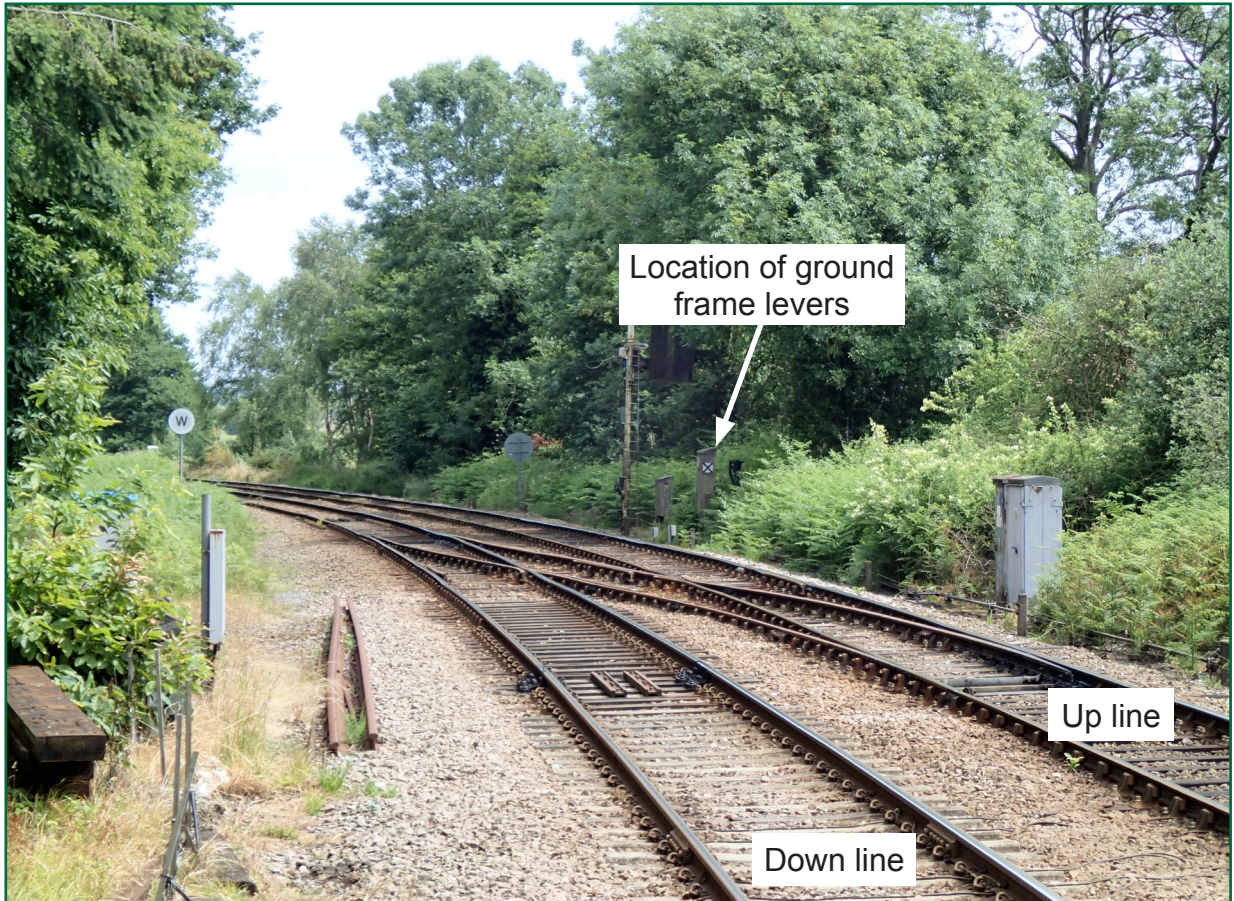


Figure 3: The crossover at Somerleyton station

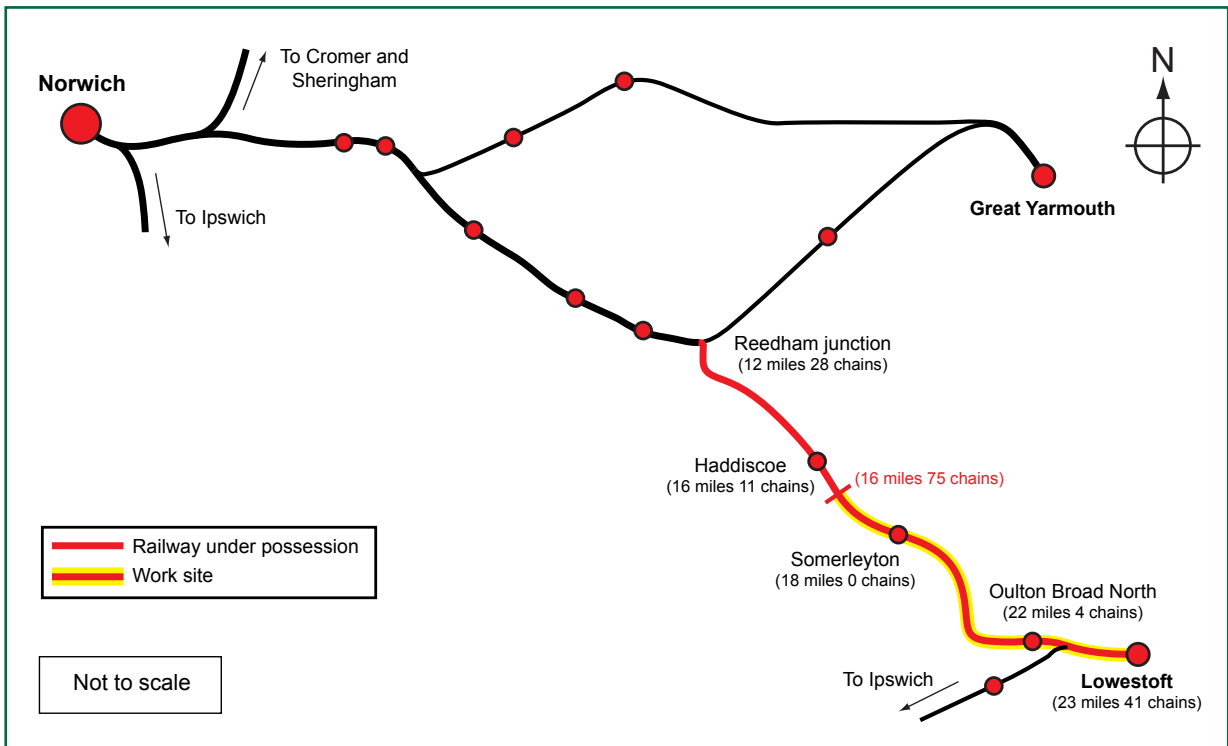


Figure 4: Map of area showing extent of possession and work site

- 8 The work required a RRV and two trailers to travel along the up line within the work site, collect the scrap, load it onto the trailers, and then take it back to Somerleyton. Here the scrap would be unloaded into the yard, ready for it to be taken away by road. The details of the work to be undertaken, the equipment to be used and the method of work were documented in a work plan known as the 'Authorised OTP/ALO Work Plan'². Part 1 of this work plan split the work into stages covering all the movements to be made by the RRV, from moving the RRV from the access point and placing it on the track, travelling, working within the work site, through to taking the RRV off the track and moving it to the egress point. The work plan assessed the hazards identified at each stage and described the control measures to be applied to mitigate these hazards. Part 2 of the work plan applied to the lifting operations that the RRV was to carry out. It included additional control measures that needed to be applied when lifting and loading the scrap onto the trailers.
- 9 The work was part of a Network Rail campaign to tidy up the railway by removing leftover scrap materials, such as used sleepers and rails. The local track maintenance team had been carrying out this type of work, on and off, over the previous six weeks on a number of lines within its area. This was the fourth night the team had been out collecting scrap that week. The base for the work on the first two nights was at Haddiscoe (figure 1), and moved to Somerleyton for the next two nights. The majority of scrap collected was old wooden sleepers, which had been stacked in bundles alongside the railway. These were sleepers that had been replaced over time as part of routine track maintenance work. Witness evidence indicated that some of these sleepers had been lying alongside the railway for up to eight years.
- 10 The following key people were involved in this work:
- The Person in Charge of the Possession (PICOP) who was the Network Rail employee responsible for taking the possession, arranging the protection for the possession, giving permission for work sites to be set up, allowing work to start within them, and giving up the possession.
 - The Engineering Supervisor (ES) who was the Network Rail employee responsible for setting up the work site, agreeing with the Controller of Site Safety (COSS) the limits of the site of work, the nature of the work and the safe system of work to be used, authorising movements by the RRV within the work site and giving up the work site.
 - The Machine Controller (MC) who was the Network Rail employee responsible for the safe operation of the RRV by controlling all of its movements, including getting the RRV on and off the track, lifting operations and loading of the trailers. The MC was also the COSS for the work. The COSS was responsible for setting up a safe system of work for the activity that was taking place.
 - The Machine Operator (MO) who was employed by a provider of rail plant and equipment, and responsible for operating the RRV, under instruction from the MC.

² The Authorised OTP/ALO Work Plan describes all of the planned work to be undertaken using a RRV, all of the equipment to be used, the hazards associated with doing the work and the control measures that need to be put in place to mitigate the risk presented by the hazards. It also covers any lifting operations carried out by the RRV. A planner prepares it and issues it to the Machine Controller (see paragraph 10).

- 11 Network Rail hired in the RRV, trailers and the MO from a rail plant provider. The RRV was a 360° excavator with a single seat cab offset to the left (figure 5). It had a two-piece boom, to which various attachments could be connected for the lifting of materials. The RRV was supplied with a log grab for lifting the scrap sleepers that were being collected. Network Rail also hired two 20 tonne flatbed trailers (figure 5) which could be coupled to the RRV. These were for carrying the scrap sleepers back to Somerleyton.



Figure 5: The RRV and trailers (image courtesy of Network Rail)

RAIB investigation findings and analysis

- 12 On 17 June 2015, the MC and ES started their night shift at Norwich depot at 22:00 hrs and arrived at Somerleyton at about 23:30 hrs. The MO was already there. While waiting to access the railway, the MO and MC checked the RRV and trailers prior to using them. At 00:45 hrs, the PICOP called the ES and told him the possession of both railway lines between Reedham junction and Lowestoft was in place. The PICOP then gave the ES permission to set up his work site. The ES did this by placing *work site marker boards* on both lines at about 17 miles 10 chains, which was about half a mile beyond Somerleyton *swing bridge* (figure 2a). The ES then gave the MC permission to on-track the RRV and trailers onto the down line.

- 13 The MC took the RRV via the road to *user worked crossing* number 58, on-tracked it and travelled to a point opposite the yard (figure 2b). Here, the RRV was used to lift and place a trailer either side of it, each trailer was coupled up and tested, and the MO attached the log grab to the end of the RRV's arm. The ES then contacted the signaller at Somerleyton Swing Bridge signal box and the signaller released the ground frame. The ES moved the points to allow the MC to move the RRV over the crossing and onto the up line. The MC and MO then set off with the RRV on the up line, heading east towards Lowestoft. By this time it was just after 01:00 hrs. The ES returned to his vehicle and set off towards Lowestoft, where he joined the rest of the local track maintenance team that was carrying out work near to Lowestoft station.
- 14 While travelling along the up line, the MC looked out for bundles of wooden sleepers alongside the railway. Most bundles comprised about 20 sleepers. The sleeper bundle locations were not recorded anywhere so the MC needed to spot them as they went. This was difficult for the MC as it was dark and some bundles were overgrown with vegetation. Once a bundle was located, the MC stopped the RRV and instructed the MO to pick up the bundle. The MO used the log grab to pick it up and drop it onto one of the trailers as directed by the MC. Banding had been placed around the bundles but this often broke when the bundle was picked up (figure 6). The MO loaded the sleepers across the trailers, in a pyramid shape, with its peak towards the trailer's centre. It is common practice for sleepers to be loaded in this way.



Figure 6: Broken banding around the sleeper bundles

- 15 The MC reported they had travelled about 1.5 miles (2.4 km), when he decided that they had loaded enough sleepers onto each trailer. The MC estimated they had about 60 sleepers on each trailer, up to a height of about 1.2 metres in the centre. The awkward loading and bulk of the sleepers limited how many sleepers were placed on each trailer. The MC and MO headed back to Somerleyton with the RRV cab turned to face in the Norwich direction.

- 16 The MC reported that he walked in the cess, ahead of the leading trailer, alternating his gaze between looking ahead, maintaining visual contact with the MO and looking towards the rear trailer to monitor its load. As they approached Somerleyton, near to user worked crossing number 59 (figure 2a), the MC noticed some sleeper bundles that they had missed on the way out. They stopped by each one, picking it up and loading the sleepers onto the trailers.
- 17 The RRV continued to Somerleyton, crossed over to the down line, and stopped adjacent to the yard. Once there, the MO unloaded the sleepers from the trailers into the yard. The trailers were then uncoupled and lifted by the RRV into the yard. At about 03:00 hrs the ES arrived back at Somerleyton and could see the RRV by the unloading point. The ES walked down and spoke to the MC who explained that he was almost finished.
- 18 The ES checked the points, confirmed with the signaller that the points were detected in the correct position and then handed control of them back to the signaller. Meanwhile the MC accompanied the RRV through the station to user worked crossing number 58 where it was taken off the track. The RRV went back to the yard by road. Once back in the yard, the RRV was used to move the trailers away from the down line and tidy up the wooden sleepers into a pile ready to be collected (figure 7). At 03:47 hrs the MC informed the ES that work was complete and that he, the MO and all equipment were clear of the line.



Figure 7: The scrap wooden sleepers piled up in the yard

- 19 At 03:56 hrs the ES called the PICOP to advise that he was ready to hand his work site back. The PICOP asked the ES to wait until a vehicle in another work site was out of the possession before he took his work site marker boards off the track. In the meantime, the ES began walking to where the work site marker boards were located. About five minutes later the PICOP called the ES to say he could now remove his boards. The ES arrived at the work site marker boards and took them off both lines, noting the time was 04:08 hrs. The ES then returned to Somerleyton. The PICOP handed the possession back at 04:30 hrs, allowing trains to resume running over the up and down lines.
- 20 Shortly afterwards, at 04:42 hrs, train 5J61 departed from a siding at Norwich and began its journey towards Lowestoft. At about 05:08 hrs the train passed through Somerleyton station on the down line travelling at about 35 mph (56 km/h). Just after passing the station the driver reported hearing a loud bang due to his train striking something. The driver applied the train's brake and brought the train to a stop. The train stopped at about 18 miles 30 chains.
- 21 The driver reported this to the signaller, and once the signaller had taken steps to stop any trains from passing on the adjacent line, the driver got out and examined the train. The driver, who was accompanied by a second driver, found a wooden sleeper wedged under the front. They removed it and after looking around the rest of the train they found another two sleepers nearby. One was lying in the track under the train and another was lying on user worked crossing number 59 behind the train (figure 8). There were no marks on these sleepers to indicate that either had been struck by the train.
- 22 The driver decided that the train was fit to move and continued to Lowestoft at a reduced speed. Here it formed a passenger train back to Norwich with the damaged vehicle now at the trailing end of the train. Upon arrival back at Norwich, engineering staff inspected the train and saw the damaged *lifeguards* (figure 9). Due to this damage, the train was taken out of service and moved to Norwich Crown Point depot.

RAIB investigation findings and analysis

- 23 The collision happened because a scrap wooden sleeper had fallen from one of the trailers and landed across the rails of the down line during the work. No one involved in carrying out this work had realised this had happened, and the line was handed back when it was not safe for the passage of trains.
- 24 Based on witness evidence, photographs of the sleepers as found afterwards and data recorded by the train, the three sleepers fell onto the down line in the vicinity of user worked crossing number 59. This is most likely to have happened when the sleeper bundles found on the way back to Somerleyton station were loaded onto the trailers (paragraph 16). Had these sleepers fallen off a trailer earlier while travelling away from Somerleyton, it is likely that the MC would have noticed them on the way back. The sleepers found on the track either fell from the top of the trailer when they were loaded onto it, or these sleepers were accidentally knocked off the trailer when the bundles near to the user worked crossing were loaded.

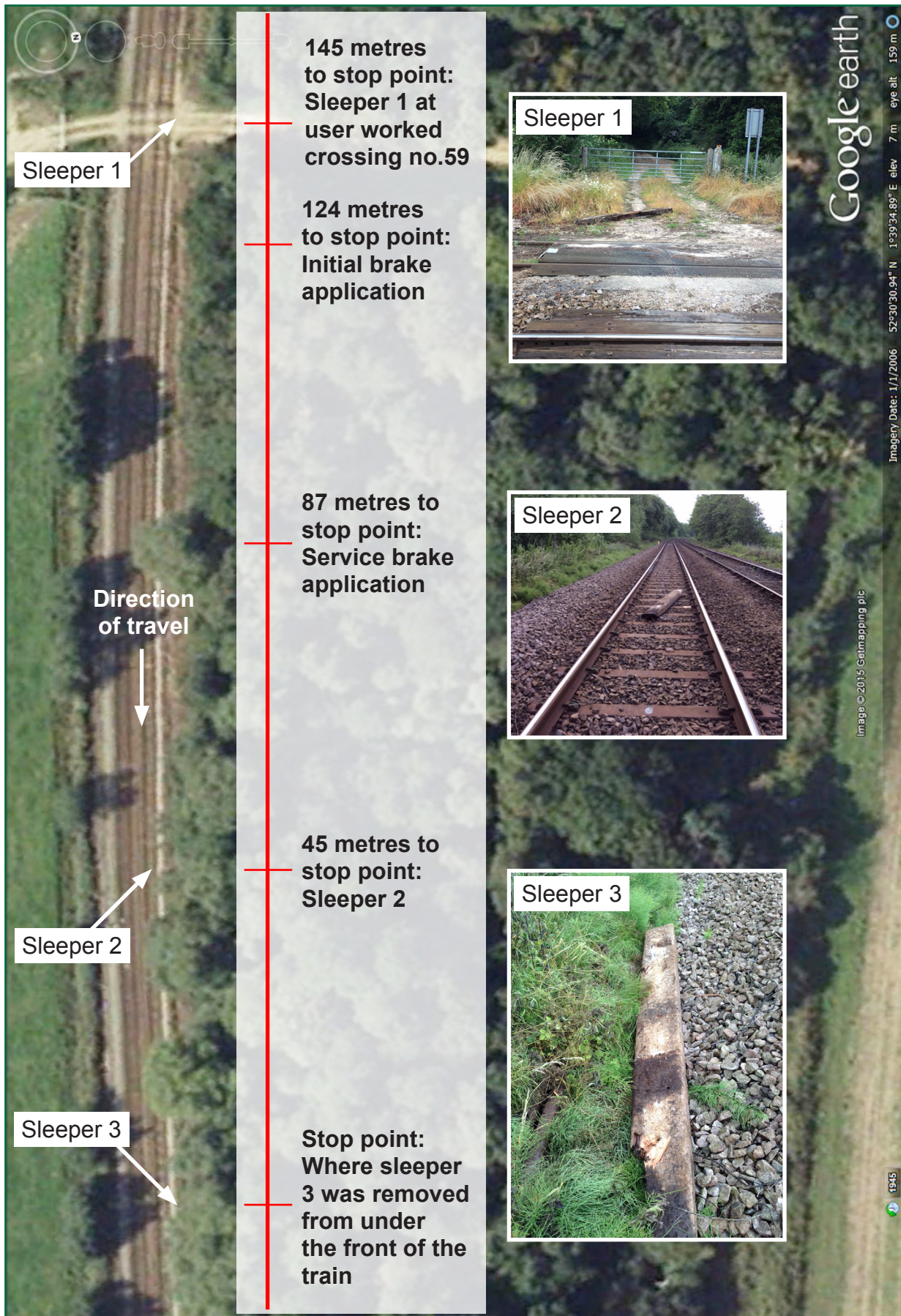


Figure 8: The wooden sleepers found on the track afterwards (inset images courtesy of Network Rail)

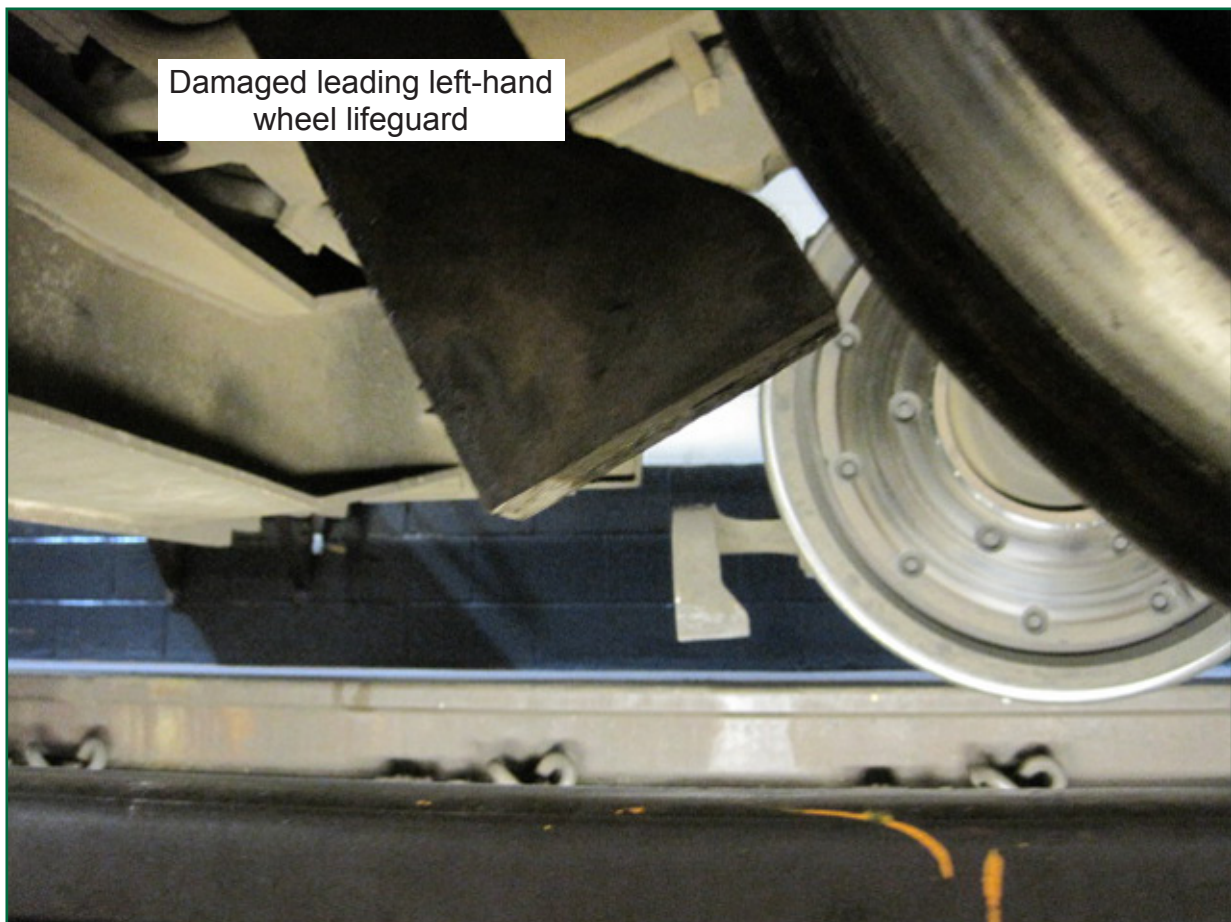


Figure 9: Minor damage to the train (image courtesy of Abellio Greater Anglia)

Method of work

- 25 The method of working that was adopted for collecting the scrap sleepers did not ensure that sleepers would not fall off the trailers, or if they did, that these sleepers would be noticed.
- 26 The sleepers were loaded onto flatbed trailers which did not have any sides to retain their load and the MC did not use any other means, such as straps, to secure the sleepers. There was no requirement in the *Rule Book* (GE/RT8000) for the MC to secure the load and there was no control measure documented in the work plan that required the MC to secure the load on the trailers.
- 27 The MC was required to use a tally sheet in the work plan to record how many sleepers were loaded onto each trailer. The tally sheet would have allowed the MC to keep a count of the number of sleepers loaded and check that the same number of sleepers were unloaded from the trailers. Any discrepancy would indicate to the MC that sleepers may have fallen off at some point. The MC did not use a tally sheet that night because many of the sleepers broke into pieces when they were picked up as they were very old and rotten, which made it difficult to maintain a count. The old sleepers also created a lot of dust when picked up, so the MC stood well away from the trailers to avoid this. This also made it difficult for him to maintain an accurate count.

28 The method of working followed that night also meant it was difficult for the MC to check that no sleepers had fallen off the trailers as they moved along. The MC could not see the far side of the rear trailer as it was in a blind spot (figure 10). Additionally, the position of the RRV's boom next to the cab meant the MO could not see that side either.

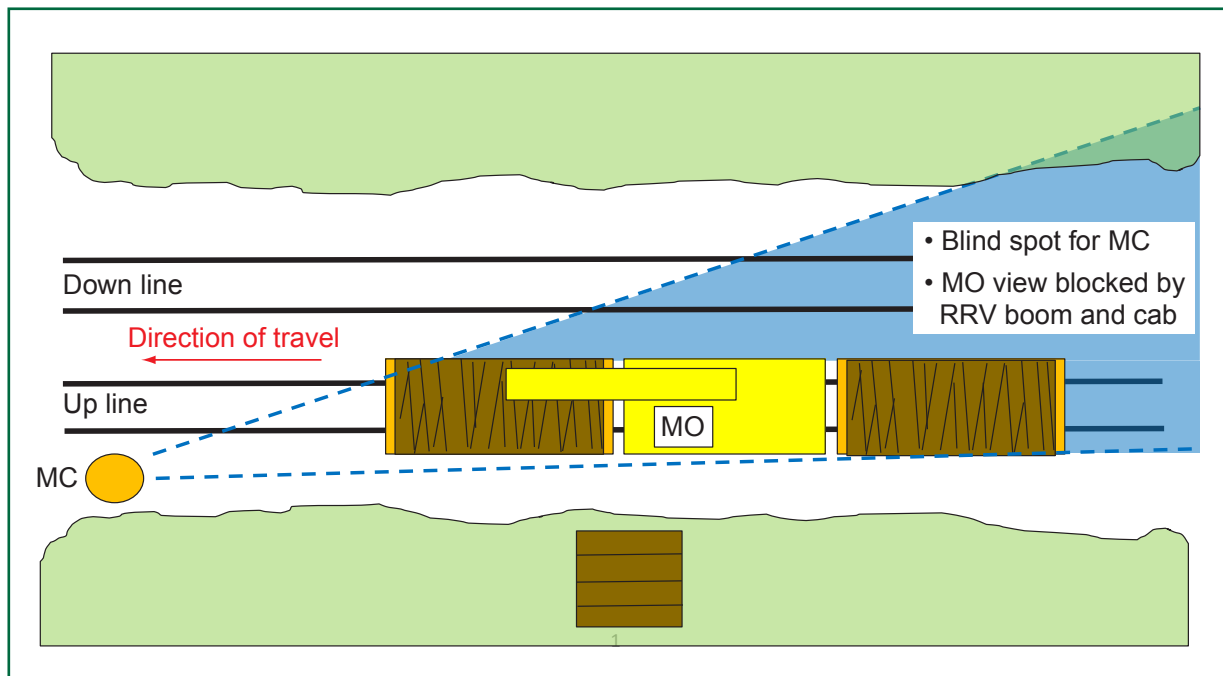


Figure 10: The MC's view of the trailers while travelling

- 29 The work plan had identified that sleepers could fall off the trailers and included a specific control measure which stated 'MC to arrange staff to walk behind machine between pick up points to make sure that nothing falls off trailer'. The MC was aware of the requirement to have an additional person to assist but there was no one available to do this as all of the other members of the maintenance team were working at Lowestoft station (paragraph 13). The MC had not had anyone walk behind the trailers on other occasions when collecting scrap sleepers. Therefore he decided to proceed with the work as planned and monitor the rear trailer as best he could (paragraph 16), rather than invoke Network Rail's *work safe procedure* or alter the planned work (eg use just one trailer that would be easier to monitor).
- 30 The MC did not have any concerns that night that anything might have fallen off the trailers. On previous occasions, when the MC had been unsure, he had walked the track afterwards to be sure that it was clear and safe for the passage of trains. Had he decided to do this that night, he would not have had time to walk all of the track before the work site was due to be handed back.

Compliance with the Rule Book

- 31 The Rule Book (GE/RT8000) defines the responsibilities of the PICOP, ES, COSS and MC when the railway is handed back at the end of engineering work for the passage of trains. GE/RT8000/HB9, Handbook 9 'IWA or COSS setting up safe systems of work within possessions', required the MC (who was also the COSS) to tell the ES when he and his group were no longer on or near the line. The COSS is then required to sign the ES's work site certificate. The MC did this at 03:47 hrs (paragraph 18). This duty on the COSS relates to people rather than checking that no equipment or anything else has been left on the line.
- 32 GE/RT8000/HB12, Handbook 12 'Duties of the engineering supervisor (ES) or safe work leader (SWL) in a possession' defines what the ES must do once every COSS has signed the work site certificate to confirm that they no longer need the ES's protection. The ES must contact the PICOP and ask for permission to remove the work site marker boards once the line is clear of all engineering trains or on-track plant such as RRVs and every COSS no longer needs the protection. The ES did this at 03:56 hrs (paragraph 19). After being given permission by the PICOP and removing the work site marker boards, GE/RT8000/HB12 states that the ES must 'tell the PICOP that, as far as you are concerned, the line is safe and clear, and your work site is given up'. This happened at 04:08 hrs (paragraph 19). There was no requirement on the ES to check that the line within his work site was safe and clear. Even if he had wanted to, he did not have time to do this after arriving back at Somerleyton station, because the work site was over 6.5 miles (10.5 km) long. Instead, he was reliant on the MC leaving the line safe and clear. Witness evidence suggests that this is common practice.
- 33 GE/RT8000/HB11, Handbook 11 'Duties of the person in charge of the possession (PICOP)', defines the PICOP's role in giving up the possession. The PICOP gives the ES permission to remove the work site marker boards once the ES has given an assurance that work is complete at their work site. The PICOP will then follow the process to give up the possession, which was completed at 04:30 hrs (paragraph 19). At this point the PICOP will tell the signaller that the line is clear and safe for trains to run on. The PICOP was reliant on the ES telling him this, who in turn was reliant on the MC.
- 34 The RAIB has concluded that it was possible for all staff to have followed the requirements of the Rule Book, and yet the line be left unsafe for the passage of trains. The RAIB has previously identified the absence of a clearly defined responsibility for checking the safety of the line in its investigation of an accident in Watford tunnel, when a train struck an equipment cabinet door. Recommendation 2 of the report ([RAIB report 12/2015](#)) addresses this.

Similar incidents

- 35 The RAIB is also aware of a similar incident where sleepers fell off a trailer near Topsham on the Exmouth branch, Devon, on 23 April 2009. The first train to run along the branch line after engineering work had taken place struck three wooden sleepers.

- 36 During the previous night, a RRV with a trailer attached to each side of it had been used to collect scrap wooden sleepers. The sleepers that the train had struck had fallen from the rear trailer when the RRV headed back to the access point for the work. As at Somerleyton:
- the sleepers had been loaded onto the trailers in a pyramid shape;
 - the load was not contained or secured on the trailers;
 - the sleepers had been banded but the banding broke when the sleepers were loaded;
 - some sleepers broke into pieces when lifted due to their poor condition; and
 - the poor condition of the sleepers made it impractical for the MC to count the number that were loaded.
- 37 Network Rail's local investigation into the collision at Topsham identified local actions related to non-compliances with standards. It did not consider whether the risk of the sleepers falling off the trailers should have been identified during the planning stages and covered in the work plan. However, this risk was identified during the planning of the work at Somerleyton but the control measure was not implemented (paragraph 29).

Actions taken afterwards

- 38 Network Rail's Ipswich Delivery Unit issued a safety bulletin on 26 June 2015. This reminded MCs to count loads using a tally sheet. If the materials are too difficult to count then the MC must monitor the load from a position where the load can be observed in transit. If a second trailer is to be used then a second person must be considered and appointed to monitor the trailer. If a suitable person cannot be appointed then the second trailer cannot be loaded.

Learning points

39 The RAIB has identified the following key learning points³:

- 1 Network Rail needs to remind its staff who plan work involving the lifting and transporting of loads on trailers, that control measures should be specified in the authorised work plan. This is particularly important where flatbed trailers are to be loaded with sleepers stacked in a pyramid shape. Network Rail also needs to remind its staff who are responsible for carrying out the planned work that these control measures should be implemented in full. If loads are to be carried on trailers, and the authorised work plan calls for a person to be appointed to monitor the load on each trailer, Network Rail should resource this control measure or provide the MC with a modified authorised work plan with control measures that can be put in place by the MC. This would prevent MCs being faced with situations where they either have to continue work without the control measure being in place, deviate from the authorised work plan so that they try to manage the risk themselves, or invoke Network Rail's work safe procedure and not carry out the work at all.
- 2 This accident reinforces the need for the Rule Book (GE/RT8000) to be reviewed with the objective of clarifying the responsibilities for ensuring the safety of the line at the conclusion of engineering work (this issue is already identified in recommendation 2 of the RAIB's investigation into an accident in Watford tunnel (RAIB report 12/2015)).

³ '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

Chain	A unit of length equal to 66 feet or 22 yards (20.1168 metres). There are 80 chains in one standard mile.
Crossover	A short section of connecting track, with points at both ends, that permits trains to move from one line to another.
Ground frame	A small group of signal and points levers or a switch panel located close to a facility such as a crossover. These levers or switches are locked by the controlling signal box, and are only released for operation when required.
Lifeguard	A heavy metal bracket fitted immediately in front of each wheel at the leading end of a vehicle, with one over each rail, to deflect small objects away from the path of the wheels.
Possession	Period of time that a section of the railway is blocked to service trains so that engineering work can be safely carried out.
Road-rail vehicle (RRV)	A road vehicle that has been adapted to make it capable of running on railway track as well as on the road.
Rule book	A document describing the duties and responsibilities of staff and the regulations in force to ensure the safe operation of the railway.
Swing bridge	An underbridge that has one or more spans which rotate to provide an unobstructed opening for the passage of ships.
User worked crossing	A private level crossing, usually protected by outward opening crossing farm type gates. Many are fitted with telephones which users crossing in a vehicle, or with animals, are required to use to obtain the permission of the signaller to cross.
Work safe procedure	A Network Rail procedure that allows its employees who consider their, or others', safety to be at risk to stop work and explain why to the person in charge. The person in charge should then make an assessment of the situation and determine the course of action required. Once agreement is reached that there has been a suitable and sufficient risk assessment of the task and the system of work is safe, work can restart. If no agreement can be reached, work will not be restarted and the person in charge consults their manager to agree when the work can be made safe, when staff can return and assigns them to other work in the meantime.
Work site	The subdivision of a possession that is delimited by boards with lights to show its entry and exit points within the possession. It is controlled by an engineering supervisor who manages the safe execution of work within it.
Work site marker board	A board with lights used to denote the entry and exit point of a work site within a possession.

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